Gender differences in Uruguayan Tertiary Education: the choice of field of study

Draft , March 1st. 2012

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Abstract

Gender gaps in higher education have taken a remarkable turn in most industrialized societies in the course of the 20th century. Women have caught up with men and presently outpace them in high school completion, transition to college and college graduation rates. Where available, evidence shows they also progress through school and earn educational degrees more quickly than males. Despite this egalitarian trend in the vertical axe of educational attainment, which accounts for a great deal of higher education dramatic expansion in the last decades, males' and females' representation across fields of study and school tracks is still far from even. In this paper we address the issue of the horizontal stratification underlying the selection of the field of study in Uruguayan Tertiary Education. We use data from the first follow-up of the stratified sample of Uruguayan students who took part on the PISA 2003 wave. The survey was carried out in 2007 when the interviewees were 19-20 years old.

1 Introduction

Gender gaps in higher education have taken a remarkable turn in most industrialized societies in the course of the 20th century. Women have caught up with men and presently outpace them in high school completion, transition to college and college graduation rates. Where available, evidence shows they also progress through school and earn educational degrees more quickly than males (Conger & Long, 2008; Buchman, DiPietri, & McDaniel, Gender Inequalities in Education, 2008). Despite this egalitarian trend in the vertical axe of educational attainment, which accounts for a great deal of higher education dramatic expansion in the last decades, males' and females' representation across fields of study and school tracks is still far from even. These two apparently contradictory drifts have posited new questions concerning educational opportunities between sexes and have led to a growing interest in the horizontal axe of gender segregation concerning school choices at post-compulsory levels. Although substantial differences between countries have been reported, gender unbalance in higher education seems to be patterned mostly along a scientific and a care-technical divide: in spite of some gains in their representation in traditionally "male-dominated" areas, in most national educational systems women are still underrepresented in scientific and technological fields and overrepresented in careers that prepare directly to care jobs -like social work or teaching- or to jobs with a symbolic affinity with caring, like medicine (Barone, 2011).

Women massive incorporation to higher education has been paralleled by the increase of female participation in other fields like the labor market or the public sphere and has important impacts on labor and marriage markets, family formation and parental practices. At the same time, it has been explained partly as a consequence of economic and cultural changes that favored gender de-segregation processes within these fields. However, gender unbalances across fields in higher education are a key factor explaining horizontal gender segregation in the labor market. Horizontal sex disparities have been highlighted as one of the major factors behind persistent gender segregation patterns across occupations and in wages (Mastekaasa & Smeby, 2008). According to Barone (2011), the choice of field of study and the occupations these choices lead to explains between 25% and 50% of the gender income gap among college graduates.

Uruguayan Tertiary Education students are a highly social, academic and gendered selected population. On one hand, those who experienced a grade retention event, lived in rural areas or were childrearing had an insignificant probability to access to Tertiary Education (Boado & Fernández, 2010). On the other hand, students enrolled at this level had a comparative higher social and economic status, higher cultural capital (i.e. books and computer facilities at home) and parents who more likely had the experience of being working in professional occupations or being a Tertiary Education student by themselves. Last but not least, women are more likely than men to graduate from Upper Secondary but, given graduation, transition rates to Tertiary Education does not differ by sex. The aggregated result of both transitions is a female overrepresentation in Tertiary Education (59% of the students in our sample) (Bucheli, Cardozo, & Fernández, Acceso a la Educación Superior y género en Uruguay, 2012; Fernández, Desigualdad, democratización y pedagogías en el acceso a la Educación Superior de Uruguay, 2009; Boado & Fernández, 2010). These general findings picture some key social and gender patterns of vertical stratification in Uruguayan educational trajectories.

In this paper we address the issue of the horizontal stratification underlying the selection of the field of study in Uruguayan Tertiary Education.

2 Previous research and hypothesis

Educational choices have been modeled at least in two main perspectives: the standard human capital theory of maximizing lifelong returns (Pollachek, 1981) and the relative risk aversion theory (Breen & Goldthorpe, 1997; Jonson, 1999). Feminist Theorists have stressed that this general ideas do not account the specific inequality that patterns the educational trajectories of women and that ends with strong segregations in the job markets. Gender segregation in education is the result of both macro and micro social processes known as vertical and horizontal differentiation. The former refers to gendered entry-barriers between levels of the Educational Systems and the latter refers to differential incentives attached to majors and careers. In this exploratory study we will rely on the Breen-Goldthorpe model adjusted to take into account the general hypothesis of gender horizontal differentiation, although our scope is neither to distinguish the proposed mechanism nor to test the rival hypothesis.

According to Charles & Bradley (2009), three major macro processes work against the de-gendering of modern educational system at this level, namely: the "equal but different" culture that celebrate gender differences and at the same time endorse self-expression as an educational and occupational goal; the consolidation of "gender-specific" careers, which are partly responsible for the development of higher education, and the growing expansion of the tertiary sector and traditionally "female-demanding" occupations in post-industrialized societies.

