Time allocation and assimilation of foreign workers: Evidence from Spain[*]

Abstract

The assimilation of immigrant workers to the Spanish labour market is a topic widely addressed by the economic literature. However, a little explored issue is the time allocation of immigrants and its effects on their integration and convergence to Spanish workers. This paper aims to study the time use of immigrants among different activities, and the influence of personal and family characteristics on the participation and the amount of time spent in each activity. The results will be compared to those obtained for the native workers, in order to detect possible similarities and differences between both groups (immigrants *versus* natives). The data used come from the Time Use Survey for the periods 2002-2003 and 2009-2010 (INE, 2004, 2011), which allows analysing the evolution of the time use's patterns of the immigrant and native workers at the beginning of the 21first century. Censored regression models are applied because the time spent in different activities is a left-truncated variable. The traditional approximation to the left-truncation is a Tobit model, but it assumes that the underlying process determining the participation and the time spent in each activity are similar, which is quite restrictive. To solve this restriction a double hurdle model is applied.

JEL: C24, D13, J22.

Author: Antonio Caparrós Ruiz

University: Universidad de Málaga

Postal address:

Facultad de Ciencias Económicas y Empresariales

Departamento de Estadística y Econometría

Calle de El Ejido nº 6

 29071 Málaga

E-mail: antonio@uma.es

Tlf: 952 13 11 63

Fax: 952 13 72 62

Time allocation and assimilation of foreign workers: Evidence from Spain

1. Introduction

Immigrant population in Spain had a huge growth during the first decade of the 21st century. According to the information of the Municipal Register conducted by the National Statistics Institute, the number of foreigners increased from 923,879 in 2000 to 5,747,764 in 2010, which accounts for 12% of the total population. The cultural peculiarities of this group of people alongside its socioeconomic importance have motivated several studies addressing its process of assimilation to the Spanish population. This topic has been focused from different standpoints by the economic literature discussing Spain. For example, Dolado (2002) or Cuadrado *et al*. (2007) review the postulated from the economic theory about the influence of the immigration on the domestic economy. Other studies focus on the labour market and aim to analyse the convergence and assimilation of foreigners to the Spanish workers from different perspectives (see, for example, Amuedo-Dorantes and De la Rica 2007, Fernández and Ortega 2008, Navarro and Rueda 2008, and Caparrós and Navarro 2010, Simón *et al*. 2014).

An issue to which little attention has been paid is the analysis of the similarities and differences about how the workers (immigrants and natives) allocate their time among activities along the day. This subject includes questions that go beyond the mere economic aspects and approaches to the research that analyses microeconomic questions related with the "family economics" as, for example, the distribution of homework (Alvarez and Miles 2003), childcare, (Hallberg and Kleumarken 2003) or the use of leisure time (Jenkins and Osberg 2004). Although the economic literature on this particular subject is scarce, it is possible to highlight the paper of Hamermesh and Trejo (2013). This study found out differences between the time use of immigrants and natives in USA and Australia, using 2004-2008 data from the American Time Use Survey and from 1992 Australian Time Use Survey,

respectively. These dissimilarities become noticeable when activities are distinguished by incidence and intensity. In Spain, there are no references in the literature discussing on the time use of immigrants. Anyway, some studies have been performed taking as main topic the time allocation. For instance, Alvarez and Miles (2003) analyze the distribution of housework time allocation between working spouses, using data from the 1991 Work Situation and Time Use Survey, carried out by the Spanish Women's Institute; Ahn *et al*. (2005) study how the time use's pattern is altered when workers become unemployed with data from the Basque Country Time Budget Survey, carried out in 1993 and 1998 by the Basque Statistics Institute; Alvarez and Milles (2011) evaluate the relationship between parents' and children's housework time allocation patterns, through the information provided by the 2002-2003 Spanish Time Use Survey (INE).

This paper intends to carry out an approach to the study of daily time allocation of the immigrants workers between different activities during the first decade of the 21st century, the results will be contrasted with those obtained for the native population, in order to detect possible similarities and differences between both groups (immigrants versus natives). Data used in this study are drawn from the Time Use Survey (TUS) for years 2002-2003 and 2009-2010 (INE, 2004, 2011). Since time use in any activity is a censored variable, appropriated regression techniques are required, in particular, double hurdle models are specified and estimated.

The remainder of the paper is organized as follows. Section 2 presents the data used in the estimates and examines from a statistical point of view the main differences between immigrants and natives according to the time use. Section 3 shows the econometric model specification. Empirical results are discussed in section 4. Finally, section 5 contains the concluding remarks.

2. Data

The data used in this study are drawn from the TUS for years 2002-2003 and 2009-2010 (INE, 2004, 2011). This survey employs the "time budget", which is a statistical measure with the sequence and duration of the activities performed by a person over a period of 24 h (from 6 am until 6 am the next day). The 24 hours are divided into ten minute intervals where the reporting person notes the main activity carried out. The classification of the activities in 10 major subgroups is the following: personal care, paid work, study, household and family care, volunteer work and meetings, social life and recreation, sport and outdoor activities, hobbies and computer, media, travel and unspecified time. The research population is all private households and all persons over 10 years living in these households, the survey also includes information about household composition, personal and demographics characteristics, and the individual labour market status.

