[PRELIMINARY & INCOMPLETE]

Which fields do women-economists choose?*

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ABSTRACT

This paper describes the gender distribution of research fields chosen by the faculty members in the top fifty Economics departments of the world, according to the rankings elaborated by Econphd.net. We document that women are unevenly distributed across fields and test some behavioral implications from theories underlying such disparities. Our main findings are that the probability that a woman chooses a given field is positively related the share of women in that field (path-dependence), and that the share of women in a field at a given department increases with the size of the department and decreases with its average research quality. Further, by using Ph.D. cohorts, we document how gender segregation across fields has evolved over the last four decades.

JEL Classification: A11, J16, J70.

Keywords: female economists, gender segregation, path-dependence, tobit and probit models.

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1. Introduction

It is a widely documented fact that there are gender differences in the career paths of academics in many research disciplines, including economics (see, e.g., Kahn, 1995). This is in line with the perception that the academic labor market is dominated by men, reflecting the widespread view that there is a glass ceiling limiting female ´s advances to the highest managerial and professional jobs. Such a belief has been rationalized by several explanations. Among them, the most popular ones are based on: (i) women ´s self-selection into less selective occupations where career interruptions are not heavily penalized, (ii) taste discrimination by employers in favor of men, and (iii) different attitudes of men and women in highly competitive environments. Although all these explanations are plausible in a variety of contexts, the traditional paucity of datasets on those occupations has made it difficult to discriminate among them. Fortunately, this problem is becoming partially overcome by empirical research using recently available micro-data containing detailed socio-economic characteristics of men and women in high-skilled occupations. A good example is the work by Bertrand and Hallock (2001) who find that women only represent 2.5 % of a group of high-level executives in US corporations, and that the main reason behind their lower earnings is that they lead smaller firms, are younger and have less tenure.

Along this line of research, following the initiative of the American Economic Association (AEA) in the early seventies of setting up a *Committee on the Status of Women in the Economics Profession* (CSWEP), there are by now a number of studies on how the prospects of females academic economists have evolved over the last two decades in parallel with the fact that women have made great inroads in the economics profession. The issues of women ´s entry in Ph.D. programs, their rate of success in completing these degrees, first-jobs for tenure-track academics or non-academics, publication records, promotion prospects to tenured professorships and academic salaries are becoming well documented in a growing literature.[1]

[1] See, e.g., Ginther and Khan (2004), Hansen (1991), Kahn (1993, 1995), Blank (1996), McDowell, Singel and Ziliak (1999), Booth, Mumford and Frank (2005), and the references therein.

However, to the best of our knowledge, much less research has been undertaken about the existence of gender differences in the distribution of Ph.D. academics across areas of specialization in economics research, and the reasons behind potential disparity across different fields. Insofar as choice of research fields may influence publications and therefore promotions, analyzing the determinants of such choices may be helpful in understanding women ´s performance in economics in general. Indeed, the only work that we know of about this topic is Hale (2005). In this study, the author uses three waves (1983, 1993 and 2003) of a database of members of the AEA in ten of the top economics departments in the US to address the central question of whether there is path-dependence in the way women choose their fields. She finds favorable evidence about this phenomenon, in the sense that the higher is the share of women in a given field in a given year the higher is the share of female academic economists that join the field in that year. Interestingly, this result holds even after controlling for field effects in panel and tobit regressions, indicating that the finding is independent of the fact that women may prefer some fields over others. By contrast, the share of tenured women in a field has an insignificant effect on the share of women joining the field. In general, Hale ´s finding points to the importance of efforts to increase gender diversity in fields where they are under-represented.

