

The gender gap in educational mismatch: evidence from the Dominican Republic

*Gómez-Paulino, Evalina*¹

*Marcenaro-Gutierrez, Oscar*²

*Marques, Helena*³

Abstract

In this paper we test the existence of gender gaps in educational mismatch for a developing country (Dominican Republic), an interesting case study due to its recent policies of education promotion, which achieved an important increase in enrolment rates at all levels of schooling, particularly for women. We use recent microdata to distinguish between over and undereducation, finding asymmetric effects by gender, particularly harmful for women. Various matching techniques based on propensity score methods were implemented in order to evaluate the impact of the over and under education index on earnings.

Keywords: education, mismatch, gender, Dominican Republic, propensity score matching.

JEL Codes: I26, J16.

¹ Banco Central de la República Dominicana. Departamento de Cuentas Nacionales y Estadísticas Económicas (División de Finanzas Públicas). Av. Pedro Henríquez Ureña esq. Leopoldo Navarro s/n, Gazcue, Santo Domingo, Distrito Nacional; e-mail: evalina.gomez@bancentral.gov.do. Tel: +80922191111

² Corresponding author. Universidad de Málaga. Facultad de Ciencias Económicas y Empresariales. Departamento de Economía Aplicada (Estadística y Econometría, 15). Plaza de El Ejido s/n, 29013, Málaga (España); e-mail: odmarcenaro@uma.es. Tel: +34952137003.

³ Universidad de las Islas Baleares. Facultad de Economía y Empresa. Departamento de Economía Aplicada. Edificio Gaspar Melchor de Jovellanos, Cra. De Valldermossa, Km. 7,5, 07122, Palma de Mallorca (España); e-mail: helena.ferreira-marques@uib.es. Tel: +34971171382.

1. Introduction

The existence of educational mismatch in the labor market arises when the economy's employment and production structure does not evolve at the same pace as the supply of highly educated labours. This means that if employment growth occurs in occupations requiring lower levels of formal training, while the economy's stock of human capital increases, over time more and more professionals will have to accept jobs for which they are overeducated (Tsang and Levin 1985). This argument is particularly noticeable for developed countries. In the case of a developing country, as the Dominican Republic –the focus of this paper-, the educational attainment of the population of the country is far from levels considered media (Barro & Lee, 2013) and, thus, the overeducation phenomena should be consider the result of an underdeveloped economic market, which is unable to expand the production frontier and, consequently, absorb the supply of professionals. From the latter perspective we could use the term 'underemployment' instead of overeducation (Maynard and Feldman 2011) to refer to this mismatch phenomenon. In this framework it is important to highlight that since the labour market is far from being perfectly competitive, the allocation of workers to jobs may not be perfect and job characteristics may also play an important role in explaining wages.

The issue of educational mismatch is of extraordinary importance from a socio-economic perspective, not only because –probably- part of the investment in education could be underutilized and it could cause production inefficiencies (McGuinness and Sloane 2011), but also because the individuals who find themselves in that situation will suffer from it, both economically (Castillo 2007, Mehta et al 2011) and psychologically¹ (Maynard and Feldman 2011, Battu et al 1999). These consequences are especially felt in the case of overeducation, which is a particularly pervasive phenomenon in developing countries (Mehta et al, 2011), because in those countries the development of the labour market does not go hand in hand with the increasing rates of enrolment in education (Quinn and Rubb 2006; Castillo 2007). This is the case of the Dominican Republic -as it will be highlighted in Section 3 (Data)- which labor market is characterised by a considerably narrow structure where most jobs are low-skilled and also where there is a considerable gender segregation of occupations. This division of occupations is magnified in the case of

developing countries to the extent that women are more subject to labour market discrimination (Baughn et al. 2006; Minniti and Naudé 2010; Estrin and Mickiewicz 2011; Ren and Miller 2012; Marques 2015), even if their education level is comparable to that of men. As a consequence, they are more easily pushed into a situation of overeducation; that is, they end up in occupations with requirements below their qualifications (McGuinness 2006). Last, but not least, it could be that there may be a trade off between formal education and other forms of human capital such as on-the-job training, years of experience and ability (Sloane et al 1999). This would mean that workers will accept jobs for which they are overeducated if the wage they obtain plus the economic value of the skills that can be acquired exceeds the reservation wage. In other words, the labour market framework significantly affects the conditions under which workers are willing to be overeducated (Dolton and Marcenaro, 2009).

The most extended hypotheses to justify the presence of overeducation in the previous literature are the Human Capital Theory -HCT- (Becker 1964), matching theory of job search (Jovanovic 1979), career mobility (Sicherman and Galor 1990), Thurow's Job Competition Model (Thurow 1975) and the assignment models (Sattinger 1993). Concretely, Jovanovic stated that the poor information about the labour market opportunities explain the presence of overeducation; this mismatch will disappear through repeated job search. In the case of Career mobility theories, workers choose jobs to improve skills as a previous step to achieve a better career progression later on in life; thus, overeducation is also considered a short term situation. However, for the Job Competition Model, the phenomenon of overeducation will appear when the supply of graduate workers exceeds the number of graduate jobs, because workers are allocated to a fixed distribution of jobs with individuals investing in education in order to preserve their place in the jobs queue. In the same vein, assignment models rely on the relevance of job distribution; nevertheless these models consider that worker choose jobs which maximize their utility functions. Last, the HCT equalize the workers' earning to their marginal product, which means that in equilibrium it can not be observed under-utilization of human capital, i.e. overeducation.

In this paper we test the existence of gender gaps in educational mismatch for a developing country, the Dominican Republic, an interesting case study due to its recent policies of education promotion, which

achieved an important increase in enrolment rates at all levels of schooling. The analysis is carried out using microdata provided by the Dominican Republic Labour Force Survey (*Encuesta Nacional de Fuerza de Trabajo*, ENFT) – carried out by the Dominican Republic’s Central Bank (DRCB) – for the period 2010-2014 on annual waves of around 45,000 individuals on average. Although this dataset contains enough information to allow a detailed study of educational mismatch at several levels, it has the drawback of not being a panel, which restricts the methodologies we are able to apply.

Given the characteristics of the data, we proceed by implementing impact evaluation techniques, more specifically, various matching techniques based on propensity score methods, in order to evaluate the impact of the over and under education index on earnings. We start by distinguishing between over and undereducation, which may have asymmetric effects, as we do find for the Dominican Republic, similarly to the previous results of García and Gómez (2015) for this country. Then, we distinguish those effects by gender, finding that in the Dominican Republic overeducation is a more serious problem for women compared to men.

In the case of the Dominican Republic, the scarce empirical evidence previously available has confirmed that education is a profitable investment, since there are positive returns associated with investing in formal training (Lizardo and Guzmán 2003; Fuentes and Villanueva 2006; Domínguez et al. 2016). However, as found by Ramírez (2012), although the return to education is positive, in the last few years it has declined, from 9.1 per cent in 2000 for each additional year of education, to 7.8 per cent in 2005 and 6.7 per cent in 2011. This suggests that, in the years of greatest educational expansion, acquiring education has resulted in lower individual returns; that evidence, according to Rumberger (1981), is an indication of the existence of educational mismatch in the labor market.

Beyond the general effects of mismatch, it is presumed that this problem coexists with a discriminatory situation resulting from gender differences underlying the Dominican Republic’s labor market, specifically in the endogenous decision to enter the labor market. Indeed, according to Gurak and Kritz (1982), the probability of women’s participation in the Dominican labor market is positively related to their level of education, although the latter is not a selection factor for men. This gender difference may

point to some labour market discrimination against women, since they would require a higher threshold for self-selection.

The rest of the paper is organised as follows: section 2 presents the relevant previous research. The ENFT data, its main characteristics and variable definitions are presented in section 3. The methodology of analysis, including selection bias issues, is described in section 4. Finally, the estimation results are reported in section 5 and section 6 concludes.