The sample used in this study is composed by paid employees aged between 16 and 65 years old. The resulting sample size for the 2002-2003 and 2009-2010 Time Use Survey are 9,739 and 3,805 individuals of which 6.1% and 13.2% correspond to immigrants, respectively. Table 1 shows the descriptive statistics of the daily time spent in the main activities by immigrants and natives obtained for all individuals (including those who don't participate in the activity) and, only, for individuals who do engage in the activity. Moreover, the percentage of participation in each activity is also shown. With respect to the most aggregated classification, some interesting decompositions have been made. On one hand, "household and family care" is divided among "household chores", "shopping" and "caring for members of the household". On the other hand, "media" is separated between "lecture" and "tv or radio". The main results obtained are summarized as follows. Apart from "personal care" and "paid work", the activities with highest incidence are "unspecified time", "tv or radio" and "social life and recreation". On the contrary, "study" and "volunteer work and meeting" have the least proportion of participation.

Table 1. Hours spent doing various activities on an average day

Activities	Year: 2002-2003 Immigrants		Year: 2002-2003 Natives		Year: 2009-2010 Immigrants		Year: 2009-2010 Natives	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Personal care								
Unconditional mean	10.06	1.59	9.89	1.49	10.17	1.65	9.93	1.56
Conditional mean	10.06	1.59	9.89	1.49	10.17	1.65	9.93	1.56
% with zero minutes	0		0		0		0	
Paid work								
Unconditional mean	7.85	2.10	7.65	1.89	7.62	2.13	7.37	1.88
Conditional mean	7.85	2.10	7.65	1.89	7.62	2.13	7.37	1.88
% with zero minutes	0		0		0		0	
Study								
Unconditional mean	0.06	0.41	0.08	0.47	0.09	0.48	0.09	0.50
Conditional mean	1.74	1.28	1.94	1.18	1.96	1.13	2.17	1.30
% with zero minutes	96.15		95.58		95.32		95.86	
Household chores								
Unconditional mean	1.17	1.33	1.19	1.45	1.18	1.33	1.31	1.36
Conditional mean	1.66	1.30	1.70	1.46	1.74	1.29	1.72	1.31
% with zero minutes	29.15		30.05		32.34		23.50	
Shopping								
Unconditional mean	0.24	0.50	0.27	0.55	0.25	0.57	0.33	0.60
Conditional mean	0.88	0.60	0.87	0.68	0.93	0.75	0.88	0.68
% with zero minutes	71.69		69.05		72.98		62.18	
Caring for members of the household								
Unconditional mean	0.32	0.76	0.30	0.81	0.44	0.93	0.45	0.96
Conditional mean	1.31	1.02	1.37	1.21	1.39	1.18	1.59	1.20
% with zero minutes	75.21		77.70		67.87		71.24	
Volunteer work and meetings								
Unconditional mean	0.04	0.22	0.09	0.49	0.06	0.40	0.10	0.51
Conditional mean	0.79	0.51	1.50	1.39	1.64	1.20	1.55	1.32
% with zero minutes	94.30		93.90		95.96		93.25	
Social life and recreation								
Unconditional mean	0.78	1.17	0.90	1.33	0.55	1.03	0.63	1.14
Conditional mean	1.31	1.27	1.53	1.43	1.21	1.23	1.24	1.24
% with zero minutes	40.54		41.01		54.47		49.06	
Sport and outdoor activities								
Unconditional mean	0.30	0.83	0.38	0.78	0.25	0.65	0.35	0.70
Conditional mean	1.63	1.24	1.42	0.88	1.35	0.88	1.30	0.77
% with zero minutes	81.24		72.83		81.28		72.56	
Hobbies and computer								
Unconditional mean	0.15	0.85	0.15	0.54	0.22	0.57	0.28	0.70
Conditional mean	1.57	1.13	1.30	0.96	1.09	0.78	1.19	1.01
% with zero minutes	90.12		87.82		79.15		76.32	
Lecture								
Unconditional mean	0.12	0.37	0.18	0.44	0.11	0.51	0.20	0.47
Conditional mean	0.82	0.57	0.84	0.61	0.99	1.18	0.89	0.61
% with zero minutes	84.42		78.51		88.09		77.73	
TV or radio								
Unconditional mean	1.30	1.11	1.25	1.14	1.37	1.30	1.35	1.18
Conditional mean	1.67	0.98	1.61	1.05	1.75	1.22	1.68	1.09
% with zero minutes	21.78		21.90		21.70		19.25	
Travel and unspecified time								
Unconditional mean	1.52	0.92	1.52	0.91	1.57	1.06	1.52	0.90
Conditional mean	1.58	0.89	1.54	0.90	1.65	1.03	1.54	0.89
% with zero minutes	3.69		1.36		5.11		1.44	
Nº Observations	560		9,179		446		3,359	

The results more relevant, in terms of participation, are summarized as follows. Firstly, the largest difference between immigrants and natives corresponds to the activity "sport and outdoor activities", around 9 percentage points in favor of native workers. Secondly, the incidence of episodes related to "social life and recreation" has an important decrease between the years 2003 and 2010 (14 and 9 percentage points for immigrants and natives, respectively), while the activity "hobbies and computer" shows the highest increase of participation between 2003 and 2010, around 10 percentage points for both immigrants and natives workers.

Concerning the number of hours devoted to each activity, firstly, it is noteworthy that people spend around 18 hours between the activities personal care (10 hours) and paid work (8 hours), without significant differences according to country of origin nor the analysis period. "Household chores" and "tv or radio" are the next activities with more hours, around 2.5 hours as a whole and for all individuals of the sample. On the contrary, "study" and "lecture" have the lowest mean time, specially for immigrant workers. However, the highest conditional mean corresponds to the activity "study", it implies that those individual who decide combine work and education put an important proportion of daily time in their training activities. Moreover, this amount has increased between the years 2003 and 2010, reaching the 2 hours. Finally, it is remarkable the process of assimilation observed for the activity "volunteer work and meetings" between immigrant and native workers, since the gap of time spent in this activity has declined from the 0.7 hours in 2003 to 0.1 in 2010.