At the micro-level, there are two main distinct, though partly overlapping perspectives to explain this educational decision. One stresses the gender system (England, The Gender Revolution : Uneven and Stalled, 2010) and the lifelong socialization process of boys and girls in gendered roles. The other one stresses the choice made by a rational agent pursing to maximize his/her benefits (Pollachek, 1981; Breen & Goldthorpe, 1997). So, stereotypes, dispositions and rational choices are the main concepts to be taken into account in order to explore the determinants of field of study chosen at the entry of Tertiary Education.

The influence of gendered stereotypes on educational inequalities could not be ignored (Buchman, DiPietri, & McDaniel, Gender Inequalities in Education, 2008). There are colors, cloths, toys, superheroes and magazines mainly for boys or for girls. Boys and girls could play distinct social roles as doctors, teachers, mothers, soldiers, mechanicals, veterinaries, cookers or architectures. Parents and relatives usually ask whether they would like to become a teacher, a lawyer, a medical doctor and so on. This gendered socialization ends up with typical female and male professional occupations and fields of study, like teachers and engineering respectively. Stereotypes are not only unconsciousness learned but also enters as variables in the educational choices (Charles & Bradley, 2002; England, 2010). One way is through expected rewards and constraints derived from the position of being part of a minority (majority) group in a female (male) dominated field (Mastekaasa & Smeby, 2008). The other way is the aversion to female devaluated jobs and lower salaries pay to early graduates in female dominated fields of study (England, et al., 2007)

3 The case of Uruguayan Tertiary Education

In Uruguay, we can assume that the educational and occupational election process is a long one, albeit not study systematically[1], and operates both at the macro and micro levels suggested above.

Although Uruguay shares the general pattern of Tertiary Education development in the last twenty years with most developed and non-developed countries, there are four further distinctive features of its institutional model of tertiary education that must be high-lighted (Fernández, 2009).

First, the Public sector has been constituted by two main sub-sectors: primary and secondary teacher education institutes ("institutos normales") and the State University, called "Universidad de la República" (UDELAR). For the last two decades, the share of UDELAR of the total Tertiary Education enrollment was at least 64% (2005), starting with 89% at 1990 and reaching 71% in 2009. Public Teacher Education Institutes shares between 10% and 19% of the total enrollment. So, the whole supply of Tertiary Education is strongly conditioned by policies defined at the public sector, mainly by the State University.

Second, all graduate level courses – and most post-graduates courses- in the public sector, are completely free. Students in public institutions face no direct costs in pursuing Tertiary Education. Plus, enrollment requires no entrance examination, and with very few and recent exceptions, there is no limit to the number of students that can be admitted in any given career at each academic term. Furthermore, each student can enroll, in theory, in any number of careers at the same time, including different colleges, and can drop out and start over unlimitedly without losing his/her student condition. Besides, there is no such thing in Uruguay as an academic explicit selection process -given high school graduation- and, as a consequence, neither is there competition between students for school or careers within school places. Yet, despite its great expansion in the last decade[2], Uruguayan rates of tertiary attendance have stayed behind those of other countries with similar human development in the region, like Chile, Argentina or Costa Rica and have increased at slower rates in the last two decades (CEPAL, 2010: Annex-Table 25). Furthermore, post-high school access remains highly stratified by socioeconomic background (Boado & Fernández, 2010; de Armas & Retamoso, 2011). As we show in this paper, Uruguayan comparatively poor performance at this level can be explained, partly, by strong inefficiencies at secondary education which result in low rates of high-school graduation, especially among males.

A third structural characteristic of Uruguay's higher education model is its historical concentration in the main capital city, Montevideo, which in 2009 accounted for 9 out of 10 tertiary level enrollments (MEC, 2010). The overall picture obviously posits important restrictions in the choices of those living in the provinces, raising both economic and non-economic costs of pursuing Tertiary Education. Geographical concentration may also affect students' field choice, given that some careers are only available in the capital city. Nevertheless, between 1996 and 2010 both the private and public sector established new institutions in province cities, accompanying a national process of institutional

[1] At the beginning of the XX century, a Uruguayan writer, Florencio Sánchez, pictured in a play called "M'hijo el dotor" the urban social expectations and family influences behind the educational decision.

[2] Gross enrollment rose from 90,000 students to 158,000 between 2000 and 2009. See MEC, 2010.

differentiation. This has been an slowly process: up to year 2007 (date of our data on analysis), only three province cities had university careers and teacher education careers still share nearly 90% of the enrollment.

The fourth distinctive feature concerns students distribution across higher education fields which show a strong primacy of Humanities (ISCED areas 1, 2 and 3), accounting for more than two thirds of graduate-level enrollees. Neither the implementation of the Program for the Development of Basic Science ("PEDECIBA") nor the development of new information technology and design careers in the in the last nineteen eighties changed this historical pattern.