Our paper aims at complementing Hale ´s (2005) study in several respects. First, we have assembled a much larger data base of economics departments and of the gender composition of their faculties by making use of one of the rankings published recently by the Econphd.net institution (www.econphd.net). The econphd.net rankings are among the most substantial in scope. Economics departments are ranked in an overall classification *(All Economics*) and in several sub-disciplines on the basis of their research quality of the publications of their faculties in 63 journals over roughly ten years, 1993-2003. Journal selection and quality adjustment are based on the citation analysis developed by Kalaitzidakis et al. (2003), one of the studies commissioned by the European Economic Association to extend and update available rankings of Economics departments which were mostly based on U.S. institutions. On the basis of the rankings

related to *All Economics* we have selected the top 50 departments (listed in the appendix) out of which 74% are North-American and the remaining 26%% are European.[2] Secondly, through a careful search on the websites of these departments, we have drawn information on the fields of specialization (using JEL codes) of their faculty members as well as a range of personal and establishment characteristics which extends the ones used by Hale (2005). Since sometimes it was not possible to draw the desired information from the personal web pages, a questionnaire was sent to the 276 women in our sample containing questions about their reasons in choosing a field of research and about some family conditions at the time they were completing their dissertations. Thirdly, by including some of the top European departments in our sample, we extend the evidence in Hale (2005) which is based on 10 of top 15 departments only in the US. Fourth….

Our main finding can be summarized as follows…

The rest of the paper is organized as follows. Section 2 discusses recent theories about differences in male and female attitudes in competitive environments, like research, and draws several implications to be tested. Section 3 describes the dataset and documents the main facts about the distribution of men and women-economists across fields. Section 4 presents the econometric methodology and results. Finally, Section 5 concludes. An Appendix offers a detailed description of the data.

2. Theories about the field choices of women-economists

There is wide empirical literature showing that large gender differences prevail in competitive high-ranking positions, particularly in terms of earning gaps (see, e.g. Blau and Kahn, 2000 and Albrecht , Bjorklund and Vroman, 2003).

[2] Out of the top 50 economics departments, 35 are based in the U.S., 13 in Europe (including Israel), and 2 in Canada.

Moreover, as discussed earlier in parallel with this line of research there are a growing number of papers documenting the conventional belief that the allocation of high profile jobs remains largely favorable to men (see, e.g., Bertrand and Hallock, 2001, and Black and Strahan, 2001). Since academic positions are generally considered to be high-profile jobs involving large human capital investments, this latter line of research turns out too be the most relevant for the purposes of this paper. The fact that women are under-represented in these occupations has been rationalized by a number of theories which can be broadly classified into three categories.

The first two explanations are very well known. The first theory rests on gender differences of abilities and preferences leading to occupational self-selection (Polachek, 1981). The idea is that, even if one were to adopt the assumption that the distribution of abilities is identical for men and women, the fact that the latter may face career interruptions (due, for example, to maternity leaves or some other family-care related issues) hampers their promotion prospects to those high-quality jobs. Thus, on the basis of expectations about these inactivity periods, women may self-select into lower profile jobs where, in contrast to top occupations, the penalty for career breaks is not so high. The second one relates to "Becker-type" taste discrimination in the work place, which leads to different treatment of men and women with equal productive skills and preferences as long as perfect competition does not prevail in the product and labor markets (see, e.g. Goldin and Rouse, 2000, and Black and Strahan, 2001).

More recently, however, a third rationalization of the under-representation of women in high-skilled occupations has been proposed (see, Gneezy, Niederle and Rustichini, 2003, and Babcok and Laschever, 2003). This more novel explanation relies upon arguments drawn from the Psychology literature and its basic conclusion is that there are gender differences in the attitudes to competition, with women being less effective than men in competitive environments. Thus, this fact may reduce the chances of success for women when they compete for new jobs, promotions, etc. Nonetheless, it is also argued that, when shielded from competition with men, women have a higher chance of developing their skills and interests.

