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Abstract

In this paper, we conduct an econometric analysis of the links of on-the-job training (OJT) and worker remuneration in the area of Tunis using a case study data based on eight firms. We pay particular attention to the way the OJT cost may be shared between firms and workers. This is done through analyzing the sign of various OJT variables and different wage information. This is important because training costs may be a major obstacle to intra-firm human capital accumulation in Tunisia. However, in this emerging economic context where severe tensions are present on the labor market, firms may be tempted to extract most of the labor relation surplus by having workers implicitly paying for their within-firm training. Our estimates show that: (1) The duration of former OJT negatively influences starting wages, while there is no anticipated effect of future training on wages at the firm entry; (2) Current wages are positively affected by former OJT but negatively affected by ongoing OJT; (3) trend factors seem to affect the influence of OJT on wages growth; (4) OJT main determinants are education, gender, family situation and firm characteristics, but neither experience nor tenure. Overall, our estimation results are consistent with popular human capital theory and broader OJT cost sharing theories. They suggest that firms bear much of the cost of OJT, which may jeopardize their profitability. Public subsidies for OJT programs may be an appropriate policy response. However, the latter are sustainable only if they are supported by adequate public education systems, allowing efficient OJT within firms.

JEL Classification: J24, J31, O12.

Keywords: wage, on-the-job training, matched worker-firm data, Tunisia.

ملخص

نقوم في هذه الورقة بإجراء تحليل اقتصادي قياسي لربط التدريب أثناء العمل (OJT) وأجر العامل في تونس باستخدام بيانات دراسة حالة على ثماني شركات. ونولي اهتماما خاصا للطريقة التى تشترك كل من الشركات والعمال في تكلفة OJT . ويتم ذلك من خلال تحليل مجموعة من المتغيرات الخاصة ب OJT ومعلومات عن الأجور. هذا أمر مهم لأن تكاليف التدريب قد تكون عقبة رئيسية أمام تراكم رأس المال البشري داخل الشركات في تونس. ومع ذلك، وبسبب التوترات الحادة موجودة في سوق العمل في سياق الاقتصاديات الناشئة، قد يحث الفائض من قبل العمال بعض الشركات لاستخدامه بعد أن يدفع العمال تكلفة تدريبهم ضمنيا داخل الشركات. تظهر تقديراتنا أن: (1) مدى التدريب أثناء العمل السابق يؤثر سلبا على الأجور الأساسية، في حين أنه لا يوجد أي تأثير متوقع من التدريب في المستقبل على الأجور في وقت دخول الشركة، (2) تتأثر بشكل إيجابي الأجور الحالية من قبل التدريب السابق ولكن تتتأثر سلبا بالتدريبات الجارية (3) بعض التوجهات تؤثر إلى حد كبير على نمو الأجور، (4 المحددات الرئيسية للتدريب هي التعليم والجنس والوضع العائلي وخصائص الشركة، وليست الخبرة ولا المنصب. وعموما، نتائج تقديرنا تتسق مع شعبية نظرية رأس المال البشري ونظريات تقاسم التكاليفOJT عموما . فهي تشير إلى أن الشركات تتحمل جزءا كبيرا من تكلفة التدريب أثناء العمل، والتي قد تعرض ربحيتها للخطر. الدعم العام لبرامج التدريب أثناء العمل قد يكون سياسة مناسبة. ومع ذلك، فان الأخيرة لا تصبح مستدامة إلا إذا كانت مدعومة بنظم تعليم عام ملائمة ، مما يسمح ببرامج تدريب كفء داخل الشركات.

1. Introduction

1.1 The issues

In this paper, we conduct an econometric analysis of the links of on-the-job training (OJT) and worker remuneration in the area of Tunis using a case study data based on eight firms. OJT involves training provided by the firm. It may occur under very diverse forms such as well-organised training by co-workers, formal courses or practical exercises. However, it is distinct from mere imitation or learning-by-doing, which are more associated with tenure. We pay particular attention to the way the OJT cost may be shared between firms and workers. This is done through analysing the sign of various OJT variables and different wage information. This is important because training costs may be a major obstacle to intra-firm human capital accumulation in Tunisia. However, in these emerging economic contexts where severe tensions are present on the labor market, firms may be tempted to extract most of the labor relation surplus by having workers implicitly paying for their within-firm training.

Our approach to the issues is to examine together wages and OJT. The relationship between human capital and earnings has been studied through wage equations by using regressors that describe education, training and other skills generated by work experience. Indeed, beyond formal education, other acquired skills may affect remunerations. For example, Dickerson and Green (2002) show in Britain that most generic skills, except physical skills, have a substantial and growing impact on wages over and above the traditional human capital indicators such as education and experience. Focusing on OJT has several advantages. First, OJT, work and wage setting decisions are nearer in time than general education and work. This should help when investigating their links. Second, OJT can often be simultaneously observed along with work performance and the type of tasks carried out. Third, OJT allows firm and workers' skills to promptly adapt to the changing economic environment. In the meantime, observers can capture the instantaneous cost sharing of OJT between the firm and the worker.

1.2 Previous empirical literature

Since the end of the 1970s, several empirical studies of the interactions of OJT and wages in developed countries are available in the literature, even though few surveys collect information on OJT (as stated in Lynch 1992; Dearden et al. 2006; Frazis and Loewenstein 2003). Most of these studies control for firm or employer size, but they are not able to control for both observed and unobserved firm characteristics through the use of firm dummies. As a matter of fact, to our knowledge, the only study to introduce firm effects in developing countries is Kahyarara and Teal (2008). One persistent question in this literature is whether OJT positively (presumably because of productivity gains), negatively (perhaps because of compensation imposed by the firm for this training service), or insignificantly affects wages.

In a seminal article, Barron, Black and Lowenstein (1989) argue for an ambiguous relationship between training and starting wages. In theory, there are reasons why this could be so. On the one hand, standard human capital theory indicates that workers should share training costs through lower wages. On the other hand, higher ability workers that are able to command higher wages should often be matched to positions offering more training. Using a survey of U.S. workers in entry-level positions, they find no significant OJT effect on starting wage and a positive significant effect on subsequent wage growth.

Lynch (1992) also found such a result of positive impact of OJT on wages. Using a longitudinal data set on younger workers in the U.S., she finds that OJT is concentrated among white married unionized males with longer work experience. Lynch's wage equations examine starting wages of young workers; in the results, all training measures (including

ongoing or former OJT in the firm) positively affect wages, except off-the-job training and OJT in a previous job.

Moreover, the impact of training variables is found to be larger than the insensitive impact of tenure on wages. Lynch concludes from her findings that there was no significant *negative* effect of OJT on wages and that OJT is mostly job specific.

Similarly, comparing British and US youths, Blanchflower and Lynch (1994) find that OJT contributes to raising wages in both countries, while no significant return is found for women in the UK. Using UK data, Dearden, Reed and van Reenen (2006) also find that work-related training is associated with higher productivity significantly. In the same vein, using data from the personal records of a large US company, Bartel (1995) finds that OJT significantly and positively affects wage growth. Using the same survey as Lynch, Loewenstein and Spletzer (1996) find that most wage growth beyond the first year of tenure is due to OJT, even sometimes late in the working life. Finally, using data from two US companies, Krueger and Rouse (1998) find a small positive impact of an OJT program on wages in one of the companies, and no impact in the other one.

However, Barron, Berger and Black (1998), challenge Lynch's conclusions of OJT specificity. Using two U.S. surveys of employers and focusing on the last worker hired, the authors argued that training lowers starting wages when workers' unobserved ability differences could be controlled for, although with small estimated coefficients.

One common feature of the works of all these authors is that they are all based on small samples of workers or firms. We share this limitation due to the difficulty of gathering information about training, firm and worker characteristics as well as about both starting and current wages.

Parent (1999) avails himself of a larger sample, although taken from the same survey of young workers as the one used by Lynch. He finds that OJT with the current employer has a negative effect on starting wages, but not on current wages. He interprets this effect as evidence that workers may be paying part of their OJT through lower wages at the entry in the firm. He also claims that employers reward skills acquired through training with previous employers as much as they do for OJT in the current firm. Employers react to market pressures by setting wages at market level with no premium paid for the firm-specific productivity of the trained worker. On the whole, it seems that firms alone largely incur OJT costs

For Africa, the literature is scant partly due to the lack of appropriate data on OJT, wages and worker characteristics. Using firm data from five African countries, Dabalen, Nieben and Rosholm (2003) find that firms pay for and provide general and specific training, especially to the best-educated workers. They find that trained workers receive significant wage premiums. Kahyarara and Teal (2008) use panel data for workers in Ghanaian and Tanzanian manufacturing firms respectively. They exhibit a positive effect of former job training on current earnings. Controlling for firm heterogeneity by using fixed effects, they find ongoing OJT to be negatively correlated with current earnings. This suggests that OJT impact in Tanzania is influenced by time-invariant firm specific characteristics. In our case study, controlling for firm heterogeneity is also feasible thanks to the matched employee-firm structure of the data.

Face to this inconclusive body of empirical results on positive, insignificant or negative effects of OJT on wages, our contribution is first to put forward some evidence of OJT cost sharing using data from a case study of eight exporting firms in Tunisia through estimated impacts of OJT on starting and current wages. The data have two major features. Its main

shortcoming is that the number of firms surveyed is very small. However, this is largely offset by the joint presence of rare information: details about OJT, our primary concern; detailed description of firm and worker characteristics; and matched employer-employee data. As a matter of fact, these data are currently the only available to investigate the issues of interest in Tunisia. It seems fair to say that little is currently known about the effect of OJT on worker remunerations in Tunisia. Filling this gap and learning about these effects is our main interest for these data.

Although there are obvious limits in the econometrics that can be carried out with such small data sets, these types of data are crucial when trying to guide policy in each given country. Indeed, large sophisticated databases are often unavailable for developing countries, in particular regarding OJT. Using data, that is available, we inquire into the factors determining OJT at the worker level. In Section 2, we discuss the modelling approach. In Section 3, we present the data used for the estimation. In Section 4, we report the estimation results. Section 5 concludes.

2. The Modelling Approach

The standard human capital accumulation model, based on perfect labor market assumptions, yields the equalization of net worker productivity (i.e., productivity minus training costs) with wage rate. In these conditions, OJT in the form of general training at the firm entry may at first correspond to a lower starting wage because of contemporary compensation for training cost, and later on to a higher current wage (assuming that the worker is observed a few years after OJT) because of the subsequent productivity rise due to the initial training. In this framework, workers bear the full cost of general training and get the full return of.

However, not all human capital generated by training is general. By definition, specific human capital is accumulated in a given firm and is useful only in that firm, while general human capital can be used in any firm. This distinction between general and specific training is important for understanding how OJT is financed. Becker (1962) produced a seminal theoretical study of these issues. Becker shows that, under perfect labor and product markets and renegotiation possibilities, if training is general, then the worker should receive all the returns and pay all the costs of the training. On the other hand, if training is specific and the firm sets wages, then this is the firm will receive all the returns and pays all the costs. However, the training return is lost if firm and worker separate. In that case, they should rather share the return. Leuven (2005) reviews works that have proposed diverse models for such sharing process.