At the micro social level of analysis, there are some persistent underlying patterns that makes likely the hypothesis of existence of vertical and horizontal gender differentiation. Academic dispositions, both cognitive and non-cognitive, have been developed for a long time when students select among Tertiary Education careers. During Primary School, the process takes the form of likes and dislikes of typical subjects as Mathematic, History or Natural Sciences. Although there seems not to be achievement differences in Math at 6th grade, girls do outperform boys in reading (Fernández, 2002; 2007a). Clear differences appear at the end of Lower Secondary level, around age 15, and are expressed in cognitive and non-cognitive dispositions (MESyFOD, 1999; Fernández, 2006; Fernández et al 2007). (Dis)likes with Math has been regularly indicated as the main reason to (not) choice a more intense-math-demanding track in Upper Secondary, generating as a consequence a sort of "(non)-scientific pipeline" which ends at the election of Tertiary Education Careers[3]. Just 50% of students enroll in humanistic (general) track in Upper Secondary and this proportion has been stable during the last two decades, despite of the structural transformation above resumed that happened in Tertiary Education. PISA-L showed that more than 90% of those who started the Humanistic branch in Upper Secondary chose a career in L-field or in T-field. This is not the case with the other branches where the continuity is less pronounced. We can infer that the underlying process covers very different types of mistakes and /or types of incomplete information (Fernández, 2011).

4 Hypothesis

The salient idea in Breen-Goldthorpe model is that downward intergenerational mobility risk aversion is a general mechanism underlying all educational choices. Youth choose to take that educational level that minimizes the risk to achieve lower education than parents did. Three main factors define the amount of risk to avoid: educational (direct and indirect) costs; foregone income and subjective probability to success. The socioeconomic status informs the financial constraints that could be faced by the family to pay for educational costs and other non-studying daily expenses of the offspring. Forgone income depends mainly on unemployment rates and on the price of unqualified jobs set by the market or by the state via minimum wage (Meschi, Swaffield, & Vignoles, 2011). Subjective probabilities of success are a function of cognitive and non-cognitive dispositions that varies among field of

[3] Unfortunately, the Educational Yearbook of the Ministry of Education does not disaggregated the information by gender at Upper Secondary.

study (Davies, Heinesen, & Holm, 2002; Tolsma, Ned, & de Jong, 2010). Based on this background, we propose the following model:

[1]

Where "M" is the jth field of study choose by the ith student; "A" represent the risk aversion of the ith student to fail in the goal of graduate from Tertiary Education; "S" stands for Socio-economic status of the ith student's household at the end of compulsory education (age 15); "O" represents the occupational position of the ith student's mother and father; "D" are the cognitive and metacognitive dispositions of the ith student.

We can suppose that each of the former determinants have a distinct effect on each the field of study. But, in sake of simplicity, we will hypothesize the following four relationships:

Risk aversion (A) is a gendered concept because is directly related with information about survival rates of males and females in each field of study. We suppose that the former tend to choose those careers that have higher survival rates than males; another word, they have a lower risk of fail in the goal of graduate[4]. If this is true, we should found a positive marginal effects of gender in those fields that have an odd ration of female graduation relative to males higher than 1; that is Teacher Education and Humanities (hereafter "T") and Law and Social Sciences (hereafter "L"). On contrary, risk aversion may explain the lower rate of females in careers like Engineering, Chemistry, Architecture, Physics, Agronomy and Natural Sciences (hereafter "EA"). Also, Medicine, Nursing and other health careers (hereafter "H").

Socioeconomic status (S) influence the choice of careers based on the expected incomes. Students living in a household with high socioeconomic status will tend to choose those careers with high incomes and avoid careers with low incomes. Students living in a household with low socioeconomic status would try first those careers that have low incomes, though probably higher than their original household had.

Parents' **occupations (O)** condition the choice by the comparing they prestige with the prestige attached to different careers. In particular, all professional occupations will have positive effect on the selection compared to non-professional occupations. Among professionals, those with high prestige (Medicine, Engineering and Agronomy) would influence their children to continue in this field. Parents with jobs in teaching, economics, law and social scientist would persuade their children to venture in a more prestigious field.

Dispositions (D). On the bases that field are not equally intellectual demanding, we suppose that students with lower dispositions for Mathematics would not chose fields in which there is a higher Mathematic demand, i.e. engineering, chemistry, natural sciences and agricultural studies (E). For academic disposition we mean both cognitive competencies, self-attitudes, educational expectations and attitudes over Math, all measured at age 15.

[4] According to Boado (2010:)

5 Data and methods

5.1 Database

We use data from the first follow-up of the stratified sample of Uruguayan students who took part on the PISA 2003 wave (Boado & Fernández, 2010). The survey –hereafter PISA-L- was carried out in 2007 when the interviewees were 19-20 years old. Sampling strata were defined by three levels of proficiency in Math. The final sample was composed of 2,201 students. Probability weights were computed in order to be used in empirical analysis.

