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Hazard Analysis: Transition Ecole-Travail des Diplomes de la FP au Maroc

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HAZARD ANALYSIS FOR INTERVAL-CENSORED DURATION OF NON-EMPLOYMENT: SCHOOL-TO-WORK TRANSITION OF VOCATIONAL TRAINING GRADUATES IN MOROCCO

Luis Sagaon TEYSSIER[a]
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Abstract

This paper analyses the determinants of the probability of being employed under the framework of a reduced form survival model. We estimated a Cox's proportional hazard model accounting for unobserved heterogeneity and duration dependence using data from the 2009 Follow-up of Moroccan Vocational Training Graduates – Class of 2006 –. Our estimations reveal the presence of spurious negative duration dependence, that becomes positive after controlling for unobserved heterogeneity. Concerning vocational training characteristics we find that individuals in the lowest training level (specialization training) are 50% more likely to be employed than individuals in other training levels (qualification, technician and specialized technician). It seems that vocational training in Morocco is more responsive to the needs of sectors requiring low-skilled individuals. Finally, our results suggest that policy makers should focus in screening the needs required in middle- and high-skilled sectors of the labour market in order to align labour supply and employment offers in these sectors. That could contribute to reduce the long-term period of non-employment to which these categories of workers seem to be confronted.

JEL Classification: C41, J21, J68

1. Introduction and context

Unemployment rate in Morocco started to decline after attaining 14% in 1999 and thereafter stabilized around 9% since 2006 up until now. During the last years, unemployment rate in Morocco was lower than the one observed in other developing countries of the Middle East and North Africa (MENA) region. In 2012, the MENA region observed an unemployment rate of around 12%, whereas it was, respectively 9.8%, 12.8% and 11.9% in Algeria, Tunisia and Egypt. Nevertheless, unemployment in Morocco remains the highest among lower-middle income countries whose average unemployment rate evolved from 6.1% in 2006 to 5.2% in 2012 (ILO-KILM, 2014). The reduction and stability of the Moroccan national unemployment rate has been explained, on the one hand, by the decline in the population growth due to the decrease in fertility rate and the consequent reduction of the number of entrants in the labour market; and on the other hand, economic growth has facilitated job creation especially in the services sector which absorbed the largest share of entrants (IMF, 2013). Unemployment rate in Morocco is driven by the urban labour market as pointed out by Tanjo (1990) and Rama (1998). It is about three times higher than the rural unemployment rate, furthermore it decreased in a slower pace compared to the national

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one: passing from 15.5% in 2006 to 13.4% in 2012 (Haut Commissariat au Plan, 2013). Indeed, this reflects the complexity of urban labour markets in developing countries where the presence of a large informal segment may attenuate more or less the impact of structural changes experienced by these economies in a context of globalization (see, for example, Ghose et al.(2008)). Unfortunately, the literature about the Moroccan labour market, and particularly about unemployment remains scarce and mainly based on institutional reports.

The more fluctuating urban unemployment rate in Morocco seems to be reflecting – at least partially – the adjustment of the economy after the structural changes produced by the trade liberalization process starting in early 80s. With the entry of Morocco into the World Trade Organization in 1995 and the subsequent signature of free trade agreements, the labour market went through a transformation with important effects on employment and wages. Even though manufacturing firms did adjust neither employment nor wages in response to trade reforms, employment declined for firms in some sectors (textile, beverage and apparel) and exporting firms (Currie and Harrison, 1997). As in other developing countries, economic openness was at the origin of technological change in seeking for competitiveness and the increase of productivity that was needed for. This resulted in the decrease of the demand for labour, particularly affecting unskilled workers (Bottini and Gasiorek, 2009). As the main consequence, both young and other fragile populations are often confronted with barriers at the entry of the labour market especially in the formal employment (Dickens and Lang, 1985) and their (only) resort is to search for a job in the informal segment.

In the Moroccan urban labour market, the most affected by unemployment are individuals aged between 15 and 34 years with rates of 34% and 46.9% respectively for the 15-24 years and 25-34 years in 2012. Nonetheless, it is important to mention that individuals aged between 35 and 44 years are associated to an unemployment rate, admittedly much lower than the one of younger (13.2%), but still higher than the national unemployment rate (Direction de la statistique, 2012). In addition, it has been demonstrated that the Moroccan urban labour market is also affected by the high unemployment level among educated individuals. O'Sullivan et al. (2011) pointed out a high unemployment rate among Moroccan graduates around 22%, compared to 14% and 11% respectively for Tunisia and Algeria. However, unemployment is not only a matter of graduates, but also of lower levels of education. Between 2010 and 2012, urban unemployment rates either for individuals with at least one diploma, in the secondary level, or in the superior level was around 18%; this is almost three times the urban unemployment rate observed among individuals without education whose rate in the same period was around 7% (Haut Commissariat au Plan, 2012). The high likelihood of unemployment among educated individuals in developing countries is related to structural adjustment policies imposed by the International Monetary Fund (IMF) in 1983 that caused a decline of hiring in the public sector, potential destination for educated workers in developing countries (Boudarbat, 2004). In Morocco this situation is due also to rapid growth of graduates (Bougroume,Ibourk and Trachen, 2002). In particular, the small demand for qualifications has been pointed out as one of the most important characteristics of the urban labour market in Morocco (Walther, 2006). In this context, relatively young individuals with any degree of education are

confronted with a double difficulty to access into the Moroccan urban labour market: almost 50% of individuals aged between 15 and 44 years were graduated from either middle- or higher level of education in 2012 (Direction de la statistique, 2012).