Inspired by this type of literature, Gneezy et al. (2003) use controlled experiments which allow to obtain a precise measure of performance and to exclude any discrimination or expectation of discrimination, namely, the characteristic features of the other two theories discussed before. Their experimental evidence confirms the previous conjecture about men and women differing in their ability or propensity to perform in competitive environments. Specifically, while the performance of men and women is the same in noncompetitive environments (e.g., under a fixed-rate payment scheme for completing a given task in a given period), the average performance of men significantly increases relative to women ´s in competitive and uncertain environments (e.g., in winner-takes-it-all tournaments where the fixed-rate payoff scheme is replaced by another one where only the participant completing the largest number of tasks is paid proportionally to the output). Interestingly, however, as mentioned above, they also find that the performance of women also increases when they compete only against women in single sex groups. By contrast, it remains unaltered in mixed groups with men. Men ´s performance, on the other hand, does not significantly change between both types of group tournaments. Thus, the main message to be drawn from this line of research is that women only dislike competition when it is against men. As a result, a man who is equally skilled than a woman may get a higher chance of being hired jobs which do not require an ability to compete, simply because of the gender differences in the attitude towards competing in the selection process.

In our opinion, the results of the above-mentioned experiments could be easily adapted to interpret gender differences in the choice of research topics in science. The reason is that the issues related to gender self-selection and taste discrimination for academic candidates, with similar publication records (scores) and other valuable skills in academic careers, should be much less relevant than in other segments of the labor market which are subject to a much lower degree of competition. Accordingly, the first two conventional explanations are likely to be less relevant than GDC in our framework. In a strong academic environment, like the one prevailing in our sample of top departments in the world, research excellence is a dominant characteristic. Both the allocation of faculty positions in

prestigious departments and the promotion to tenured professorships are rewards which take place in tournament-type environments, that is, through highly competitive selection processes. In effect, it is a generally accepted view that only the best researchers, backed by excellent scores, get access to these positions.

In this respect, it is important to notice that not all research fields may yield the same return in relation to the scores achieved by the researchers. Hence, some uncertainty is present in the choice of fields. For example, publishing a paper in a fashionable topic may have a higher return, in terms of prestige and tenure prospects, than publication of another paper in a more trodden field, even when both appear in the same journal. Thus, if highly competitive men choose those fields with a higher chance of getting a good payoff, yet subject to more risk because of the presence of highly talented colleagues working on a similar hot topic, a prediction of the GDC theory would be that women-researchers would choose fields in which there less men, with whom they feel uneasy to compete. This leads to the following testable hypothesis concerning the behavior of women-economists:

Hypothesis 1 (H1): *Women will prefer fields where other women have a significant presence, leading to path dependence by field.*

This is the main hypothesis of GDC and the one on which Hale ´s (2005) study focuses. Nevertheless, the above-mentioned results in Gneezy et al. (2003) yield three further interesting implications of GDC to be tested. First, since men are bound to be present in highly prestigious departments where expected returns are high, women should be under-represented in those departments. Hence, on average, quality of a given department and female share should be negatively related. However, for given average quality of a department, female presence is likely to depend on the size of the department. In a large top department, it is likely that there are a wide variety of fields which are covered by their faculty members. By contrast, in a small top department, it is likely that its researchers specialize in a few topics with high returns; otherwise, the department would not have reached its current prestigious status. Hence,

initially, one should expect women to prefer working in large top departments, where they can choose field with lower competition, than in small top departments, where specialization leads to a fiercer competition with men. Notice, however, that this conjecture is bound to be more relevant for determining the field choices of the older female Ph.D. cohorts than for the choices of younger cohorts, due to the dynamic effects of competition in single sex groups. In effect, over time, the preferences of the younger Ph.D. cohorts can change depending on the number of women who already work in a given field. The underlying idea is that those fields which were chosen by older female academics may become "too large and mature", and therefore the returns to doing research on them may be lower over time. Since the basic prediction of GDC is that women only like to compete with themselves, younger female researchers may prefer to work in alternative more novel fields, which typically enjoy higher rewards, than those chosen by their female predecessors in order to compete with them in a given department. Accordingly, the following three hypotheses could be considered

Hypothesis 2 (H2): *There is a negative relationship between quality of a department in a given field, for a given size of the department, and the share of women-researchers in that field.*

Hypothesis 3 (H3): *There is a positive relationship between size of department and the share of women-researchers in a given field, for given quality of a department in such a field.*

Hypothesis 4 (H4): *Gender segregation by field should be lower for the younger cohorts.*