According to Boado & Fernández (2010), 21% of 15 year-old population did not take part on PISA 2003 because they had already dropped out of school by that age. Consequently, the original PISA sample is not randomly selected from the birth cohort. Further on, as early drop-out is more frequent among boys than girls, selection bias is gender-unbalanced affecting males' and females' background characteristics (see below). We do not deal with this particular problem in this paper.

The PISA-L questionnaire inquired whether the individual was enrolled in each academic year from 2003 to 2007, the attended educational level, program and field of study and whether the student completed or not the academic year. Besides, it gathered information about first and current employment as well as family structure in 2007 and changes between 2003 and 2007. Therefore, the PISA database plus the PISA-L data allow us to analyze the educational transition points up to age 20 using information related to prior characteristics, events and perceptions.

5.2 Model

We fitted a full model allowing different slopes for males and females and we introduced appropriate controls for parents' Tertiary Education diploma (separate dummies for father and mother) and the existence of computer facilities at home (at age 15). Owing to numerical problems, we had to discard those variables that were nearly constant for this population: immigrant status, residence in a small town or rural areas in 2003, and the condition of not native speaking. We also discard to specify a model with separate variables for the three competencies (Reading, Science and Math) because the scores in Reading and Science for those who didn't take those domains in PISA were actually imputed using a function of the mean score of the school in Math (PISA-OECD, 2005). This introduces serious concerns on validity and on collinearity in the model.

The complete multinomial logit model is shown in Annex Table 2 with coefficients, the standard errors and significance. In this section we will comment the results using and presenting the marginal effects for each main concept hypothesized. As the previous sections, we will treat as significant those estimates where the null hypothesis was rejected at least at 0.10.

6 Descriptives

There seems to be a clear gender and social pattern underlying the choices made for the first tertiary education enrollment of the 2003 PISA cohort students: 44.5% of males choose a career of the EA field comparing with the 23.5% of female who did it. The gender gap is of 21 percent points; the OR is near half. The same OR is observed between males and females in the choice of careers in the H-field. This support the well-known scientific-gender divide.

Table 1

	Teacher Education / Arts / Humanities	Law / Social Sciences / Administration	Medicine / Nursing / Dentistry / Medical Technology	Engineering / Architecture / Chemistry / Natural Science /Agronomy /Veterinary
Females	0.70	.62	0.73	0.41
ESCS	-0.41	0.42	0.32	0.52
Father is Engin	0.01	0.02	0.05	0.10
Mather is Engin/MD	0.00	0.05	0.10	0.10
Father is Lawyer / Teacher	0.06	0.13	0.09	0.08
Mather is Teacher	0.11	0.15	0.19	0.17
Math score in PISA 2003	465	485	451	513
Math instrumental motivation	0.20	0.16	0.03	0.76
Math self concept	0.12	0.21	0.26	0.71
Source: PISA-L Uruguay (2003-2007)				

This propensity are reinforced by gender differences in other variables. Dispositions for Math, both cognitive and metacognitive, are also higher among EA field students. Neither parental occupations, nor household socioeconomic status seem to explain the scientific divide.

7 Results

We signaled that females were significantly overrepresented in all fields but E-field. When we control for the set of variables included in our model, the pattern of reproduction of female/male dominated majors persists in three out of four fields (Table 4.5). Females have higher probabilities to choose an L-Field career and males have higher probability to choose an E-field one. But when we treated everyone as females or males, there not seems to be a different probability to choose among careers in the T-field. All thing equal, we can infer that young Uruguayan women that access to the tertiary level would prefer to study Law, Social Sciences, Economy, Administration or Social Communication and young boys would prefer Engineering, Physics, Chemistry, Math, Agronomy or Veterinary.

Table 2. Predicted probabilities for males and females in each field of study. Final model

T- Field			L-Field			H-field			E-Field		
As Males	As Females	Diff	As Males	As Females	Diff	As Males	As Females	Diff	As Males	As Females	Diff
0.132	0.136		0.331	0.427	**	0.121	0.181	*	0.417	0.256	***

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Socioeconomic and cultural status appears to be inverse related only with the choice of T-field: one additional standard deviation in the ESCS contributes decreasing the probability of choice in 4.7% (Table 4.6). In contrast, the selection among other majors appears not to be related with the socioeconomic status. When differences are estimated separately for males and females, the impact of ESCS is only found on average for the T and L fields. In the former, the gender gap increase about 12% for each standard deviation of increment in the ESCS. In the latter, gender gap increases 13%. It is less probable that a rich girls study a career in the T-field than rich boys and the contrary is true about the careers in the L-field. Although the careers compared here have very different length, financial constraints seem to play a very restricted role in the educational choice and there seems to be a gender gap. The most remarkable finding is that lower income families seems to influence their daughter (but not their sons) to choice teacher education where the length of the careers is shorter and the employment is assured. When the social status improves, the family becomes less strict with their daughter (but not with their sons) and allow a longer career with more uncertain employment perspectives. But direct and indirect costs do not function as constraints in the gender differences in the E-field.