To get another standpoint of the between-group differences, it is possible to obtain an index that sums up the separation in "activity profiles and measures how overall time use differs by natives and immigrants. The measure used is the weighted absolute deviation index (Stewart, 2006):

$$DI = \sum_{i=1}^{k} \left\{ \frac{|a_i - b_i|}{a_i + b_i} \left(\frac{a_i + b_i}{\sum_{i=1}^{k}(a_i + b_i)} \right) \right\} \qquad (1)$$

where a_i and b_i are the times spent in activity i by group a and b, respectively, and k is the number of activities. This index ranges between 0 and 1, a value of 0 indicates that the two groups spend the same amount of time in each activity, and a value of 1 means that the two groups do not have common activities. A relevant and desirable property of this index is its insensitivity to the level of aggregation of activities. The indices obtained are arranged in Table 2 distinguishing according to some interesting personal characteristics such as gender or human capital. As main conclusion, it is worth highlighting that time use's pattern is quite similar between immigrants and natives, since the weighted absolute deviation indices are close to zero for all cases. The highest values of the index are obtained for women and individuals with upper level vocational and technical training, with a figure of 0.05. In addition, it is noteworthy that the dissimilarities between the years 2003 and 2010 has slightly increased for all categories, with the exception of those individuals with higher education.

Table 2. Weighted absolute deviation indices

Gender	Year: 2002-2003	Year: 2009-2010
Male	0.02	0.03
Female	0.03	0.05
Educational level		
Primary or not education	0.03	0.04
Lower secondary	0.02	0.02
Upper secondary	0.03	0.03
Medium level vocational and technical training	0.03	0.04
Upper level vocational and technical training	0.02	0.05
Higher education	0.03	0.02

Source: Own elaboration from data of 2002-2003 TUS (INE, 2004).and 2009-2010 TUS (INE, 2011).

3. Econometric framework

A particular feature of time-use data is that a significant proportion of individuals report zero minutes for many activities. The econometric methodology has traditionally used Tobit model for account for such censoring problem (see, for example, McDonald and Moffitt, 1980). Specifically, the time spent in a particular activity, y_i^*, is specified by the following equation:

$$y_i^{*'} = x_i'\beta + \varepsilon_i \tag{2}$$

X_i is the vector of explanatory variables, β is the vector of unknown coefficients and $\varepsilon_i \approx N(0, \sigma_\varepsilon^2)$. The observed variable is:

$$y_i = \begin{cases} y_i^* & if \ \ y_i^* > 0 \\ 0 & otherwise \end{cases} \tag{3}$$

The Tobit model supposes that the underlying processes determining the participation and the time spent in an activity are the same (that, is the same parameters). This restriction can be overcome with a more flexible model that allows separate processes. In particular, Cragg (1971) proposed the double-hurdle model, where two separate hurdles must be passed before observing a positive value for the time spent in a particular activity. The first hurdle is specified through the latent variable y_i^*, which represents the unobserved propensity to participate in an activity and is modelled as:

$$y_i^* = x_{1i}'\gamma + \varepsilon_{1i} \tag{4}$$

So, the individual participates in an activity if $y_i^* > 0$. The second hurdle concerns the duration of the action, y_i (given that $y_i^* > 0$), which is supposed following a normal truncated regression model:

$$E(y_i \mid y_i^* > 0, x_{2i}) = x_{2i}'\beta + E(\varepsilon_{2i} \mid y_i^* > 0, x_{2i}) \tag{5}$$

X_{1i} and x_{2i} are the vectors of explanatory variables. In this case, it is supposed that both vectors contains the same regressors, which are the following: gender, age, health status, geographic origin, type of family, educational level, number of household members, type of working day, region of residence, municipality size and a dummy variable that shows if the individual belongs to the 2002-2003 TUS or to the 2009-2010 TUS (in this way, the empirical strategy applied consists in obtaining a sample a result of pooling the two surveys). On the other hand, γ and β are the vectors of unknown coefficients. With respect to the unobservable error terms (ε_{1i} and ε_{2i}) is considered that:

$$\begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \approx N \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix} \right]$$

(6)

where the diagonal of the covariance matrix denotes that the two error terms are assumed to be independently distributed.

The double hurdle model is estimated using maximum likelihood estimation procedures and the log-likelihood function is:

$$L = \prod_{y_i=0} [1 - \Phi(x_{1i}'\gamma)] * \prod_{y_i>0} \left[\Phi(x_{1i}'\beta) \frac{1}{2\pi\sigma} \exp\left\{ -(y - x_{2i}\beta)^2 / 2\sigma^2 \right\} / \Phi(x_{2i}\beta / \sigma) \right]$$

(7)

where Φ is the cumulative distribution function of the normal distribution. The first term of this equation corresponds to the contributions of all the observations with an observed zero minutes for participation in an particular activity activities. The second term accounts for the contribution of all the observations with non-zero minutes. This model is estimated for all activities with the exception of "personal care", since the percentage of participation in this activity is 100%, and "unspecified time" where the estimates have no relevance given the ambiguous definition of the activity.