3. Data

The data was obtained from the personal web pages of faculty members of the top 50 economics departments in the world as listed in Econphd.net (*All Economics* category) based on affiliations in the first term of 2005. In this fashion, we extracted information on 1949 individuals out of which 276 are women, representing a share of 14.2%. Using JEL codes, fields were assigned based on the

topics of the main bodies of published research and, in many instances, on their own information about main areas of research. For some of the analysis, following Hale (2005), we grouped the disaggregate JEL codes in ten main fields, with the tenth one capturing "other fields" or in short "Other".[3] In some other instances, however, where less aggregation is convenient, we used a finer list of twenty fields. The aggregation procedures of JEL codes are described in the appendix. It should important to notice that, in most cases, researchers report more than one field of specialization. However, on average, men and women report almost identically two fields of research (male avg. =1.93, female avg. =2.04). Hence, in the sequel, we will refer to this count as researcher-fields (Rfs. in short) instead of just researchers.

3.1 Descriptive Statistics and Gender Segregation by field of research

To document the gender distribution of Rfs. across areas of research, Table 1 presents the results obtained for the ten fields considered in the coarser aggregation. Overall, our sample comprises 3826 Rfs, out of which 562 are female- Rfs. Note that this yields a share of 14.2% (=562/3826)-- an almost identical fraction to the one obtained when considering individuals instead of Rfs (=276/1949). Column (1) shows the total number Rfs in which faculty members (assistant/lecturer, associate/reader and full professors) are specialized, while column (2) reports the weight of each field, namely the fraction of the overall sample of Rfs who selects a given field. Thus, for example, Micro/Theory (17.3%), followed by Other (16.8%) and, at some distance, by Macro (11.3%) and Econometrics (10.7%), are the highest populated fields, whilst International (6.8%) and Economic History (3.0%) are the ones with less researchers. Finally, column (3) displays the fractions of female Rfs in each on the ten fields. In this case, the three fields with the largest shares of women are Labor Economics (18.8%), Public Economics (17.9%) and I.O. (16.8%), whilst the three categories with the lowest share are Other (11.3%), Micro/Theory (12.1%) and Econometrics (13.9%).

[3] We added Economic History to Hale ´s (2005) nine fields because, in some universities, economic historians have their own department, different from the Economics one.

Table 1

Gender distribution by field

Field	(1) Number of Rfs	(2) Fraction of Rfs (%)	(3) % of Females
Econometrics	411	10.7	13.9
Micro/Th.	663	17.3	12.1
Macro	431	11.3	14.4
International	241	6.3	16.6
Public	391	10.2	17.9
Labor	336	8.8	18.8
I.O.	299	7.8	16.8
Dev/ Growth	297	7.8	15.7
Econ. History	114	3.0	16.7
Other	643	16.8	11.5
Total	**3826**	**100.0**	**14.2**

In Table 2, in turn, we document the fraction of women with tenure (Full and Associate professorships are lumped together in this category) across fields. When considering individuals, there are 1346 tenured faculty members, which represent 69% of the 1949 individuals in the sample. The number of women with tenure is 124, i.e., a 9.2% of the sample (1949). This fraction could be compared with the proportion of women completing a Ph.D. degree in Economics which was approximately 27% in the US by 2002 (See CSWEP, 2003)

Column (1) reports the distribution of the number of tenured professors (males and females) in terms of Rfs by field of specialization. Notice that the overall number (2625) is larger than the number of tenured professors (1346) since, as mentioned earlier, on average faculty members have two fields of specialization. Thus, for example a tenured professor who specializes in, say, Labor and Econometrics, appears as such in both categories. Column (2) reports the corresponding frequency distribution of tenured professors by fields i.e., the