In this context, vocational training (VT) became one of the main instruments attempting the reduction of unemployment among young individuals in Morocco, especially among new entrants. The financing of the first VT project in Morocco was approved in 1984 by the World Bank. In the Project Completion Report published in 2013 about this project, the deficiency of the project's preparation, design, implementation and outcomes were pointed out. Although the objective of expanding VT capacity was attained, "…the labour market and economic analysis on which training needs were based was incorrect, leading to a mismatch of skills and job opportunities…" (World Bank, 1993). Following this project, the government launched in 1989 the 16/87 Law with the main objective of improving the access into the labour market of self-employed graduates from VT. This was the beginning of an important number of programs aimed to improve the employment opportunities for young individuals by the promotion of VT as an alternative to general education. VT was (and is still) supposed to allow young individuals to acquire skills adapted to the needs of the Moroccan labour market, although the mismatch with job opportunities seemed to persist. In 2000, the National Agency for the Promotion of Employment and Skills (ANAPEC in French) was created not only to facilitate the matching between job offers and labour supply, but also to assist young people in their access into the labour market as self-employed. In doing so, the ANAPEC established three main programs: *Moukawalati* (my business) promoting self-employment among graduated from VT; *Idmaj* (inclusion) with the objective of improving employability among young; and *Taehil* (qualification) which aims the reduction of mismatching between the educational system and the labour market by providing adapted skills. Nevertheless, barriers to implementation, have often compromised the responsiveness of the VT system to the labour market requirements, in spite of the variety of policies that have been elabourated with this purpose (Boudarbat and Egel, 2012). Unfortunately, to our knowledge, there is no official evaluation of the effectiveness of these policies and it is difficult to quantify the extent to which their implementation contributed to the reduction of youth unemployment especially among those graduated from VT.

The scarcity of the literature about VT in Morocco is due principally to the lack of data on this subject. The most recent study focus on the factors associated to unemployment duration before the first job using a similar approach on data of the 1991 class collected in 1992 for OFPPT graduates (Montmarquette, Mourji, and Garni, 1996) and on data concerning the 2000 class of Moroccan VT graduates interviewed in 2004 (Boudarbat, 2007). These studies confirm the persistence of high unemployment among recent VT graduates (58% still have not yet been integrated into the labour market one year after graduation in 1991, and around 30% still searching for a first job 49 months after graduation in 2000). The results of both studies lead to very similar conclusions concerning the effect of observed characteristics on the length of the unemployment spell preceding employment.

The little empirical knowledge about the situation of individuals graduated from VT in that concerning their entry process into the urban Moroccan labour market raises the question about whether policies are constructed. We argue that a better knowledge about the factors associated with the length of the school-to-work transition is crucial for the construction of evidence-based policy and a better orientation of new VT programs. This study is prepared in the mid-implementation of the Training-Employment Matching Support Program (PAAFE) launched on July 2013 (Gueye et al., 2013), nonetheless, the remaining question is the extent in which empirical studies were considered for its preparation.

Although the existing literature in Morocco provides important features about school-to-work duration among VT graduates, there is an important methodological lack. Indeed, authors do not account either for duration dependence or unobserved heterogeneity that is a major aspect as stressed in the existing literature. On the one hand, duration dependence may bring some light about some aspects of the job-search process. Positive duration dependence has been associated with the decline of reservation wages resulting in higher probability of leaving unemployment for long-term unemployed (Lippman and McCall, 1976). On the opposite, negative duration dependence points out the difficulties of access into employment that may come either from barriers in the labour market or by the behavior of job-seekers. In fact, negative duration dependence has often been associated to both discouragement in the job-search process or stigmatization of long-term unemployed (Flinn and Heckman, 1983; Van den Berg, 1994). On the other hand, not accounting for unobserved heterogeneity may not only overestimate duration dependence, but inference based on the latter may be erroneous as unobserved heterogeneity may, indeed, shift the sign of duration dependence (Machin and Manning,1999).

From this perspective, we propose a study based on information provided by a recent survey of VT graduates belonging to the 2006 class. This survey provides retrospective information about the employment trajectories of graduates from VT. Our analysis attempts to estimate the determinants of the probability of being employed under the framework of a reduced form survival model. More precisely, we estimate Cox's proportional hazard model accounting for unobserved heterogeneity and for duration dependence which is one of the main contributions of this article to the Moroccan literature about unemployment duration of VT graduates.
The article is organized as follows. Section II presents data on the sample used to carry out our estimations. Section III presents the model and its main characteristics. Section IV presents the results of the estimations, which pay particular attention to the term accounting for duration dependence. Finally, section V presents the concluding remarks.

II. Stylized facts of unemployment in Morocco

In 2012, the population of Morocco aged 15 years and over reached 11.6 millions. The structure of the Moroccan active population is characterized by the predominance of youth (Bensaïd et El Aoufi, 2006). Active young people aged under 35 years account

for almost 47.7% of the labour force (45.6% in urban areas and 50.2% in rural areas) (Direction de la statistique, 2012).

The structure of unemployment by age did not significantly change between 2000 and 2012. Individuals aged 15-34 years are most vulnerable to unemployment. They constituted more than 80% percent of all of the unemployed (tableI.1).

Table 1. Unemployment rate (%) by age

	2000	2012
15-24 years old	39.8	37.9
25-34 years old	44.0	43.1
35-44 years old	11.8	12.6
45 and above	4.3	6.4

Source : Haut-Commissariat au Plan

At the national level, women are more likely to be unemployed —9.9% vs. 8.7 % for men. In urban areas, the unemployment rate of women is 20.6% vs. 11.5% for men. Particularly, in these areas, the 15-34 years old age cohort is most vulnerable to unemployment—33.5 % for 15-24 vs. 19.6 % for 25-34 years old.

Table 2. Unemployment rate (%) by gender, age and area in 2012

Unemployment rate (%) by gender	Urban	Rural	National
Males	11.5	4.9	8.7
Females	20.6	1.9	9.9
Unemployment rate (%) by age			
15-24 years old	33.5	8.9	18.6
25-34 years old	19.6	4.3	13.2
35-44 years old	7	2.1	5
45 and above	2.7	1	1.9

Source : Haut-Commissariat au Plan

III. The Structure of economic activity and sectoral employment in Morocco

Despite being situated in a region characterized by many changes since the inception of the "Arab Spring" in 2011, Morocco has successfully kept a relatively stable and peaceful social stability. Moreover, many difficulties have hampered the performance of the Moroccan economy since 2009, namely the global economic recession, the soaring fuel oil prices and the European financial crisis. Nevertheless, economic growth in Morocco has remained relatively strong (4.6%) in 2013 against 2.8% on average for the MENA region in 2013 , by far exceeding other oil-producing countries in the region (World Bank, 2013).