As also emphasized by Weiss (1986), in the case of specific training, workers and firms may share both costs and returns. Workers may pay part of their OJT costs by accepting a lower starting wage, and realize later a return on this investment through greater wage growth. In some cases, the firm may pay the whole cost of OJT because it would correspond to highly firm specific training, which would not be associated with a decrease in starting wage. Hints on how the cost is shared can be obtained from the signs and the magnitudes of the coefficients of former OJT and ongoing OJT in starting and current wage equations. We shall then concentrate our attention on the estimates of these coefficients.

Meanwhile, the above picture of the link of OJT and wages may be blurred by the presence of various market imperfections, expectations, incentives and risk sharing considerations. In particular, if there are transaction costs when hiring or firing employees, the firm may be prepared to give up some of its gains to induce the worker not to move to another firm with their newly acquired human capital. For example, in some theoretical models, it has been found that firms may pay for an investment that benefits directly the workers. Possible explanations as to why firms may pay for the costs of general training relates to uncertainties

on workers' skills, credit constraints, imperfect labor market competition, the presence of federal rules and/or labor market frictions compressing the structure of wage[1]. For instance, Acemoglu and Pischke (1998) attempt to explain why German firms pay for apprenticeship training, a form of training that offers a number of skills that are not specific to these firms. The authors hypothesise that firms pay for general training because the current employer has more information about a worker's ability than potential employers. The existence of this asymmetric information provides the firm with some monopsony power and allows the firm to extract rents from the worker. Another approach is based on the assumption of information asymmetry on the received training (Katz and Ziderman 1990). However, these hypotheses of information asymmetry are also questioned: using data from the United States, Loewenstein and Spletzer (1999) show that employers can actually assess the value of training that might be received in previous jobs. Finally, some authors (e.g., Barron, Black and Loewenstein 1989; Sicilian 2001) acknowledged that the effect of job-match or individual heterogeneity biases will be to underestimate the impact of training on the starting wage, even possibly masking it totally, the reason being that more able persons may receive more training and may be paid more even if they are undergoing training, as compared with workers who are not being trained. Then, ultimately the jury is still out. Empirical evidence is necessary to ascertain what the correlation of starting and current wages with OJT is.

2.1 Sharing the training cost

Typically, there is a strong negative correlation between OJT and job separation in the empirical literature. This relationship has been explained by the fact that firms and workers who have invested heavily in specific human capital should also be less likely to separate. We do not deal with separation in this paper since we do not observe it.

However, the corresponding theoretical argument can be exploited to clarify the mechanisms of OJT cost sharing between firm and workers. Becker (1975) suggests that cost sharing minimizes inefficient separation by reducing the incentive for unilateral withdrawal. Mortensen (1978) and Hashimoto (1981) decompose worker productivity in firm i, V_i, $i = 0$, 1, into two additive contributions: a parameter m_i that describes the mean productivity of the homogeneous worker within the firm, and a random shock u_i: $V_i = m_i + u_i$. Assume Firm $i = 0$ is the firm which the worker belongs to, and Firm $i = 1$ is the firm that they might join. Under perfect markets, in the absence of human capital investment costs or information problems, the firm and the worker agree to separate if $V_0 < V_1$, as a consequence of the misallocation of the worker across firms. When there is a totally specific investment cost, c, the separation should satisfy $V_0 + c < V_1$. Thus, larger specific human capital investment contributing to this cost should generate lower separation rates, as supported empirically by Parsons (1972) and Pencavel (1972).

These theories can be used to characterize work productivity in different firms, while not directly wages, which is what we observe. Hashimoto (1981) fills this gap by introducing profit sharing contracts. In Hashimoto's model, the investment is shared because of the post-investment transaction cost of evaluating the productivity gains in current and alternative firms. In this setting, the sharing decision determines the shape of the wage profile. Indeed, under long run competitive environment, the parties share the investment cost so as to maximize the sum of net gains. This leads us to examine the wage determination process.

[1] Katz and Ziderman (1990), MacLeod and Malcomson (1993), Stevens (1994), Acemoglu and Pischke (1998, 1999), Booth and Bryan (2005).

2.2 Wage equations

Starting wage, current wage and annual wage growth equations are the basis of our investigation of the wage determination process. The standard human capital accumulation model, without OJT, yields the usual log-wage equation (Mincer 1974), which is the starting point of our specification. We complement it with OJT and firm dummy variables, and we distinguish tenure and off-firm experience. In practice, we simplify the wage growth equation in order to adjust it to the identification possibilities of the data.

Controlling for firm fixed effects through firm dummies is important on several grounds. It first accounts for unobserved firm characteristics that may affect wages and so limits the impact of omitted variable bias. Second, and more importantly for our purpose, it helps us control for the fact that many OJT decisions, and their connections with wages may be firm specific. In particular, some of the human capital accumulation during OJT may not be portable to other firms.

Wage changes over time are also determined by changes in the economic environment. First, shifts in labor supply and labor demand may contribute to setting the levels of competitive wages. In the absence of accurate information on supply and demand characteristics, we include period dummies in order to capture features of the labor market at firm entry. Second, rents from institutions (such as belonging to specific industries, unions, or the presence of different minimal wages) are controlled using firm dummies. Additional correlates describing unions, minimal wages and industries are also included. Finally, the technological characteristics of firms are controlled through firm dummies and information on the type of job occupied by the workers (team work, production line, and supervisor). The latter is useful as a possible important determinant of wage heterogeneity through the differences in quality and productivity of different jobs. It is also important because OJT may affect wages differently for different jobs. Due to limited degrees of freedom, we cannot run separate regressions or include interacted effects for different job types, but at least we can attempt to control for them with these dummies.

As a consequence of the sharing of the cost of OJT between firms and workers, in the first period, before or during OJT, the actual wage is lower than the alternative wage. In the second period, after OJT, the wage rises at a level intermediate between that of the marginal product of the worker's labor in this firm and in alternative firms. These features translate into wage equations characterised, on the one hand by a negative coefficient of OJT for starting wage equations, and on the other hand for current wage equations when OJT is still ongoing.

On the other hand, we expect a positive OJT coefficient in current wage equations after OJT has been completed and the worker productivity has risen. Consequently, this characterisation in terms of the signs of OJT coefficients in starting and current wages, already consistent with naive human capital theories, can be extended to a broader framework, making these signs particularly plausible. This justifies giving our attention to the signs of these coefficients. Finally, in estimated growth equations, the coefficient of recent former OJT should be negative if there is recent cost sharing, while this should not be the case for ancient former OJT for which the effect should rather be positive if it occurred at the firm entry. We now turn to the data we use.

3. The Data

3.1 The context

High unemployment in Tunisia was around 16 percent in 1999, the date of the survey. The government attempted to reduce this unemployment through policies enhancing the skills of

the Tunisian workers. There are other policies accompanying this training effort. The Labor Code was revised in 1994 and in 1996 to clarify lay off conditions and to set guidelines for financial compensation.

The labor market situation since the survey has still worsened. With the end of the Multi-Fibre Arrangements scheduled in 2005 and the implementation in 2007 of the Association Agreement with the EU, Tunisian firms face fiercer competition. Moreover, economic globalization has generated further challenges for Tunisian firms and workers. In 1994, the average wage of unskilled industrial workers was lower than in Mediterranean competitors (CNUCED/PNUD, 2001). However, wages at the same skill levels are still three times lower in China and India than in Tunisia.

Improving sector productivity by enhancing human capital may be an appropriate response to these diverse shocks. The Tunisian government set in 1996 a modernisation program to assist firms (MANFORME, *Mise à Niveau de la Formation Professionnelle et de l'Emploi*). In particular, intra-firm human capital investment was fostered. The Tunisian authorities notably stress on vocational training. Between 1996 and 1999, 1161.7 million dinars (UNDP 1994) were spent on this program. In March 2000, more than 1300 firms had been supported through this program, amounting for 40 percent of total employment in firms of more than 20 employees. A stronger participation of the private sector is however considered necessary as far as OJT is concerned (CNUCED/PNUD 2001).

The World Bank (2000) promotes OJT as a key element of the strategy to face tensions in the labor market while the economy moves closer to international integration. They claim that 'recent labor studies reveal that job creation has been faster in urban areas, employment opportunities have been shifting toward higher skills, value added per worker is rising, and non-salaried jobs are increasing for men'. The improvement in the education of the Tunisian workforce is accompanied by growth in labor productivity. Over 1989-97, value-added per worker increased by 17 percent, and by 34 percent in the Textile sector.

In 2002, the vocational education and training system was involving 60 000 individuals, divided into 20 000 technical workers and 40 000 skilled workers. OJT is therefore pervasive in the Tunisian economy. Besides, Belhareth and Hergli (2000) report that 90 percent of employers they surveyed intended to provide some OJT.

3.2 The survey and the firm sample

We base our econometric investigation on matched worker-firm survey data[2], for the first time available in the Tunisian case[3]. This is notably useful for distinguishing specific versus general human capital. Indeed, identifying whether a worker's human capital is specific requires simultaneously observing the worker and the firm so as to be able to see if something different happens in different firms.

The data provide rich information on workers, while we can control for firm heterogeneity, mostly by using firm dummy variables. These data were directly collected in the workplace in 1999[4]. Eight firms were selected based on criteria of size (not less than 50 employees), activity, vocation to export and capital ownership. The observed firms were selected among exporting firms, which are not fully foreign owned. They all belong to the formal sector within two manufacturing segments: four firms from the textile-clothing sector and four firms

[2] See Abowd and Kramarz (1999) for a literature review on this type of data.

[3] Matched worker-firm data have been collected as part of the World Bank's Regional Program for Enterprise Development (RPED) surveys in Africa. Each of these surveys constitutes a sample of about 200 firms with about 10 interviewed workers in each firm. However, similar data are not yet available for Tunisia.

[4] The methodology of the Tunisian survey appears in Nordman (2002) and Destré and Nordman (2003).

from the Mechanics, Metallurgical, Electrical and Electronics Industries (IMMEE). Although the firms were randomly selected in these two sectors of interest, the sample is too small to be safely considered as accurately representing the underlying firm population. Therefore, we present our results as those of a case study. The eight firms are located in the Tunis area and their average size is 130 employees. The occupational structure within each firm, which was obtained from interviewing employers, was used to constitute representative sub-samples of their workers. The surveyed workers were randomly chosen within each occupation strata and not less than 10 per cent of the workforce was interviewed in each selected firm.

3.3 The workers

The 231 workers in the final sample were interviewed in February 1999. The questionnaire provides precise information about each worker: individual characteristics (matrimonial status, number of dependent children, geographic origin, father's education), wages, educational investments (number of years spent in primary, secondary, higher and vocational education), post-school vocational training (apprenticeships, former internships, formal training within the current firm), total experience in the labor market and occupation in the current firm.

Table 1 in the Appendix provides a few summary statistics. The sample is equally split across the considered sectors and across gender: 54.1 per cent of the selected employees work in the four textile firms and 45.9 per cent in the four IMMEE firms. Moreover, about half of the workers in the overall sample are female.

