The effects of state dependence on university graduates' unemployment in Morocco: Analysis using a dynamic model

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Abstract - This paper examines the causal relationship that exists between an individual's unemployment experience and his or her future employment prospects. In literature, such relationship is termed "state dependence". The data of the present study comes from a survey addressed to a representative sample of Moroccan graduates from three universities covering all their faculties and schools. A dynamic random-effects probit model is applied to the data to test for state dependence effects for Active Moroccan University Graduates. In this model, an individual's unemployment probability at a given point in time, during a period of three years after graduation, is primarily dependent on his or her professional status in the previous time point and personal characteristics. After controlling both for observed and unobserved population heterogeneity, results strongly suggest that past unemployment increases individuals' chances of current unemployment, validating the "scar theory" of unemployment, which stipulates that a previous unemployment spell precludes the accumulation of work experience and may bring the deterioration of human capital.

Classification JEL
    C23, C25, J22

Mots-clés
    Human capital
    Labor Market
    Dynamic random-effects probit model
    Panel data
    Stigmatization effects

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INTRODUCTION

The idea that, there is a causal relationship between an individual's past employment or unemployment and his future labor force status, is of considerable interest in the theory of unemployment. Furthermore, the 'scar theory' of unemployment holds "that unemployment experience alters one's future probability of being unemployed because individuals lose valuable work experience while they are unemployed, or because they are marked as 'losers' by potential employers" (Heckman and Borjas, 1980, p. 250). This means that unemployment, especially a long-term one, may lead to a depreciation of human capital or gives a negative signal for companies, and then affects an individual's future employment prospects.

Becker (1975) predicted this scarring theory. Following him, although general skills increase an individual's marginal productivity in different sectors, these skills are non-transferable and specific to the company providing the investment. A consequence of unemployment is the depreciation of general skills and the loss of company specific skills.

Pissarides (1994) thinks that low quality companies recruit unemployed individuals but lose them to high quality companies that pay well, and this loss of a good job may decrease the probability of having a better-paid job later.

Several previous empirical studies have tried to investigate the extent of state dependence in employment or unemployment. Heckman (1981a) shows that there is significant state dependence in the employment probabilities of US married women. Furthermore, Hyslop (1999) also finds strong state dependence in employment for US married women in the 1980s.

Omori (1997) finds that if the duration of previous non-employment increases, the duration of current non-employment increases as well. However, Corcoran and Hill (1985) find that past unemployment does not raise the probability of current unemployment for men at prime age. For Britain, Narendranathan and Elias (1993) and Arulampalam et al. (2000) find strong state dependence in unemployment. Frijters, Lindeboom, and Van den Berg (2009) for Holland, Haan (2006) for Germany and Islam (2006) for Sweden, also found this result. Le Maire and Scheuer (2006) have also found a positive and significant state dependence for groups with weak labor market participation in the Danish case. Furthermore, Lynch (1985) shows that the length of previous unemployment spells does not have a significant effect on the current duration of unemployment for British youths. In the same way, Gregg (2001) finds that early-cumulated duration of unemployment significantly affects the unemployment experience in the future. A study of Denise and Doiron (2008) analyses the level of state dependence in labor force outcomes for young low-skilled Australians. They found that having experienced an employment spell in the past increases the probability of future employment and also, unemployment spells raise the probability of future unemployment, but the duration of past spells does not matter. Moreover, using data from the German Socioeconomic Panel (GSOEP) to estimate the probability of being unemployed conditional on the employment state of the previous period, Biewen and Steffes (2008) found that the disadvantage from being in unemployment in the previous period is smaller for individuals in times of relatively high aggregate unemployment and larger when aggregate unemployment is low.

In addition to that, some studies show that unemployment may be examined in conjunction with the type of job taken after exiting unemployment. State dependence in unemployment is also viewed as a result of non-accumulation of new human capital during an unemployment spell or during a low-paid employment period. Therefore, low-wage jobs have similar adverse effects to unemployment.

Layard et al. (1990) argue that being in a low-quality job may be a bad sign as well as being in unemployment. McCormick (1990) argues that employers use the type of job held as well as the unemployment duration (Blanchard and Diamond, 1994) as indicators of future productivity. Stewart and Swaffield (1999), Weber (2002) and Stewart (2007) have considered an example of persistence in low pay, among others.

To explain Moroccan graduates' labor force behavior during a period of three years after graduation, we estimate a dynamic random-effects probit model and test for state dependence effects with respect to both observed and unobserved population heterogeneity.

The initial conditions' problem arises in a dynamic context. It is caused by the presence of the past value of the dependent variable, an unobserved heterogeneity term in the dynamic equation and the correlation between them. Heckman (1981a, 1981b) was the first to address this problem and proposed an approximation to "the initial conditions" by a reduced-form equation for the initial observation (at the beginning of the observation period). The maximum likelihood is estimated here using the full set of sample observations. However, the Heckman estimator remains a very time-consuming one. This has led to the suggestion of other alternative estimators that have the advantage of using standard software such as the estimators suggested by Orme (1997, 2001) and Wooldridge (2005).

This paper therefore provides an examination of the relationship that exists between an individual's unemployment experience and his or her current labor force status. Special attention is paid to account for the unobserved heterogeneity and initial conditions' problem using the Heckman, Orme and Wooldridge estimators, and comparing the results of each one.

The remainder of the paper proceeds as follows. The data used are presented in section 1 and the econometric model is set out in section 2. The main results of the paper are contained in section 3.

1. DATA DESCRIPTION

The data of the present study come from a survey carried out in 2012 by the National Authority of Evaluation in Morocco affiliated to the Higher Council of Education, Training and Scientific Research. The survey was addressed to a representative sample of graduates from three universities covering all their faculties and schools: Hassan 1st University-Settat, Hassan II University-Casablanca and Mohammed V University-Rabat. It is based on a three-year monthly retrospective calendar, aiming to collect monthly data about occupational status of young graduates. The longitudinal sample consists *of young students who graduated in 2009* from the three universities.