2. Literature review

It is possible to compare the economic impact of educational mismatch in the labor market through wage and productivity levels set in the market. According to Duncan and Hoffman (1981), because it is not possible to discriminate wage levels between matched and unmatched individuals, when an individual is undereducated for her/his job s/he benefits from having wage and production levels identical to those workers that meet the required education level. However, for those workers with education levels above the required one (overeducated), the job dissatisfaction reduces the work effort, resulting in increased production costs and consequently decreasing their productivity.

The empirical literature on this issue started by studying developed countries, although more recently increasing evidence has been provided for developing countries. Since education mismatch may arise when the labor market is undergoing rapid transformation through, for example, structural change and technological development, the level of mismatch in developed economies may be a lower bound that provides a useful benchmark against which to assess the results found for developing countries. Thus we are summarising the findings, first, for more developed countries and, secondly, for developing and Latin America/Caribbean countries.

Regarding the results for the United States, Verdugo and Verdugo (1989) showed that, in terms of wages, overeducated workers earned between 14 per cent and 32 per cent less than those who had the required education level; while undereducated workers received between 10 per cent and 16 per cent more when compared to the same peer group. More recently, Clark et al. (2014) confirm that North-American

workers continue to receive a penalty for being overeducated, although over time it was reduced to 5.8 per cent. However, for the case of the undereducated they observed that, unlike what was presented by Verdugo and Verdugo (1989), workers perceive a loss of income, which reached 6.9 per cent. In addition, the authors find gender pay gaps to the detriment of women, with a disadvantage for these rising on average to 15.5 per cent.

With regards to the European Union, Dolton and Marcenaro (2009) estimated the effects of overeducation on wages using data from the E-Living survey², 2001, and the European Cohort Household Panel (ECHP), 1994 to 2001³. The results suggest that, on average, the negative impact of overeducation on wages varies in a range of 11.2 per cent to 17.6 per cent. However, when the sample was restricted to the year 2001 (based on the E-Living survey), this negative effect decreases to 1.9 per cent; according to the authors, these differences relate to the way overeducation was measured in each survey. Despite this difference, the data show that in these countries overeducation has a negative impact on earnings.

Additional empirical evidence for specific European countries confirms the negative impact of educational mismatch. In the UK, for example, Lenton (2012) estimates that educational mismatch has a penalty on income that varies by region between 4 and 9.5 per cent for the overeducated, and between 3.8 and 8.6 per cent in the case of undereducated workers. On the other hand, in Spain, Murillo et al. (2010) show that the loss of income of the overeducated – compared with matched workers – ranged from 1.9 per cent to 3.2 for 1995 and 2006, respectively; while the undereducated have returns of approximately 5 per cent, for those years, above the returns of workers who are appropriately allocated to their jobs. Another study for Spain, presented by Pascual et al. (2015) indicates that overeducation represents a loss of up to 5,000 euros a year⁴.

In the developing world, empirical studies have focussed either on Asia or Latin America, with varying results, although the evidence tends to point towards greater mismatch in Latin America, whilst its extent in Asian countries comes closer to that of developed countries. For example, Abbas (2008), evaluating data for Pakistan (over the period 1998 to 2004), found that the return to over-education has increased for males, while for female workers it has decreased over time. However, the penalty for under-

education is volatile in the period studied. For the case of China, Ren and Miller (2012) found that the payoff to correctly matched education in rural China is around 50 per cent higher for females (9.35%) than for males (6.35%). Associated with this, the wage penalty where workers are under qualified in their occupation is greater for females than for males (-7.63% and -0.75%, respectively); however, overeducated females expect similar returns (5.83%) compared with their male counterparts (5.78%).

Concerning Latin America, the literature shows qualitatively similar effects on the impact of educational mismatch on wages. In general, the size of the effects is inversely related to the country's level of economic development. In a comparative study of several developing countries, Mehta et al. (2011) report evidence of growing overeducation in technologically stagnant unskilled jobs in the Philippines and milder evidence of it in Mexico. Also for Mexico, Quinn and Rubb (2006), between 1987 and 1999, found a positive return of 4.3 per cent to the overeducated (slightly more than half the return from an increase in required education). For the undereducated, the size of the effect is similar, although negative (3% to 3.9%). In Argentina, Waisgrais (2005) indicates that in the case of young workers the economic return from an extra year of education is approximately 8 per cent in the case of men, while for women it reaches 11 per cent. In Peru, a similar study conducted by the Ministry of Labour and Employment Promotion shows that in 2013 the penalty received by overeducated workers was approximately 25 per cent; while the undereducated benefitted from an increase in earnings between 17.9 per cent and 25.4 per cent. In this case, the gender wage gap is between 18.7 per cent and 20.7 per cent.

Last but not least, in the case of Colombia, Castillo (2007) and Herrera-Idárraga et al. (2015) provide different approaches to the problem of educational mismatch. Specifically, Castillo (2007) estimates the impact of over/undereducation by activity sector, providing a wide range of returns to educational mismatch⁵. Recently, Herrera-Idárraga et al. (2015), using data from the Colombian Household Survey (2010), focus on the gap between formal and informal sector workers, concluding that formal workers receive a much higher payoff for required and overeducation than do informal workers. In particular they found that years of surplus education are associated with an earnings increase of 9.3 per cent

for formal workers and 4.2 per cent for informal workers, while the penalty of deficit schooling is not very dissimilar across the two sectors (3.36% for formal workers and 4.68% for informal workers).

In the case of the Dominican Republic, the decreasing returns to education reported by Ramírez (2012) were the benchmark for García and Gómez (2015) to study the educational mismatch in the employed population for the 2010-2014 period, using data from the ENFT. Using Maximum Likelihood (ML) estimation and controlling for sample selection bias, the results suggest that, by 2014, the loss in income of overeducated workers was 17.0 per cent, while the average return of the undereducated was 3.6 per cent above the return for those matching the job education requirement. These figures are lower than those found for other Latin American countries and actually come closer to the results found for developed countries. In the Dominican Republic, there is, however, a large asymmetry between the effects of over and undereducation. Moreover, gender differences remain unstudied. This is a gap we intend to fill, following on previous research for other countries, especially in what concerns gender differences in self-selection into labour market participation.

Specifically, Gurak and Kritz (1982) argue that the probability of employment for women is positively related to their education level and that of their parents, and negatively related to age and being married. Education, however, is negatively related to work in services in general and domestic service in particular. In the case of women not employed, both the intention of future work and of job search are positively related to parent's education and negatively related to being married.

On the other hand, Lizardo et al. (2007) argue that while men show a higher rate of self-employment, women – particularly female heads of household – are more likely to work as employees (particularly as informal employees). However, women who live in families with children or elderly are more likely to become self-employed, which as stated before may reflect the value assigned by the woman to schedule flexibility to balance their paid work with their role in parenting and home management.

For the case of the Dominican Republic, Ramírez (2013) argues that women who are household heads are more likely to enter the labor force than those who are not, but those women who receive remittances or other non-labor resources are less likely to enter the labour market. Interestingly, the number

of children was not found to be important in explaining differences in the probability of participation among women, unlike geographical location, for which significant gender differences were found.

In this context, we need to condition the earnings functions with – a first step – Heckman-correction model of labor market participation to correct for the selection bias that results from observing the wages only for those actually working. Similarly, it is considered appropriate to control for the endogeneity problem of schooling in the estimations because failure to do so – as Pecoraro (2011) argues – will result in biased estimates of the returns to educational mismatch. The reason for this is the existence of common factors (for example, ability, motivation and so forth) determining both schooling decisions (consequently potential mismatch between education and job) and returns to education. For this reason, in order to control for this problem, econometric impact techniques will be applied, as shown in Section 4.