The average education, which is 9.6 years over the sample, is calculated using information on the highest education level reached. Successful educational years are slightly higher for men (10.6 years) than for women (8.7 years)[5]. Only a very small proportion (0.8 per cent) of the observed workers have never been to school, 9.9 per cent have only primary education (1 to 5 years), 71.8 per cent have achieved secondary education (6 to 12 years) and 17.3 per cent have reached higher education. The proportion of employees with a vocational diploma connected to their current job amounts to 31.6 per cent.

Average tenure in the current firm is 5.9 years (5 years for women, 6.7 years for men). Total actual experience is on average of 9.1 years. This experience variable describes actual stated years of experience, as opposed to just extrapolating experience from age. Thus, it excludes unemployment and other inactivity periods. On average, male workers in the sample have accumulated over 10 years of total experience against less than 8 years for female workers. Previous experience off the current job is on average 3.3 years (2.8 years for women, 3.6 years for men). Thus, the ratio of mean tenure to mean overall work experience is 64 per cent, a favourable situation to well separate human capital accumulated off and on current firm. This also indicates a non-negligible proportion of young, first-time workers, which is confirmed by an average age at 29.5 years.

In our data, OJT in the current firm is described by three variables. One dummy variable reports the worker's answer as to whether he/she received formal OJT in his/her current firm (FORMAD, 1 if yes). A second variable is defined as the number of years the worker has spent in formal OJT up to the interview date (FORMAA). The third OJT variable identifies either whether training is still ongoing at the interview date or if it occurred for workers in the firm for less than two years (FORSTIL, 1 if yes). Workers with FORSTIL equal to 1 may have not yet achieved all the OJT productivity gains at the time of the survey.

[5] When calculated instead from the age at school leave (from which 6 years are deducted), the average number of schooling years nearly amounts to 13. Thus, by eliminating unsuccessful years of education, we obtain an education variable net from repeated classes. For comparison, Angrist and Lavy (1997) estimate the number of repeated classes at two to three years in Morocco. Besides, UNDP (1994) reports that Tunisia in the 1980's had a higher rate of repeated classes at the primary school than Morocco.

Although, 18 per cent of workers in the sample have benefited from OJT within the current firm, its occurrence is much higher for males (34.5 per cent versus 1.7 per cent for females). Moreover, the average OJT duration for trainees (about 6 month) is unequal across genders (6.3 months for men versus 1.6 months for women). Among the 42 trainees of the overall sample, 10 are still undergoing or have just finished OJT. Most OJT is concentrated in the IMMEE firms.

Some wage characteristics are worth noting. The average monthly wage by employees corresponds to 213 US dollars[6], while male wages are on average 1.7 times female wages. Beyond differences in human capital endowments between sexes, the large female share of the labor force in textile firms, where wages are generally low, contributes to this wage differential: 94 per cent of the observed female workers belong to the clothing sector, while male workers of this sector represent only 14 per cent of all male workers. The average wage in the IMMEE sector is 1.6 times higher than in the textile sector. However, educational and training differences partially explain this gap. On average, the IMMEE workers have 10.6 years of education compared to 8.9 years for textile workers.

The minimum wages (SMIG, *Salaire Minimum Interprofessionnel Garanti*) corresponds to 40 hours and 48 hours per week, since different minimum wages are used for the two categories. In 1999, the SMIG of employees working 40 hours per week amounted to 156.7 dinars, while the SMIG for 48 hours per week was 177.8 Dinars. Workers in the textile sector are all rationed to a maximum of 48 hours of work per week, while in the IMMEE sector this boundary only concerns non-executive workers. The workers' current monthly wages in the two sectors are concentrated around values slightly above the minimum wages, while heavy right tails account for a small number of very skilled workers. Indeed, individuals earning more than 500 Dinars per month only represent 12.5 per cent of the sample. Also, 80 per cent of these workers have achieved higher education versus only 7.4 per cent of the workers with monthly wages below 500 Dinars. By contrast, while monthly starting wages are also very concentrated, they are often below the current minimum wage. This latter feature may be due to the rise in the SMIG since the worker entry in the firm as well as to workers actually paid under the SMIG.

4. The Results

4.1. Wage determination

The estimates of wage equations are discussed in the following order. We first present basic OLS estimates, which include education and OJT regressors. Then, additional regressors are incorporated to control for characteristics of firms and jobs: firm dummies, job type (production line, denoted by CHAINE; team work, denoted by TEAM; and executive positions, denoted by ENCADR). They help us control for task complexity, ability and screening effects. For wage growth regressions, we also introduce the entry date in the current firm as a regressor. Finally, we move to 2SLS estimates as an attempt to deal with the possible endogeneity of education, experience and training variables. For all models, the standard errors of the estimated coefficients are corrected or not for cluster effects at the firm level (in case there is heteroskedasticity across firms), and using or not robust estimators. On the whole, little differences in the results emerge by varying these procedures. We do not provide separate estimates for male and female workers for two reasons. First, doing so preserves degrees of freedom with a small sample. Second, introducing dummies for female workers is generally found to be insignificant.

[6] The average monthly wage corresponds to 1.8 times the monthly SMIG of 1997 for 48 hours per week (177.8 Tunisian Dinars, that is: 125 US dollars in 2001). The declared monthly wages are those of January and February 1999.

In Muller and Nordman (2005), wage equations for different wage quartiles were investigated with these data. With such a special specification and a basic set of correlates, we found a preliminary evidence of correlation of OJT with current wages. Similarly, Muller and Nordman (2011) include OJT variables in current wage equations, while focusing on within-firm human capital externalities. However, in these previous studies, the dynamic dimension of the data on wages was not exploited, in particular the possibility of combining the employees' starting and current wages in the analysis.

OJT may depend on wages and be endogenous through several mechanisms. Firstly, there may exist a significant wage elasticity of education and training demand in developed economies (Friedmann 1986). In that case, wage and OJT-education could be determined simultaneously. Secondly, wages and training may both respond to labor supply factors (as in Hoddinot, 1996, for urban Africa), which would generate another type of simultaneity. Finally, unobserved ability affecting wages and OJT may be correlated through faster learning of the most talented workers.

We successively report the estimated equations for starting, current and growth rates of wages, and for the diverse specifications shown in Tables 2 to 5.

4.1.1. Starting wages

We first describe the effects of the OJT variables on starting wages (Table 2), our main interest. Although the coefficient of the dummy for OJT in the current firm is not significant at the 5 per cent level, the coefficient of the number of years of OJT in the current firm is significant in all OLS specifications and with a negative sign. Yet, this effect vanishes for inefficient 2SLS. Despite the latter caveat, the results are consistent with OJT cost sharing between firm and worker, at least at the entry in the firm. Indeed, most former OJT takes place at the firm entry. In order to test for possible agreement of future training at the firm entry, which may be accounted for in the bargaining for the starting wage, we include ongoing OJT in the regressors. However, since the coefficient of ongoing OJT is never significant, cost sharing does not seem to occur at the firm entry in the case of training spells occurring a few years later. It is plausible that these training spells are not anticipated at the entry time.

For the firm dummies (FDM) OLS model of column 5, we introduce three dummies to control for heterogeneity related to task complexity, as in Barron et al. (1998): for executive or supervisor (ENCADR), for working in production line (CHAINE), and for working in a team (EQUIPE). In our data, these variables appear not to have any significant effects in the starting wage equation, except for ENCADR that corresponds to weakly significant lower starting wages, perhaps as an early compensation for future promotion opportunities. However, their inclusion slightly refines downwards the estimated negative impact of OJT on starting wages and therefore reinforces the cost-sharing hypothesis. This result is expected if individual heterogeneity biases lead to underestimate the negative impact of OJT on the starting wage (as discussed in Parent 1999).

The effect of off-firm experience is highly significant and positive in all estimated models, exhibiting an expected concave profile. At the sample mean, the marginal return to off-firm experience amounts to 6.9 per cent in the FDM OLS model of column 5, but this rate of return is relatively stable along the estimated models (1) to (5).

We briefly describe the impact of the other determinants of starting wages. The estimated effect of the education years is generally not significant, whatever the specification and estimation method. This is partly because we allowed for quadratic education effects, although linear education effects are also weakly significant. As we show later, in these data,

education is a major determinant of current wages. The fact that it does not determine much the starting wages suggests that something distinct from pure productivity assessment may be taking place when employers set wages at the firm entry. In particular, the prominence of OJT cost sharing may contribute to subsuming most education effects. Similarly, the human capital accumulation that takes place in Koranic school does not appear to be converted into higher earnings in these firms. By contrast, former internship years have a strong positive effect on entry wages, hinting at the importance of specific human capital in these industries.

Surprisingly, female workers do not receive significantly lower wages at the firm entry, once firm dummies and other explanatory variables are included. It seems that for female workers the concentration in textile sector and in low job categories, along with limited education, suffices to explain the gender starting wage gap in the data. By contrast, starting wage is clearly increasing in age at the entry, beyond the role of actual experience. This suggests that either the firm values age for itself, e.g. as a signal of private life experience contributing to skill accumulation, or that it uses age as a proxy of the actual worker experience (ill observed by the firm). However, the return to age in that sense, around 4 per cent per year for all estimates, remains clearly below the return to experience stricto sensu.

Finally, the estimates of the firm dummies' coefficients are large and sometimes strongly significant, except for (a) the second firm that shares similar characteristics with the reference firm 6, and (b) in Column (6) where too few degrees of freedom are available. This result is in accordance with the usual persistence of wage differentials across individuals with identical productive characteristics in empirical studies. However, we are here dealing with wage at the firm entry instead of current wages in most studies. In these data, workers with comparable measured characteristics earn different starting wages partly because they enter different firms. There is no significant effect of firm dummies interacted with OJT or education, including for the most technology-intensive firm. This feature rather favours the basic human capital theory interpretation of the negative OJT coefficient rather than more sophisticated risk-sharing theories for specific OJT.

In order to deal with potential endogeneity issues, we instrument the following variables in the 2SLS regressions of Table 2 for starting wage and Table 3 for current wage: years of completed schooling (EDUCATION), years of off-the-job actual experience (EXPERIENCE) and tenure in the current job (TENURE), the squared values of these three variables, years of formal OJT received in the incumbent firm (FORMAA) and the dummy for whether OJT is ongoing or recent (FORSTIL). The obtained substantial levels of the F-statistics and R^2 in instrumental equations ensure that we are not in the weak instrument case (Abadie et al.2002).

The instruments in these regressions are indicated at the bottom of each Table. The main instruments are socio-demographic characteristics either entered, or insignificant and omitted, in the wage equation, and the characteristics of the worker's father. Namely, the socio-demographic instruments include the worker's age, dummies for apprenticeship in a former firm, unemployment years, the number of dependent children and the marital status (married or single). These variables are correlated with worker human capital, while they should not be notable determinants of wage differentials. Interacting these variables with the gender dummy, and the age and father's education generates additional instruments. The schooling level of the worker's father is an important instrument, capturing various genetic and environment influences (Sahn and Alderman 1988).