The graduates' sample was stratified based on school and diploma of the graduate, then a systematic sampling was used within each stratum to obtain a representative sample of the population. The starting sample contains 45,500 observations for 1625 individuals (active and inactive). The data contains information on: the curriculum studied up to graduation in 2009, the monthly occupational status between 2009 and 2012, the first and the last unemployment spell details, the first and the last employment details, the student's family background and personal characteristics.

For the present analysis, the sample was reduced to 22,518 observations for 834 graduates by focusing on active graduates only. Individuals who were inactive, state employees and those who were pursuing their studies along the period of observation were withdrawn. We focused on unemployment experienced by active population during the 36 months after graduation

The dependent variable used is the professional status of the individual i at time t, disaggregated into the categories 'unemployed' and 'employed'. The unemployment indicator used is constructed following the ILO/OECD's definition of unemployment. Thus, a person is unemployed if he or she does not have a job during a specified period and is available for work. The sample included self-employed persons, full time and part time employees, graduates with fixed term, temporary and casual contract, paid trainees whether in formal or informal sector. State employees are excluded from the sample because they definitely come back working in their home institution. Table 1 summarizes the definitions of the main explanatory variables used in the analysis and presents summary statistics (means and standard deviations) for these variables.

Table 1: Definitions of variables and summary statistics

Variable	Description	Mean (SD)
chom	Current Labor force status (at time t) (0 = employed, 1 = unemployed)	0.218 (0.413)
chomlag	Labor force status in the previous month (t-1)	0.226 (0.419)
Gender	(0 = Female, 1 = Male)	0.533 (0.499)
Age	Age completed at the time of graduation	26.053 (4.928)
French	Level of fluency in the French language	0.796 (0.403)
Residence	Living with parents	0.632 (0.482)
Nb_empl_broth	The number of employed brothers and sisters	1.928 (1.782)
Mobility	The mobility between the region origin and the region of university where the laureate graduated (0= Non mobile, 1 = Mobile)	0.256 (0.437)
High_parents_Educ	The highest education level of one of the parents *No schooling* *Primary school level* *Secondary school level* *Tertiary school level*	0.184 (0.388) 0.183 (0.387) 0.331 (0.471) 0.302 (0.459)
Qualif_degree	Qualification degree *Bachelor and less* *Master* *Engineering qualification* *Doctoral qualification*	0.484 (0.499) 0.313 (0.464) 0.134 (0.341) 0.068 (0.252)

Source: Author's calculation (for the sample of active graduates).

In our dataset, females represent 47% of the sample and individuals are aged between 19 and 56 years at the time of gradation.

We have distinguished between three age groups[1]. The first group includes individuals who are under 25 years of age, the second concerns graduates aged between 25 and 34 years and the third category is associated with individuals being over 34 years of age. Most of our graduates are young individuals. Thus, 10% of the university graduates are aged under 25 years at the time of the interview, while 81% of them are aged between 25 and 34 years.

Moreover, 84% of graduates in our reduced sample declared that, while they were studying, their fathers were employed, 14% said that their fathers were inactive and only the fathers of 2% of the graduates were unemployed. In addition to that, mothers of about 83% of graduates did not have a job (80% were inactive and 3% were unemployed).

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1 This categorization is considered by the High Commissioner for Planning in Morocco.

In addition, 20% of our graduates have parents without schooling level while 29% of them have at least one of their parents with tertiary school level.

Most of the graduates were living with their parents while studying (62%). Some 14% of our university graduates were heading up a household in which they lived alone or with one or more friends, 5% were living with a spouse in their own household and 20% lived in university campus.

Most of the students (71%) graduated from open access institutes (Faculty of Science, Faculty of Legal, Economic and Social Sciences and Faculty of Letters and Human Sciences). Concerning the qualification degree, 49% of our graduates have Bachelor degree and less while 31% have Master degree. Surprisingly, 76% of the graduates declared that they have excellent or high level of French language.
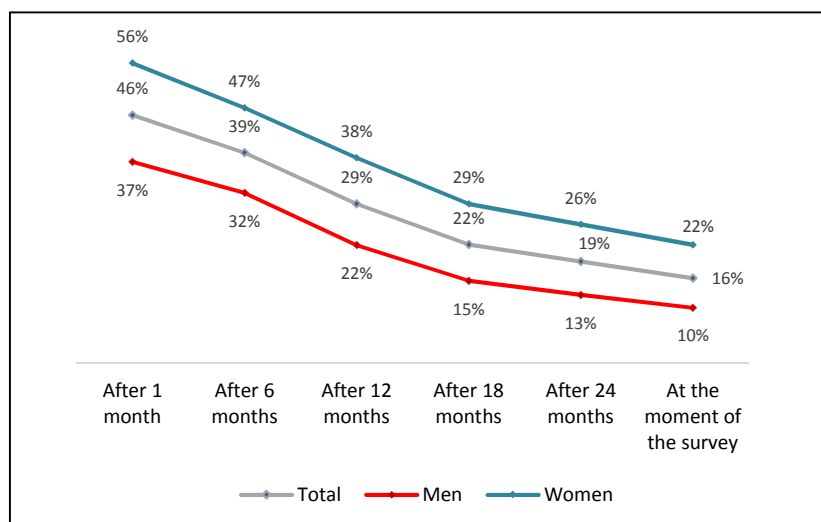
Unemployment rates between the time of graduation and 36 months later

The feature implemented to measure the unemployment rates consists of the administration of a retrospective monthly calendar tracking the situation of the individuals during a period of 36 months after the graduation.