3. Data

We use microdata for the 2010-2014 period extracted from the Dominican Republic Labour Force Survey (ENFT) carried out annually by the DRCB. The database covers a total of 19,904 households, corresponding to around 45,000 individuals per year; we extract data for those individuals that are economically active, that is, are between 16 and 64 years old.⁶ Table A1 in the Appendix lists all the variables used in the analysis.

The variable of interest for the analysis (dependent variable in the second stage of the econometric model) is the gross income per hour obtained from the main occupation of individuals, excluding those employees who are unpaid and 5 per cent of atypical observations of the distribution (2.5% of the left tail and 2.5% of the right tail). After these considerations, the number of observations under analysis was 114,654.

As for the explanatory variables related to the educational level we rely on a variable that accounts for the years of education accumulated by the individual at the time of the interview. Additional variables under scrutiny were sex, age, marital status, working hours, area of residence (rural or urban), region of residence (Ozama or Metropolitan, North or Cibao, South and East), as well as characteristics of the job

(elementary or non-elementary) and sector (formal or informal) to which they relate. Regarding the occupations, these were organised according to the system of International Standard Classification of Occupations (ISCO-88).

According to the data, in the Dominican Republic more than 60 per cent of employed men and women are concentrated in six occupations. In the case of men, 46.4 per cent work within the agricultural, industrial and construction sectors occupations, while 55.6 per cent of women work in occupations related to the service sector. These data suggest that the Dominican labor market is characterised by a considerably narrow structure where most jobs are low-skilled and also where there is a considerable gender division of occupations.

In this sense, Table 1 shows the distribution of employees by type of job (elementary and non-elementary)⁷ and the sector to which they belong (formal or informal)⁸. According to the figures presented in Table 1, 63.8 per cent of men are employed in the informal sector, of which 17.1 per cent have elementary jobs. Instead, employed women are distributed evenly between the two sector types, with 49.2 per cent in the formal sector and 50.8 per cent in the informal one. From those figures it is possible to note that although men tend to informality in greater proportion than women, in relative terms women have greater participation in elementary jobs in the informal sector. That is, the occupations of men in the informal sector are of higher ‘quality’ than the occupations of women, since they correspond to a higher proportion of non-elementary jobs.

Table 1. Proportion of employees by gender, occupational sector and type of job (2010-2014)

Type of Job / Sector	Men		Women	
	Formal	Informal	Formal	Informal
Non-Elementary	27.1	46.7	40.3	31.2
Elementary	9.1	17.1	9.0	19.5
Total	36.2	63.8	49.2	50.8

Source. – Author’s own calculations using the ENFT (2010-2014).

An essential factor to consider in this analysis is the worker's education level. According to the data, 28.7 per cent of employed women have more than 12 years of schooling, equivalent to college, and 19.2 per cent completed secondary education. In contrast, only 10.9 per cent of employed men has instruction at the university level, and 15.8 per cent has completed secondary education. More revealing is that approximately 60.9 per cent of women have more than primary education, while 58.0 per cent of men do not exceed the primary level. This shows that in the Dominican Republic education is valued more highly by women.

Additionally, we observe a high degree of specialization of employees in the formal sector, particularly in the case of women, whose highest education level from the age of 26 years onwards corresponds to the university level. Of these, 48.1 per cent is in free union or married, while 21.9 per cent are divorced or separated. In the case of men, the situation varies considerably, since up to 45 years of age the educational level observed most frequently is the one corresponding to secondary education, except for those found in the informal sector, which have a lower educational level, mostly at the primary level. From 46 years of age onwards, a lower level of modal years of education is observed, except in the case of those who are married and in the formal sector.

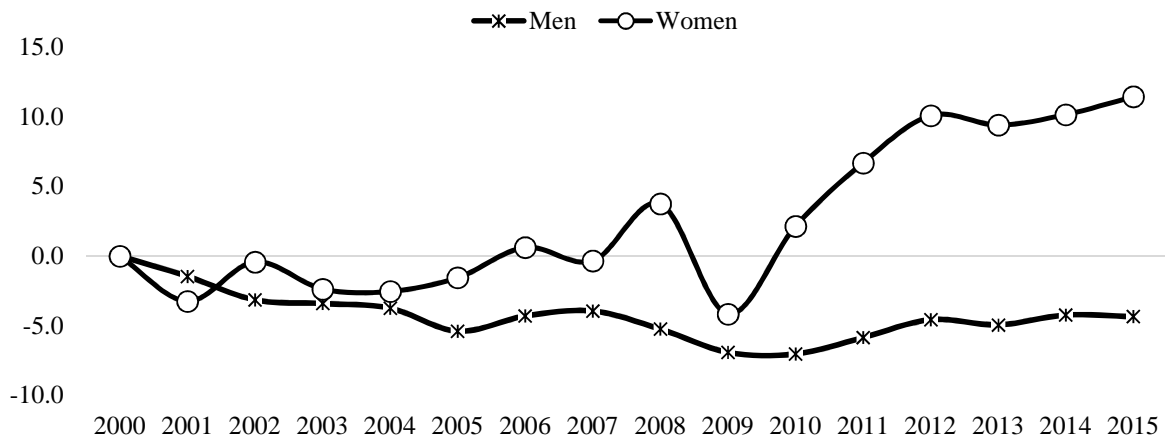
Overall, the data highlight that informality is concentrated in men and middle-aged women, mostly in free union, a feature that may be related to low-income groups. Educational levels for different groups and subgroups show that women place higher value on education. However, the youth, in general, exhibit this behavior with different goals: women apparently to be employed in the formal sector and men mainly in the informal sector.

To better understand the relative situation of women and men in the labor market of the Dominican Republic, in Figures 1 and 2 the evolution of the economically active population's cumulative growth rate (EAP Open) and of the Open Unemployment Rate by Gender are presented. It can be inferred – from those figures – that in the last fifteen years the participation of women has experienced an average cumulative growth of 11.4 per cent, especially after 2010. In contrast, male involvement evidences the opposite behavior by means of a cumulative average decrease of approximately 4.3 per cent. Despite this, the

participation of men shows a more stable trend than that of women, which denotes the existing difference between the processes of labor selection of both groups.

Furthermore, the path of the open unemployment rate shows that in the period 2007-2010 the country had the lowest levels of unemployment. From 2010, unemployment increased, reaching the highest point in 2013, year in which the central government implemented an austerity policy in the country. Unemployment levels by 2013 were nearly equaled to those of 2003, when the country suffered the biggest banking crisis in its history. Likewise, in this chart considerable differences between men and women are observed; which suggests that, in relative terms, women show greater difficulty in finding a job.

Figure 1. Evolution of the Economically Active Population’s Cumulative Growth Rate by Gender, 2000-2015.



Source. DRCB.

¹ E.g. via lower levels of job satisfaction.

² Survey designed to provide data related to the consumption and use of information technology and communications at the household level in six countries (Bulgaria, Israel, Germany, Norway, Italy and United Kingdom).

³ The sample was restricted to 7 countries, Denmark, France, Ireland, Italy, Greece, Spain and Portugal; due to shortage of information on some variables for other countries.

⁴ This represents approximately 1/3 of the mean salary.

⁵ Based on data from the Colombian Quality of Life Survey (2003).

⁶ Note that the dataset is not a panel, as the individuals in each year are not necessarily the same. This forces us to use pooled estimation and prevents us from using lagged variables or individual fixed effects.

⁷ This clustering was performed from ISCO-88 to a single digit. At this level of disaggregation, we have a group of elementary jobs, which is composed of: sales and services' elementary occupations; agricultural, fishery and related labourers; and labourers in mining, construction, manufacturing and transport. The Non Elementary Jobs group contains the rest of the people in other occupations.