A word of caution is useful here. Some of these instruments could be deemed endogenous themselves if, for instance, the father has facilitated his child's access to job. For lack of better instruments, we are constrained to assume that it is not the case. Besides, the presence of firm-specific effects in the regressions should strengthen the quality of these instruments

since firm effects should capture part of the influence of parental characteristics on the worker's insertion in the labor market. For example, the father may know well the firm's manager. Then, the severity of such issues is much reduced by the presence of firm dummies. The plausibility of the instrument hypothesis is also reinforced by the fact that we are dealing with formal firms with well-established recruitment processes rather than with the informal sector where the father's connections could have a bigger role.

Despite data limitations, using 2SLS provides an alternative perspective to OLS estimates on human capital returns in the Tunisian firms. Even if endogeneity issues may not be as fully corrected as we would like, the convergence of results from OLS and 2SLS, both in equations with and without firm dummies, should help convincing the reader of their qualitative robustness.

As shown in the tables, Sargan's tests of over-identification support the validity of the used instruments and their non-inclusion as explanatory variables. Since the small sample may make difficult testing over-identifying restrictions, one may alternatively stick to OLS estimates of the augmented Mincer model completed with firm dummies, rather than using instrumented variables. However, ultimately, the choice of the instrumental variables being somewhat subjective, we keep the two sets of estimates – OLS and 2SLS – to allow comparisons. Finally, Wu-Hausman's tests do not reject the exogeneity of education, experience and training variables. Drawing from our estimation results, we discuss the likely source of endogeneity in the sub-section about current wages.

As an additional control of endogeneity problems in current wage equations, we also provide OLS estimates where the tenure variable is excluded. Indeed, first, tenure may be endogenous and hard to instrument, and second, it is not included in the standard Mincer model.

4.1.2. Current wages

We now turn to the current wage equations (Table 3). The theories we discussed imply a positive impact of former OJT in the current firm, as work productivity should have grown in time as a consequence of the training, and a negative impact of ongoing OJT, as firms and workers may share the cost of ongoing training. This is exactly what is obtained in the estimates. Although the coefficients of the OJT years in the current firm are not significant (columns 1 and 2), the dummy for former OJT has always a positive and significant coefficient. Therefore, only OJT incidence affects wage differentials, as opposed to OJT duration. A similar result has been obtained by Veum (1995) using US data, who interprets it as originated from measurement error in duration, a characteristic hard to recall with accuracy.

Moreover, the coefficient of the dummy for ongoing OJT is negatively significant at the 10 per cent level for all specifications. These results, jointly with the results in the starting wage equations, support both OJT raising worker productivity and the presence of contemporary cost sharing between firm and worker[7].

Years of former internship have positive significant effects at the 5 per cent level in all OLS regressions and at the 10 per cent level in 2SLS estimates. Job tenure and its square are newly introduced variables compared to the starting wage equations. Recall that if general and specific human capitals were identical the marginal returns to experience and tenure would be the same. As a matter of fact, estimated marginal returns of tenure appear to be lower than

[7] Crossing OJT with education years produces mixed results (not shown). On the one hand, former OJT crossed by education years is never significant whether in starting or current wages equations. On the other hand, current OJT crossed by education years is not significant in the starting wage equation, while it has a positive significant effect in the current wage equation, indicating that OJT may be more efficient for better-educated workers. Yet, in order to preserve on degrees of freedom with our small sample, we choose not to introduce the crossed effects of OJT and education.

those of off-firm experience. However, the results of Wald tests fail to reject the hypothesis of equality of the marginal returns to tenure and experience in current wage equations, and this, whatever the used estimation technique. These results support our intuition that, for our sample, acquired human capital over time may be mostly general and therefore transferable across firms.

The highly statistically significant marginal return to tenure (at the sample mean) is insensitive to the inclusion of OJT variables. This finding is surprising given that job tenure is sometimes introduced in wage equations in part to capture the effects of OJT (Mincer and Jovanovic 1981). One explanation of this insensitivity of tenure impact on OJT coefficients is that such approaches are too coarse to properly account for OJT characteristics. For example, tenure here may be mostly related to informal training as opposed to formal OJT[8]. Furthermore, our personal observations of the actual functioning of these firms suggest us that informal learning processes are widespread. Workers informally learn on-the-job through their own experience and by watching others performing tasks. For example, in garment firms, experience often enhances productivity through trial-and-error spells applied to clothing scraps.

Table 4 summarizes the marginal returns to the main human capital variables obtained from the regressions of starting and current wages displayed in columns (5) and (8) of Tables 2 and 3.

As typically found in the literature on returns to schooling in Africa (Schultz 2004; Kahyarara and Teal 2008; Kuépié et al. 2009), private returns are higher at secondary and post-secondary levels, thus increasing with the number of education years. This may be due to the fact that those who enrolled at higher levels are more likely to come from the most educated families. An alternative explanation is that there is a shortage of high skills, relative to firm and state labor demands, on the Tunisian labor market. Using data from National Population-Employment Surveys in Tunisia in 1980 and 1999, Zouari-Bouattar et al. (2004) also find education returns increasing with education levels in simple Mincer-type equations. Their estimated mean education return is 9.5 per cent in 1980 and 5.9 per cent in 1999.

The marginal returns to education and experience considerably drop when moving from starting wage to current wage equations, even if those returns are much more significant in current wage equations. This may be attributed to several factors. First, returns may have been higher in the past when the Tunisian manpower was generally less skilled. Second, the impact of education and experience on starting wages includes a short-run 'selection premium' in the sense that the ablest workers could be hired more easily and simultaneously get higher earnings than less experienced or less educated workers. This would contribute to increasing the apparent returns to human capital at the entry.

Making the plausible assumption that OJT dummies correspond to about one year duration or less, we find that the wage premiums for OJT, either former or ongoing, is significantly higher at the 5 per cent level than the marginal returns to education and experience[9]. OJT content may be much firm specific, making it more valuable to the firm than mere experience or schooling. Moreover, OJT sessions may be much more intensive than spending time routinely learning at work or at school. Another reason why post-training OJT returns appear as high may be the occurrence of promotions for which OJT is required.

Focusing on FDM OLS estimates, we find that the possible compensation suffered by the workers for the OJT at the entry is substantial, about three times the marginal return to

[8] See for instance Lynch (1992), Bartel (1995), Veum (1995) and Parent (1999).

[9] Except in the rare occurrence when all the corresponding coefficients are not significantly different from zero.

education. For current wages, the coefficients of the OJT dummies are also considerable: minus 3.7 times the marginal return to education for ongoing OJT, and plus 3.9 times for former OJT. Clearly, omitting OJT would miss an important part of the relation between wages and human capital accumulation for these workers.

Let us examine the other wage determinants. The coefficient of the dummy for female workers was rarely significant with starting wages. By contrast, it is always negatively significant in current wage equations, except for inaccurate 2SLS or misspecified OLS (in Column 7 that does not include tenure lest it would be overly endogenous). These results suggest a degree of gender discrimination against female workers. Such possible discrimination appears to be absent at the firm entry, and rather develops along with worker's career.

On the opposite, schooling in a Koranic school affects neither starting nor current wages, no more than no schooling at all does. The powerful negative impact on starting wages of joining a trade union altogether vanishes for current wages. It may be that negative opinions about hiring unionized workers by the firm manager fade away along with growing familiarity with those workers.

Measurement error yields a drop in the education coefficient, while ability bias would increase it. With FFE OLS, the return to education in the current wage equation without squared education amounts to .072. With 2SLS, it diminishes slightly to .069. Then, the OLS bias is upward. With a quadratic profile in education, the diagnostic is not changed: upward bias of the OLS estimates (even if exogeneity cannot be rejected in the Hausman tests). For OLS: -.0415 for education and .0058 for squared education that is: .0707 at the sample mean. For 2SLS: -.0649 for education and .0069 for squared education that is: .0686 at the sample mean. On the whole, the results suggest a small and insignificant ability bias, or almost exact compensation of measurement error and ability biases.

Let us turn to work type variables. In contrast with findings for starting wages, being executive or supervisor is associated with significantly higher wages. On the other hand, working either on a production line or in a team appears to have no significant effect on current wages. In the estimated specification, the reference firm is chosen as the more technology-intensive among the observed firms. Indeed, Firm 6's characteristics set it apart from other firms in this respect because this firm operates in the ITC branch of the IMMEE and remunerates its employees better. The mean education of its observed employees amounts to 15.4 years of completed schooling, whereas the firm sample average is 10 years. It is also a young company, in which average employee tenure is 1.4 years (the firm sample average is 5.8 years). Moreover, it is monopolistic for its product (electronics components) within the country. It may thus seem relevant to introduce interaction terms for the Firm 6 dummy, notably with the various human capital variables. Even though the small sample size prevents us from doing so systematically (or to include such interacted effects for all firms), we maintained education and OJT variables interacted with the Firm 6 dummy in Column (6), where all these interacted coefficients appeared insignificant. Thus, there seems to be little support for specificity of OJT in such effects[10].

Finally, other firm dummies are found to be more significant for current wages than for starting wages. This may be due to specific rules for wage hikes and career development

[10] We also attempted a more general specification with interaction effects of Firm 6 with all individual human capital variables, gender and job dummies (not shown). As expected because of limited available information, this version showed insignificant interacted effects. However, these results suggest that the high returns to these components of human capital in Firm 6 are relatively well taken into account by the level of human capital variables in this firm and by the non-linearities in returns. As a matter of fact, removing the observations of this firm from the sample has little influence on the OLS estimates of the marginal returns once firm dummies are introduced.

within each firm, whereas starting wages may be more constrained by market conditions since new workers usually do not suffer from large exit costs.

4.1.3. Wage growth

Another way to look at the information on starting and current wages is to consider estimated equations of annual wage growth rates, as shown in Table 5. Doing so may allow for sample selection if self-selection varies only across individuals and not over time for the individual. Indeed, in that case, by deducting entry wage from current wage, all time-invariant effects (both observed and unobserved) drop out, and the coefficients on OJT may be estimated without bias[11]. We shall discuss possible selection effects later on.

We estimate wage growth equations also for other reasons. First, as just mentioned, they allow us to cancel out the influence of unobserved individual permanent heterogeneity, an important source of randomness in wage equations. Second, we take advantage of larger degrees of freedom in this specification, from eliminating fixed individual or firm factors, to introduce information about the entry date. In particular, this allows us to examine the impact of economic conjuncture on wage growth. Thus, our wage growth equations slightly differ from the mere gap between our current and starting wage equations. On the one hand, new correlates are introduced, while fixed correlates are dropped. On the other hand, starting dates vary across workers, which justifies dividing the gap by tenure years.

In a first specification (Column 1), the entry date is included through year fixed effects. By contrast, in Columns 2 (OLS) and 3 (2SLS), we use three period dummies that we describe below. Attempts of crossing training variables with period dummies are reported in Columns 4 (OLS) and 5 (2SLS). Tenure variables have been dropped first because tenure is used in the definition of the dependent growth rate variable, and second as their effect cannot be identified with such a small sample when starting date or period dummies are included. Then, the period regressors may partly incorporate tenure effects.