Using different professional situations declared by the individuals in this monthly calendar (employment, unemployment, inactivity), we calculated the unemployment rate for each month and we derived the unemployment rate for specific times: one month, six months, twelve months, eighteen months and two years after graduation. Inactive graduates (students and other inactive graduates) are not taken into account in the calculation of these rates.

Figure 1 shows that unemployment rate one month after leaving the university is 46%. This rate gradually decreases to 16% after 36 months from the time of graduation. Women have higher unemployment rates than men, with a gap of 12 points at the time of the interview (22% for women and 10% for men).

**Figure 1: Unemployment rates between the time of graduation
and the time of the interview**

Source: Author's calculation (for the sample of active graduates).

Table 1 presents the distribution of active university graduates according to the duration of unemployment between the time of graduation and the time of the interview. Results show that 42.46% of our graduates have never had an

unemployment spell during the studied period, 18.19% have been unemployed for one to six months, and 16.41% have had a long unemployment duration exceeding two years in the observed period. Differences in length of unemployment duration between men and women are important. Thus, more men (51.17%) than women (32.70%) have never had an unemployment spell after leaving the university. However, a visible gender gap is observed regarding the long unemployment duration exceeding two years: 10.94% of men and 22.53% of women.

Table 1: Length of graduates' unemployment according to gender

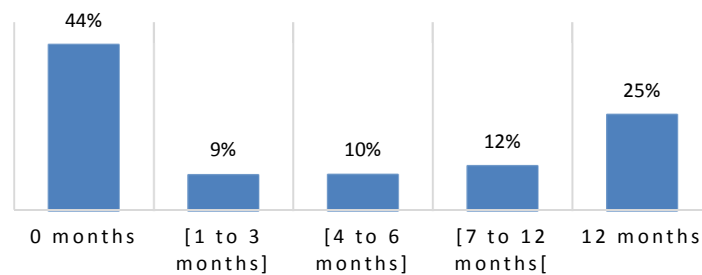|	**Total**	**Women**	**Men**
0 months	42,46%	32,70%	51,17%
From 1 to 6 months	18,19%	18,61%	17,82%
From 7 to 12 months	10,26%	9,88%	10,60%
From 13 to 18 months	7,39%	9,93%	5,12%
From 19 to 24 months	5,29%	6,35%	4,34%
Over 24 months	16,41%	22,53%	10,94%

Source: Author's calculation (for the sample of active graduates).

Unemployment rates at the time of the interview

At the time of the interview (36 months after the completion of the university studies), 16% of the active graduates were unemployed and 84% were employed. The unemployment rate for men peaked at 10%, while the one for women peaked at 22%.

In our dataset, the most people affected by unemployment are individuals aged between 25 and 34 years with a rate of 18% at the time of the interview. Nonetheless, individuals aged under 25 years are associated with an unemployment rate of 5%. The lowest unemployment rate is around 3% for graduates aged over 34 years.

Figure 2: Distribution of the unemployment durations observed 12 months after graduation

Source: Author's calculation (for the sample of active graduates).

Study results show also that unemployment rate is high among university graduates who hold a bachelor's degree or less, standing at 26%. However, the percentage of unemployed graduates who hold a Master's degree stands at 8% while a percentage of 3% only was recorded for individuals who hold doctoral degree.

Graduates that can speak and write French fluently are less likely to be unemployed. Thus, the unemployment rate for individuals with excellent or high level of French language amounts to 11%, 36 months after graduation.

Moreover, the unemployment rate stands at around 14% for university graduates whose fathers were employed and at only 6% for those whose mothers were employed. However, 40% of individuals who have unemployed fathers and 47% of graduates who have unemployed mothers were unemployed at the time of the interview.

In addition, graduates who have at least one of their parents with tertiary school level of education are less likely to be unemployed. Only 6% of them were unemployed 36 months after graduation.
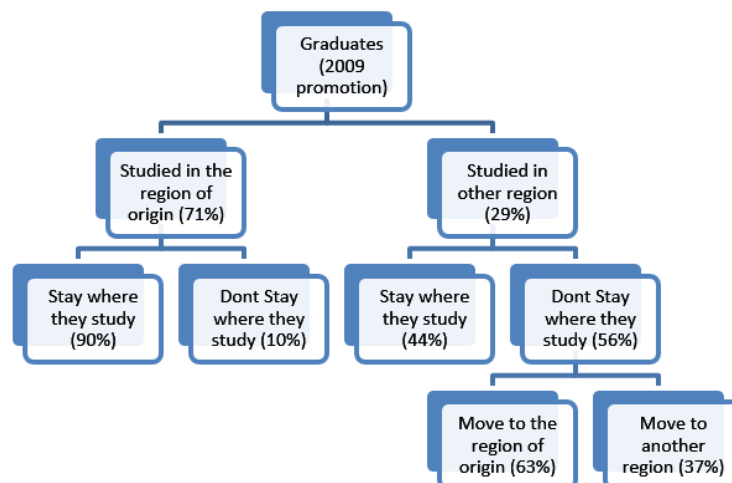
Figure 2 shows the distribution of the unemployment durations observed twelve months after graduation. 44% of graduates have never been in unemployment between graduation and twelve months later. However, 37% of graduates have not found an employment six months after leaving the university. This percentage stands at 25% within the period between the graduation and 12 months after. The unemployment history has a significant effect on the probability of unemployment.

Interregional mobility

Figure 3 shows that 71% of our graduates studied in the region of origin while 29% of them moved to study from their region of origin to another region. 56% of the graduates who already moved to study don't stay where they studied after graduation. This percentage is largely lower among those who studied in the region of origin (10%). This shows the impact of the graduate's mobility for studies on the post-graduation decision. Therefore, a graduate is more likely to move after graduation if he or she previously moved to study (Davanzo, 1983). One reason of the mobility to study is to look for a better performing university, and after graduation, this university from where the student graduated will be a signal to employers (Spence, 1973) and may affect his employability.