Table 4.4.4. Marginal effect of PISA economic, social and cultural status INDEX (2003) on predicted probability of field of study chosen

	T-field		L_field		H-field	E-field
ESCS	-0.047	*	-0.005		0.020	0.033
As males	0.031		-0.082	*	0.018	0.032
As females	-0.091	***	0.043		0.019	0.029

	Differences	-0.122	**	0.125	*	0.000	-0.003
Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0							
Source: PISA-L Uruguay (2003-2007)							

Mother's professional occupation seems to have an impact on career choices, although no clear pattern is found. Mothers who were working in ISCO groups 21 or 21 in 2003, influenced *equally and negatively* on average both sons and daughters against the choice of T-field careers. No other effect was found, except in the choice of H-field for their daughters (not for sons). At first, this could be interpreted in the frame of intergenerational mobility expectation. But when we analyze the effects of ISCO group 23, the picture slightly changes. When the mother worked as a teacher, the probability of choosing a T-field career decreases by 11 points *for girls,* and increases 16 points for boys. The opposite pattern is observed on the choice of H-field careers. Mothers who were teachers tend to guide their daughters to the H-field field. In contrast, Teachers mothers influence negatively boys' H-field elections. No influences were estimated of mothers' occupation to the choice of E-field. A hypothesis could be posited: mothers expect that their daughters reach a higher status occupation than they did (no matter whether this field was a female-dominated one, (i.e. H-field) because they think education is the more secure path to an upward mobility in the labor market.

Table 3 Marginal effects on predicted probabilities of mot he r s' occupation on the field of study chosen.

	T-field	Sig.	L-field	Sig.	H-field	Sig.	E-field	Sig.
Engin/MD								
As males	-0.093	**	-0.005		-0.042		0.139	
As females	-0.144	***	-0.154		0.192	*	0.105	
Differences	-0.051		-0.149		0.234	*	-0.034	
As males	0.158	*	0.049		-0.153	***	-0.055	
As females	-0.112	**	-0.130		0.126		0.116	
Differences	-0.270	***	-0.179		0.279	***	0.171	
As males	-0.080		0.214	**	-0.122	*	-0.012	
As females	-0.105	*	-0.010		0.136		-0.021	
Differences	-0.025		-0.224		0.258	**	-0.009	

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Father's professional occupation has a lower number of significant marginal effects than mother's occupation, but appears to have a clearer pattern: apparently, fathers do not condition the choices neither in H-Field nor in E-field.

Occupation prestige does not appear to play any role. Fathers who worked as Engineers in 2003, *did* ***not*** discourage their *sons* or daughters to choose careers in the T-field (female-dominated). Neither do they positive influence the choice of careers in the E-field (male-dominated) or in the H-field (female-dominated and high prestige). They did in the L-field: daughters had near 30% less probability to choice one of these careers[5]. Also fathers' medical doctors seemed to have the same behavior.

On the other hand, fathers that worked as teachers, lawyers, social scientists or administrators (ISCO groups 23 and 24), *discourage* boys to choose T-field careers (female-dominated) but they *encouraged* them to choose L-field careers (also female dominated). The effects on the probabilities really big: 13% and 22% respectively.

Clearer is the gender pattern of father's occupation effect beyond the prestige effect. Fathers who worked as teachers or lawyers have a positive impact on the choice of L-field when we consider all students as male but no impact when we consider everyone as females. Though reversed, the same pattern was found for the T-field choice. Male medical doctors (and other similar occupations) have a negative and significant influence on the probability of a *girl's* choosing L-field careers but don't influence their *sons*.

[5] Difference between boys and girls were significant.

Table 4 Marginal effects on predicted probabilities of f athe r s' occupation on the field of study chosen.

	T-field	*Sign*	L-field	*Sign*	H-field	*Sign*	E-field	*Sign*
Engineer								
As males	-0.066		-0.040		0.018		0.089	
As females	0.036		-0.296	***	0.063		0.197	
Differences	0.102		-0.256	*	0.046		0.108	
As males	0.202		-0.003		-0.012		-0.187	
As females	0.113		-0.215	**	0.052		0.050	
Differences	-0.089		-0.212		0.064		0.237	*
As males	-0.132	***	0.216	**	0.029		-0.113	
As females	0.078		-0.064		-0.023		0.008	
Differences	0.210	***	-0.280	**	-0.052		0.121	

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Dispositional variables seem to have a gendered pattern, with opposite effects for males and females in some distinct categories of contrast.