The estimated coefficients in the double-hurdle model cannot be interpreted as in a linear regression model. So, it is necessary to obtain the marginal effects to measure accurately the influence of the regressors on the dependent variables. For a given observation, the marginal effect of a continuous explanatory variable x_j around the probability that $y_i^* > 0$ is:

$$\frac{\partial P(y_i^* > 0 \mid x_{1i})}{\partial x_{ji}} = \gamma_j \phi(x_{1i}' \gamma) \tag{8}$$

where γ_j is the coefficient on x_j in equation (4). On other hand, the partial effect of x_j on the expected value of y_i, given $y_i^* > 0$ is:

$$\frac{\partial E(y_i \mid y_i^* > 0, x_{2i})}{\partial x_{ji}} = \beta_j [1 - \lambda(x_{2i}' \beta / \sigma) \{ x_{2i}' \beta / \sigma + \lambda(x_{2i}' \beta / \sigma) \}] \tag{9}$$

where β_j is the coefficient on x_j in equation (5).

For the dummy explanatory variables, the marginal effects are obtained in a different way, in particular, as changes in the dependent variable when the dummy variable is shifted from zero to one:

$$P(y_i^* > 0 \mid x_{1i}, x_{ji} = 1) - P(y_i^* > 0 \mid x_{1i}, x_{ji} = 0) \tag{10}$$

$$E(y_i \mid y_i^* > 0, x_{2i}, x_{ji} = 1) - E(y_i \mid y_i^* > 0, x_{2i}, x_{ji} = 0) \tag{11}$$

Once the marginal effects are obtained for all observations, the average partial effect is calculated for each independent variable (Burke 2009).

4. Results

Tables 4 and 5 provide the marginal effects corresponding to the first hurdle (that is, the influence of the regressors on the probability of participating in the activity) for immigrants and natives, respectively. The following is a detailed explanation of the main differences between both collectives analysed by type of activity.

Table 4. Marginal effects of the first hurdle: Participation for immigrant workers

Regressors	Study	Household	Shopping	Family	Meeting	Social Life	Sport	Hobbies and computer	Reading	TV or Radio
Gender										
Male	0.020**	-0.209***	-0.166***	-0.140***	0.001	-0.045	0.073***	0.082**	-0.035	0.101**
Age	-0.001**	0.001***	-0.001**	-0.001^	0.002	-0.001	-0.001	-0.002**	0.004***	0.001
Health Status										
Very good	-0.009	-0.021	-0.090***	0.006	0.014	0.011	0.038	0.062*	0.063**	-0.039
Geographic origin										
Not UE	0.019*	0.025**	-0.028	-0.040	0.012	0.001	-0.087**	-0.084***	-0.080***	0.028
Type of family										
Couple without children	0.011	-0.033**	-0.023	0.210***	-0.005	-0.028	-0.028	-0.008	-0.055	-0.017
Couple with children	-0.009	-0.050**	0.007	0.213***	0.015	-0.030	0.001	0.036**	0.006	-0.004
Nº of household members	-0.003**	-0.038**	-0.020**	0.064***	-0.001	0.002	-0.027***	-0.017	-0.010	0.008
Education										
Lower secondary education	-0.013**	0.066**	0.055^	-0.019	-0.080***	-0.069***	0.073*	0.075***	0.103**	-0.007
Upper secondary education	0.002	0.086*	0.076*	0.089^	-0.050*	-0.083***	0.067**	0.145***	0.161***	-0.054*
Higher education and upper tech. training	0.025^	0.088**	0.158***	0.184***	-0.091**	-0.025	0.061*	0.237***	0.257***	-0.032
Type of working day										
Full and continuous	0.023**	-0.107***	-0.122**	-0.052**	-0.054^	-0.069*	-0.087**	-0.002	0.019*	-0.063**
Full and not continuous	-0.017*	-0.178***	-0.108***	-0.138***	-0.003	0.060*	-0.130**	-0.029	-0.035***	-0.086**
Spanish region										
Northwest	0.026**	0.034	-0.052	-0.023	-0.004	0.032	0.062	0.072*	0.101**	-0.064**
Northeast	-0.001	0.056**	-0.087**	0.094**	-0.042***	-0.062***	0.059	0.034	0.017	0.014
Madrid	0.008	0.005	-0.068	-0.051	-0.054***	-0.103*	-0.002	0.028	0.064**	-0.028^
Center	0.005^	-0.034	-0.173***	-0.015	-0.061***	-0.017	0.130**	-0.039	0.088	-0.075**
East	0.001	0.029	-0.020	0.030	-0.030	-0.108**	-0.022	0.051**	0.042	-0.040*
Municipality size (inh.)										
Less than 10,000	0.288*	0.001	-0.005	0.025	0.006	-0.040	0.041*	-0.041**	0.033	-0.014
Year										
2010	0.010	-0.071**	-0.031	-0.025	-0.016	-0.124**	-0.007	0.111***	-0.070*	0.018
Number of observations	1,067									

Notes:

(1) The individual of reference is woman not married, born in an European Union country, with not very good health status and with primary studies, working part-time in the South region and in a municipality with more than 10,000 inhabitants. Moreover, she was surveyed between the period 2002-2003.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%., (^) at 15%.
Source: Own elaboration from data of 2002-2003 TUS (INE, 2004).and 2009-2010 TUS (INE, 2011).