In addition, 63% of the graduates who move to study and move again after graduation go back to their region of origin, and among them, 15% are moving to a city different to the city of origin.

**Figure 3: Interregional mobility for the graduates of the
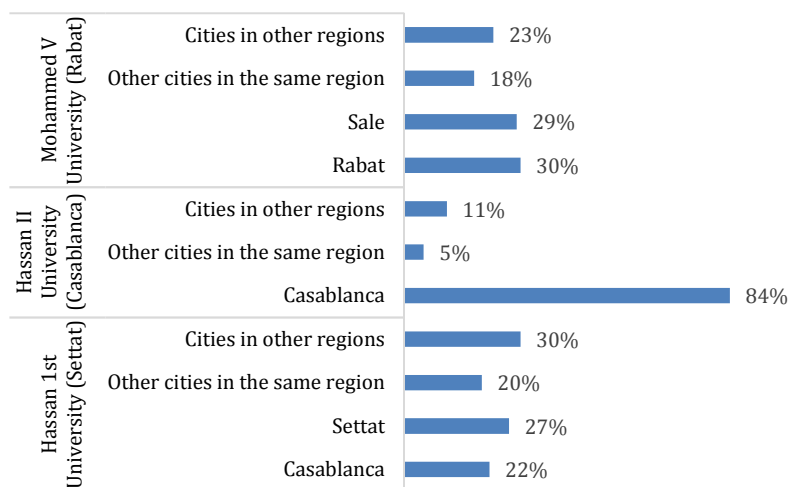three Moroccan universities**

Source: Author's calculation (for the sample of active graduates).

Intercity mobility and unemployment

Almost 27% of the students who graduated from Hassan 1st University located in the city of Settat stayed in Settat three years after graduation and 22% of them migrated to Casablanca (economic capital of Morocco). Among them, only 4% of active graduates are unemployed 3 years after graduation.

Figure 4: Mobility between the city of the university and the city of residence 3 years after graduation

Source: Author's calculation (for the sample of active graduates).

In the same way, the percentage of the graduates of Mohammed V University, located in Rabat, who stayed in Rabat stands at 30% and 29% migrated to Sale (city on the outskirts of Rabat) having the lowest unemployment rate (14%).

Casablanca is the city characterized by the lowest percentage of post-graduation migration (16%). Thus, only 5% of the graduates of Hassan II University located in this town migrated to another city in the same region and 11% of them migrated to a city in another region.

Table 2: Unemployment rates according to the intercity mobility

University	City of residence after graduation	Unemployment
Hassan 1st (Settat)	Casablanca	4%
	Settat	28%
Hassan II (Casablanca)	Casablanca	20%
Mohamed V (Rabat)	Sale	14%
	Rabat	20%

The low unemployment rates for the graduates who migrate may be explained in part by the fact that they are moving to areas where unemployment is low and the employment perspectives are larger. However, the graduates' mobility does not always increase employability opportunities. It depends strongly on the type of mobility and the regions concerned.

Unconditional and conditional probabilities of unemployment

Table 3 presents unconditional and conditional probabilities of unemployment on the previous status at t-1. The unconditional probability of being unemployed at a point in time is 21.8%. The probability of being unemployed at t is over 94.8% for those who were unemployed at t-1, so someone unemployed at t-1 is more likely to be unemployed at t than someone employed at t-1. This result shows that there is strong state dependence in unemployment. However, part of this dependence could be due to heterogeneity. The probability of unemployment is higher for those with medium or low level of French language, for those who live with their parents, for those who have less than 3 brothers and sisters at work, for those whose parents have never reached school, for the graduates who studied in their region of origin and for those with bachelor degree and less, among others.

Table 3 presents also unconditional and conditional unemployment probabilities for various subgroups of graduates differentiated by gender, age, language, number of employed brothers and sisters, parents' education, experience, residence, mobility and educational level. These factors are likely to influence the probability of unemployment. We first estimated a general specification of the random-effects probit model by including these variables as explanatory variables.

Table 3: Conditional and unconditional probabilities of unemployment

	Unconditional	Employed at t-1	Unemployed at t-1
All	0.218	0.004	0.948
Gender			
Male	0.159	0.003	0.937
Female	0.286	0.005	0.955
Level of fluency in the French language			
Excellent or high level	0.174	0.004	0.938
Medium or low level	0.389	0.007	0.965
Residence			
With parents	0.275	0.005	0.954
Alone or with others	0.119	0.003	0.925
Number of employed brothers and sisters			
One or two	0.227	0.004	0.949
Three and more	0.166	0.003	0.934
Mobility between region of origin and region of university			
Mobile	0.159	0.002	0.917
Non mobile	0.306	0.005	0.949
Parents' highest education level			
No schooling	0.278	0.006	0.966
Primary school level	0.254	0.006	0.958
Secondary school level	0.244	0.004	0.944
Tertiary school level	0.129	0.002	0.918
Qualification degree			
Bachelor and less	0.313	0.007	0.960
Master	0.178	0.003	0.933
Engineering qualification	0.020	0.001	0.721
Doctoral qualification	0.119	0.002	0.896

Source: Author's calculation (for the sample of active graduates).

2. ECONOMETRIC SPECIFICATION

In this section, we present the dynamic probit model used to analyze the effects of employment or unemployment experience of Moroccan University Graduates on the probability of being unemployed later. The model includes the previous state

among the explanatory variables to allow for state dependence. An important focus has been made to the treatment of unobserved heterogeneity and initial conditions.

2.1. A dynamic random-effects probit model

In our model, the dependent variable y_{it}^* depends on a vector x_{it} of measured exogenous variables, on the unemployment status in the previous period y_{it-1} and on the error term ε_{it}.