⁸ The informal sector includes: Wage earners who work in companies with fewer than 5 employees; Self-employed or employers who work in occupational groups; Farmers and Ranchers, Operators and Drivers, Artisans and Machine Operators, Merchants and Vendors, and Elementary Workers. In addition, they include the domestic service and unpaid family workers (the latter not being considered within the sample because they do not earn a salary). Consequently, the formal sector includes: Wage earners who work in companies with 5 or more employees; Self-employed and employers who work, regardless of the size of the company, in occupational groups; Professionals and Intellectuals; Managers and Managers and Professionals and Technicians.

Figure 2. Evolution of the Open Unemployment Rate by Gender, 2000-2015



Source. DRCB.

With regards to working hours and hourly wages⁹, the data show that men’s working hours are more extensive than those of women. Specifically, the proportion of men working more than 44 hours a week exceeds that of women by 13.7 per cent; however, this surplus occurs in the ‘Non-professional self employed workers’ occupational group, where men have greater participation than women (55.7%). In the other groups, the differences are smaller in magnitude. In the remaining working times, especially in less than 44 hours, the participation of women is increased, which shows that the trade-off between employment and other social roles is much more intensive for women.

As for the average hourly wage, it can be observed that there are considerable wage gaps between men and women when we split the sample by occupational groups. The largest differences in working time correspond to the group ‘Business manager non-registered as society’. In this group, specifically for those who work less hours that part-time, the average hourly wage of men exceeds that of women in 148.5 dominican pesos (equivalent to 2.75€)⁰. In the same working day, for the employees working in ‘Public companies’, the average hourly wage of men exceeds that of women in 126.5 dominican pesos (2.34€); however, this value practically equals that of other working days. This gap is slightly in favor of women in

almost all working days of the ‘General government employees’ group, and part-time worker groups of ‘Self-employed professional’ and ‘Domestic service’.

4. Methodology

Departing from Sattinger’s (1980) allocation theory, Verdugo and Verdugo (1989) presented an extension of the Mincerian earnings function by incorporating productive features offered and demanded in the labor market. In this regard, they propose the following equation:

$$\ln W = \beta_0 + \beta_1 S + \beta_2 DS_0 + \beta_3 DS_u + \delta \boldsymbol{\varphi} + \varepsilon \quad (1)$$

where the current schooling (S) is the number of years of education of the individual; DS_0 is a dummy variable that takes the value of one (1) if the individual is overeducated for a specific occupation, while DS_u takes the value of one (1) if the individual is undereducated. Finally, $\boldsymbol{\varphi}$ is the vector of control variables including experience, characteristics of the worker, geographic location and characteristics of the job; and ε is the error term.

It is expected that $\beta_2 < 0$, indicating that overeducated individuals earn less than they would earn in a job that required their level of education, and that $\beta_3 > 0$, so that undereducated individuals earn more than they would earn in a job that requires their level of education.

In the present study, the modal years of instruction -suggested by Kiker, Santos and Mendes de Oliveira (1997)- in each 2 digit-occupational group¹¹ -by gender- are used as a statistical measure of educational mismatch. In this sense, over/under educated workers are those whose number of years of formal education is above/below the modal value of years of education in their occupational group¹². In Dolton and Marcenaro (2009) a wide discussion of different methods of accounting for over/under education is presented. In our case this approach to the measurement of overeducation -followed recently by, e.g., Battu & Sloane (2004) and Ghignoni and Verashchagina (2014)- is adopted due to the lack of subjective based measures of educational mismatch within the ENFT. Alternatively, as suggested by Dolton and Marcenaro (2005), it could be used an empirical definition of the ‘typical educational level’ based on an external dataset, in order to avoid using endogenous reference or census measures of over/under education

in the sample we have used in our empirical implementation (ENFT); unfortunately there is not such external dataset, providing these figures for representative sample sizes, in the Dominican Republic.

It is important to note that because the sample under scrutiny consists of people in paid jobs, estimates of the earnings equation by OLS would produce inconsistent estimates because the employed population is a segment of the total population filtered by a self-selection process to enter the labor market. This problem, known in the literature as sample selection bias, is controlled by applying the two-step method proposed by Heckman (1979), which is estimated by maximum likelihood. In the first stage (selection equation), the probability of belonging or not to the group of employees is obtained, and in the second step the earnings equation is estimated taking into account the predicted probabilities from the first stage. Following this two-step procedure the estimates obtained by OLS would be consistent.

However, the OLS estimates are not endogeneity-free, which must be controlled for to obtain unbiased estimators. For such purposes, we use econometric impact techniques which allow us to net out, under certain assumptions, the problem of endogeneity by measuring – through a non-experimental design – the effect of treatment (being overeducated or undereducated) on the outcome of the variable of interest (individual earnings), thus identifying a situation of educational mismatch in the Dominican labor market. The method can be described as follows.

Let y_1 and y_0 be the potential outcomes or counterfactuals, respectively. The impact treatment y for an individual will be y_1 in case of treatment and y_0 in absence of treatment. Let the variable D be a binary treatment indicator, where $D = 1$ denotes treatment and $D = 0$ otherwise. Assuming that we have a random vector (y_0, y_1, D) from an individual of the population of interest, Rosenbaum and Rubin (1983) defined the average treatment effect on treated (ATET) as:

$$ATET = E(y_1 - y_0 | D = 1) \quad (2)$$

Let x be a set of covariates of the individual characteristics listed in Table A1. Then, we can define both previous treatments conditioning on x . The ATET conditional on x is:

$$ATET = E(y_1 - y_0 | x, D = 1) \quad (3)$$

However, the previous effects cannot be estimated because we can only observe the outcome after the treatment, as is shown below:

$$y = (1 - D)y_0 + Dy_1 = y_0 + D(y_1 - y_0) \quad (4)$$

This problem was identified by Holland (1986) as the *Fundamental Problem of Causal Inference*: it is impossible to observe the outcomes of the same unit in both treatment conditions at the same time.

To solve the problem of the counterfactual's absence (y_0) the matching methods allow us to find a nontreated unit 'similar' to a participating unit in order to build an estimate of the intervention's impact as the difference between a participant and the matched comparison case.

One commonly used matching method is the propensity score matching. The propensity score is defined as the probability that a unit in the combined sample of treated and untreated units receives the treatment, given a set of observables to the researcher:

$$p(x) \equiv P(D = 1|x) \quad (5)$$

If all information is relevant to participation and outcome is observable to the researcher, the propensity score (or probability of participation) will produce valid matches for estimating the impact of an intervention.

Once we have calculated the propensity score we produce matches based on two common methods, the nearest-neighbour and the radius matching methods, according to which the set of control individuals matched to the treated individual i with an estimated value of the propensity of p_i ($C(i)$) is given respectively by:

$$C(i) = \min \| p_i - p_j \|, \quad (6)$$

and

$$C(i) = \{p_j: \| p_i - p_j \| < r\} \quad (7)$$

with p_j the score of each individual of the control group and r the distance threshold.

5. Results

The level of educational mismatch in the Dominican Republic measured according to the modal method is presented in Tables 2 and 3, summarising the information at 1 digit-occupation level (to conserve space). In general, it is observed that 75.9 per cent of the employees are in a situation of mismatch, of which 41.8 per cent are classified as overeducated and 34.1 per cent as undereducated. The occupations with the highest incidence of overeducation are ‘Skilled agricultural and fishery workers’ and ‘Elementary occupations’; while the undereducated are in occupations such as ‘Sales and service workers and armed forces’, ‘Craft and related trades workers’ and ‘Plant and machine operators and assemblers’.

Table 2. Modal value for years of education by 1 digit-occupation

Occupational group	Modal Value
Legislators, seniors officials and managers	16
Professionals	16
Technicians and associate professionals	12
Clerks	12
Sales and services workers and armed forces	12
Skilled agricultural and fishery workers	0
Craft and related trades workers	12
Plant and machine operators and assemblers	12
Elementary occupations	0

Source. Author’s own calculations, from ENFT (2010-2014).