Table 5. Marginal effects of the first hurdle: Participation for Spanish workers

Regressors	Study	Household	Shopping	Family	Meeting	Social Life	Sport	Hobbies and computer	Reading	TV or Radio
Gender										
Male	-0.007*	-0.304***	-0.206***	-0.076***	-0.016**	-0.025**	0.048***	0.058***	0.001	0.042***
Age	-0.001***	0.004***	0.004***	-0.002***	-0.001	-0.002***	-0.001	-0.002***	0.005***	0.002***
Health Status										
Very good	-0.006	-0.001	-0.020*	0.004	-0.002	0.010	0.024**	-0.078***	0.006	0.011
Type of family										
Couple without children	-0.012**	0.053***	0.036***	0.156***	-0.002	0.002	-0.045***	-0.082***	-0.003	0.005
Couple with children	-0.018***	0.106***	0.079***	0.423***	-0.015***	-0.014*	-0.041**	-0.088***	-0.002	0.008
Nº of household members	-0.003**	-0.0.32***	-0.025***	0.050***	-0.001	0.005	-0.002	-0.008***	-0.003	0.002
Education										
Lower secondary education	0.009***	0.049**	0.044***	0.045***	0.017**	0.003	0.017**	-0.016	0.062***	0.005
Upper secondary education	0.026***	0.077***	0.0627***	0.081***	0.018**	0.028*	0.040**	0.056***	0.181***	-0.014
Higher education and upper tech. training	0.042***	0.110***	0.088***	0.113***	0.025***	0.034**	0.089***	0.077***	0.259***	-0.024***
Type of working day										
Full and continuous	-0.011**	-0.024**	-0.053***	-0.043***	0.011*	-0.010	-0.001	-0.111***	-0.008	-0.044***
Full and not continuous	-0.031***	-0.084***	-0.148***	-0.070***	0.013*	-0.014*	-0.083***	-0.142***	-0.027***	-0.009***
Spanish region										
Northwest	-0.009**	-0.007	0.035**	-0.018**	-0.013*	-0.017*	0.057**	-0.054***	0.073***	-0.007
Northeast	-0.007^	0.035**	0.068**	0.029^	0.004	-0.042**	0.074**	-0.032***	0.117***	0.012*
Madrid	0.016**	0.004	0.017*	0.004	-0.023**	-0.113***	-0.001	-0.039***	0.051***	-0.001
Center	0.020**	0.029**	0.033***	-0.007**	-0.001	-0.014	0.073***	-0.041**	0.081***	0.007*
East	0.002	0.043**	0.051***	0.029**	-0.017**	-0.091***	0.014**	-0.045***	0.025**	-0.010*
Municipality size (inh.)										
Less than 10,000	0.007*	-0.002	0.037***	0.015***	-0.001	-0.012**	0.025**	-0.034***	0.038***	0.019**
Year										
2010	-0.001	0.013	0.028**	0.088***	-0.005	-0.076***	-0.001	0.064***	-0.029*	0.008
Number of observations	12,587									

Notes:

(1) The individual of reference is woman not married, with not very good health status and with primary studies, working part-time in the South region and in a municipality with more than 10,000 inhabitants. Moreover, she was surveyed between the period 2002-2003.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%., (^) at 15%.
Source: Own elaboration from data of 2002-2003 TUS (INE, 2004).and 2009-2010 TUS (INE, 2011).

With respect to the activity of "study", there are significant differences according to the country of origin. Firstly, gender has an important influence in the case of foreigners workers, in particular, the probability of receiving training out of work is 2 percentages points higher for men than for women. It can indicate, on one hand, that the portability of human capital for females is more suitable to the needs of the Spanish labour market than the corresponding one to males or, on the other hand, that immigrant women are in low-skilled occupations with little probability of being promoted or getting a better job. For example, it is known that a high proportion of foreign-work women in Spain are employed in housework or care work that are occupations with few requirements of human capital and skills (Vidal-Coso and Miret-Gamundi, 2012). Secondly, immigrants from non-European Union countries have more probability of doing activities related to training. For this type of countries, the educational mismatch between their country of origin and Spain is higher than the gap existing with countries more developed and with less cultural distant (SanRoma *et. al*. 2008). On the other hand, the type of family is only influential for Spanish-workers where those individuals living alone has the highest incidence in the activity of study. However, for both collectives of people (immigrants and natives), the number of household members has a negative effect on the probability of training. Another result is that the educational background of the workers is correlated positively with the probability of studying outside work. This effect is particularly intense for Spanish workers with higher education whose probability is 4 points higher than workers with primary studies. Other interesting conclusions are that the incidence of "study" is highest for immigrant workers with full and continuous working day, while for Spanish people it occurs for part-time workers.

As regard the activities related to "household and family care" (that is, "household chores", "shopping" and "caring for members of the household"), firstly, it is verified the relevant role of the gender and the prevalence of the household division of labour in the Spanish society for both immigrants and natives. For example, the probability of "household chores" is 30 point

higher for men than for women in the case of Spanish workers (20 point, for immigrants workers). These results reveals that the incorporation of women to the labour market has not been accompanied by a reduction of their family duties compared to men. Theoretical models have offered several explanations for intra-household time allocation. Becker (1981) postulates that women are best suited to housework as a result of the biology. Another explanation is given by bargaining models (see, for example, Lundberg and Pollak, 1993) that suppose that women' labour market hours are adjusted depending on housework needs. Secondly, the possibility of caring for members of the households increases substantively if the individual is married and has children. Moreover, this effect is more pronounced for Spanish workers (42 points more than people living alone) than for foreign employees (only 21 points). On the other hand, human capital is associated positively with "household and family care", in particular, for those individuals with higher education. For example, people with primary studies have a probability of "household" care around 10 points (for both immigrants and natives) lesser than individuals with the highest educational level. With respect to the type of working day, workers with part-time job participate more than those with full-time job in this group of activities. Finally, the region of residence exerts an important influence for Spanish workers in the activity of shopping. In particular, individuals living in Spanish regions different from the South region has the highest probability of doing it.. This result can show the regional disparities in the purchasing power of consumers.