The latent equation for the random-effects dynamic probit model to be considered is specified as:

$$y_{it}^* = \gamma y_{it-1} + \beta' x_{it} + \alpha_i + \varepsilon_{it} \tag{1}$$

where the subscript i indexes individuals (i = 1,…, N) and t time periods (t = 2,…, T). y_{it}^* is the latent dependent variable for individual i in period t describing an individual's unemployment propensity, x_{it} is a vector of exogenous explanatory variables, α_i are (unobserved) individual-specific random effects, and the ε_{it} are assumed to be distributed N(0, σ^2).

The observed binary outcome variable y_{it} is defined as:

$$y_{it} = \begin{cases} 1 \ si \ \ y_{it}^* = \gamma y_{it-1} + \beta' x_{it} + \alpha_i + \varepsilon_{it} > 0 \\ 0 \ si \ \ y_{it}^* \leq 0 \end{cases} \tag{2}$$

The presence of the lagged outcome variable y_{it-1} allows us to test the hypothesis of true state dependence. However, the error term may be serially correlated, for a given individual, which would lead to spurious state dependence[2]. Therefore, in order to test for true state dependence, we have to control for unobserved individual effect. The Heckman's estimator allows us to resolve this problem.

2.2. Heckman's estimator and initial conditions problem

The following dynamic reduced form model is specified:

$$Prob[y_{it} = 1 | y_{it-1}, x_{it}, \alpha_i] = \Phi[\gamma y_{it-1} + x'_{it}\beta + \alpha_i] \quad i=1,…,N \tag{3}$$

Heckman (1981b) proposed the approach to the initial conditions' problem that involves specifying a linearized reduced form equation for the initial period:

$$Prob[y_{i1} = 1 | \alpha_i] = \Phi[z'_{i1}\lambda + \theta\alpha_i] \quad i=1,…,N \tag{4}$$

where Z_{i1} includes x_{i1} and exogenous instruments. The likelihood function for a random sample is then:

$$L_i = \int \left(\phi[(z'_{i1}\lambda + \theta\alpha_i)(2y_{i1} - 1)] \prod_{t=2}^{T_i} \phi[(x'_{it}\beta + \gamma y_{it-1} + \alpha_i)(2y_{it} - 1)] \right) g(\alpha_i) d\alpha_i \tag{5}$$

where g(α) is the density probability function of unobserved heterogeneity specific to individuals, and in this standard case, α is taken to be normally distributed and the integral given in this last equation can be calculated using Gaussian-Hermite quadrature (Butler and Moffitt, 1982).

2.3. Wooldridge's cml estimator

In contrast to Heckman who approximates the joint probability of the full-observed y sequence, Wooldridge (2005) has proposed an alternative Conditional

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[2] The distinction between true or structural and spurious state dependence in unemployment was clearly stressed by Heckman and Borjas (1980). Testing for true or spurious state dependence imply to test whether an individual's unemployment probability at a given point in time depends on his labour force status in the previous period in a causal way or is rather due to serially correlated explanatory variables and /or unobserved individual effects.

Maximum Likelihood (CML) estimator that considers the distribution conditional on the initial period value (and exogenous variables). Wooldridge suggests modelling the density of $(y_{i2}...y_{iT})$ conditional on (y_{i1}, x_i).

Specifying a model for yi1 given xi and αi is replaced by specifying one for α_i given y_{i1} and x_i. The model for α_i is specified in its simplest form as:

$$\alpha_i = \xi_0 + \xi_1 y_{i1} + z_{i'}\xi + a_i \qquad (6)$$

Substituting into equation (3) gives:

$$Prob[y_{it} = 1\backslash y_{it-1}, \mathrm{x}_{it}, \alpha_i] = \Phi(x'_{it}\beta + \gamma y_{it-1} + \xi_0 + \xi_1 y_{i1} + z_i\xi + a_i), \text{t=2,...,Ti} \quad (7)$$

2.4. Orme's two-step estimator

Orme's two-step estimator is used for addressing the issue of endogeneity. Orme (1997, 2001) uses an approximation to substitute αi with another unobservable component that is uncorrelated with the initial observation y_{i1}.

We can write: $\alpha_i = \delta\eta_i + \varpi_i$ $\qquad\qquad\qquad$ (8)

where ϖ_i *is* orthogonal to η_i by construction and distributed as N(0,1). Substituting for α_i in (3) gives:

$$Prob[y_{it} = 1\backslash y_{it-1}, ..., y_1, \mathrm{x}_{it}, \varpi_i] = \Phi(x'_{it}\beta + \gamma y_{it-1} + \delta\eta_i + \varpi_i), \text{ t=2,...,Ti} \quad (9)$$

This equation has two time-invariant unobserved components, η_i et ϖ_i. Since $E[\varpi_i\backslash y_{i1}] = 0$ by construction, the initial conditions problem will be addressed.

As Orme notes that under the assumption of bivariate normality for the joint distribution of (η_i, α_i), $E[\eta_i\backslash y_{i1}] = e_i$
where $e_i = (2y_{i1} - 1)\varphi(\lambda' z_{i1})/\Phi(\{2y_{i1} - 1\}\lambda' z_{i1})$

(9) is the generalized error from a first period probit equation, analogous to that used in Heckman's sample selection model estimator (equation 4), where φ and Φ are the Normal density and distribution functions respectively.

We can then estimate (equation 9) by a random-effects probit model with η_i replaced with an estimate of e_i after the estimation of (equation 4) using a simple probit.

2.5. Empirical specification

The model includes, as discussed previously, the usual set of exogenous control variables such as family variables (gender, level of parents' education, residence, mobility and number of employed brothers and sisters) and educational variables (Qualifications or graduate degree, level of fluency in French). The state dependence effect is accounted for by the inclusion of the lagged labor market status variable y_{it-1}, with the allowance for unobservable individual characteristics in the model.