No worker in the data is observed joining the firm before 1968. The first period (PERIOD1) corresponds to President Bourguiba's terms, before 1987. At that time, the Tunisian economy was reoriented towards private initiatives, economic liberalization and trade opening (Gouia and Mongi 1996). These new policies, and the subsequent improvement in terms of trade, contributed to increasing state revenues. On average, the annual growth rate reached 6.8 per cent over this period. The increase in jobs was three times larger than during the first independence decade. It was accompanied by a fifty per cent increase in individual real incomes. However, these outcomes were only obtained through factor growth in capital and labor, which was detrimental to productivity rise and optimal resource utilization.

The second period (PERIOD2), between 1987 and 1994, is the first term of Ben Ali's presidency. It coincides with a structural adjustment program, conducted under the supervision of the IMF and the World Bank, which was officially launched in 1986 but only implemented during the *VII^e Plan de développement économique et social* (1987-1991), after Ben Ali's election. Liberalisation and economic opening were further emphasized with the revision of investment codes and procedures, changes in the tax system, price and import liberalization, monetary and financial reforms and state disengagement in favor of the private sector. Finally, the third period (PERIOD3) corresponds to 1995 up to the survey date. It follows Ben Ali's re-election, who henceforth has the complete control of the State apparatus.

Period 3 dummy is negatively significant in all specifications, except for Column (5) estimates for which it is still weakly significant with 2SLS. Period 2 effects are less

[11] Obviously this approach works only if there are *no major* unobserved factors varying both across individuals *and* over time. This is notably relevant for genetic and family background, which do not vary over time.

prominent, while they appear as negatively significant in 2SLS estimates of Column (3). These results support the roles of economic policy and conjuncture factors in explaining wage growth. The slowdown of wage growth in Period 3 may be associated with raising unemployment rates, or to decreasing rate of growth along with development.

As typical in wage growth equations, few coefficients are significant, as emphasized for example in Barron et al. (1989). As a matter of fact, we obtain more numerous significant effects than other studies thanks to the introduction of firm and period dummies.

We concentrate mostly on the effect of the OJT variables, our main interest. The dummy coefficient for former OJT is never significant in the wage growth equations (not shown) and has been dropped. Similarly, ongoing OJT never influences OLS and 2SLS estimate. However, the effect of the number of years of former OJT is now significantly negative (at the 1 per cent level) for all OLS estimates[12]. This result is at odd with findings in Barron et al. (1989), Bartel (1995) and Loewenstein and Spleitzer (1996) who all find a positive and significant impact of OJT on wage growth in the US. However, Lynch (1992) also found no significant effect of OJT on wage growth using a sample of young US workers. Also, cost sharing of OJT at the entry is likely to generate a larger wage dip at the start and a larger wage hike later. Both effects should reinforce themselves in growth equations. Not observing them militates for general rather than specific OJT, as one expects smaller effects in that case.

A first possible explanation of this odd negative sign of the coefficient of OJT duration is that it may stem from the definition of the annual wage growth rate, which includes a division operation by tenure. This operation is likely to generate further heterogeneity and heteroscedasticity, which are not easy to control completely with our small sample, which may yield imprecise and biased inferences. Moreover, OJT duration may be hard to recall and then may include substantial measurement errors correlated with respondent intellectual capacity. For example, the least able workers may overstate duration. Finally, the larger the tenure the larger the probability gets of large OJT duration. A related issue is that the inevitable removal of tenure from the equation might lead to an omitted variable problem. For example, the probability of attending OJT might be higher at the beginning of the job relationship if initial training is necessary to perform new tasks (even if this is not found in our OJT determination estimates below). Then, there exist potential endogeneity issues stemming from OJT determination processes when the dependent variable incorporates tenure. Besides, the OJT duration effect vanishes in 2SLS estimates.

Bearing all these caveats in mind, there may still be some economic insight to get from the estimates. In particular, when introducing period dummies the odd negative OJT duration effect much vanishes over time. It remains really significant only after 1994 (Column 4)[13]. This suggests that conjuncture factors may be at work. Indeed, unemployed skilled workers have been increasingly present on the labor market after 1994, thereby putting pressure on wages for these skill categories. In particular, the 1990-1991 reform of the vocational education and training (VET) system fostered the supply of skilled workers. Then, workers following OJT in the third period suffered from negative externalities through such changes in the structure of the labor market. They found themselves in competition with crowds of skilled applicants, which may have depleted their wages. Another possible interpretation of the effect of OJT duration after 1994 is that the OJT spells are close enough in time to still involve some cost sharing affecting current wages. Finally, as general OJT have smaller

[12] Not so for inaccurate 2SLS estimates. Since Wu-Hausman test results reveal only weak evidence for endogenous regressors, we focus on OLS estimates. Wu-Hausman test results do not reject the exogeneity of the education, experience and training variables in Columns (3) and (5) for wage growth equations. However, this may partly be caused by the limited set of available instruments.

[13] This is the case for 65 per cent of the trained workers.

impact on wage fluctuations, a limited specificity content of OJT may explain why OJT effects are little significant for most periods. Let us now say a few words about selection issues in our estimates.

4.1.4. Selectivity

In the estimates, higher impact of OJT on wages may result from worker selection by firms and vice versa. For example, assuming high ability workers can learn faster from OJT, and then there may be selection of the abler workers into OJT programs. It may be that the observed firms, more modern and export-oriented than many Tunisian firms, select or attract workers of higher unobserved productivity or more motivated workers. Moreover, firms may decide to invest in the human capital only of these employees they seek to retain. Although such or other selectivity effects may take place, it is impossible to control completely for them in these data. We thus have little choice but to assume that selectivity and matching effects may be overlooked. Although this is not a completely satisfactory hypothesis, we are currently limited to this method for the purposes of investigating OJT issues in the Tunisian case. However, due to the rigidity and inefficiency of the Tunisian formal labor market (with sluggish administrative procedures, and little public information on jobs and workers), it is plausible that selection effects are less intensive than in industrialized countries.

Still, a way to deal with selectivity issues is to model them. Then, even for a case study, we now check if there is clear evidence that our results could not extend to broader populations of firms and workers because of blatant estimated selectivity. That way, we examine if there is something unusual in our data. For this, we use the following truncated regression model for wage equations:

$$Y_{1i} = X_{1i}\beta_1 + u_{1i} \text{ if } Y_{1i} \geq Y_{2i}\text{, and unobserved otherwise;} \quad (1)$$

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

where Y_{1i} is the logarithm of the observed wage of worker i ($i = 1,\ldots, n$, where n is the sample size), while Y_{2i} denotes the unobserved logarithm of her reservation wage. Parameters β_1 and β_2 are coefficient vectors to be estimated. The row vectors X_{1i} and X_{2i} describe the worker's observable characteristics. Whereas X_{1i} contains the usual covariates in Mincer-type wage regressions, such as education, experience and training variables, X_{2i} also includes socio-demographic characteristics not present in X_{1i} (e.g., the number of dependent children, marital status, and geographic origin) that can be used to identify the reservation wage. For example, the number of dependent children can help us identify selectivity if some female workers choose not to work or to avoid modern firms with tight time schedule in order to instead take care of their children. As usual, we assume the normality of the errors:

$$(u_{1i}, u_{2i})' \sim N\left[\begin{pmatrix}0\\0\end{pmatrix},\begin{pmatrix}\sigma_1^2 & \rho\sigma_1\sigma_2\\ \rho\sigma_1\sigma_2 & \sigma_2^2\end{pmatrix}\right].$$

The credibility of this assumption is enhanced by incorporating a regressor describing the proximity to the minimum wage, which may contribute to redressing irregularities in the lower tail of the error distribution.

In equation (1), the first two truncated centred moments of the dependent variable can be written as:

$E(Y_{1i} \mid i \text{ observed}) = X_{1i}\beta_1 + \rho\sigma_1\varphi(X_{2i}b_2/\sigma_2)/\Phi(X_{2i}b_2/\sigma_2)$ and

$V(Y_{1i} \mid i \text{ observed}) = \sigma_1^2 + (\rho\sigma_1)^2[-X_{2i}c_2\ \varphi(X_{2i}c_2)/\Phi(X_{2i}c_2) - (\varphi(X_{2i}c_2)/\Phi(X_{2i}c_2))^2]$, where $c_2 = b_2/\sigma_2$. Clearly, the generalized inverse Mills ratio (φ/Φ) in the first moment equation cannot

be estimated since the non-participants are not observed in our data. However, we know that X_{2i} should include the number of dependent children (ENFT). Then, we use this variable to detect whether selectivity is likely to affect wage estimation. Our approach here is to approximate the role of ENFT in determining the generalized inverse Mills ratio by a polynomial in ENFT. To allow for sufficient approximation, 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-generalized least-squares estimation.

First, for starting wages, the P-values of F-tests of the null hypothesis of non-significance of the coefficients of the polynomial in ENFT are: 1.2 per cent in OLS Mincer-type equations without OJT variables, 23.5 per cent with the same equation adding firm dummies (FDM), 17.8 per cent when OJT variables are added, 24.8 per cent with job type controls, and finally 77.7 per cent for IV FDM. In all cases, except the ill specified Mincer equation, the selectivity characterization is rejected in starting wage equations. Second, for current wages, the P-values are respectively: 85 per cent, 27 per cent, 19 per cent, 24 per cent and 13 per cent. Again, the selectivity characterization is rejected. This is also the case when considering wage growth equations (P-values not shown). We now turn to the direct explanation of the OJT process in the next subsection.

4.2 OJT Determination

The role of OJT in work organization is now analyzed through a Probit model of OJT determination (either former or ongoing). In this model, we introduce (1) the available variables describing the worker characteristics such as age and human capital characteristics, and (2) family, period and environment characteristics. Firm characteristics are incorporated through a Textile industry dummy, and through firm dummies. In particular, strongly significant firm dummy coefficients in the OJT Probit estimates should be a hint that there is something firm specific about OJT in these firms.

The estimates are reported in Columns 1 and 2 of Table 6. The specification is similar to that in Lynch (1992) and Veum (1995). Krueger and Rouse (1998) estimate similar Probit models for two given firms separately, although they also include log hourly wage, which we exclude to avoid endogeneity issues. Using all firm dummies is not possible with our data because some dummies correspond to too many perfect predictions of OJT. In particular, OJT has not been observed for the interviewed workers within firms 2, 4, and 5, which are accounted for in Column (3) where observations for these firms have been excluded.

In our estimates, a worker participation in OJT has four significant determinants at 10 per cent level: technology (i.e. industrial sector), education (hinting at capacity to follow the training since schooling improves ability to learn, as found in Rosenzweig, 1995), family situation (through the number of children) and gender. On the other hand, being married, age and geographical origin are all insignificant at the 10 per cent level. We also checked that working in a team or as a supervisor does not significantly change the probability of OJT, which explains why we excluded these variables to save on degrees of freedom. Unlike results found by Lynch or Veum, and as those of Krueger and Rouse, former work experience and tenure with the current employer do not significantly increase the likelihood of receiving OJT in these data. Even the coefficient of previous training experiences was insignificant when included.