Regarding the activities of "meeting" and "social life", the results show cultural differences since gender is a relevant variable for the Spanish workers but not for immigrants employees. On the one hand, Spanish women have around 2 point more than probability of participating in these activities than men. On the other hand, the effect of human capital is different for both collectives, positive for natives and negative for immigrants.

The similarities between immigrants and natives reappear when the activities "sport" and "hobbies and computer" are analyzed. For both group of people, gender and educational level

are significant variables and influence in the same way. So, males and more educated individuals have the highest possibility of participating in these activities. As an example, workers with higher education (immigrants or natives) have a probability of joining in activities associated with hobbies and computer around 25 points higher than individual with primary education. Moreover, the type of working day affects the practice of these activities, part-time employees are more likely to do sport and enjoy hobbies. Finally, another remarkable finding is the immigrants from non-European Union countries show less options of having episodes of "sport" or "hobbies and computer", in particular, 8 point less than foreign-workers from European Union countries.

With respect to the episodes of "reading", there is a positive relation between this activity and the educational level of workers. In this sense, this fact is coherent with the strand of the Human Capital's theory that emphasizes the existence of positive externalities and social returns of the education beyond the benefits associated with the productive process and the professional success (Lange and Topel, 2006). This productive association between education and the incidence of reading appears for both immigrants and natives. In particular, the probability of reading for individuals with university studies is 25 points higher than the corresponding one to workers without studies. Moreover, it is noteworthy that the gender does not explain the participation in activities of reading, while the probability of reading for immigrants from non-Union European countries is 8 point lesser than the corresponding to Union European workers. Finally, watching TV or listening radio depends mainly on the gender, the educational level and the type of working day. In particular, the highest probability of participating in these activities corresponds to men, individual with lower educational level and part-time employees.

As a whole, the main differences associated with the survey's reference year appears for the activities "social life" and "hobbies and computer". The social life is affected negatively by

the economic crisis, since the participation of people in this activity decreases about 12 points for immigrants (7 points for Spanish workers) in 2011 with respect to 2003.

Tables 6 and 7 contain the marginal effects corresponding to the second hurdle (that is, the influence of the regressors on the duration of the activity conditioned to the participation in it) for immigrants and natives, respectively. From these tables, it is possible to highlight some interesting results. With respect to the variable "gender", the main influence is registered for the activity "household chores" where women has a duration higher than men. This effect is specially intense for female Spanish workers who devote to this activity a half hour more than their male counterparts (for immigrants, the gap is around 20 minutes). Moreover, age is a variable related positively to the duration of this activity. As regard the country of origin, individuals born in not European Union countries have episodes of "sport", "hobbies and computer" and "reading" shorter than immigrants from European Union countries. According to the activity "caring for members of the household", the variables associated with the type of family are the variable more relevant. In particular, the time spent in this activity increase for those individuals living with a partner and with children about a half hour and a quarter hour, for natives and immigrants respectively, with respect to people without partner. On other hand, reading time is linked positively to the educational background. Thus, for example, individuals whit higher education or upper technical training have episodes around 20 minutes longer than people with primary studies. In relation to the type of working day, it is an important explanatory variable on how immigrant workers allocate their time away from work. The activities more affected by the daily number of worked hours and their distribution along the day are "household chores", "family", "sport" and "TV or radio". In particular, workers with full and not continuous working day spend less time in these activities than the rest of employees. The main differences are with respect to part-time workers (for example, around 20 minutes in the activity "household chores").

Table 6. Marginal effects of the second hurdle:
Conditional expected value for immigrant workers

Regressors	Study	Household	Shopping	Family	Meeting	Social Life	Sport	Hobbies and computer	Reading	TV or Radio
Gender										
Male	-0.012	-0.373***	-0.135***	-0.135***	0.002	-0.044***	0.065**	0.079***	-0.038*	0.180***
Age	-0.002	0.016**	0.003	-0.019**	0.002	-0.005	-0.004	-0.031**	0.064**	0.006**
Health Status										
Very good	0.031	-0.038	-0.076*	0.008	0.018	-0.027	0.034	0.001	0.072**	-0.078
Geographic origin										
Not UE	0.037***	-0.041	-0.023	-0.041*	0.013^	0.001	-0.079**	-0.086**	-0.094**	0.056
Type of family										
Couple without children	0.015	-0.085*	-0.019	0.211***	-0.006**	-0.027	-0.025	-0.008	-0.062**	-0.031
Couple with children	-0.015	-0.058	0.006	0.213***	0.017**	-0.029	0.001	-0.034	0.007	-0.009
Education										
Lower secondary education	0.023	0.103^	0.045	-0.010	-0.085***	-0.068*	0.065**	0.001	0.140**	-0.014
Upper secondary education	0.003	0.139***	0.062*	0.091**	-0.046**	-0.081*	0.060	0.064	0.201**	-0.0697*
Higher education or upper tech. training	0.034**	0.140**	0.131**	0.084***	-0.073***	-0.027	0.055	0.143**	0.295***	-0.062
Nº of household members	-0.037	0.008	-0.020	0.043	-0.028	0.059**	-0.023	-0.019**	-0.023	-0.016
Type of working day										
Full and continuous	0.032**	-0.203**	-0.101**	-0.050	0.015	-0.066**	-0.067**	-0.002	0.010	-0.125*
Full and not continuous	-0.033*	-0.303**	-0.090**	-0.139***	-0.006	0.059	-0.115***	-0.028**	-0.049*	-0.163***
Spanish region										
Northwest	0.053	0.059^	-0.040	-0.023	-0.004	0.040	0.054	0.038	0.110^	-0.017
Northeast	-0.001	0.099	-0.072***	0.093*	-0.051**	-0.053	0.052	0.004	0.020	0.031
Madrid	0.019*	0.009	-0.056	-0.052	-0.088**	-0.092	-0.002	-0.001	0.071**	-0.057
Center	0.012	-0.053	-0.143***	-0.015	-0.015^	-0.009	0.115	-0.065	0.097	-0.136
East	-0.002	0.056	-0.017	0.030	-0.034**	-0.096	-0.020	0.019	0.047**	-0.078**
Municipality size (inh.)										
Less than 10,000	0.032**	0.002	-0.004	-0.057	-0.001	-0.031	0.036^	0.225	0.037	-0.27
Year										
2010	0.011	-0.117***	-0.025	-0.105**	-0.010	-0.111**	-0.007	0.127***	-0.078	0.034
Number of observations	1,067									