Morocco is a low medium income country. The Moroccan economy is relatively well diversified. Primary sector is still a vital part of the Moroccan economy, accounting for almost 15% of GDP. Its contribution to growth averaged 1.1% per year between 2008 and 2012 after 0.8% over the 2000-2007 period thanks to efforts under the Green

Morocco Plan[1] and the Maritime Halieutis Plan[2]. Nevertheless, Moroccan agriculture productivity remains low compared to advanced countries (Dadush, 2015).The industrial sector represents a key source of foreign exchange earnings, with export products (phosphate, phosphate by-products and manufactured goods), contributing to nearly 26% of the GDP. The secondary sector's contribution to growth has decreased from 1% on average over the period 2000-2007 to 0.64% in 2008-2012. The structure of Moroccan economy is still dominated by services. It accounts for more than half of the GDP. The contribution of the tertiary sector to the growth of the GDP during the period 2008-2012 was significant (almost 2.84 percentage points on average).

Within the services sector, both the commerce and services provided to companies are fairly well-developed. The modern services sector (finance, telecommunications, transport and business services) accounts for a interesting share of Moroccan growth). Morocco has one of Africa and the middle east's most developed manufacturing sector, which accounts for about one-sixth of GDP. Whereas, the mining and energy sector accounts for around 8 per cent of real GDP Mining is dominated by phosphates[3]. Petroleum products are mainly imported.

Economic growth is necessary to meet social requirements, such as jobs'creation. Namely in a context characterized by an increasing number of young people seeking jobs. Morocco has invested in targeted sectoral strategies to accelerate employment creation, especially for young people. Nevertheless, some sectors that contribute to GDP growth may not create enough jobs. Indeed, Morocco has one of the largest financial sectors in Africa (Council for International Development Cooperation, 2014), a sector that creates few jobs for youth compared to its contribution to GDP. Services sector accounts for an interesting share of growth but don't generate enough job for youth. The agriculture, forestry and fisheries sector absorbs the largest share of young people aged between 15 et 34 years old. Indeed, around 40% of young working Moroccans were employed in the agricultural sector in 2012, and in 2000 they were almost 50%. However, the sector contributes only with 14% to the GDP, which is due to the fact that most agricultural workers are subsistence farmers. Moreover, in Morocco agriculture creates jobs with low wages and poor conditions mainly due to its sensitivity to the weather (ETF, 2012). It should be also noted that more than 42 % of the labour force population employed in the informal sector is aged under 35 years (Direction de la statistique, 2006-2007).

It is noteworthy that the economic sector shares have been very stable in the last decade. It means that the mobility across the sectors is somehow rigid which reflects restrictive labor market regulations limiting labour market flexibility in Morocco (Agénor and El Aynaoui, 2005).

[1] The Green Morocco Plan, which constitutes the national agriculture strategy, is intended to implement an agricultural policy that will bring about competitive upgrading of agricultural production and integration into the world market, while creating wealth for stakeholders along the value chain.

[2] the Halieutis Plan aims to develop the fisheries sector.

[3] Morocco has three-quarters of the world's phosphate reserves. The exploitation, processing and marketing of phosphates are a State monopoly exercised by the OCP.

Table 4. Sectoral distribution of employed youth aged 15-34

	2000	2012
Agriculture,forestry and fisheries	49.29%	40.76%
Extractive industry	0.32%	0.76%
Food processing industry	1.13%	1.53%
Textiles industry	8.35%	4.92%
Manufacturing industry	5.41%	5.83%
Electricity, gas and water	0.19%	0.16%
Building and public works	6.08%	11.72%
Repairs	2.33%	2.73%
Commerce	11.76%	12.95%
Hotel and catering	1.78%	2.95%
Transport, warehousing and communications	2.66%	3.62%
Banking, insurance and property dealing	0.89%	2.20%
Personal and domestic services	4.01%	4.19%
Community services	2.69%	3.35%
General administration	3.01%	2.24%
Poorly designated activities	0.09%	0.10%
Total	100.00%	100.00%

Source: HCP, authors

IV. Data

This study uses data from the 2009 Follow-up of Moroccan Vocational Training Graduates – Class of 2006 –. The design of this survey allows to reconstitute the urban labour market trajectories since graduation. Data was collected retrospectively in 2009 by questionnaires distributed to a nationally representative sample of 8715 graduates. The situation in the labour market of each individual is recorded for total of 37 months starting from July 2006. Given that we focus on the urban labour market, data concerning individuals declaring to live in rural areas was removed: this represents only 3% of the total sample. By doing so, the final sample is formed by the trajectories of 8451 VT graduated individuals.

The main characteristics of the sample in table 1 show that individuals in our dataset are aged between 18 and 45 years, although observations are concentrated in the range 20-30 years (97%). However, we retained all the information as this study attempts to explain the factors explaining the length of the school-to-work transition in the urban labour market of the 2006 class of graduates from VT in 2009. In the sample, 50% are females, 68.3% were enrolled in either a qualification training level or a technician training level. Most of the graduates undertook training managed by a private training operator (43%), contrasting with the 36.4% of individuals in training managed by the public training operator (OFPPT). Surprisingly, 95% of graduates from VT declared that their parents were employed at the time of the interview, and less than 4% were unsatisfied at all of the VT that they followed.