numbers in column (1) of this Table as a fraction of the sample size. Column (3) displays the ratio between the number of tenured professors and the number of overall faculty members, both again in terms of number of Rfs. (column (1) in Table1). This ratio can be interpreted as the probability of obtaining tenure (without controlling for research performance) within each of the fields. The overall (male and female) probability is about 0.686 and, as can be inspected, there is very little variation across fields. The field with the highest probability of getting tenure is Economic History (0.79) whilst the ones with the lowest probabilities are I.O., Labor and Econometrics, whose probabilities are close to 2/3. Column (4) presents these probabilities for male professors, i.e., the ratio between the number of tenured male professors and the number of male professors within each field. The average probability is about 0.738. For a male researcher, Economic History (0.810) is again the field with the highest probability of getting tenure for a male researcher, whereas Labor is the one with the lowest probability (0.706). Lastly, Column (5) offers the corresponding probabilities for women. The average promotion probability, 0.44, is much lower than the one reported above for their male colleagues. Once again, Economic History (0.68) turns out to be the field with the highest probability of tenure, and Micro/Theory (0.35) and Econometrics (0.368) the ones with lowest probabilities.

For comparative purposes with the 10-field aggregation procedure used in the previous two Tables, Figure 1 depicts the proportion of women across fields but this time using a finer aggregation of the JEL codes, consisting of 20 fields. Like before, Rfs. is the unit of measurement. As can be observed, the distribution of the fraction of women with this finer classification is fairly similar to the one presented in column (3) of Table 1. Health, Education & Welfare and Labor & Demographic Economics are the fields with the largest shares of women (20-25%) whereas Mathematical Economics, Agricultural Economics and Other Special Topics are the ones with the lowest fraction of women, with shares below 10%.