Notes:

(1) The individual of reference is woman not married, born in an European Union country, with not very good health status and with primary studies, working part-time in the South region and in a municipality with more than 10,000 inhabitants. Moreover, she was surveyed between the period 2002-2003.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%., (^) at 15%.
Source: Own elaboration from data of 2002-2003 TUS (INE, 2004).and 2009-2010 TUS (INE, 2011).

Table 7. Marginal effects of the second hurdle:
Conditional expected value for Spanish workers

Regressors	Study	Household	Shopping	Family	Meeting	Social Life	Sport	Hobbies and computer	Reading	TV or Radio
Gender										
Male	-0.015**	-0.538***	-0.177***	-0.089***	-0.036***	-0.016	0.0381***	0.127***	0.001	0.077***
Age	-0.002	0.029**	0.002*	-0.032**	-0.005	-0.019**	0.005**	-0.032**	0.005***	0.007**
Health Status										
Very good	0.005	-0.002	-0.018**	0.005	-0.005	0.001	0.019*	-0.012*	0.005	0.021
Type of family										
Couple without children	0.015	0.085***	0.032***	0.195***	-0.006	-0.007	-0.035***	-0.016**	-0.007	0.058**
Couple with children	-0.015	0.182***	0.070***	0.454***	-0.034**	-0.023**	-0.032***	-0.024**	-0.006	0.015
Parental education										
Lower secondary education	0.050***	0.074***	0.038***	0.054***	0.042**	-0.006	0.013***	0.045**	0.050***	0.010
Upper secondary education	0.141***	0.121***	0.054**	0.098***	0.043***	0.017	0.031**	0.124***	0.141***	-0.027
Higher education or upper tech. training	0.201***	0.182**	0.077***	0.135***	0.060***	0.023*	0.069***	0.145***	0.201***	-0.044**
Nº of household members	-0.030	0.009	0.021***	0.065**	-0.086**	-0.014	-0.016	0.065**	-0.016**	-0.016
Type of working day										
Full and continuous	-0.011**	-0.043	-0.047**	-0.051***	0.024**	-0.020	-0.001	-0.072**	-0.011^	-0.018**
Full and not continuous	-0.026**	-0.137***	-0.128***	-0.083**	-0.037***	-0.023*	-0.065***	-0.079***	-0.026***	0.060**
Spanish region										
Northwest	-0.002**	-0.012	0.031**	-0.020*	-0.028**	-0.027**	0.055	0.009	0.054***	-0.013
Northeast	-0.015**	0.060**	0.060***	0.035***	0.009	-0.050***	0.052	0.033***	0.089***	0.024
Madrid	0.030**	0.006	0.028***	0.005	-0.054***	-0.117***	-0.002	0.025**	0.036***	-0.003
Center	0.035**	0.048**	0.0208*	-0.009	-0.003	-0.024*	0.116**	0.023^	0.060***	0.015
East	0.004	0.073***	0.045***	0.034***	-0.039**	-0.098***	-0.020	0.019**	0.016**	-0.019
Municipality size (inh.)										
Less than 10,000	0.013	-0.004	0.033	0.018**	-0.002	-0.011	0.033	-0.034***	0.026***	0.036**
Year										
2010	0.002	0.023*	0.025**	0.103***	-0.010	-0.072***	-0.007	0.064***	-0.028**	0.015
Number of observations	12,587									

Notes:
(1) The individual of reference is woman not married, with not very good health status and with primary studies, working part-time in the South region and in a municipality with more than 10,000 inhabitants. Moreover, she was surveyed between the period 2002-2003.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.
Source: Own elaboration from data of 2002-2003 TUS (INE, 2004).and 2009-2010 TUS (INE, 2011).

Concerning the region of residence, their effects are mainly on Spanish workers and, specifically, on the activities of "reading" and "social life" where it is observed that all

regions spend more and less time, respectively, than the South region. Finally, in relation to survey's reference year, the results are in line with those obtained for the first hurdle (that is, the probability of participation) since the time spent with "hobbies and computer" has increased between the year 2003 and 2011, but for the activity "social life" it have decreased.

5. Conclusions

This study has attempted to shed empirical evidence on an unknown topic in the economic literature on assimilation of immigrants in Spain. Basically, making use of the statistical information provided by the 2002-2003 TUS (INE, 2004) and the 2009-2010 TUS (INE, 2011), the main differences and similarities between the native and immigrant population in their use of time have been analyzed. In this way, the degree of convergence between both groups have been examined from a perspective not only economic but also social. The empirical and econometric procedure have consisted in pooling the two surveys named above and estimate double-hurdle models that have the advantage of separating the processes determining the incidence and the duration of a particular activity.