The outcome in this article is the number of months elapsed since graduation from VT until the time at which the employment state was observed. Indeed, this defines a school-to-work period in which individuals may experience one or more situations among unemployment, internship or inactivity (that is, a non-employment state). Table

1 shows the descriptive statistics the sample and the average time that graduates from VT spent in the non-employment state. On the one hand, we observe that 30% of individuals in the sample have not found an employment within the observation period of 37 months after graduation. On the other hand, the non-employment spells are on average relatively longer for: females (19.3 months), those either in qualification (18.5 months) or technician (18.3 months) training levels, those enrolled in agriculture training operator (20.3 months), individuals whose parents were not employed at the time of the interview (19.3 months), and those not at all satisfied with the VT they followed (20.1 months). Nevertheless, a more accurate vision of the school-to-work process is offered by the Kaplan-Meier survival and hazard functions (that account for censored spells) presented in the figure 1.

Table 5. School-to-work: non-employment duration and characteristics of graduated from vocational training in 2009

Variable	N	% Censored	% Uncensored	Duration in months of non-employment after VT: mean (s.d.)
Complete spells	5953		100	17.8 (0.154)
Censored	2498	100		37.0 (0)
Age (mean. sd)		26.0 (0.042)	26.0 (0.029)	
Gender				
Male	4274	41.3	54.5	16.3 (0.211)
Female	4177	58.7	45.5	19.3 (0.223)
Training level				
Specialisation	1086	12.5	13.0	15.9 (0.443)
Qualification	3090	41.0	34.7	18.5 (0.261)
Technician	2694	31.4	32.1	18.3 (0.268)
Specialized technician	1581	15.1	20.2	16.8 (0.340)
Training operator				
Private schools	2444	28.1	29.3	17.6 (0.284)
Ofppt	3079	31.5	38.4	16.8 (0.249)
Tourism	921	10.0	11.3	17.5 (0.455)
Agriculture	382	5.9	4.0	20.3 (0.771)
Craft industry	1398	22.6	14.0	16.3 (0.953)
Maritime fishing	194	1.7	2.5	15.3 (1.029)
Public buildings and works	33	0.2	0.5	11.0 (2.184)
Parent's labour force status				
Not employed	394	5.8	4.2	19.3 (0.761)
Employed	8057	94.2	95.8	17.7 (0.157)
Satisfaction				
Not at all satisfied	98	4.2	2.6	20.1 (1.532)
Somewhat satisfied	2048	70.9	60.3	18.8 (0.314)
Very satisfied	1088	24.9	37.2	15.4 (0.411)

The survival function figure 1 shows not only that 50% of individuals were still out of employment 12 months after leaving VT, but it is also possible to observe that at the end of the observation period 28% were still waiting for an employment. These features highlight the non-negligible proportion of individuals confronted to long duration of non-employment. At the same time, the empirical hazard rate (figure 2) shows that the probability of finding an employment is overall decreasing, although the fluctuations reveal that individuals with durations between 6 and 11 months are the most likely to leave the non-employment state. The lowest probabilities of finding an employment correspond to individuals with non-employment spells of more than 26 months. On the one hand, these features raise the question about the factors associated to these low probabilities of finding an employment; and on the other hand, the importance of accounting for duration dependence that seems to be negative.

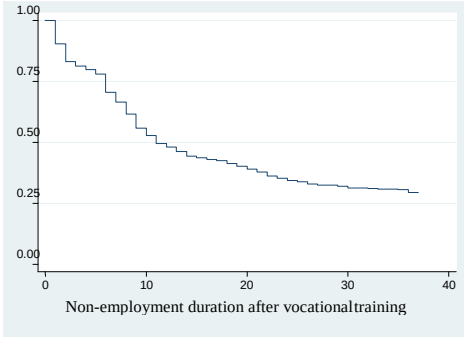


Figure 1.Probability of staying in non-employment (Empirical survival function)

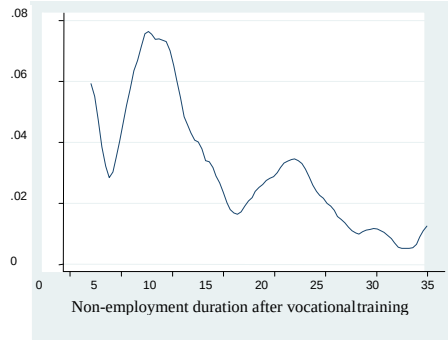


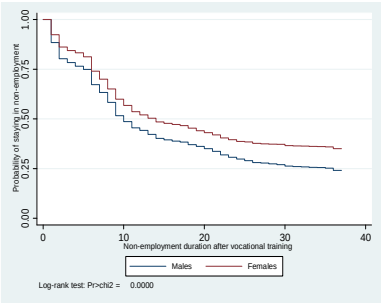
Figure 2.Instantaneous probability to leave non-employment (Empirical hazard function)

Survival functions according to individual characteristics and those related to VT are presented in the figure 3. The log-rank test results in the rejection of the null hypothesis of no difference between the groups in the probability of going out from the non employment state. Indeed, survival curves according to the different variables describe different profiles. Similar to the descriptive statistics of table 1, females (3.a), those enrolled in agricultural training operator (3.c), those with parents not employed at the time of the interview (3.d), and those declaring not satisfied at all of VT (3.e) are less likely to find an employment after VT: these categories experience the longest episodes of non-employment. However, accounting for censored spells in the Kaplan-Meier estimations offers additional information. Firstly, individuals in the craft industry training operator are confronted with the same probability of staying in non-employment experienced by those in the agricultural training operator especially 10 months after leaving VT. Secondly, the school-to-work transition process is not as clear as pointed out by mean durations in terms of training level. Differences among training levels are less well defined (3.b) and only those in a specialization training appear to be the most likely to find an employment, at least within the first 12 months after leaving VT. Observing the probability of staying in non-employment after VT conditional to duration reveals patterns suggesting negative duration dependence (i.e.