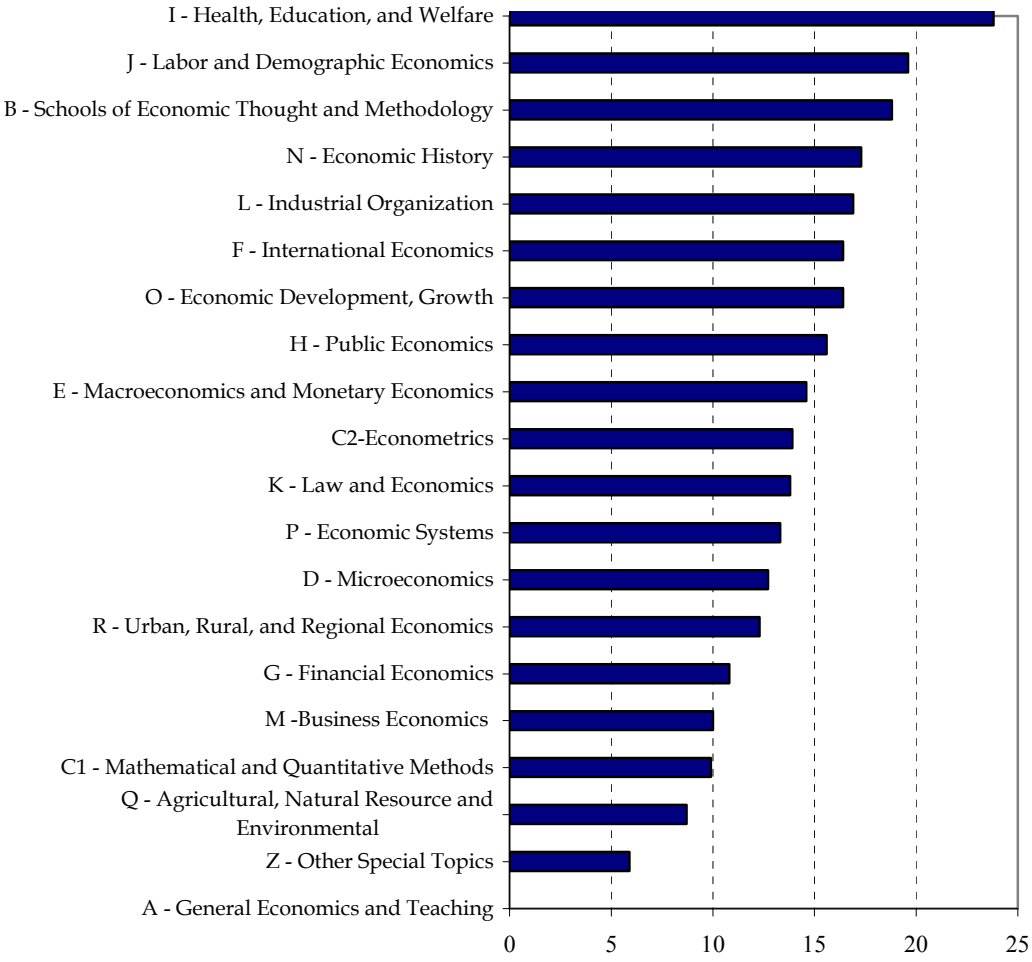
Table 2

Tenure distribution by gender

Field	(1) Number of Tenured Profs.	(2) Fraction of Tenured Profs.	(3) Prob. of tenure (all)	(4) Male - Prob. of tenure.	(5) Female - Prob. of tenure
Econometrics.	275	10.5	0.669	0.717	0.368
Micro/Theory	444	16.9	0.670	0.713	0.350
Macro	293	11.2	0.680	0.718	0.452
International	167	6.4	0.693	0.741	0.450
Public	271	10.3	0.693	0.741	0.471
Labor	224	8.5	0.667	0.706	0.492
I.O.	199	7.6	0.665	0.718	0.400
Dev/ Growth	210	8.0	0.707	0.756	0.447
Econ. History	90	3.4	0.789	0.810	0.684
Other	452	17.2	0.702	0.738	0.432
Total	**2625**	**100.0**	**0.686**	**0.729**	**0.436**

Figure 1

Proportion of women in each field



3.2 Ph.D. cohorts

In this section, we are interested in analyzing the distribution of the Top 50 Departments by gender and age. The issues we wish to address is whether younger female generations are entering those departments at a higher rate than their older colleagues, and how these different accession rates have evolved over time. Unfortunately, there were a sizeable proportion of researchers than did not report their date of birth on their web pages. However, in all cases we were able to obtain the year of completion of their Ph.D. dissertations which is bound to be a good proxy for age. For this reason we use Ph.D. cohorts instead of age cohorts, where the corresponding cohort is defined in terms of five-year spells.

Figure 2 shows the distribution of faculty members by Ph.D. cohorts, while Figure 3 presents the fraction of women in each cohort. The sample of years of Ph.D. completion has been split into nine cohorts, as represented in the horizontal axis of each graph. As can be seen in Figure 2, there is a clear increase in the participation of women in the younger cohorts. Such a proportion has surged from less than 3% for those women who completed their Ph.D.´ s in the 1960s to almost 27% for those who defended after 2000. By contrast, the distribution for men is much has a much flatter slope, exhibiting a slight increase from 8% to less than 15%, which visually is not too different from a uniform distribution. Thus, young women-economists are entering these distinguished departments at a much higher rate than their older colleagues. When analyzing the presence of women by Ph.D. cohort, Figure 3 makes clear that 65.3% of women have completed their thesis after 1990 whereas only 39% of men have done so. This implies that female Ph.D. ´s make a growing share of the supply of young researchers to be recruited in the academic job market by economics departments.