Table 3. Proportion of employees in educational mismatch condition by gender and 1 digit-occupational sector (2010-2014)

Occupational Groups	Overeducated		Undereducated	
	Men	Women	Men	Women
Legislators, seniors officials and managers	0.1	0.1	0.7	0.3
Professionals	0.3	0.5	0.1	0.1
Technicians and associate professionals	1.1	1.4	0.9	0.4
Clerks	0.7	1.9	0.8	1.0
Sales and Service workers and Armed Forces	1.0	1.3	6.1	6.3
Skilled agricultural and fishery workers	8.5	0.4	0.0	0.0
Craft and related trades workers	0.8	0.1	9.3	0.7
Plant and machine operators and assemblers	0.5	0.1	6.9	0.5
Elementary occupations	14.6	8.5	0.0	0.0
Total	27.5	14.3	24.8	9.4

Source. Author’s own calculations, Modal Method; from ENFT (2010-2014).

Table 2. Modal value for years of education by 1 digit-occupation

Occupational group	Modal Value
Fuerzas armadas	8
Miembros del poder ejecutivo y de los cuerpos legislativos y personal directivo de la administracion publica	12
Directores de empresa	16
Gerentes de empresa	12
Profesionales de las ciencias físicas, químicas y matemáticas y de la ingeniería	16
Profesionales de las ciencias biológicas, la medicina y la salud	16
Profesionales de la enseñanza	16
Otros profesionales científicos e intelectuales	16
Técnicos y profesionales de nivel medio de las ciencias físicas y químicas, la ingeniería y afines	12
Técnicos y profesionales de nivel medio de las ciencias biológicas, la medicina y la salud	12
Maestros e instructores de nivel medio	12
Otros técnicos y profesionales de nivel medio	12
Oficinistas	12
Empleados en trato directo con el público	12
Trabajadores de los servicios personales y de los servicios de protección y seguridad	12
Modelos, vendedores y demostradores	12
Agricultores y trabajadores calificados de explotaciones agropecuarias, forestales y pesqueras con destino al mercado	0
Oficiales y operarios de las industrias extractivas y de la construcción	8
Oficiales y operarios de la metalurgia, la construcción mecánica y afines	12
Mecánicos de precisión, artesanos, operarios de las artes gráficas y afines	12
Otros oficiales, operarios y artesanos de artes mecánicas y de otros oficios	12
Operadores de instalaciones fijas y afines	12
Operadores de máquinas y montadores	12
Conductores de vehículos y operadores de equipos pesados móviles	12
Trabajadores no calificados de ventas y servicios	12
Peones agropecuarios, forestales, pesqueros y afines	0
Peones de la minería, la construcción, la industria manufacturera y el transporte	12

Source. Author's own calculations, from ENFT (2010-2014).

⁹ For this analysis the following groups have been defined: working day inferior to partial: less than 22 hours per week, partial working day: 22 hours per week, complete working day: 44 hours per week, working day between partial and complete: between 23 and 43 hours per week, and working day more than complete: more than 44 hours per week.

¹⁰ Conversion performed using the 2010-2014 average exchange rate.

¹¹ Occupations have been recoded into 27 categories corresponding to the 2-digit classification of ISCO-88, which entails more detailed differences than the one-digit classification in ISCO-88.

¹² Our benchmark is the modal method, which compares a worker's level of studies with that of other workers in the same occupation, taking as reference the modal value of the distribution (Murillo et al. 2010). As a robustness check, we use the interval method. Here the reference value is a one standard deviation confidence interval around the mean of the distribution.

Table 3. Proportion of employees in educational mismatch condition by gender and 1 digit-occupational sector (2010-2014)

Occupational Groups	Overeducated		Undereducated	
	Men	Women	Men	Women
Fuerzas armadas	45.71	69.23	30.56	19.78
Miembros del poder ejecutivo y de los cuerpos legislativos y personal directivo de la administracion publica	27.78	33.33	44.44	37.04
Directores de empresa	13.94	13.61	21.95	20.12
Gerentes de empresa	32.01	53.25	41.83	27.51
Profesionales de las ciencias fisicas, quimicas y matematicas y de la ingenieria	24.09	22.50	2.85	0.00
Profesionales de las ciencias biologicas, la medicina y la salud	51.34	29.55	2.68	3.69
Profesionales de la enseñanza	12.61	9.90	2.58	2.72
Otros profesionales cientificos e intelectuales	11.70	13.64	3.19	4.06
Tecnicos y profesionales de nivel medio de las ciencias fisicas y quimicas, la ingenieria y afines	32.25	33.16	36.74	33.16
Tecnicos y profesionales de nivel medio de las ciencias biologicas, la medicina y la salud	31.78	28.92	32.71	21.97
Maestros e instructores de nivel medio	56.47	54.46	7.65	11.39
Otros tecnicos y profesionales de nivel medio	38.95	62.41	32.37	14.78
Oficinistas	33.88	55.46	37.14	13.56
Empleados en trato directo con el publico	30.10	33.23	41.50	31.54
Trabajadores de los servicios personales y de los servicios de proteccion y seguridad	9.91	11.02	61.60	65.02
Modelos, vendedores y demostradores	13.10	16.47	63.78	62.12
Agricultores y trabajadores calificados de explotaciones agropecuarias, forestales y pesqueras con destino al mercado	79.39	71.62	0.00	0.00
Oficiales y operarios de las industrias extractivas y de la construccion	34.72	41.38	50.69	46.55
Oficiales y operarios de la metalurgia, la construccion mecanica y afines	9.95	19.05	65.40	46.43
Mecanicos de precision, artesanos, operarios de las artes graficas y afines	12.11	11.76	62.89	65.55
Otros oficiales, operarios y artesanos de artes mecanicas y de otros oficios	7.92	9.41	73.60	67.35
Operadores de instalaciones fijas y afines	5.71	15.38	78.78	46.15
Operadores de maquinas y montadores	9.08	12.32	62.89	56.58
Conductores de vehiculos y operadores de equipos pesados moviles	4.62	15.63	79.36	73.44
Trabajadores no calificados de ventas y servicios	6.13	4.89	77.71	82.57
Peones agropecuarios, forestales, pesqueros y afines	74.55	62.05	0.00	0.00
Peones de la mineria, la construccion, la industria manufacturera y el transporte	3.72	10.42	82.14	66.00
Total	31.42	19.83	45.69	51.18

Source. Author's own calculations, Modal Method; from ENFT (2010-2014).

Comparing the results obtained for the proportion of employed people who are in a situation of educational mismatch by the interval method and the relative proportions of each subgroup (men and women) for each method, in relative terms the women are more overeducated than men, however in the case of undereducation results vary depending on the method used. Despite this, the modal method is more credible because it reflects the fact that in the Dominican Republic women value education more highly and therefore are more likely (in absolute terms) to suffer overeducation than undereducation, whereas the interval method contradicts this. For this reason, the modal method is our preferred method.

The contradiction found between the two methods is the consequence of one of the main criticisms pointed out by McGuinness (2006), according to which the use of the mean (plus/minus the standard deviation) tends to underestimate the true level of overeducation. Other authors indicate that, while it is true that both methods have difficulties with the choice of a 'data-based' criterion to measure the mismatch, the modal method is superior to the 'mean' method; since the modal value is less sensitive to the presence of outliers in the data, plus it provides a more precise degree of overeducation (undereducation) than those obtained using the mean (Kiker, Santos and Mendes de Oliveira 1997; Mendes de Oliveira, Santos and Kiker 2000).