A higher *instrumental motivation* on Mathematics decreases the likelihood of choosing non-Mathematical fields, but only the estimate for H-field was significant. It is remarkably that there is no influence of this disposition on the choice of T-field (education and arts), usually seen as a founded in a "non-quantitative spirit". Gender differences exist and are informative of an underlying pattern in three out of four fields of study. When everyone is treated as males, the effect of higher Math instrumental motivation negatively conditioned the election of L-field (8%) and positively influenced the choice of E-field (12%). The patter with everyone treated as female is different: instead of former effects, only the choice of H-field of study appears to have been conditioned by instrumental motivation (6%). This disposition did not affect females to choice of E-field, but the gender gap is statistically significant.

Table 5. Marginal effect of PISA Math instrumental motivation on predicted probability of the choice of field of study. Males and Females

	T-field		L_field		H-field		E-field	
Instrumetal motivation	-0.009		-0.027		-0.040	***	0.075	***
As males	-0.033		-0.083	***	-0.008		0.123	***
As females	0.005		0.016		-0.061	***	0.040	
Differences	0.038		0.099	**	-0.053	*	-0.084	**

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Math-self concept was a better predictor for men and women career choices and had a different patter than Math instrumental motivation. A higher self-confidence level on

Mathematic was not associated with the choice of E-field options (contrary of what expected), neither for boys nor for girls. Though, there were gendered effects for females in T and L fields of study: choices were reducen among 2% and 7% in both majors. A gender pattern with opposite effects was found for the H-field: boys with higher Math-self-concept tend to reject H-field careers, while the effect over girls is positive.

Table 6. Marginal effect of PISA Math self-concept on predicted probability of the choice of field of study. Males and Females

	T-field		L_field		H-field		E-field
Math self-concept	-0.010		-0.034		0.027	*	0.017
As males	0.014		0.014	**	-0.061	**	0.033
As females	-0.022	**	-0.068	***	0.082	***	0.007
Differences	0.038	*	-0.082	***	0.143	***	-0.025

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Having declared *tertiary education aspirations* at age 15 is negatively associated with the election of an Engineering career (and other alike) three or four years later. The probability of following an E-Field track reduces by 17 points. This effect is significant and did not differ by sex. This may be suggesting that the decision to study this type of careers, relative to any other, could be made later in the life course. On the contrary, early expectations are positively related to an H-field option, especially for males (12%) than for females (5%).

At a more liberal level of significance, Tertiary Education aspirations expressed at 15 years old were also found to be associated with the choice of L-field among females.

Table 7 Marginal effect of Tertiary Education Aspirations on predicted probabilities of the choice of field of study. Males and Females

	T-field		L_field		H-field		E-field	
Aspirations	0.033		0.068		0.071	*	-0.172	***
As males	0.001		0.071		0.120	*	-0.192	***
As females	0.049		0.067	*	0.046	***	-0.163	***
Differences	0.038		-0.082		0.143	***	-0.025	

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Although tiny, *Mathematic skills* show a gendered pattern that reinforces well known recommendations in Mathematic Teaching. When all students are treated as males, the estimated marginal effects of this variable are zero across all the fields of study. When treated as females, yet, a positive effect is found for the probability of choosing E-Field (10% for every 100 points in the PISA scale) and a negative effect of a similar magnitude is found for the H-field option. That is, girls that had developed a high Math competency at the age of

15 years old, four year latter on average tend to choose more math-demanding careers and avert H-field tracks.

Table 7 Marginal effect of Math competency on predicted probabilities of the choice of field of study. Males and Females

	T-field	Sign	L_field	Sign	H-field	Sign	E-field	Sign
PV1math	0.000		0.000		-0.001	***	0.001	**
As males	0.000		0.000		0.000		0.000	
As females	0.000		0.000		-0.001	***	0.001	**
Differences	0.000		0.000		-0.001	**	0.001	

Reference: *** p<0.01, ** p<0.05, * p<0.1; Ho is different from 0

Source: PISA-L Uruguay (2003-2007)

Finally, the three background controls included in our models have very limited though no remarkable impacts on career choices. While fathers' tertiary education diploma (in comparison with Primary Education diploma) has no impact at all, mothers who have a tertiary degree significantly decrease the probability that their sons choose a career in the T-field. It is interesting to note that this effect is parallel to those commented for mothers' professional occupation (see above). No similar effect is found for daughters on the T-field option, but being born to a graduated mother seems to decrease the probability of girls of following an E-field career by 17 points roughly.

Access to computer facilities at home to do homework at age of 15 *decreased* the probabilities (14%) to choose a specialty in the T-field of study only among boys but not for girls. This gendered effect is again seen in the H-field of study: among girls the probability to choose Medicine, Nursing, Dentistry or a similar career *decreases* in 20 points when they had reported computer facilities at home at age 15. In the case of L-field, the effect on the choices is *positive* both for men and women; though, non-statistic gender difference was founded.

No general effects were found for those students who declared having more than 100 books at age 15. Nevertheless, this cultural capital indicator was negatively associated with the choice of T-field among males, creating a significant gender difference. Other gender difference was estimated for the L-field: a higher cultural capital avert girls to choose this field of study.