Firms could react to the imposition of a legal minimum wage by reducing non-pecuniary job attributes like OJT, as argued in Hashimoto (1982). We did not find this effect since the coefficient of the dummy for proximity to the SMIG is insignificant in the OJT Probit estimates. Between 1989 and 1997, the movements of bottom wages were contained as real minimum wages for agriculture and industry remained almost constant. Note that a previous

period of unemployment seems to be a disadvantage for being selected for OJT (Columns 2 and 3).

There is little OJT in the textile sector, in which usual tasks may require little skill. This explains the significantly negative coefficient of the corresponding dummy variable. As a matter of fact, employees working in production line, a common feature of Textile industry, have never been selected for OJT in this sample. In that sense, there is a clear sector-specificity component in OJT occurrence. However, this does not imply that within each sector, there is firm-specificity of OJT.

Moreover, we find that more education significantly raises the probability of formal OJT, although only slightly, with a marginal effect of 0.009 in the regression without period dummies (respectively 0.003 with period dummies). That general education matters only to some extent for OJT participation, as also found by Lynch, is confirmed by the fact that having attended a Koranic school, former internship, apprenticeship or vocational degree (ETUTPA) has no significant effect on OJT probability.

Finally, having many children is positively correlated with high OJT probability. Here, the marginal effect is stronger at 0.025. An extended family may make the worker more likely to seek OJT - and sometimes an accompanying prospect of future promotion - in order to provide for large family needs. Meanwhile, female workers are less likely to be involved in OJT. This situation may be associated with an indirect mechanism of gender discrimination, contributing to the gender wage gap.

Once the three firms without OJT are omitted, a sector dummy is included. One could think that there remains little scope for firm effects in this estimation. This is not so, as shows the strongly and significantly negative coefficient of Firm 8 dummy. Some firm-specificity of OJT may be at the origin of this. On the whole, as in other papers of the literature, only limited explanation of OJT can be reached by using typical variables in labor force surveys. This may be because the firm training decisions depend on many other factors than the typically observed worker characteristics.

5. Conclusion

Using matched employer-employee data from Tunisia, we have investigated the interaction of OJT investment and wages. This is important for several reasons. First, OJT is a major channel of human capital accumulation in the economy, likely to yield crucial productivity augmentation because training is precisely adapted to firm needs. In this respect, the firm specificity of the OJT investment is of interest for the analyst. Second, studying the relationship between OJT and wages appears as a privileged way to understand the relation of human capital accumulation and remunerations in general. Indeed, OJT and wage changes are closer in time than general education and production and remuneration processes. In particular, it may be easier to observe how the cost of human capital accumulation is shared between firm and workers. Since OJT should increase productivity, one may expect a positive impact on workers' wages if most of the training cost is borne by the firm. In contrast, if a substantial share of the training cost is paid by the worker, this one may see his/her remuneration drop, at least during the training, as a consequence of compensation agreement.

Using a case study of firm-employee data in the area of Tunis, we find that:

(1) The duration of former OJT negatively influences starting wages, while there is no anticipated effect of delayed future training on wages at the firm entry;

(2) Current wages are positively affected by former OJT but negatively affected by ongoing OJT;

(3) Conjuncture factors seem to greatly affect the influence of OJT on wage growth;

(4) OJT main determinants are education level, gender, family situation and firm characteristics, but not experience or tenure.

These results support the hypothesis that there may be both productivity gains and cost sharing along with OJT. On the whole, our estimation results are consistent with popular human capital theories and broader OJT cost sharing theories. This is comforting because this was not always the case in the empirical literature. Of course, our results would call for confirmation from other data from Tunisia and other developing countries. However, our case study encourages further investigation, perhaps by designing specific firm-employee surveys. In particular, understanding better the determinants of OJT, a path we have begun to explore, is at the core of future avenues of research.

Finally, our estimation results may suggest policy implications, although caution should be taken not to extrapolate results for a few firms to the whole Tunisian manufacturing or more broadly. Technical change and intensifying competition resulting from trade liberalization imply more advanced skills and higher productivity from workers. From a social point of view, such skill upgrade is also important for improving the incomes of vulnerable groups in Tunisia who are increasingly politically active, as the recent unrest accompanying President Ben Ali's fall has shown. In these conditions, the private sector may crucially contribute to enhancing the skills of the labor force through OJT programs. This is notably interesting because much of the human capital accumulated through OJT seems to be portable between firms. However, our estimates show that firms are bearing much of the cost of OJT. This is sustainable only if this cost does not jeopardize their profitability.

This raises the question of whether the state should directly support the firms in their OJT effort. What are the market failures that would justify such policy interventions? First, as stressed by the endogenous growth theory, positive knowledge externalities are not incorporated in market mechanisms. Second, social externalities may result from avoiding too big a dip in starting salary for young workers, particularly in a context of social unrest characterized by massive involvement of youth in the events of the Arab spring.

Finally, it is unclear that the sharing of the OJT cost among firms and workers corresponds to efficient contracts. It may be that inefficiently low levels of OJT are carried out because the cost cannot be shared optimally. Of course, there are other social welfare reasons to foster OJT, such as alleviating poverty among households in the short and medium term.

We found that OJT is partly determined by a minimum education level of workers. In many LDCs, sustainable OJT programs should indeed be supported by efficient public education systems, e.g. through vocational and technical institutes and technology parks as currently operate in Tunisia (see Cammett 2007). Subsidies to stimulate within-firm OJT programs may also be useful if they lead firms to substantially raise their training initiatives. Fostering OJT in this way would benefit young workers by preserving their remunerations at entry into firms, as our results show. This is also important because these young workers, who often originate from destitute and frustrated households, may be tempted to express their dissatisfaction through political unrest, thus contributing to the country's instability.

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Appendix

Table 1: Descriptive Statistics of the Workers' Characteristics

Variables	Mean	Standard deviation	min	max
Age of individuals (AGE)	29.532	7.774	15	52
Sex (FEMALE, 1: woman; 0 man; conversely for MALE)	0.498		0	1
Geographical origin (PROVE, 1: rural area; 0 otherwise)	0.147		0	1
Matrimonial situation (MARI, 1: if married; 0 if divorced, widowed or single)	0.368		0	1
Single male (CELIBAH, 1: yes; 0 otherwise)	0.303		0	1
Number of dependent children (ENFT)	0.580	1.060	0	5
Father has a level of Primary school (PPRIM, 1: yes; 0 otherwise)	0.173		0	1
Father has a level of Secondary school (PSECON, 1: yes; 0 otherwise)	0.164		0	1
Father has a level of Higher education (PSUP, 1: yes; 0 otherwise)	0.125		0	1
Father is illiterate (PANAL, 1: yes; 0 otherwise)	0.194		0	1
Years of schooling (EDUCATION)	9.676	3.880	0	18
Individual went to Koranic school only (KORAN, 1: yes; 0 otherwise)	0.177		0	1
Previous apprenticeship in a firm (APPRENTI, 1: yes; 0 otherwise)	0.363		0	1
Periods of internship related to the current job (STAGA, in years)	1.468	3.617	0.00	24.0
Periods of internship not related to the current job (STAGAN, in years)	0.121	0.759	0.00	6.00
Unemployment spells (CHOMA, in years)	1.385	2.825	0.00	18.0
Previous relevant experience (EMSIM, 1: yes; 0 otherwise)	0.554		0	1
Previous professional experience (EXPE*, in years)	3.261	4.689	0	22
Start date in the current firm (ENTREE)	1992.1	5.901	1968	1997
Tenure in the current firm (TENURE, in years)	5.898	5.902	0.17	30.08
Former formal training received in the current firm (FORMAD, 1: yes; 0 otherwise)	0.182		0	1
Former formal training period in the current firm in years (FORMAA)	0.091	0.323	0	3
Ongoing or recent formal training in the current firm (FORSTIL, 1: yes; 0 otherwise)	0.043		0	1
Member of an union (SYNDIC, 1: yes; 0 otherwise)	0.203		0	1
Work in team (EQUIPE, 1: yes; 0 otherwise)	0.367		0	1
Work in production line (CHAINE, 1: yes; 0 otherwise)	0.320		0	1
Executive or supervisor (ENCADR, 1: yes; 0 otherwise)	0.190		0	1
Current hourly wage (in dinars)	1.893	1.347	0.29	7.57
Starting hourly wage (in dinars)	1.138	1.019	0.04	6.73
Log of current hourly wage (LNSALH)	0.197	0.251	-0.54	0.88
Log of starting hourly wage (LNSALEH)	-0.213	0.863	-3.209	1.906
Current monthly wage (in dinars)	315.13	231.38	52	1350
Starting monthly wage (in dinars)	190.19	172.07	6	1000
Proximity to the minimum wage (SMIG, 1: if 150<=SAL<=190; 0 otherwise)	0.17	0.37	0.17	0	0.37	1	0	1
Firm dummies **				
FIRM 1 (IMMEE sector)	0.134		0	1
FIRM 2 (IMMEE sector)	0.160		0	1
FIRM 3 (Textile sector)	0.143		0	1
FIRM 4 (Textile sector)	0.130		0	1
FIRM 5 (Textile sector)	0.130		0	1
FIRM 6 (IMMEE sector)	0.087		0	1
FIRM 7 (IMMEE sector)	0.078		0	1
FIRM 8 (Textile sector)	0.139		0	1

Notes: *: This experience variable is an actual measure, as opposed to a potential one based on age. It excludes experience in the current job (TENURE) and possible unemployment and inactivity periods. **: The means of the firm dummies describe the sample distribution of the workers across firms and sectors.