Having said that, we present the results of the estimates obtained by following the methodology proposed earlier, with the hourly wage as the dependent variable. Table 4 shows the estimation of the earnings equation by OLS. The coefficients are generally significant and with the expected signs, although the variables considered explain only 13.1 per cent of variations of the hourly wage, which is less than usually obtained in the estimation of earnings functions for other countries. This suggests that in the case of the Dominican Republic, a higher share of changes in earnings is determined by additional factors to those considered in the equation, possibly in relation to variants of informality, since according to the DRCB (2014) 'informality in the Dominican labor market is a complex and heterogeneous phenomenon with different motivations, where employees in precarious earning conditions coexist with self-employed who choose voluntarily to be self-employed.'

In particular, from the estimates it follows that, on average, a person who is considered overeducated for the occupation performed earns 15.54 pesos (0.28€) less for each hour worked, than a person who is properly matched. This figure, based on the average hourly wage of the sampled population, represents a penalty of about 25 per cent. Instead, people who occupy a position for which they do not have the required academic level, on average, receive 1.62 pesos (0.03€) more than those engaged in the same activity with the required qualification. This gain represents 2.6 per cent of the average hourly wage of the population.

On the other hand, a gender pay gap is inferred from these results, because on average for each worked hour men receive 17.39 pesos (0.32€) more than women; in terms of the average hourly wage of the population this amounts to 27.5 per cent. Similarly, we observe a positive influence on earnings of characteristics such as: being head of household, living in urban areas, having a university education and being married.

In regard to sample selection bias, by using the modal method, significance tests indicate that it is not significant.¹³

Table 4. Regression results for the Hourly Wage – non-corrected for selection bias – (Modal method)

	Variables	β		S.E.
Mismatch	Overeducated	-15.54	***	0.68
	Undereducated	1.62	**	0.72
In-Work Abilities	Experience	0.96	***	0.13
	Experience ²	-0.03	***	0.00
Gender	Men	17.39	***	0.64
Condition in the Household	Head of Household	4.94	***	0.63
Economic Sector	Informal	1.71	***	0.59
Zone of Residence	Urban	4.10	***	0.58
	North	-4.48	***	0.85
	South	-13.11	***	0.92
	East	-3.42	***	0.95
Workingday	Workingday inferior to Partial	63.36	***	0.95
	Partial workingday	17.64	***	5.05
	Complete workingday	-9.52	***	0.77
	Workingday upper than Complete	-15.70	***	0.62
Educational Level	Low education	-6.57	***	0.81
	High education	41.59	***	0.94
Marital Status	Free Union	4.93	***	0.80

	Married	14.66	***	0.99
	Divorced/Separated	2.69	***	0.96
	Widowed	2.47		2.18
Age Range	Age 16-25	-40.48	***	3.16
	Age 26-35	-33.76	***	2.60
	Age 36-45	-26.24	***	2.05
	Age 46-55	-13.01	***	1.47
Year of the Survey	Year 2011	1.47	*	0.81
	Year 2012	5.60	***	0.82
	Year 2013	3.70	***	0.82
	Year 2014	8.04	***	0.82
β_0	Constant	74.19	***	3.71
	Number of Observations	96,272		
	Model F	502.81	***	
	R-squared	0.13		

Note. – Estimations carried out by OLS. ***, **, *, significant at 1%, 5% y 10%, respectively.

Observing the results obtained with the technique of PSM (Table 5), it can be seen that OLS underestimates the effect of educational mismatch on earnings, and this should be due to the existence of endogeneity. When comparing the results of both methods we obtain that the effect of being overeducated, estimated by PSM, is about 25 per cent higher than the one estimated by OLS, while the underestimation of undereducation is even greater, being about 7 times below the value estimated by the PSM method (see Table 5).

Table 5. Average Treatment Effect on the Treated (ATET), 2010-2014

Modal Method		ATET					
		Sample		Men		Women	
Nearest-neighbour	Overeducated	-19.6	***	-17.6	***	-21.6	***
		(0.8)		(1.0)		(1.0)	
	Undereducated	11.6	***	11.3	***	11.1	***
		(0.5)		(0.7)		(1.2)	
Radius (0.2)	Overeducated	-19.2	***	-16.2	***	-19.3	***
		(1.1)		(1.0)		(1.2)	
	Undereducated	12.1	***	11.5	***	12.0	***
		(0.7)		(0.9)		(1.4)	

Note. Estimations carried out by PSM. ***, **, *, significant at 1, 5 y 10%, respectively.

Table 5. Average Treatment Effect on the Treated (ATET), 2010-2014

Modal Method		ATET					
		Sample		Men		Women	
Nearest-neighbour	Overeducated	-23.5	***	-15.0	***	-20.9	***
		(8.5)		(1.8)		(1.7)	
Radius (0.2)	Undereducated	4.2	***	5.9	***	3.1	***
		(0.6)		(0.8)		(1.2)	
Nearest-neighbour	Overeducated	-16.0	***	-12.1	***	-20.3	***
		(1.8)		(1.5)		(2.8)	
Radius (0.2)	Undereducated	3.8	***	6.8	***	2.5	**
		(0.6)		(1.0)		(1.3)	

Note. Estimations carried out by PSM; Robust Standard Error in brackets; ***, **, *, significant at 1, 5 y 10%, respectively.

As for the effects by gender, the existence of gender differences in the wages of overeducated workers is clearly evidenced, with women being 22.9 per cent more penalised than men. Since the gender wage gap for undereducated workers does not appear to be significant¹⁴, these results suggest that the gender wage gap at the national level is caused largely by the problem of overeducation, where the mismatch of women achieves the highest incidence. However, the increased participation of overeducated women in occupations with high educational requirements shows a potential discriminatory effect, given that women have to be overeducated to access higher-level occupations. This would imply that, in a context of high proportion of employed overeducated women, the salary agreed in the labor market is lower than that of men, who rarely are overeducated. Consequently it can be inferred that the gender wage gap in the Dominican Republic is a problem related to access to certain occupations in the labor market, which would be eliminated if there was no gender bias in filling those occupations¹⁵. One can only speculate that the reason for a gender division of occupations (men into agriculture and construction, and women into services) may be related to cultural issues and foreseeably may be offset by gender-equal cultural change, to be fostered by economic development.

6. Conclusions

In the recent past the Dominican labor market has been undergoing a process of expanding the quantity and quality of its stock of human capital, although the educational attainment of the population of the country is far from levels considered media and, thus, the overeducation phenomena should be consider the result of an underdeveloped economic market, which is unable to expand the production frontier and, consequently, absorb the supply of professionals. As a result is not surprising that we find in this study that the increase in the academic training of individuals has not led to a perceived improvement in wage returns. In particular, the data show that more than 75 per cent of the employees are in a situation of educational mismatch, with overeducation being the most frequent situation on this segment of the workforce (more than 40% are overeducated). This considerable mismatch, between the labor market and the Dominican education system, has led to significant monetary consequences for the population. Specifically, the estimates obtained by PSM suggest that, in the Dominican labor market, those workers who have a higher educational level than is required for their jobs face an earnings relative penalty of approximately 30 per cent of the average hourly wage of the population. On the contrary, those who are below the required education level get better relative pay - about 19 per cent of the average hourly wage -. These results show that the Dominican Republic, in terms of educational mismatch, is in a significantly unfavorable situation with regards to the most recent estimates summarised in section 2, which had underestimated the extent of mismatch by not correcting for issues such as selection bias and endogeneity.

In addition, an extension of the analysis to gender differences shows very similar results to those observed in developed countries such as Spain and the US. According to the estimates, overeducation has a greater impact on women by increasing the penalty on their wage income between 18 and 22 per cent, compared to that experienced by men in the same conditions. This suggests that overeducation in the Dominican Republic hides a gender issue in which it appears that the Dominican woman remains behind in terms of equal pay, even though they 'constitute half of the Dominican population and just over half of the electorate, 60 per cent of those studying at universities and 80 per cent of those graduating with honors' (Centro de Estudios de Género del Instituto Tecnológico de Santo Domingo 2012). Beyond these

implications, the data suggest that wage differences -to the detriment of women- come from a discriminatory trend in the Dominican labor market in which to access better employment opportunities, especially in occupational groups where a high academic level is required, women are forced to be overeducated.