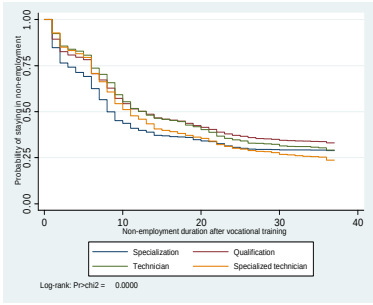
the probability of finding an employment decreases as duration in non-employment increases). The remaining question is whether the patterns observed for the individual and VT-related characteristics persist after controlling for duration dependence and unobserved heterogeneity under a multivariate framework.

Figure 3. Survival functions according to different characteristics

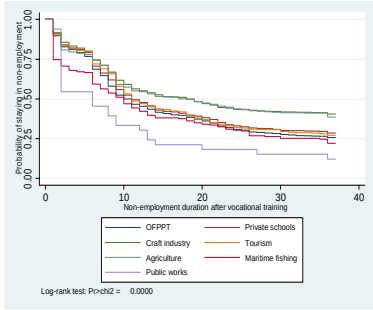
3.a Gender



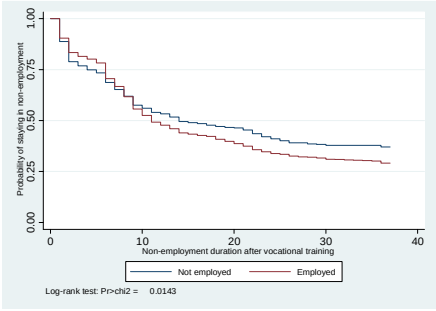
3.b Training level



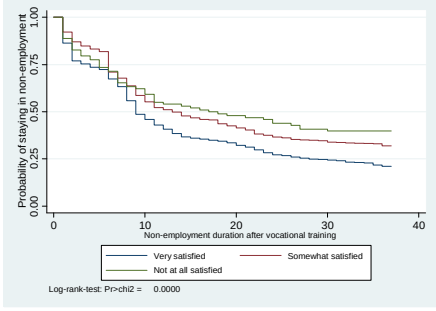
3.c Training operator



3.d Parent's status in the labour market



3.e Satisfaction towards VT



A discrete Cox's proportional hazards model for modeling interval-censored duration: accounting for duration dependence and unobserved heterogeneity

We use a Cox's proportional hazards frailty model for grouped data (Prentice and Gloeckler, 1978; Kieffer, 1988; Han and Hausman, 1990) in order to estimate the factors associated with the probability of finding an employment among the graduates from VT after an episode of non-employment. This is a complementary log-log (cloglog) model that is an analogous version of the continuous proportional hazard model applied to interval-censored survival times (see Lancaster, 1990; and van den Berg, 2001 among other authors). The main advantage of this model is that it allows modeling duration, as in our case, expressed in time intervals (e.g. months). Indeed, this kind of discrete survival model is adapted to samples with a large number of tied observations as in this article (see appendix 1). Basically, the model estimates a Cox's proportional hazard model by using the likelihood function for variables with Bernoulli

distribution where the binary variable corresponds to whether durations are censored (=0) or not (=1) at a given time interval. (See Annex 2).

Estimated parameters are obtained after the maximization of the following log-likelihood function:

$$L(\beta, \delta) = \sum_{l}^{k} \sum_{r \in R_l} \left[-(1 - c_{rl}) \exp(\delta_l + \beta' x_r) + c_{rl} \ln\left(1 - \exp\left(-\exp(\delta_l + \beta' x_r)\right)\right) \right] \quad (5)$$

where $\delta_l = \ln\left(-\ln\left(\frac{S_0(s_l)}{S_0(s_{l-1})}\right)\right)$ which is the complementary loglog transformation. In order to account for duration dependence Ham and Rea (1987) suggests adding the duration variable as explanatory in the cloglog model. In doing so, we added the logarithm of the duration of the non-employment: the term $\delta_l + \beta' x_r$ in the expression (5) becomes $\delta_l + \gamma \ln(t) + \beta' x_r$. However, one has to be cautious when specifying duration dependence as its presence may be rather due to the presence of unobserved heterogeneity (spurious duration dependence) than genuine duration dependence (Zorn, 2000). Indeed, it has been demonstrated that duration dependence is reduced or even vanished when observed and unobserved heterogeneity is controlled (Machin and Manning, 1999). Thus, the specification of duration dependence and unobserved heterogeneity result in the following log-likelihood function to be maximized:

$$L(\beta, \delta) = \sum_{l}^{k} \sum_{r \in R_l} \left[\begin{array}{l} -(1 - c_{rl}) \exp(\delta_l + \gamma \ln(t) + \beta' x_r + u_r) + \\ c_{rl} \ln\left(1 - \exp\left(-\exp(\delta_l + \gamma \ln(t) + \beta' x_r + u_r)\right)\right) \end{array} \right] \quad (6)$$

where u_r is the unobserved individual error term controlled by a random variable normally distributed.

Introducing the random variable controlling for unobserved heterogeneity implies the decomposition of the total variability of the duration of non-employment. Indeed, variance is explained either by the observed and the unobserved heterogeneity. In the case of cloglog model one way of quantifying the amount of variance explained by unobserved heterogeneity is given by the intraclass correlation coefficient

$$\rho_{cloglog} = \frac{\sigma_u^2}{\sigma_u^2 + \frac{\pi^3}{6}}$$

(see Rodriguez and Elo, 2003). As in the traditional Cox's proportional hazard model, the exponential of the estimated coefficients are interpreted as hazard ratios.

The explanatory variable used in the estimations are those presented in section 2: gender, age, training level, kind of training operator, parent's status in the labour market, and satisfaction towards VT. In addition, the regional unemployment rate is included in order to account for macroeconomic conditions of the urban Moroccan labour market

V. Empirical Results

Table 2 presents the estimation of the Cox's hazard model estimation for discrete durations without (model 1) and with (model 2) the random effects accounting for

unobserved heterogeneity. The likelihood ratio test points out the relevance of controlling for unobserved characteristics as the null hypothesis of a rho coefficient equal to zero is rejected (see, endnotes of table 2). Indeed, 86% of the total variability of the non-employment duration variable is explained by unobserved factors. Model 1 shows that neglecting the specification of the random effects conducts to erroneous conclusion in that concerning duration dependence. In fact, the negative duration dependence estimated without accounting for unobserved heterogeneity appears as being spurious. Coefficients in the model 1 seem to be underestimated when unobserved factors are not accounted for. In addition, the coefficients estimated in model 1 could conduct to erroneous inference as many of them become significant once unobserved heterogeneity is controlled. The specification of random effects in model 2 reveals that duration dependence is, indeed, positive. That is, the probability of finding an employment increases with the time elapsed in the non-employment state (either, unemployment, inactivity, internship, or a combination of them).