The results reveal important differences in the time allocation between immigrants and natives from an econometric point of view. Particularly, it is noted that the Spanish group is a more heterogeneous collective than the immigrant group, since in the former case the effects of personal and household characteristics on the time use are generally more relevant and significant. This fact reflects that the social and cultural assimilation of immigrants workers to the Spanish society has not yet been fully achieved. With respect to the participation in a particular activity, some interesting results has been obtained. Firstly, immigrants from not UE countries and men has more probability of studying. Secondly, the gender play a relevant role in the incidence of episodes related to "household and family care", for example, the probability of "household chores" is 30 point higher for men than for women in the case of Spanish workers (20 point, for immigrants workers). On other hand, the probability of "caring for members of the households" increases significantly substantively if the individual is

married and has children. Moreover, the results show cultural differences for the activities of "meeting" and "social life", since gender is a relevant variable for the Spanish workers but not for immigrants employees. Finally, as regard the rest of activities, on one side, foreign workers from European Union countries has higher probability of doing "sport" or "hobbies and computer" than the rest of immigrant employees. On the other side, there is a positive relation between the activity of reading and the educational level of workers (for both immigrants and natives), which is coherent with the the existence of positive externalities and social returns associated with the human capital acquired by the workers. Regarding the influence of the regressors on the duration of the activity, the main conclusions are the following. Firstly, the most relevant variables to explain the duration of the episodes of "household chores" and the "caring for member of the household" are gender, type of working day and type of household, respectively. Secondly, the activity of reading is positively associated with the human capital acquired by the individuals in the educational system. Finally, the collective of immigrants workers is not a homogenous groups, since individual from outside the European Union have different behaviour in relation to the duration of the following activities "sport", "hobbies and computer" and "reading".

References

Ahn, N., Jimeno, J. and Ugidos, A. 2005. *Monday at the sun: Unemployment, time use and consumption patterns in Spain*. In: Hamermesh, D., Pfann, G. (Eds). The Economics of Time Use. Elsevier. Amsterdam, pp. 237-259.

Alvarez, B. and Miles, D. 2003. Gender effect on housework allocation: Evidence from Spanish two-earner couples. *Journal of Population Economics*, 16(3), pp. 227-242.

Alvarez, B. and Miles, D. 2011: "Exploring the relationship between parents' and children's housework time in Spain". *Review of Economics of Household*, 24, pp. 1-20.

Amuedo-Dorantes, C. and De la Rica, S. (2007). Labour market assimilation of recent immigrants in Spain. *British Journal of Industrial Relations*, 45(2), pp. 257-284.

Becker, G. 1981. A treatise on the family. Cambridge: Harvard University Press, 1981.

Caparrós, A. y Navarro, Mª L. (2010). Determinantes de la contratación indefinida en España. *Revista de Economía Laboral,* 7(1), pp. 38-62.

Gragg, J. 1971. Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometríca*39(5), pp. 829-844.

Cuadrado, JR., Iglesias, C. y Llorente, R. (2007). Inmigración y mercado de trabajo (1997-2005), Fundación BBVA, Madrid.

Dolado, J. (2002). Los nuevos fenómenos migratorios: Retos y políticas. Universidad Carlos III, Economic Working Paper 021303.

Fernández, C. y Ortega, C. 2008. Labour market assimilation of immigrants in Spain: Employment at the expense of bad job-matches? *Spanish Economic Review*, 10(2), pp. 83-107.

Hallberg, D. and Klewmarken, A. 2003. Time for children: a study's of parent time allocation. *Journal of Population Economics*, 16(2), pp. 205-226.

Hamermesh, D. and Trejo, S. 2013. How do immigrants spend their time? The process of assimilation. *Journal of Population Economics*, 26(2), pp. 507-530.

Jenkins, S. P. and Osberg, L. 2004. Nobody to play with? The implications of leisure coordination. In (ed.) The Economics of Time Use (Contributions to Economic Analysis, Volume 271), Emerald Group Publishing Limited, pp. 113-145.

Lange, F. and Topel, R. (2006) The Social Value of Education and Human Capital. In Eric A. Hanushek & Finis Welc (Eds.), *Handbook of the Economics of Education*, Vol.1, pp. 1-68. Amsterdam: North Holland.

Lundberg, S. and Pollak, R.A. (1993). Separate Spheres Bargaining and the Marriage Market. *Journal of Political Economy* 101(6), pp. 988-1010.

McDonald, J. and Moffit, R. (1980). The uses of Tobit analysis. *The Review of Economics and Statistics* 62(2), pp. 318-321.

Navarro, Mª.L. and Rueda, M. F. (2008). ¿Sufren discriminación salarial los inmigrantes en España? Una perspectiva regional", CENTRA, Working Paper E2008/05.

Sanroma, E., Ramos, R., Simon, H. (2008). The portability of human capital and immigrant assimilation: Evidence for Spain. *IZA, Discussion Paper*,nº 3649.

Simón, H., Sanromá, E, Ramos, R. (2014). Immigrant occupational mobility: Longitudinal evidence from Spain. *European Journal of Population*, 30(2), pp. 223-255.

Vidal-Coso, E. and Miret-Gamundi, P. (2012). The labour trajectories of immigrants women in Spain: are there signs of upward social mobility?. *Demographic Research,* 30-article 13, pp. 337-380.