Figure 2
Distribution of faculty members by Ph.D cohort, for each gender

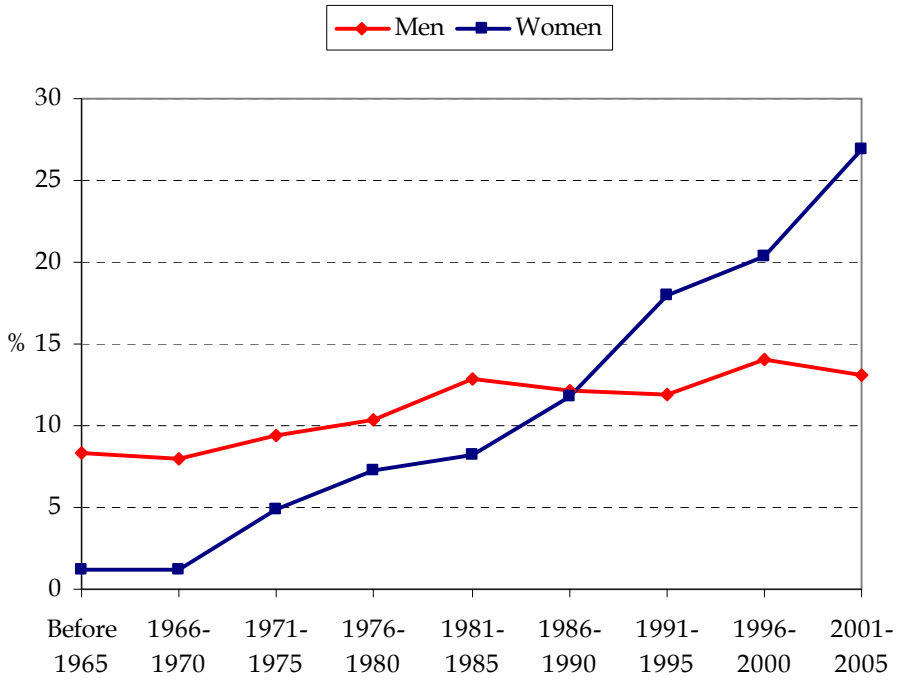
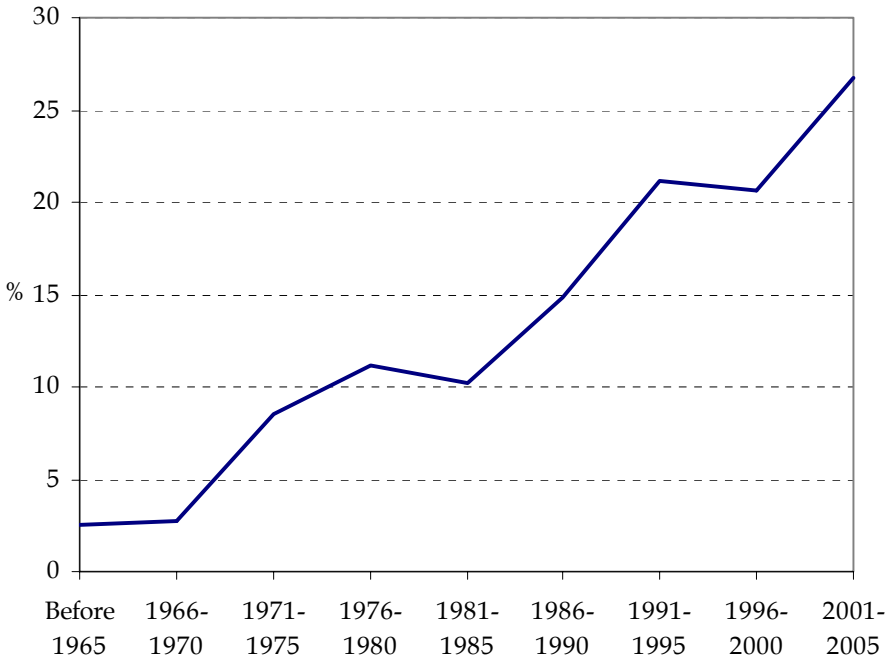