The empirical specification for testing the effects of unemployment experience of Moroccan University Graduates on the probability of being unemployed later involves the following latent equation for the random-effects dynamic probit model:

$$\text{chom}^*_{it} = \gamma\text{chom}_{it-1} + \beta_1\,Gender_i + \beta_2\,French_i + \beta_3\,Residence_i + \beta_4\,Mobility_i + \beta_5 Nb\_emp\_broth_i + \beta_6\text{High\_parents\_Educ2}_i + \beta_7\text{High\_parents\_Educ3}_i + \beta_8\text{High\_parents\_Educ4}_i + \beta_9 Adv\_studies_i + \alpha_i + \varepsilon_{it}$$

(i=1,..., N, t=1,...,T)

where chom^*_{it} is the latent dependent variable for individual i in period t describing an individual's unemployment propensity, chom_{it} is the unemployment status of the individual i at time t, aggregated into the categories 'employed' and 'non-employed'. A value of 1 indicates an individual's unemployment status in period t.

$Gender_i$ is a dichotomous variable indicating if the graduate is female or male (1=female).

$French_i$: whether someone's level of fluency in French language is high or not (1=High or excellent level).

$Adv\_studies_i$ indicates whether the graduate has completed 5 years and more of higher education after having his baccalaureate which is equivalent to the secondary school diploma (1=5 years and more)

$Residence_i$: respondents are asked if they lived with their parents while studying (1=live with parents).

$Mobility_i$ indicates if the graduate moves from the region of origin to another region to study in university (1=mobile).

$Nb\_emp\_broth_i$ is a discrete variable indicating the number of employed brothers and sisters.

The highest education level of one of the parents: we distinguish between four categories:

High_parents_Educ2$_i$: Primary school level,

High_parents_Educ3$_i$: Secondary school level,

High_parents_Educ4$_i$: Tertiary school level or higher education.

β_i ($i = 1, ...,10$) are the parameters to estimate, α_i are unobserved individual-specific random effects, and the ε_{it} are assumed to be distributed N(0, σ^2).

3. RESULTS AND DISCUSSION

Estimates of the random-effects probit model for the probability of unemployment are given in Table A1 of the appendix, using Heckman, Wooldridge and Orme estimators respectively. The lagged dependent variable is included to allow for state dependence in our models.

In the Heckman estimator, the exogeneity hypothesis of the initial conditions in the random-effects model is rejected after using a simple significance test under the nullity of θ ($\theta = 0$). In Wooldridge and Orme estimators, the estimate of the coefficient on the initial value of unemployment status is statistically significant. This test confirms the existence of a considerable correlation between the initial condition and the unobserved heterogeneity, which must be taken into account.

The Pooled probit model does not allow any correlation across different periods and the parameters estimates are inefficient. In Table A1, column 2 gives the standard random-effects probit estimates, treating lagged unemployment as exogenous. The Heckman estimates for the same model are given in column 3. The Wooldridge and the Orme two-step estimates are presented in columns 4 and 5 respectively.

The null hypothesis under the likelihood-ratio test for ρ is rejected in all the estimated models, i.e. $\rho \neq 0$. This result implies that pooled probit estimates are rejected and the random-effects probit model is retained.

In all estimated models, the coefficient of the lagged dependent variable (unemployment status) is highly significant. Hence, the estimated coefficient on lagged unemployment status is 4.137 for the random-effects probit, coefficients are reduced to 3.912, 3.925 and 3.929 for Heckman, the Wooldridge and the Orme estimators respectively.

To interpret at which level each of the explanatory variables affect the probability of being in unemployment status, we have introduced marginal effects on probabilities in Table A2 of the Appendix. These results show that an individual's current unemployment status is strongly dependent on his state in the previous period. The unemployment probability for a graduate who has been unemployed at the previous period strongly increases by 92,4% in the random-effects probit

estimation, by 88.5% in the Wooldridge specification and by 88.7% in the Orme estimation. That is, once the individual experiences an unemployment spell, he is really scarred by his experience.

Overall, estimated coefficients shown in the Appendix have the expected sign and are of reasonable magnitude in the structural reduced-form probit equation as in the Orme and Wooldridge estimators. As expected, men are less likely to be unemployed than women at a significant decreasing rate of 2.1% in the random-effects probit specification, and 2.7% and 1.8% respectively in the Orme and Wooldridge estimators.

In our model, the variable *age of the graduate* is not significant and has no effect on the probability of unemployment.

Marginal effects coefficients show that the probability of being in unemployment is significantly lower for graduates who have excellent or high level fluency in French language, at a decreasing rate of 2.4% % in the random-effects probit specification, and 3% and 1.7% in the Orme and the Wooldridge estimators.

We also conclude that the probability of being unemployed significantly decreases with the number of brothers and sisters who work at a decreasing rate of 0.4% in both the Orme and the Wooldridge estimators.

It is also interesting to notice that unemployment probability increases for graduates who lived with their parents while they were studying in the university compared to those who were not. Living with parents increases the unemployment probability to 3% in the Orme estimator and to 2.6% in the Wooldridge estimator.

Furthermore, the highest level of education of one of the parents has a significant impact on unemployment probability. In fact, graduates who have at least one of their parents with tertiary school level of education are less likely to be unemployed. Their probability of being in unemployment decreases at 3.4% in the Orme estimator and at 3.5% in the Wooldridge estimator.

Concerning educational qualification variable, we notice that individuals who spend 5 years and more in Higher Education are less likely to be unemployed. Their probability of unemployment decreases to 2.7% in the random-effects probit specification, to 2.3% and 0.7% in the Wooldridge and Orme estimators respect-tively.