Concerning individual characteristics, model 2 shows that females are 43% less likely to find an employment than males indicating that the latter experience shorter non-employment spells after VT. It appears that the probability of finding an employment increases with age (around 8% per additional year): an alternative model including the squared age did not improve the goodness-of-fit of the model and the estimated coefficient is not significant. Individuals in the qualification, technician or specialized technician training levels are less likely to find an employment: probabilities are reduced to 50%, 42.4% and 53.5% respectively in relation to the specialization training level. Not accounting for unobserved heterogeneity (model 1) would induce wrong inference with regard to the training level variable where the specialized technician training appeared not significant. The same situation is observed in the operator training variable where maritime fishing operator training was highlighted as one of the categories with the most important probabilities of finding a job after VT. Indeed, the probability of finding an employment for graduates from VT in the maritime fishing operator is 4 times higher than the reference category (private training operator), although those in the public buildings and works training operator are the most likely of being employed after VT: with a probability around 13 times higher than the individuals in private training operator. The only training operator does not seem to favor graduates in finding an employment after VT: this is the only training operator associated with a probability of getting employed near 61% lower than the private one of individuals in the private training operator.

Concerning the parent's status in the labour market, the estimations in model 2 show that graduates from VT with parents employed have 50% more chances of being employed than individuals whose parents are out of the labour force. Satisfaction points out that there is no difference between graduates from VT not satisfied at all and those moderately satisfied (not significant coefficient): the exit rate out of non-employment of individuals satisfied with the VT they followed is almost 4 times higher than the one of the former categories. Finally, both model 1 and model 2 show that the hazard rate is not sensitive to macroeconomic fluctuations as the coefficient associated to the regional unemployment rate is not significant.

Table 6. Cox's proportional hazard model for interval-censored duration of non-employment among graduated from VT in the urban Moroccan labour market

	Model 1: Without unobserved heterogeneity			Model 2: With unobserved heterogeneity		
	Coefficient	S.E	HR	Coefficient	S.E	HR
Constant	-3.008***	0.317		-7.243***	0.891	
Log t	-0.416***	0.018	0.659	1.064***	0.112	2.897
Gender: Ref.=Male						
Female	-0.179***	0.045	0.836	-0.562***	0.121	0.570
Age	0.021**	0.009	1.021	0.077***	0.024	1.080
Training level:Ref.=Specialisation						
Qualification	-0.124**	0.063	0.883	-0.696***	0.171	0.498
Technician	-0.200**	0.067	0.818	-0.976***	0.185	0.376
Specialized technician	-0.102	0.075	0.903	-0.764***	0.205	0.465
Training operator: Ref.=Private schools						
OFPPT	0.059	0.049	1.060	0.149	0.131	1.160
Tourism	0.023	0.080	1.023	0.040	0.211	1.040
Agriculture	-0.528***	0.131	0.589	-0.944***	0.306	0.389
Craft industry	0.167	0.135	1.181	0.551	0.377	1.734
Maritime fishing	0.207	0.168	1.229	1.394***	0.506	4.030
Public buildings and works	1.058**	0.340	2.880	2.611**	1.142	13.612
Parent's labour force status:Ref.=Not employed						
Employed	0.197***	0.101	1.217	0.407**	0.254	1.502
Satisfaction with the training received: Ref.= not at all satisfied						
Somewhat satisfied	0.187	0.134	1.205	0.330	0.327	1.390
Very satisfied	0.503***	0.136	1.653	1.333***	0.339	3.792
Regional unemployment rate	-0.006	0.008	0.994	-0.010	0.021	0.990
Rho[1]				0.860***	0.015	
Log-likelihood	-41207,757			-40999,492		

Significant coefficients at: *10%, **5%, ***1% confidence levels.

[1]The likelihood-ratio test rejects H0: Rho=0. The value of the test is, χ^2 =55.57 (p<0.001).

VI. Concluding remarks

In the context of an urban labour market with high unemployment rates especially for young and/or educated individuals, VT remains the main instrument searching for reducing the mismatch between skills and employment demand in Morocco. This article attempts to explain whether Moroccan Vocational Training Graduates – Class of 2006 –interviewed retrospectively in 2009 are confronted with difficulties to find an employment according to different individual and VT-related characteristics. In doing so, we implemented a Cox's proportional hazards model under the framework of interval-censored (discrete) duration technique. Our estimations confirmed the pertinence of accounting for unobserved heterogeneity especially when duration dependence is specified as the latter turned into a different sign. Indeed, duration dependence became significantly positive pointing out that not controlling for unobserved characteristics results in spurious negative duration dependence. This change of sign is not an isolated phenomenon and has already been observed in other studies as the one of Machin and Manning (1999) and Steiner (2001). According to this result, the positive duration dependence suggests Moroccan graduated from VT are more likely to find an employment as the time elapsed in non-employment increases.

This phenomenon has been explained in the traditional literature about job-search by the deterioration of reservation wages as a result of a persistent situation of non-employment (Lippman and McCall, 1976); and could be also the explanation in the Moroccan labour market where the responsiveness of the VT system to the labour market requirements in terms of skills has not been very convincing in the last years (e.g. persistent mismatch between employers and vocational trainees).