Table 2: Starting Wage Equations: Dependent Variable: Log Hourly Starting Wage (LNSALEH)

	(1) OLS	(2) FDM OLS	(3) FDM OLS	(4) FDM OLS	(5) FDM OLS	(6) FDM OLS	(7) FDM IV (2SLS)
Individual socio-economic characteristics							
Years of education (EDUC)	-0.0479	0.0164	0.0172	0.0202	0.0118	0.0280	0.0481
	(0.0438)	(0.0423)	(0.0417)	(0.0417)	(0.0419)	(0.0436)	(0.1175)
Years of education squared ($EDUC^2$)	0.0065***	0.0032	0.0032	0.0030	0.0037*	0.0027	0.0023
	(0.0022)	(0.0022)	(0.0021)	(0.0021)	(0.0021)	(0.0023)	(0.0060)
Years of former internships (STAGAA)	0.4088***	0.3811***	0.3672***	0.3662***	0.3545***	0.3256***	0.3986***
	(0.1276)	(0.1237)	(0.1225)	(0.1224)	(0.1230)	(0.1245)	(0.1450)
Off-the-job actual experience (EXPE)	0.1051***	0.0973***	0.0957***	0.0954***	0.0993***	0.0902***	0.1754***
	(0.0231)	(0.0224)	(0.0222)	(0.0222)	(0.0222)	(0.0230)	(0.0443)
$(\text{Off-the-job actual experience})^2$	-0.0050***	-0.0047***	-0.0045***	-0.0046***	-0.0046***	-0.0040***	-0.0087***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0023)
Dummy for female (FEMALE)	-0.3468***	-0.1595	-0.1844*	-0.1741	-0.1252	-0.1285	-0.1668
	(0.0839)	(0.1105)	(0.1090)	(0.1091)	(0.1210)	(0.1242)	(0.1242)
Age when entering firm (AGENTR)	0.0476***	0.0425***	0.0416***	0.0414***	0.0408***	0.0442***	0.0348***
	(0.0093)	(0.0090)	(0.0089)	(0.0089)	(0.0089)	(0.0092)	(0.0107)
Dummy for Koranic school (KORAN)	-0.0979	-0.1606*	-0.1220	-0.1247	-0.1344	-0.1538	-0.1644
	(0.0931)	(0.0907)	(0.0918)	(0.0917)	(0.0931)	(0.0942)	(0.1333)
Dummy for trade union membership (SYNDIC)	-0.2608***	-0.2180**	-0.2154**	-0.1974**	-0.2074**	-0.2092**	-0.2862**
	(0.0999)	(0.0970)	(0.0961)	(0.0970)	(0.0980)	(0.0989)	(0.1328)
On-the-job training (OJT) variables							
Dummy for former formal OJT in the current firm (FORMAD)	-0.0316	0.0394					
	(0.1002)	(0.1189)					
Years of former formal OJT in the current firm (FORMAA)			-0.2345*	-0.2368**	-0.2426**	-0.2496**	0.0041
			(0.1195)	(0.1194)	(0.1203)	(0.1217)	(0.5323)
Dummy for ongoing OJT in the current firm (FORSTIL)				0.2120	0.2184	0.2592	-0.3690
				(0.1671)	(0.1674)	(0.2479)	(0.7483)
Individual heterogeneity controls							
Dummy for executive or supervisor at the time of the survey (ENCADR)					-0.1644*	-0.1862*	
					(0.0927)	(0.0951)	
Dummy for work in production line at the time of the survey (CHAINE)					-0.1247	-0.1366	
					(0.1159)	(0.1175)	
Dummy for work team at the time of the survey (EQUIPE)					0.0422	0.0219	
					(0.0842)	(0.0853)	
Firm dummies and interactions							
EDUC*FIRM 6						0.2567	
						(0.5162)	
EDUC2*FIRM 6						-0.0057	
						(0.0197)	
FORMAA*FIRM 6						-0.3197	
						(1.3833)	
FORSTIL*FIRM 6						0.0891	
						(0.3939)	

Table 2: Continued

	(1) OLS	(2) FDM OLS	(3) FDM OLS	(4) FDM OLS	(5) FDM OLS	(6) FDM OLS	(7) FDM IV (2SLS)
FIRM 1		-0.5328***	-0.4559***	-0.4178**	-0.3577**	2.1899	-0.6614*
		(0.1662)	(0.1686)	(0.1710)	(0.1786)	(3.3375)	(0.3571)
FIRM 2		-0.1328	-0.2096	-0.1533	-0.1096	2.4146	-0.2545
		(0.1710)	(0.1560)	(0.1620)	(0.1733)	(3.3284)	(0.3030)
FIRM 3		-0.3022*	-0.3576**	-0.3051*	-0.2149	2.3200	-0.4869
		(0.1777)	(0.1684)	(0.1732)	(0.1783)	(3.3406)	(0.3122)
FIRM 4		-0.5587***	-0.6058***	-0.5534***	-0.4429**	2.0718	-0.6780**
		(0.1851)	(0.1755)	(0.1801)	(0.1876)	(3.3374)	(0.3326)
FIRM 5		-0.3211*	-0.3692**	-0.3137*	-0.2246	2.2997	-0.5061
		(0.1787)	(0.1677)	(0.1731)	(0.1785)	(3.3378)	(0.3282)
FIRM 7		-0.3387*	-0.3779**	-0.3332*	-0.3055*	2.2223	-0.4949*
		(0.1735)	(0.1677)	(0.1711)	(0.1748)	(3.3338)	(0.2888)
FIRM 8		-0.7986***	-0.8461***	-0.8014***	-0.7347***	1.8011	-0.8987***
		(0.1726)	(0.1617)	(0.1652)	(0.1699)	(3.3417)	(0.2796)
Constant	-1.5632***	-1.4043***	-1.3200***	-1.3892***	-1.4024***	-4.0277	-1.3845**
	(0.2810)	(0.2968)	(0.2826)	(0.2874)	(0.3117)	(3.3387)	(0.5580)
Observations	231	231	231	231	231	231	231
R-squared	0.67	0.73	0.73	0.73	0.74	0.74	
Pseudo Squared							0.69
Sargan statistic of over identifying restrictions							22.89
Sargan p-value							0.12
Wu-Hausman F test (H_0: 'Exogeneity of instrumented variables')							1.05
Wu-Hausman p-value							0.39

Notes: Standard errors are given in parentheses. ***, ** and * mean respectively significant at the 1%, 5% and 10% levels. The instrumented variables in the IV regression (7) are: EDUC, $EDUC^2$, EXPE, $EXPE^2$, FORMAA, FORSTIL. The excluded instruments used in the IV regression include: PPRIM, PANAL, ENFT, $ENFT^2$, ENFT*AGE, PROVE, MARI*FEMALE, MARI*MALE, CHOMA, $CHOMA^2$, EMSIM, APPRENTI, STAGAN, PPRIM*AGE, PANAL*AGE, PPRIM*ENFT, PSECON*ENFT, PSUP*ENFT, PANAL*ENFT, PPRIM*CHOMA, PSECON*CHOMA, PANAL*CHOMA. The definitions of the variables and instruments appear in Table 1.

Table 3: Current Wage Equations: Dependent variable: Log Hourly Current Wage (LNSALH)

	(1) OLS	(2) FDM OLS	(3) FDM OLS	(4) FDM OLS	(5) FDM OLS	(6) FDM OLS	(7) FDM OLS	(8) FDM IV (2SLS)
EDUC	-0.0880***	-0.0487*	-0.0413	-0.0416*	-0.0371	-0.0309	-0.0183	-0.0650
	(0.0268)	(0.0254)	(0.0251)	(0.0250)	(0.0247)	(0.0254)	(0.0271)	(0.0911)
$EDUC^2$	0.0088***	0.0064***	0.0059***	0.0059***	0.0050***	0.0047***	0.0035**	0.0069
	(0.0013)	(0.0013)	(0.0013)	(0.0012)	(0.0012)	(0.0013)	(0.0014)	(0.0046)
STAGAA	0.2271***	0.1656**	0.1759**	0.1788**	0.2011***	0.1800**	0.1967**	0.1807*
	(0.0777)	(0.0748)	(0.0737)	(0.0733)	(0.0722)	(0.0730)	(0.0797)	(0.1039)
EXPE	0.0415***	0.0502***	0.0512***	0.0519***	0.0493***	0.0475***	0.0421***	0.0797***
	(0.0118)	(0.0115)	(0.0113)	(0.0113)	(0.0111)	(0.0113)	(0.0122)	(0.0294)
$EXPE^2$	-0.0007	-0.0012*	-0.0012*	-0.0012*	-0.0014**	-0.0012*	-0.0013*	-0.0026
	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0019)
Tenure in the firm (TENURE)	0.0489***	0.0590***	0.0597***	0.0571***	0.0523***	0.0515***		0.0629*
	(0.0101)	(0.0097)	(0.0095)	(0.0096)	(0.0095)	(0.0096)		(0.0373)
$TENURE^2$	-0.0008*	-0.0012***	-0.0012***	-0.0011**	-0.0012***	-0.0012***		-0.0019
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)		(0.0018)
FEMALE	-0.2885***	-0.1990***	-0.1788***	-0.1805***	-0.1766**	-0.1846**	-0.1259	-0.1477
	(0.0508)	(0.0665)	(0.0658)	(0.0655)	(0.0715)	(0.0727)	(0.0786)	(0.0996)
KORAN	-0.0482	-0.0619	-0.0631	-0.0626	-0.0339	-0.0415	-0.0296	-0.0704
	(0.0580)	(0.0553)	(0.0534)	(0.0531)	(0.0528)	(0.0531)	(0.0584)	(0.0672)
SYNDIC	-0.0972	-0.0907	-0.0887	-0.0994	-0.0763	-0.0847	0.0434	-0.1198
	(0.0647)	(0.0612)	(0.0602)	(0.0602)	(0.0607)	(0.0609)	(0.0634)	(0.0923)
FORMAA	0.0982	0.0371						
	(0.0696)	(0.0727)						
FORMAD			0.1861***	0.2323***	0.2321***	0.2021**	0.2393***	0.7408*
			(0.0707)	(0.0750)	(0.0736)	(0.0838)	(0.0813)	(0.4072)
FORSTIL				-0.1919*	-0.2240**	-0.2584*	-0.3590***	-1.0347**
				(0.1079)	(0.1061)	(0.1557)	(0.1153)	(0.5252)
ENCADR					0.1917***	0.1750***	0.3530***	
					(0.0617)	(0.0631)	(0.0599)	
CHAINE					-0.0533	-0.0615	-0.0697	
					(0.0678)	(0.0686)	(0.0747)	
EQUIPE					-0.0738	-0.0859*	-0.0894*	
					(0.0490)	(0.0493)	(0.0540)	
EDUC*FIRM 6						0.2971		
						(0.3049)		
$EDUC^2$* FIRM 6						-0.0092		
						(0.0117)		
FORMAD* FIRM 6						0.1227		
						(0.1843)		
FORSTIL* FIRM 6						0.1251		
						(0.2189)		

Table3: Continued

	(1) OLS	(2) FDM OLS	(3) FDM OLS	(4) FDM OLS	(5) FDM OLS	(6) FDM OLS	(7) FDM OLS	(8) FDM IV (2SLS)
FIRM 1		-0.4423***	-0.4535***	-0.4837***	-0.5414***	1.9208	-0.3982***	-0.5521**
		(0.1077)	(0.1037)	(0.1045)	(0.1058)	(1.9656)	(0.1137)	(0.2272)
FIRM 2		-0.4611***	-0.3566***	-0.3787***	-0.4805***	1.9485	-0.5386***	-0.2606
		(0.0949)	(0.1016)	(0.1018)	(0.1064)	(1.9598)	(0.1170)	(0.3184)
FIRM 3		-0.5901***	-0.5082***	-0.5342***	-0.6280***	1.8120	-0.7222***	-0.5038*
		(0.1025)	(0.1057)	(0.1062)	(0.1087)	(1.9665)	(0.1184)	(0.2809)
FIRM 4		-0.5578***	-0.4762***	-0.4966***	-0.5824***	1.8526	-0.5700***	-0.4217
		(0.1079)	(0.1108)	(0.1108)	(0.1136)	(1.9650)	(0.1239)	(0.3074)
FIRM 5		-0.5940***	-0.5067***	-0.5299***	-0.6071***	1.8273	-0.6075***	-0.4763
		(0.1029)	(0.1068)	(0.1070)	(0.1085)	(1.9648)	(0.1192)	(0.2993)
FIRM 7		-0.5906***	-0.5332***	-0.5518***	-0.5868***	1.8568	-0.4979***	-0.5141**
		(0.1039)	(0.1046)	(0.1046)	(0.1044)	(1.9631)	(0.1143)	(0.2334)
FIRM 8		-0.5911***	-0.5060***	-0.5199***	-0.6047***	1.8374	-0.6021***	-0.3839
		(0.0992)	(0.1030)	(0.1028)	(0.1035)	(1.9666)	(0.1138)	(0.2711)
Constant	0.1390	0.4410***	0.3101**	0.3451**	0.5123***	-1.9295	0.6710***	0.3108
	(0.1343)	(0.1396)	(0.1465)	(0.1471)	(0.1629)	(1.9579)	(0.1784)	(0.5165)
Observations	231	231	231	231	231	231	231	231
R-squared	0.73	0.78	0.79	0.79	0.80	0.81	0.76	
Pseudo Squared								0.69
Sargan statistic								16.54
Sargan p-value								0.28
Wu-Hausman F test								1.57
Wu-Hausman p-value								0.13