Given the above scenario, women, particularly, -in the Dominican Republic- are expected to face in the coming years two main wage penalties: on the one hand, they will be underemployed in terms of the investment in education, which means that their wages are relative lower than women not overeducated, and, second, there are self-selection and segregation issues that push women to accept a loss of earnings due to the pervasiveness of gender roles that allocate family responsibilities mostly to women. This, potentially, would mean a major difficulty with regards to the inclusion of women in the productive sector of the country; in addition this would potentially invalidate the progress made as a result of the public policies implemented previously.

These negative consequences of this would go beyond the microeconomic effects. In fact, the lack of an advanced labour market would imply a problem of efficiency in the economy due to the loss of productive contribution of individuals, which would compromise the levels of development and economic growth.

In this regard, to ensure that the economy continues aimed at increasing its competitiveness and ensuring equitable prosperity among individuals, the educational mismatch problem must be tackled from the base of its generation. On the one hand, as overeducation is a reflection of the closed productive structure of the country where the jobs available do not match the growth of the supply of professionals, the government should focus not only on providing the population with opportunities to acquire education, but also to stimulate demand for professionals through macroeconomic policies for making proper use of these resources in the economy, for example, it can provide tax incentives for firms to make better use of skilled workers.. That is, it is imperative that public policies promote the development of new productive sectors that stimulate the labor market by providing new and better jobs.

On the other hand, this research has shown that the educational mismatch, specifically on the side of overeducation, entails a gender problem in that it discriminates against women presumably because they represent an 'expensive' asset to the employer, conditioning their access to employment through overeducation. This conditioning has led to an offer of overeducated women higher than the required by the labor market, which has led to lower wage levels, compared to men. That said, State action to address this situation would require the implementation of policies that seek to equalise and prevent differences in employment conditions between men and women. In addition, this problem should be addressed beyond the public sector. That is, it is necessary that policies include actions that compromise the different actors of society to establish agreements needed to eliminate discrimination against women for employment on equal opportunities. In this sense, anti-segregation policies could be a relevant issue to promote equal opportunities by gender in the labour market.

Appendix

Table A1. Definition of Variables

Name	Definition
Hourly Wage	Gross income per hour of the principal occupation
Overeducated	1 if an individual is overeducated, 0 otherwise
Undereducated	1 if an individual is undereducated, 0 otherwise
Experience	Years of experience of the person
Experience ²	Squared years of experience of the person
Men	1 if men, 0 otherwise
Head of Household	1 if head of household, 0 otherwise
Urban	1 if lives in urban zone, 0 otherwise
Informal	1 if occupied in the informal sector, 0 otherwise
Ozama or Metropolitan	1 if lives in the Ozama or metropolitan region, 0 otherwise
North	1 if lives in the North region, 0 otherwise
South	1 if lives in the South region, 0 otherwise
East	1 if lives in the East region, 0 otherwise
Workingday inferior to partial	1 if works less than 22 hours per week, 0 otherwise
Partial workingday	1 if works 22 hours per week, 0 otherwise
Workingday between partial and complete	1 if works between 23 and 43 hours per week, 0 otherwise
Complete workingday	1 if works 44 hours per week, 0 otherwise
Workingday upper than complete	1 if works more than 44 hours per week, 0 otherwise
Low education	1 if highest academic qualification is first level (ISCED 0-2), 0 otherwise
High Education	1 if highest academic qualification is tertiary education (ISCED 5-6), 0 otherwise
Free Union	1 if free union, 0 otherwise
Married	1 if married, 0 otherwise
Divorced/Separated	1 if divorced/separated, 0 otherwise
Widowed	1 if widowed, 0 otherwise
Single	1 if single, 0 otherwise
Age 16-25	1 if age is between 16 y 25 years, 0 otherwise
Age 26-35	1 if age is between 26 y 35 years, 0 otherwise
Age 36-45	1 if age is between 36 y 45 years, 0 otherwise
Age 46-55	1 if age is between 46 y 55 years, 0 otherwise
Age 56-64	1 if age is between 56 y 64 years, 0 otherwise
Year 2010	1 if observations are from year 2010, 0 otherwise
Year 2011	1 if observations are from year 2011, 0 otherwise
Year 2012	1 if observations are from year 2012, 0 otherwise
Year 2013	1 if observations are from year 2013, 0 otherwise
Year 2014	1 if observations are from year 2014, 0 otherwise

Endnotes

¹³ Although the modal method is our preferred method, we also carry out a robustness check using the interval method. In general, the results obtained by correcting for sample selection bias are conditioned by the method used to estimate the educational mismatch. With the 'mean' method, the sample selection bias becomes significant, which generates considerable differences in estimates. Among them, we obtain a coefficient for undereducation nine times higher than the one estimated by the modal method, whereas the parameter of overeducation presents an increase of 21.4 per cent. In this sense, the estimates obtained by the modal method were considered more credible, since the composition of the mismatch using this method reflects more accurately the characteristics observed in the population (women who value education to a greater extent than men, by which are more prone to overeducation than to undereducation).

¹⁴ The direction of the wage gap between undereducated workers is not conclusive because they differ by matching method.

¹⁵ For a range of developing countries, Marques (2015) shows that women frequently start businesses in sectors that require a higher level of education compared to men, although businesses run by women do not show higher survival rates or higher profitability. Rather, in the context of developing countries, women may be pushed into those sectors due to gender roles and expectations.

References

- Abbas, Q. (2008). Over-education and under-education and their effects on earnings: Evidence from Pakistan, 1998–2004. *SAARC Journal of Human Resource Development*, 4, 109–125.
- Banco Central de la República Dominicana (2014). Algunas Consideraciones sobre la Informalidad y los Ingresos en el Mercado Laboral de la República Dominicana (Parte II) [Some considerations on the informality of the income in the Dominican Republic labour market]. Retrieved from http://www.bancentral.gov.do/noticias/pag_abierta/archivos/bc2014-07-07.pdf (accessed May 15, 2016).
- Barro, R.J., & Lee, J.W., 2013. A new data set of educational attainment in the world, 1950- 2010. *Journal of Development Economics*, 104, 184–198.
- Battu, H., & Sloane, P. (2004). Over-education and ethnic minorities in Britain. *The Manchester School*, 72 (4), 535-559.
- Battu, H., Belfield, C. R. & Sloane, P. (1999). Overeducation among graduates: a cohort view. *Education Economics*, 7(1), 21-38.
- Baughn, C.C., Chua, G-L., & Neupert, K.E. (2006). The Normative Context for Women’s Participation in Entrepreneurship: A Multicountry Study. *Entrepreneurship: Theory and Practice*, 30(5), 687-708.
- Becker, G.S. (1964). Human Capital. Columbia University Press, New York.
- Castillo, M. (2007). Desajuste educativo por regiones en Colombia: ¿Competencia por salarios o por puestos de trabajo? *Revista Cuadernos de Economía*, 26, 107–145.
- Centro de Estudios de Género del Instituto Tecnológico de Santo Domingo (2011). *Situación de las Mujeres en la República Dominicana, 2011*. Retrieved from <http://es.scribd.com/doc/84466190/Informe-Situacion-de-las-Mujeres-en-Republica-Dominicana-2011> (accessed April 21, 2016).
- Clark, B., Joubert, C., & Maurel, A. (2014). *The Career Prospects of Overeducated Americans*. IZA Discussion Paper no. 8313, Institute for the Study of Labor, Bonn, Germany.
- Dolton, P., & Marcenaro, O. (2009). *Overeducation across Europe*. In *Education and Inequality across Europe*, eds. Peter Dolton, Rita Ashplund and Erling Barth. UK: Edward Edgar Publishing