8 Discussion and conclusions

Once socio-economic and academic characteristics are taken into account, horizontal gender gaps were less sharp than unconditional descriptions had suggested at first glance. Even though, after controls are included, gender differences persist in three out of the four fields considered. Against expectations, women are not overrepresented in the T-field (Teacher Education, Arts and Humanities). On the other hand, following the international global pattern (Charles & Bradley, 2009), men have higher probabilities of choosing an E-field track (Engineering, Chemistry, Architecture, Physics, Agronomy and Natural Sciences).

Secondly, we found a gendered pattern in the influence of socio economic and cultural status indexes upon field choices. Lower cultural capital influence boys and lower economic status influence girls in the choice of T-field of study. This type of occupations seems to be a preferred way to an upward social mobility among girls of middle and lower classes who reach Tertiary Education. None of the social, economic and cultural indexes were related to the choice of the E-field, except father's secondary education that positively influences daughters' choices.

The effect of dispositions upon educational elections does not follow a clear pattern. Instrumental motivation towards Math, that is, the belief that Math will be helpful for pursuing further education or getting a job, raises the probability that boys –but not girls- choose an E-field career. When we consider girls, a higher instrumental motivation towards Math decreases their chances of following H-field studies compared to any of the three remaining options.

In turn, Math scores in 2003 PISA assessment has a positive impact towards an E-field election, but the effect is only significant for women. As argued by Jonson (Jonson, 1999), it is possible that it is the relative -more than the absolute- ability in some subject, as compared to the ability in any other field, what actually counts for an educational election. As discussed before, we cannot include such a relative measure due to collinearity problems.

On the whole, the results seem to picture a first opposition in career choices between the E-field and H-field, organized basically alongside a dispositional axis (cognitive and non-cognitive motivation). Both the L-field and the T-field are orthogonal to that choice and are organized alongside a second axis of cultural and economic indexes. The emergence of these two axis could be situated at the beginning of Upper Secondary School when students have to choose among three branches of studies (Humanistic, Biology and Mathematic)[6]. This hypothesis is known in the literature as the "pipeline". The contribution of our study is that this pipeline is not defined (at least alone or predominantly) as a (dis)like or an incompetency with Mathematic.

[6] Also in Technical Upper Secondary, the different programs can be merged in same three general branches.

9 Bibliography

ANEP - DIEE. (2009). *Uruguay en el Segundo Estudio Regional Comparativo y Explicativo (SERCE). Informe Nacional.* Montevideo: Administración Nacional de Educación Pública.

ANEP. (2011). *Estado de Situación 2010. Monitor Educativo de Enseñanza Primaria.* Montevideo: Administración Nacional de Educación Pública.

ANEP-MESyFOD. (1999). *Censo Nacional de Aprendizajes en los 3eros. años del Ciclo Básico.* Montevideo: Administración Nacional de Educación Pública.

Barone, C. (2011). Some things never change: Gender Segregation in Higher Education across Eight Nations and Three Decades. *Sociology of Education, 84*, 157-176.

Boado, M., & Fernández, T. (2010). *Trayectorias académicas y experiencias laborales de los jóvenes uruguayos evaluados por PISA 2003.* Montevideo: Facultad de Ciencias Sociales de la Universidad de la República.

Bradley, K. (2000). The incorporation of woman into higher education. Paradoxical Outcomes? *Sociology of Education, 71*(1), 1-18.

Breen, R., & Goldthorpe, J. (1997). Explaining educational differences. Towards a formal rational action theory. *Rationality & Society, 9*(3), 275-305.

Bucheli, M., Cardozo, S., & Fernández, T. (2012). Acceso a la Educación Superior y género en Uruguay. In A. Riella (Ed.), *El Uruguay desde la Sociología X* (Vol. X, pp. 50-65). Montevideo: Departamento de Sociología de la Facultad de Ciencias Sociales, Universidad de la República.

Bucheli, M., Miles, D., & Vigorito, A. (2000). *Un análisis dinámico de la toma de decisiones en los hogares de América Latina.* Washington: Inter American Development Bank.

Buchman, C., & DiPetre, T. (2006). The Growing Female Advantage in College Completion: The Role of Family Background and Academic Achievement. *American Sociological Review, 71*, 515-541.

Buchman, C., DiPietri, T., & McDaniel, A. (2008). Gender Inequalities in Education. *Annual Review of Sociology, 34*, 19-37.

Cardozo, S. (2010). *El comienzo del fin: desandando los caminos de la desafiliación escolar en la educación media.* Montevideo: DS-UdelaR.

Charles, M., & Bradley, K. (2002). Equal But Separate? A cross-national study of sex seggregation in higher education. *American Sociological Review, 67*(4), 573-599.

Charles, M., & Bradley, K. (2009). Including our gendered selves? Sex-seggregation by fields of studies in 44 countries. *American Journal of Sociology, 114*(4), 914-926.