Our results about gender differences in favor of males employability are not unconnected with the existing literature, (Tansel and Tasçi, 2004) in Turkey, (Khan and Yousaf, 2013) in Bahawalpur/Pakistan, (Ben Ouada Jamoussi and Gassab,2011) in Tunisia, and Bourdabat (2007) in Morocco are some examples of this result. According to the results of the last author obtained from the graduated from VT in 2000, it seems that the situation has not evolved as the proportion of individuals in non-employment at the end of the observation period is still 30% (right-censored spells). Nevertheless, our results about the effect of age on the probability of finding an employment (not significant for males and negative effect for females) are different and indicate that older individuals are more likely to leave the non-employment state than younger. This difference in the effect of age on the probability of finding an employment could be explained by the definition of the initial state. Indeed, Bourdabat (2007) analyses the unemployment duration, whereas in our article the analysis is about the time of non-employment (inactivity, unemployment or internship) which is a more accurate definition in the attempt in explaining why graduates VT stay longer out of employment. Indeed, we argue that inactivity and internship could be considered as a kind of involuntary unemployment given that vocational trainees are supposed to enroll in these programs with the purpose of making an easier access into employment. The positive effect of age on the probability of being employed that we found after our estimations, could be explained by reservation wages. In fact, it has been demonstrated that reservation wages in Morocco are higher among young individuals explaining –at least partially- why older graduates from VT are more likely to find an employment (Boudarbat,2004; and Bougroum, Ibourk and Trachen,1999). This notion of reservation wages declining with age is not such a striking result as some authors (see De Coen et al., 2012) have found that this relationship is U-shaped among individuals between 18 and 60 years, which implies the decrease of reservation wages with age among young.

The lower hazard rates of leaving non-employment estimated for either qualification, technician or specialization technician training levels is in line with the relatively high likelihood of unemployment documented by the Haut Commisariat au Plan (Direction de la statistque, 2009a). Indeed, individuals in a specialization training level (which is the lowest) are much more likely to find an employment in the urban Moroccan labour market after leaving VT: with a probability at least 50% higher than the other (higher) levels. In addition, we found that graduates receiving training in private schools, in the main public training operator (OFPPT), tourism and craft industry training operators experience much lower exit rates out of non-employment than trainees in maritime fishing and especially in public buildings and works training operators: respectively 4 and 13.6 times lower. This kind of result has already been observed in other countries as Greece (Livanos, 2010) and has been related to the orientation of the education

system towards a specific sector with skills not required in other segments of the labour market. In this context, our results would be suggesting that VT in Morocco is more responsive to the needs of sectors requiring low-skilled individuals (e.g. those in the specialization training level), which is in line with the specialization of Morocco in un(low-) skilled intensive sectors since trade liberalization pointed out by Bottini and Gasiorek (2009). This last result could be also explain the important opportunities of finding an employment for vocational trainees in the maritime fishing training operator, which seems to be producing mainly low-skilled graduates as indicated by the 79% (in 2007, see El Kouhen, 2008) of individuals enrolling into a vulgarization program oriented principally towards traditional fishermen. Nevertheless, these results could be also reflecting the link between VT and trends of the economy in these areas, given the expansion of both the fishing sector and the public buildings and work sector observed in the last years in Morocco. During the period 1999-2009 the public buildings and work sector has been among the best performing sectors in terms of job creation (Direction de la statistique, 2009b). Furthermore, the fishing sector plays an essential role in the economic and social development of the country through export and job creation (DEPF, 2008). For the remaining training operators (private and public) our results highlight the persistent mismatch between VT skills production and the labour market demand as individuals in these training operators are the less likely to leave the non-employment state.

In line with Biggeri et al. (2001), our results highlight the significant positive effect of parent's activity status on the chances of finding an employment (50% more probable than individuals with inactive parents). One possible explanation to this result may be given by the support that parents may provide to vocational trainees, either in terms of the affordability of the costs caused by employment search or as a search channel for finding an employment. In addition, it has already been demonstrated that employed contacts (i.e. in this article, parents of graduates from VT) system have privileged access to information about employment opportunities, which may help to increase the probability of finding an employment (Cingano and Rosolia 2012). Further, concerning satisfaction related to the VT program followed, our results indicate that individuals completely satisfied are the most likely to find an employment rapidly (with a hazard rate almost 4 times higher than unsatisfied or moderately satisfied). This result has to be interpreted cautiously given the possibility of a justification bias: it is possible that individuals declared being unsatisfied (moderately satisfied) with VT because they spent a long time in the non-employment state. However, our estimation about satisfaction provides –at least- some information about the effect that fulfilling (or not) the expectations of graduates from VT may have on their insertion in the Moroccan urban labour market.

The multiple policies implemented in Morocco focusing on the improvement of employment opportunities through the creation of the skills required in the labour market, show the important efforts made by the government on this subject. In the search of reducing the mismatch between employment offers and labour supply, VT became the main instrument with several programs implemented in the last decades. However, the mismatch seems to be persistent on the evidence of the statistics about the urban Moroccan labour market. Although these programs allowed the expansion of

the VT capacity of the country, one of the main reproaches is the absence of accurate analysis of the labour market situation in order to target the needs in terms of skills. Our results show that individuals in higher levels of training, and those in private, the main public, tourism, or craft industry training operators are confronted ceteris paribus to the longest episodes of non-employment.

These results together with the positive duration dependence found in this article suggest that these categories of individuals are exposed to a context in which their only resort for obtaining an employment is revising their reservation wage. These findings were possible thanks to the estimation accounting for unobserved heterogeneity which is another important contribution of this article to the –scarce- literature about the Moroccan labour market. Undoubtedly, evidence-based policies should allow Moroccan authorities to better target the areas of the labour market in which the efforts in terms of VT have to be made. To conclude, our results suggest that policy makers should focus in screening the needs required in middle- and high-skilled sectors of the labour market in order to align labour supply and employment offers in these sectors. That could contribute to reduce the long-term period of non-employment to which these categories of workers seem to be confronted.

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Annex on line at the journal Website: http://www.usc.es/economet/eaat.htm

Appendix 1. Duration of non-employment histogram: evidence of tied observations.