- Domínguez, B., García, C.A., & Evalina Gómez (2016). República Dominicana: Tasa de Retorno de la Educación, 2000-2014. *Revista de Investigación y Evaluación Educativa* 4(1), 4-19.
- Duncan, G., & Saul D. Hoffman (1981). The Incidence and Wage Effects of Overeducation. *Economics of Education Review*, 1(1), 75-86.
- Estrin, S., & Mickiewicz, T. (2011). Institutions and Female Entrepreneurship. *Small Business Economics* 37(4), 397-415.
- Freeman, R.B. (1976). *The Overeducated American*. NY: Academic Press.
- Fuentes, F., & Villanueva, B. (2007). ¿Vale la pena estudiar en la universidad en República Dominicana?: análisis de la rentabilidad de la educación superior en el mercado formal utilizando funciones de ingresos mincerianas. *Nueva Literatura Económica Dominicana*, 96(10), 79-144.
- García, C. A., & Gomez, E.. Desajuste educativo: Incidencia y efectos sobre los salarios y la productividad, 2010-2014. [http://www.bancentral.gov.do/bibliotecap/-pdf/ganadores/-2015/tercer .pdf](http://www.bancentral.gov.do/bibliotecap/-pdf/ganadores/-2015/tercer.pdf) (accesed February 8, 2016).
- Gurak, D. T., & Kritz, M.M. (1982). Female Employment and Fertility in the Dominican Republic: A Dynamic Perspective. *American Sociological Review*, 47(6), 810-818.
- Heckman, J.J. (1979). Sample selection bias as a specification error. *Econometrica* 47(1), 153-161.
- Herrera-Idárraga, P., López-Bazo, E., & Motellón, E. (2015). Double Penalty in Returns to Education: Informality and Educational Mismatch in the Colombian Labour Market. *The Journal of Development Studies*, 51(12), 1683-1701.
- Holland, P.W. (1986). Statistics and Causal Inference. *Journal of the American Statistical Association* 81(396), 945-960.
- Kiker, B.F., Santos, M.C., & Mendes de Oliveira, M. (1997). Overeducation and Undereducation: Evidence for Portugal. *Economics of Education Review* 16(2), 111-125.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of Political Economy*. 87, 972-990.
- Lenton, P. (2012). Over-education across British Regions. *Regional Studies* 46(9), 1121-1135.

- Lizardo, J., Reyes, H., & Orlando, M.B. (2007). Equidad de Género en la República Dominicana: Resultados del Informe sobre la Pobreza. Retrieve from <http://siteresources.worldbank.org/INTDOMINICANREPUBLICINSPANISH/Resources/equidad-de-genero.pdf> (accessed February 14, 2016).
- Lizardo, M., & Guzmán, R. (2003). *Crecimiento económico, acumulación de factores y productividad en la República Dominicana*. Serie de Estudios Económicos y Sectoriales, RE2 –03 – 002. Banco Interamericano de Desarrollo. Washington, D.C.
- McGuinness, S., & Sloane, P.J. (2011). Labour market mismatch among UK graduates: an analysis using reflex data. *Economics of Education Review*, 30, 130-145.
- Marcenaro, O., De La Torre, R., & Dominguez-Serrano, M. (2012). Informal care for the disabled: hours of care and labour market participation. *Revista de Estudios Regionales*, 94, 107-137.
- Marques, H. (2015). Does the Gender of Top Managers and Owners Matter for Firm Exports? *Feminist Economics* 21(4), 89–117.
- Maynard, D.C., & Feldman, D.C. (2011). *Underemployment: Psychological, Economic and Social Challenges*. Springer Science and Business.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economics Surveys*, 20(3), 387-418.
- Mendes de Oliveira, M., Santos, M.C., & Kiker, B. F. (2000). The role of human capital and technological change in overeducation. *Economics of Education Review*, 19, 199–206.
- Mehta, A., Felipe, J., Quising, P., & Camingue, S. (2011). Overeducation in developing economies: How can we test for it, and what does it mean? *Economics of Education Review*, 30, 1334–1347. doi:10.1016/j.econedurev.2011.06.004
- Ministerio de Educación de la República Dominicana (2014). *Anuario de Indicadores Educativos*. Año lectivo 2012-2013. Santo Domingo: República Dominicana.

- Ministerio de Educación Superior, Ciencia y Tecnología de la República Dominicana (2012). *Informe General Sobre Estadísticas de Educación Superior 2010-2011*. Santo Domingo: República Dominicana.
- Ministerio de Trabajo y Promoción del Empleo de Perú (2014). *La inadecuación ocupacional de los profesionales con educación superior en Perú*. Lima, Perú.
- Minniti M., & Naudé, W. (2010). What do we Know about the Patterns and Determinants of Female Entrepreneurship across Countries? *European Journal of Development Research* 22(3), 277-293.
- Murillo, I.P., Rahona, M., & Salinas, M.M. (2010). Efectos del desajuste educativo sobre el rendimiento privado de la educación: un análisis para el caso español. *Investigaciones de Economía de la Educación* 1(5), 267-284.
- Pascual, M., González, N. & Cantarero, D. (2015). Is Over-Education a Problem in Spain? Empirical Evidence Based on the EU-SILC. *Social Indicators Research*, 126, 617-632.
- Pecoraro, M. (2011). *Estimating the returns to educational mismatch with panel data: the role of unobserved heterogeneity*. Institut de Recherches Économiques et Sociales de l'Université catholique de Louvain (IRES) Discussion Paper no. 2011-36. Université Catholique de Louvain, Louvain-la-Neuve, Belgium.
- Quinn, M. A., & Rubb, S. (2006). Mexico's labor market: The importance of education-occupation matching on wages and productivity in developing countries. *Economics of Education Review*, 25, 147–156. doi:10.1016/j.econedurev.2005.01.003
- Ramírez, F. (2012). *Descomponiendo la desigualdad salarial en la República Dominicana: análisis empírico para el periodo 2000-2011*. Munich Personal RePEc Archive (MPRA) Paper, no. 51993.
- . 2013. *Oferta Laboral en la República Dominicana: Tendencias y Determinantes*. Munich Personal RePEc Archive (MPRA) Paper, no. 51913.
- Ren, W., & Miller, P.W. (2012). Gender differentials in the payoff to schooling in rural China. *The Journal of Development Studies*, 48, 133–150. doi:10.1080/00220388.2011.561326

- Rosenbaum, P.R., & Rubin, D.B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.
- Rumberger, R. (1981). The rising incidence of overeducation in the U.S. labor market. *Economics of Education Review*, 1(3), 293-314.
- Sattinger, M. (1980). Capital and the Distribution of Labor Earnings. *American Journal of Sociology*, 89(2), 460-463.
- Sattinger, M. (1993). Assignment models of the distribution of earnings. *Journal of Political Economy*, 31, 831-880.
- Sicherman, N., Galor, O. (1990). A theory of career mobility. *Journal of Political Economy*. 98, 169-192.
- Thurow, L.C. (1975). *Generating Inequality*. Basic Books, New York.
- Tsang, M.C., & Levin, H.M. 1985. The Economics of Overeducation. *Economics of Education Review*, 4(2), 93-104.
- Verdugo, R.R., & Verdugo, N.T. (1989). The Impact of Surplus Schooling on Earnings: Some Additional Findings. *The Journal of Human Resources*, 24(4), 629-643.
- Waisgrais, S. (2005). *Determinantes de la sobreeducación de los jóvenes en el mercado laboral Argentino* [Determinants of over-education of young people in the Argentine labor market] Paper presented at the 7° Congreso de Estudios del Trabajo, Buenos Aires, August 10-12.