Notes: Standard errors are given in parentheses. ***, ** and * mean respectively significant at the 1%, 5% and 10% levels. The instrumented variables in the IV regression (8) are: EDUC, $EDUC^2$, TENURE, $TENURE^2$, EXPE, $EXPE^2$, FORMAD, FORSTIL. The excluded instruments used in the IV regression include: PPRIM, PANAL, ENFT, $ENFT^2$, ENFT*AGE, PROVE, MARI*FEMALE, MARI*MALE, CHOMA, $CHOMA^2$, EMSIM, APPRENTI, STAGAN, PPRIM*AGE, PANAL*AGE, PPRIM*ENFT, PSECON*ENFT, PSUP*ENFT, PANAL*ENFT, PPRIM*CHOMA, PSECON*CHOMA, PANAL*CHOMA. The definitions of the variables and instruments appear in Table 1.

Table 4: Marginal Returns to Human Capital across Specifications

	FDM OLS (5)	**FDM 2SLS** (8)	**FDM OLS** (5)	**FDM 2SLS** (8)
	Starting wage equations		***Current wage equations***	
Years of education	0.0828*	0.0923	0.0599***	0.0692
Off-the-job actual experience	0.0693***	0.1185**	0.0401***	0.0628***
Years of Tenure			0.0382***	0.0406*
Years of former OJT	-0.2426**	0.0041		
Dummy for ongoing OJT	0.2184	-0.3690	-0.2240**	-1.0347**
Dummy for former OJT			0.2321***	0.7408*

Notes: ***, ** and * mean respectively significant at the 1%, 5% and 10% levels. [a]: the returns are calculated at the sample means.

Table 5: Annual Wage Growth Equations with Entry Dates and Periods in the Current Firm: Dependent variable: (Log hourly current wage - Log hourly starting wage) / tenure in the firm

	(1) FDM OLS + entry date dummies	(2) FDM OLS + period dummies	(3) FDM 2SLS + period dummies	(4) FDM OLS + period dummies interactions	(5) FDM 2SLS + period dummies interactions
Years of education (EDUC)	-0.0200	-0.0115	-0.0002	-0.0093	0.0277
	(0.0206)	(0.0195)	(0.0706)	(0.0188)	(0.0865)
Years of education squared ($EDUC^2$)	0.0021	0.0015	0.0019	0.0013	0.0007
	(0.0013)	(0.0012)	(0.0036)	(0.0011)	(0.0044)
Off-the-job actual experience (EXPE)	0.0193**	0.0174**	0.0241	0.0164*	0.0087
	(0.0077)	(0.0073)	(0.0215)	(0.0076)	(0.0309)
Off-the-job actual experience squared ($EXPE^2$)	-0.0003	-0.0003	-0.0006	-0.0003	0.0003
	(0.0004)	(0.0004)	(0.0013)	(0.0004)	(0.0018)
Dummy for TU membership (SYNDIC)	0.0654	0.0711	0.1010	0.0570	0.1651
	(0.0667)	(0.0599)	(0.0660)	(0.0671)	(0.1203)
On-the-job training (OJT) variables					
Years of former OJT in the current firm (FORMAA)	-0.1165***	-0.0680***	0.0061	-0.0007	-0.2435
	(0.0235)	(0.0176)	(0.3309)	(0.0127)	(0.5317)
Dummy for ongoing OJT in the current firm (FORSTIL)	-0.0697	-0.1089	0.4365	-0.0935	0.5929
	(0.1483)	(0.1389)	(0.4762)	(0.1590)	(0.5881)
Individual heterogeneity controls					
Dummy for executive or supervisor (ENCADR)	-0.1009	-0.0691	-0.1449*	-0.0553	-0.1751
	(0.0596)	(0.0395)	(0.0876)	(0.0415)	(0.1077)
Dummy for work in production line at the time of the survey (CHAINE)	-0.0000	0.0147	0.0869	0.0089	0.1283
	(0.0492)	(0.0464)	(0.0772)	(0.0461)	(0.0992)
Dummy for work team at the time of the survey (EQUIPE)	0.0624	0.0698	0.1115**	0.0662	0.1516**
	(0.0533)	(0.0417)	(0.0517)	(0.0458)	(0.0733)
Dummies and interactions of period of entry in the current firm					
Before 1987 (PERIOD1) (*Reference*)					
Between 1987 and 1994 (PERIOD2)		-0.1597*	-0.2372**	-0.0982	-0.3038
		(0.0675)	(0.1104)	(0.0633)	(0.2608)
After 1994 (PERIOD3)		-0.2867***	-0.4082***	-0.2176**	-0.5158*
		(0.0785)	(0.1226)	(0.0797)	(0.2922)
FORMAA*PERIOD2				-0.4530*	-3.4387
				(0.2175)	(4.0940)
FORMAA*PERIOD3				-0.2844***	0.5509
				(0.0712)	(1.1017)

Table 5: Continued

	(1) FDM OLS + entry date dummies	(2) FDM OLS + period dummies	(3) FDM 2SLS + period dummies	(4) FDM OLS + period dummies interactions	(5) FDM 2SLS + period dummies interactions
FIRM 1	0.0152	-0.0115	0.1198	0.0193	0.1890
	(0.0559)	(0.0618)	(0.2332)	(0.0525)	(0.2934)
FIRM 2	0.1878**	0.1460***	0.4337**	0.1266**	0.5067*
	(0.0604)	(0.0379)	(0.2070)	(0.0483)	(0.2597)
FIRM 3	0.2301***	0.2349***	0.5049**	0.2131**	0.5939**
	(0.0653)	(0.0549)	(0.2222)	(0.0663)	(0.2865)
FIRM 4	0.2315**	0.2190***	0.4858**	0.1954**	0.5473**
	(0.0772)	(0.0552)	(0.2214)	(0.0647)	(0.2761)
FIRM 5	0.2037**	0.1838***	0.4387**	0.1615**	0.5234*
	(0.0684)	(0.0500)	(0.2193)	(0.0608)	(0.2861)
FIRM 7	0.1539***	0.1400***	0.3037*	0.1425**	0.3920*
	(0.0423)	(0.0378)	(0.1730)	(0.0413)	(0.2191)
FIRM 8	0.0802	0.0630	0.2868	0.0479	0.3267
	(0.0687)	(0.0520)	(0.1826)	(0.0559)	(0.2185)
Constant	-0.4043***	-0.2164	-0.5700*	-0.2577	-0.7055*
	(0.0986)	(0.1381)	(0.3353)	(0.1361)	(0.4261)
Observations	231	231	231	231	231
R-squared	0.25	0.22		0.24	
Pseudo Squared			0.33		0.11
Sargan stat			8.10		5.25
Sargan p-value			0.95		0.98
Wu-Hausman F test			0.90		0.98
Wu-Hausman p-value			0.48		0.45

Notes: Robust standard errors are given in parentheses. ***, ** and * mean respectively significant at the 1%, 5% and 10% levels. The instrumented variables in the IV regressions are: EDUC, $EDUC^2$, EXPE, $EXPE^2$, FORMAA, FORSTIL (and FORMAA*PERIOD2, FORMAA*PERIOD3 for column (5)). The excluded instruments used in the IV regression include: PPRIM, PANAL, ENFT, ENFT2, ENFT*AGE, PROVE, MARI*FEMALE, MARI*MALE, CHOMA, CHOMA2, EMSIM, APPRENTI, STAGAN, PPRIM*AGE, PANAL*AGE, PPRIM*ENFT, PSECON*ENFT, PSUP*ENFT, PANAL*ENFT, PPRIM*CHOMA, PSECON*CHOMA, PANAL*CHOMA.

Table 6: Probit Models of OJT

	(1) Pr(OJT) Marginal Effects	(2) Pr(OJT) Marginal Effects	(3) Pr(OJT) Marginal Effects
SEX	-0.0502*	-0.0221*	-0.1775**
	(1.78)	(1.80)	(1.96)
AGE	-0.0051	-0.0012	-0.0224
	(0.68)	(0.37)	(0.74)
AGE^2	0.0001	0.0000	0.0006
	(0.52)	(0.41)	(1.19)
MARI	-0.0184	-0.0050	0.0341
	(0.83)	(0.54)	(0.39)
ENFT	0.0263**	0.0103**	0.0639
	(2.18)	(2.02)	(1.44)
SMIG	-0.0201	-0.0032	0.0340
	(0.76)	(0.25)	(0.19)
PROVE	-0.0101	-0.0000	-0.0094
	(0.57)	(0.00)	(0.13)
CORAN	0.0497	0.0260	0.1092
	(1.56)	(1.62)	(0.89)
EDUCATION	0.0092**	0.0034**	0.0105
	(2.19)	(2.01)	(0.69)
APPRENTI	0.0087	0.0032	0.0218
	(0.40)	(0.34)	(0.23)
ETUTPA	0.0041	0.0055	0.0307
	(0.26)	(0.77)	(0.55)
STAGA	0.0074	-0.0026	-0.0408
	(0.38)	(0.32)	(0.64)
CHOMA	-0.0162	-0.0092*	-0.1015*
	(1.54)	(1.78)	(1.95)
TENURE	0.0019	0.0009	-0.0472
	(0.41)	(0.23)	(1.28)
$TENURE^2$	-0.0000	-0.0001	0.0001
	(0.26)	(0.98)	(0.15)
EXPE	-0.0003	-0.0008	-0.0234
	(0.07)	(0.46)	(1.38)
Dummy for Textile	-0.0858***	-0.0404***	
	(2.97)	(2.88)	
PERIOD 2		-0.0438**	-0.1037
		(2.20)	(0.84)
PERIOD 3		-0.0207	-0.4519
		(0.56)	(1.10)
FIRM 1			0.2096
			(1.51)
FIRM 3			-0.0988
			(1.36)
FIRM 7			-0.0743
			(1.31)
FIRM 8			-0.1390**
			(2.31)
FIRM 2			
FIRM 4			
FIRM 5			
Observations	231	231	134
Log-likelihood	-61.75	-55.10	-37.29
Pseudo R2	0.44	0.50	0.55

Notes: Absolute value for robust z statistics is in parentheses. Column (3) excludes firms 2, 4 and 5. ***, ** and * mean respectively significant at the 1%, 5% and 10% levels.