After analyzing the regional mobility effect of our university graduates, we found an important association between mobility to study in university and the probability to be in unemployment. Thus, a graduate who move to study in university from his region of origin to another region is less likely to be unemployed after graduation: -1,4% in the random-effects probit specification, and -1.3% in the Orme and the Wooldridge estimators.

CONCLUSION

This paper consists on the examination of the effect of state dependence on unemployment probability. Although of considerable interest, this type of analyses has never been intended for university graduates in Morocco. We have particularly tested at which level an individual's current unemployment probability depends on his labor force status in the previous period. Our estimations confirm that, in the special case of the state dependence, accounting for unobserved heterogeneity is pertinent.

One avenue of research would be to inspect the effect of the time of occurrence of the unemployment spell on the probability to be unemployed and to see if this effect is always linear in the whole observation period. In other words, does an unemployment spell just after graduation have the same impact as an unem-ployment spell two or three years after graduation? Is the stigmatization effect

immediate after leaving university or is it linked to the duration of unemployment? This fact suggests a hypothesis that opens up a new plausible line of inquiry.

The main finding is that state dependence in unemployment overestimates the risk to be in unemployment. The probability of unemployment increases at a rate of 92% if the graduate had experimented unemployment in the previous period. This rate is reduced to 89% when the unobserved heterogeneity and initial conditions are taken into account in both the Orme and the Wooldridge estimators meaning that individuals who experiment unemployment are more likely to be in unemployment in the future. One explanation to this finding is the existence of stigmatization effects which mean that individuals who are or who have been unemployed face difficulties finding a new job in the future and may have lower probabilities to be hired. Indeed, unemployment, especially long-term unemployment may be a negative signal to employers. This result has been also explained in the traditional literature by the depreciation of human capital as a result of a persistent situation of non-employment, thus, the graduate's human capital tends to deteriorate over time (Heckman and Borjas, 1980, p. 250). Many empirical studies explain the rise of stigmatization effect. Thus, Oberholzer-Gee (2007) suggest that employers are less likely to invite job searchers, who apply for a job interviews within their company, if they conclude through their CVs that applicants were unemployed or long-term unemployed.

In general, difficulties in accessing to employment may result from barriers at the entry of the labor market or from the discouragement during the job search process (Flinn and Heckman, 1983; Van den Berg, 1994). Moreover, in economies such as Morocco, where companies do not have enough developed a culture of training for their staff, young people find themselves vulnerable to entry into the labor market unlike experienced labor force (El Aynaoui and Ibourk, 2018).

In addition, many authors argue that the mismatch between demand and skill supply of young workers is a determining influencing factor of the situation of unemployment among young people in Morocco and the MENA region (Ibourk et al., 2014 ; Masood Ahmed, 2012 ; UNESCO, 2012 ; Assaf and Benhassine, 2003, cited in World Bank, 2004). Several studies about the MENA region show that employers confirm that the lack of skills represent an important constraint to hiring. Furthermore, the mismatch between acquired and required skills provides a plausible explanation for the difficulties of accessing to the labor market for young people. However, as stipulated in the human capital and job search theories, some of the young graduates prefer to wait longer in a situation of unemployment before accepting a convenient job for them extending the period between leaving the University and the first job held (El Aynaoui and Ibourk, 2018).

Our results about gender differences indicate that women are more likely to be in unemployment that men. This finding has been found in few studies.

Johnson (1983) suggests that the women unemployment rate is likely to be higher than the men's one. One explanation is that women who want to flow out from home production into employment are likely to experiment a period of intervening unemployment. In contrary, men who want to change jobs are likely to remain in employment. Tansel and Tasçi (2004) show that men are experiencing lower unemployment durations than women. Eusamio (2004) found that men had less difficulties to leave unemployment in the period 1994-1998. According to Havet (2006), having children may lead to decrease the probability of women to get a stable job. Gassab and Ben Ouada Jamoussi (2011) have studied unemployment among graduates of higher education in Tunisia and found that the rate of unemployed women outnumbers the men rate.

Our results about the effect of French language on the probability of being in unemployment indicate that graduates whose French ability is high are less likely to know a non-employment state. In Morocco, French language monopolizes the modern labor market and is the language of science, technology and new technologies (see for more details, Benzakour et al., 2000 and Benzakour, 2001, 2007 and 2010). In addition to that, in an extremely difficult labor market, having fluent oral and written French is an important asset (Bourdereau, 2006).

Regarding the effect of household structure on the probability of unemployment, it is captured by two variables: the number of employed siblings and the educational level of the parents. The negative effect of the number of employed siblings on the probability of unemployment is explained by the fact that this variable is likely to reinforce the social network of the graduate and to contribute to implement favorable attitudes to the activity within the household. This issue has been treated in some few studies such as the one of Rees and Gray (1982) who suggest the fact that siblings are able to help each other find jobs. O'Regan and Quigley (1993) show that youth are more likely to be employed if their mothers, fathers or siblings are employed. Recently, Rao and Chatterjee (2018) estimate the relationship between sibling gender and wage rates. Thus, brothers help to increase wages of men through social networks but the wages of women are insensitive to sibling gender.

We also examine whether the educational qualification reduces the risk of becoming unemployed. Several studies report this link between educational qualification and the incidence of unemployment such as Nickell (1979). Using UK data who demonstrates that acquiring qualifications at ordinary and high levels decreases the unemployment duration by 12 percent. Mincer (1991) found that one of the benefits of education is a lowered probabilitiy of unemployment. In the same way, Farber (2004) concludes that people who lose their jobs with high level of education have more chances to be re-employed full-time. Idiris Aden (2017) found, using data in the case of Canada's labor market, that individuals that have a relatively higher level of education have lower risk of unemployment.

The mobility to study in university from the region of origin to another region reduces the probability of unemployment after graduation. This finding was supported also by Bacci et al. (2008) who found that students who move away from their region of origin to study are much more likely to find employment in the region where they graduated.