Conger, D., & Long, M. (2008). Why are men falling behind? Explanations for the. *Texas Higher Education Opportunity Project Conference.* Princeton.

Davies, R., Heinesen, E., & Holm, A. (2002). The relative risk aversion hypothesis of educational choice. *Journal of Population Economics, 15*, 683-713.

England, P. (2010). The Gender Revolution : Uneven and Stalled. *Gender & Society no.24*, 149-166.

England, P., Allison, P., Li, S., Mark, N., Thompson, J., Buding, M., et al. (2007). Why Are Some Academic Fields Tipping Toward Female? The Sex Composition of US Fields of Doctoral Degree Receipt, 1971-2002. *Sociology of Education, 80*, 23-42.

Ermisch, J. (2008). Child support and non-resident fathers' contact with their children. *Journal of Population Economics 21:, 21*, 827-853.

Fernández, T. (2003). La desigualdad educativa en Uruguay entre 1996 y 1999. *REICE - Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 1*(1).

Fernández, T. (2007). *Distribución del conocimiento escolar: clases sociales, escuela y sistema educativo en América Latina.* México, D.F.: El Colegio de México.

Fernández, T. (2007). Las expectativas educativas y las competencias matemáticas desarrolladas por los alumnos uruguayos de 15 años evaludos por PISA 2003. In *El Uruguay desde la Sociología. Tomo V* (pp. 55-68). Montevideo: Departamento de Sociologiia de la Unviersidad de la República.

Fernández, T. (2007). Persistent Inequalities in Uruguayan Primary Education 1996-2002. In R. Teese, S. Lamb, & M. Duru-Bellat, *International Studies in Educational Inequalitiy, Theory and Policy. Volume Two: Inequality in Education Systems* (p. 324). Dordrecht: Spinger.

Fernández, T. (2009). Desigualdad, democratización y pedagogías en el acceso a la Educación Superior de Uruguay. *Revista de Educación Superior, 152*, 13-32.

Fernández, T. (2009). La desafiliación en la educación media de Uruguay.Una aproximación con base en el panel de estudiantes evaluados por PISA 2003. *Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 7*(4), 165-179.

Fernández, T., Armúa, M., Bernadou, O., Centanino, I., Fernández, M., Leymonié, J., et al. (2007). *Uruguay en PISA 2006. Primeros Resultados en Ciencias, Matemática y Lectura del Programa Internacional de Evaluación de Estudiantes.* Montevideo: Administración Nacional de Educación Pública.

Greene, W. (2002). *Econometric Analysis. Fith Edition.* Upper Saddle River, New Jersey: Prentice Hall.

Jacobs, J. (1995). Gender and Academic Specialties: Trends among recipients of Coleges Degrees. *Sociology of Education, 68*, 81-98.

Jonson, J. (1999). Explaining Sex Differences in Educational Choice: An Empirical Assessment of a Rational Choice Model. *European Sociological Review, 15*(4), 391-404.

Mastekaasa, A., & Smeby, J.-C. (2008). Educational choice and persistence in male and female -dominanted fields. *Higher Education, 55*, 189-202.

Meschi, E., Swaffield, J., & Vignoles, A. (2011). *The Relative Importance of Local Labour Market Conditions and Pupil Attainment on Post-Compulsory Schooling Decisions.* Bonn: IZA - Institute for the Study of Labor.

Ministerio de Educación y Cultura (MEC). (2010). *Anuario Estadístico de Educación.* Montevideo: MEC.

Nguyen, A., & Taylor, J. (2003). Post-high school choices: New evidence from a multinomial logit model. *Journal of Population Economics, 16*, 287-306.

Papadópulos, J., & Radakovich, R. (2006). Educación Superior y Género en América Latina. In I. I. Caribe, *Informe sobre la educación superior en América Latina y el Caribe 2000 – 2005. La metamorfosis de la educación superior.* Caracas: IEASALC.

PISA-OECD. (2005). *PISA 2003 Technical Report.* Paris: OECD.

Pollachek, S. (1981). Occupational Self Selection: a Human Capital Spproach to Sex Differences in Occupational Structure. *The Review of Economics and Statistic, 63*(1), 60-68.

Stoké, V. (2007). Explaining Educational Decision and Effects of Family Social Position: An Empirical Test of Breen Goldthorpe Model of Educational Attainment. *European Sociological Review, 23*(4), 505-519.

Tolsma, J., Ned, A., & de Jong, U. (2010). Explaining Participation Diferentials in Dutch Higher Education: the Impact of Subjective Success Probabilities on Level Choice and Field Choice. *European Sociological Review, 26*(2), 235-252.

Van de Werfhorst, H. G., Sullivan, A., & Cheung, S. Y. (2003). Social Class, Ability and Choice of Subject in Secondary and Tertiary Education in Britain. *British Educational Research Journal, 29*(1), 41-63.

Willms, J. D. (2003). *Student Engagement at School. A sense of belonging and participation. Results from PISA 2000.* Paris: OECD.