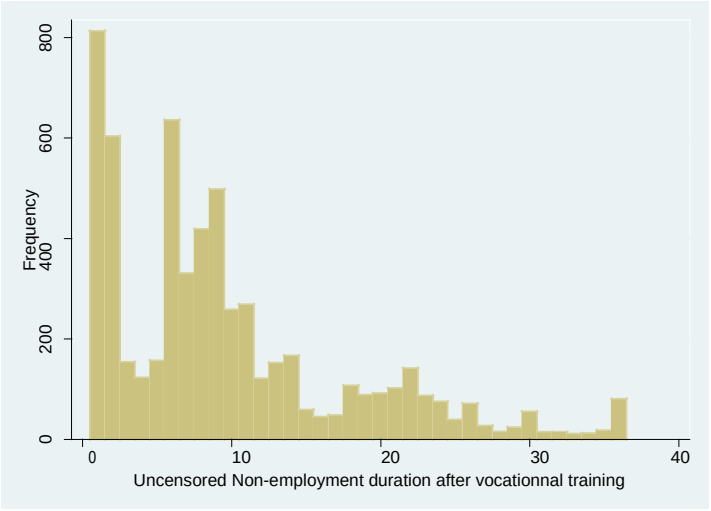


Table 3. Sectoral Contribution to GDP growth (percentage)

	2000-2007		2008-2012	
	Sectoral shares in GDP	Contribution to growth	Sectoral shares in GDP	Contribution to growth
Primary sector	**14.2**	**0.8**	**15.3**	**1.1**
Agriculture. forestry and fisheries	14.2	0.8	15.3	1.1
Secondary sector	**26.6**	**1**	**25.04**	**0.64**
Extractive industry	2.2	0.1	1.9	0.04
Industry (except Petroleum refining)	15	0.5	13.1	0.3
Petroleum refining	0.2	-0.1	0.04	0
Electricity. water	2.9	0.2	3.2	0.2
Building and public works	6.3	0.3	6.8	0.1
Tertiary sector	**59.2**	**3.3**	**58.2**	**2.84**
Commerce	11.6	0.4	10.7	0.3
Hotel and catering	1.9	0.1	1.8	0.04
Transport	4.8	0.2	5	0.2
warehousing and communications	4.9	0.6	6.5	0.8
financial activities and insurance.	5.5	0.6	5.3	0.2
property dealing and	11.2	0.6	11.7	0.4

services provided to companies				
Other non financial services	1.7	0.1	1.5	0
General administration and social security	8	0.3	7.7	0.5
Education. helath and social action	9.6	0.4	8	0.4

Source: Haut Commissariat au Plan, (Vergne, 2014)

Annex 2

Let duration of non-employment be represented by T_r with $r = 1, \dots, m$, where m is the number of individuals in the sample. These durations are grouped into k intervals I: in our case an interval corresponds to a month and k may take values from 1 up to 37 which is the maximal number of months observed in the follow-up. So, $I_i = [s_{i-1}, s_i]$. with $i = 1, \dots, k$ and it is assumed that each interval is censored at the end of each month. If c_{ri} is the variable indicating whether the r th individual is censored ($c_{ri} = 0$) at the interval I_i or not ($c_{ri} = 1$), then the contributions to the likelihood function under the framework of a discrete model are written as follows:

Uncensored spells. The probability of individual r of getting employed at a given interval I_i conditional on the observable characteristics x_r is given by:

$$P(T_r \in I_i | x_r) = P(s_{i-1} \leq T_r \leq s_i | x_r)$$

Expressing this probability in terms of the survival function $S(.)$ yields in

$$P(T_r \in I_i | x_r) = S(s_{i-1} | x_r) - S(s_i | x_r) = \left[\left(1 - p_1(x_r)\right), \dots, \left(1 - p_{i-1}(x_r)\right) p_i(x_r)\right]$$

where $p_i(x_r)$ is the probability for the rth individual finding an employment in the interval $I_i = [s_{i-1}, s_i]$.

Right censored spells. The probability of individual r surviving in the non-employment state at a given interval I_i conditional on the observable characteristics x_r is given by the following survival function:

$$S(s_i | x_r) = \left[\left(1 - p_1(x_r)\right), \dots, \left(1 - p_i(x_r)\right) p_i(x_r)\right]$$

Based on the last contributions, the likelihood function for the Bernoulli distributed variable c_{ri} (i.e. our censoring variable) is:

$$L = \prod_{i}^{k} \prod_{r \in R_i} (p_i(x_r))^{c_{ri}} (1 - p_i(x_r))^{(1-c_{ri})} \qquad (1)$$

where R_i is the group of individuals at risk at the beginning of the interval $I_i = [s_{i-1}, s_i]$.

Cox's proportional hazard model under the framework of discrete models

Using the same notation, the proportional hazard function in the Cox's model $h(t|x_r) = h_0(t)\exp(\beta' x_r)$ expressed in terms of the survival function yields in:

$$S(t|x_r) = \exp\left(-\int_0^t h(u|x_r)du\right) = [S_0(t)]^{\exp(\beta' x_r)} \qquad (2)$$

where $S_0(t)$ is the baseline survival function and is used to model the probability of finding an employment, $p_i(x_r)$, as follows:

$$p_i(x_r) = 1 - \left[\frac{S_0(a_i)}{S_0(a_{i-1})}\right]^{\exp(\beta' x_r)} \qquad (3)$$

The likelihood function of the Cox's proportional hazard model for modeling interval-censored data is obtained from the replacement of (3) into (1):

$$L = \prod_{i}^{k} \prod_{r \in R_i} \left(1 - \left[\frac{S_0(s_i)}{S_0(s_{i-1})}\right]^{\exp(\beta' x_r)}\right)^{c_{ri}} \left(\left[\frac{S_0(s_i)}{S_0(s_{i-1})}\right]^{\exp(\beta' x_r)}\right)^{(1-c_{ri})} \qquad (4)$$