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APPENDIX

Table A1: Estimation results for Unemployment Probabilities of University Graduates

	Random effects Probit	Heckman Estimator	Wooldridge Estimator	Orme Estimator
Lagged dependent variable (Yt-1)	4.139*** (0.052)	3.911*** (0.067)	3.927*** (0.064)	3.932*** (0.065)
Initial condition (at t=1)	-	-	0.502*** (0.105)	0.305*** (0.065)
Gender	-0.165*** (0.051)	-0.255*** (0.066)	-0.163*** (0.059)	-0.246*** (0.062)
Residence with parents	0.196*** (0.065)	0.260*** (0.081)	0.217*** (0.076)	0.257*** (0.077)
French level	-0.185** (0.058)	-0.268*** (0.075)	-0.153** (0.068)	-0.258** (0.070)
Number of employed brothers and sisters	-0.028* (0.015)	-0.041** (0.019)	-0.035** (0.018)	-0.039* (0.018)
Mobility	-0.122* (0.072)	-0.133* (0.089)	-0.131* (0.084)	-0.128* (0.083)
Age	Non-sign.	Non-sign.	Non-sign.	Non-sign.
Highest level of education of one of the parents				
No schooling	Ref	Ref	Ref	Ref
Primary school level	-0.145* (0.081)	-0.171* (0.100)	-0.187** (0.095)	-0.166* (0.094)
Secondary school level	-0.197** (0.071)	-0.222*** (0.088)	-0.235** (0.083)	-0.217** (0.083)
Tertiary school level	-0.306*** (0.080)	-0.358*** (0.099)	-0.372*** (0.094)	-0.352*** (0.093)
Qualification degree				
Having less than 5 years in High Education	Ref	Ref	Ref	Ref
Having 5 years and more in High Education	-0.213*** (0.056)	-0.258*** (0.070)	-0.205*** (0.065)	-0.256*** (0.066)
ρ	0.033*** (0.024)	0.153*** (0.043)	0.102*** (0.031)	0.101*** (0.031)
σ_u	0.186*** (0.070)	-	0.337*** (0.057)	0.336*** (0.057)
θ	-	2.841*** (0.989)	-	-
Log likelihood	-1677.03	-2102.900	-1662.834	-1663.5298
Wald	6475.19 (0.000)	4231.92 (0.000)	5695.37 (0.000)	5708.75 (0.000)

*The table presents marginal effects and standard deviations in brackets. ***, **, * indicate thresholds of significance respectively of 1%, 5% and 10%. Sample size= 22518.*

Source: Author's calculation (A sample of 2009 year's graduates from 3 universities).

Table A2: Dynamic Probit Model results for Graduates' Unemployment Behavior (Marginal effects)

	Random effects probit	Wooldridge Estimator	Orme Estimator
Lagged dependent variable (Yt-1)	0.924*** (0.005)	0.885*** (0.012)	0.887*** (0.011)
Initial condition (at t=1)	-	0.051*** (0.009)	0.031*** (0.006)
Gender	-0.016*** (0.008)	-0.017*** (0.006)	-0.026*** (0.006)
Residence with parents	0.023*** (0.007)	0.022*** (0.007)	0.025*** (0.007)
French level	-0.024** (0.008)	-0.017** (0.008)	-0.031** (0.009)
Number of employed brothers and sisters	-0.003* (0.002)	-0.004* (0.002)	-0.004* (0.002)
Mobility	-0.014* (0.008)	-0.013* (0.008)	-0.013* (0.008)
Age	Non-sign.	Non-sign.	Non-sign.
Highest level of education of one of the parents			
No schooling	Ref	Ref	Ref
Primary school level	-0.016* (0.008)	-0.018** (0.008)	-0.016* (0.008)
Secondary school level 1	-0.022*** (0.008)	-0.023*** (0.008)	-0.022** (0.008)
Tertiary school level	-0.033*** (0.008)	-0.035*** (0.008)	-0.033*** (0.008)
Qualification degree			
Having less than 5 years in High Education	Ref	Ref	Ref
Having 5 years and more in High Education	-0.025*** (0.007)	-0.021*** (0.007)	-0.027*** (0.007)
ρ Unobserved heterogeneity	0.033*** (0.024)	0.102*** (0.031)	0.101*** (0.031)
Log likelihood	-1677.03	-1662.834	-1663.5298
Wald	6475.19 (0.000)	5695.37 (0.000)	5708.75 (0.000)

The table presents marginal effects and standard deviations in brackets. ***, **, * indicate thresholds of significance respectively of 1%, 5% and 10%.

Source: Author's calculation (A sample of 2009 year's graduates from 3 universities).

Les effets de la dépendance d'état sur le chômage des diplômés de l'université au Maroc : Une analyse utilisant un modèle probit dynamique

Résumé - Cet article examine la relation qui existe entre le passage d'un individu par une situation de chômage dans le passé et sa situation professionnelle actuelle. Dans la littérature, cette relation est appelée « dépendance d'état ». Les données de cette étude sont issues d'une enquête adressée à un échantillon représentatif des diplômés des facultés et des écoles de trois universités marocaines. Nous avons estimé un modèle probit dynamique à effets aléatoires pour tester l'effet de la dépendance d'état sur un panel des diplômés actifs lauréats des trois universités. La probabilité de chômage à l'instant t dépend principalement du statut du diplômé sur le marché du travail à l'instant t-1 et des caractéristiques personnelles de l'individu. Une fois que l'hétérogénéité individuelle observée et non observée est contrôlée, les résultats de la modélisation révèlent que le fait de tomber dans le chômage augmente la probabilité de chômage dans le futur, validant la théorie des « effets de retour négatifs » qui stipule que la transition par des périodes de chômage empêche l'accumulation de l'expérience dans le travail et peut contribuer à la dégradation du capital humain.