Figure 3
Proportion of female members for each PH.D cohort



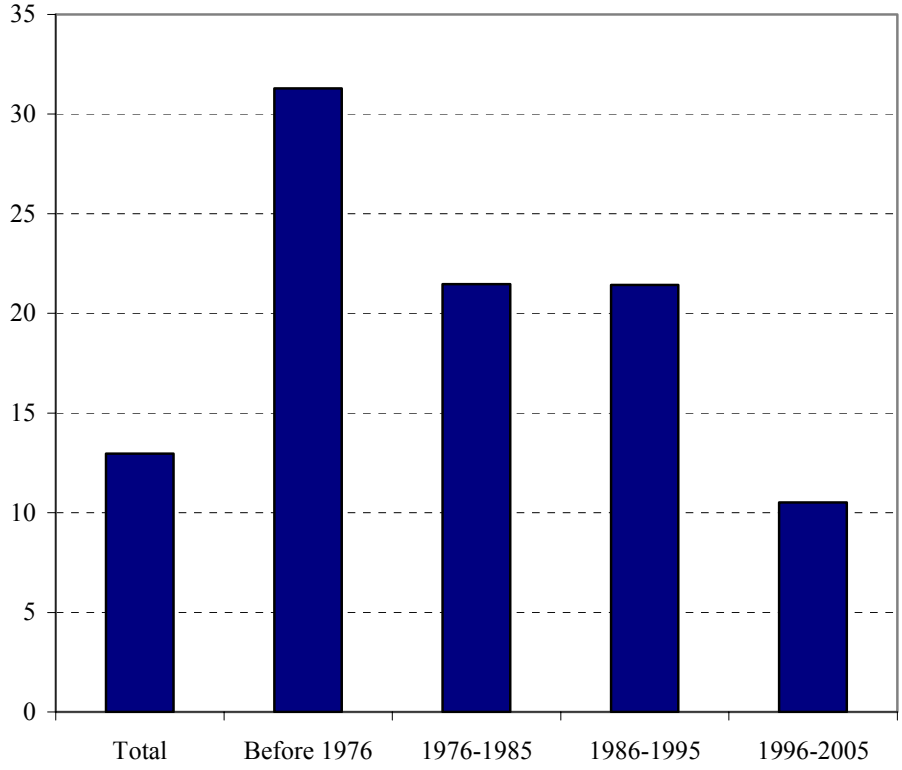
3.3 Gender Segregation by field of research

In the previous sections we have presented descriptive evidence documenting the advance of women faculty in the top departments of the world and how this steady advance has experienced a rapid acceleration since the 1990s. In order make a deeper analysis about the determinants of these changes, in this section we provide some new evidence about the evolution of segregation by gender in the field choices of these faculty members. To do so we use the Ph.D. cohorts discussed above, but now aggregated to four decades instead of the nine half-decade periods considered in the previous analysis.

Preliminary evidence on this issue can be obtained by computing the well-known Duncan and Duncan (1955) segregation index across the different fields by cohort.[4] Figure 4 shows that gender segregation by field is much higher among the members of the older cohorts (before the mid-seventies) than among those researchers belonging to the younger cohorts. Notice however, that the fall in segregation only took place for the older and younger cohorts in our sample, namely, those with Ph.D.´ s in 1976-1985 and 1996-2005. By contrast it remains basically unchanged for the cohort 1986-1995. Both features are somewhat consistent with the evidence presented in Figures 2 and 3 where 1976-85 was the only cohort in the sample where the shares of women completing a Ph.D. and/or becoming a faculty member experienced a slowdown. This evidence provides some support to our conjecture H4 in section 2 about younger female cohorts experiencing lower segregation by field than older cohorts, a hypothesis which will be further examined in section 4 below.

[4] The Duncan & Duncan segregation index is defined as $S_c = 0.5\Sigma_i \left| m_{ic} - f_{ic} \right|$, where m_{ic} (f_{ic}) is the is the proportion of male (female) faculty members in field *i* for Ph.D. cohort *c*. This index, expressed as a percentage, can be loosely interpreted as the proportion of women (or men) who have to change fields for the field distribution of men and women to remain the same. A value of 0% indicates that the distribution of men and women across fields is the same, while a value of 100% indicated that women and men work in completely different fields.

Figure 4
Segregation index by Ph.D. cohort



When pooling all cohorts, the value of the overall segregation index is 13%. This is a much lower value than the corresponding indexes reported by Dolado, Felgueroso and Jimeno (2001, 2004) for occupational gender segregation in the population with college education in the US (around 35%) and in the EU (around 38%). Following the increasing participation of female graduates in the labor market, this lower gender segregation in research fields supports the view that, the competitive environment surrounding academic activities leads to a higher decline in segregation in these jobs than in alternative occupations where high-educated women work.

Lastly, in order to improve our understanding of the observed evolution in segregation over cohorts, the next step is to analyze the extent to which the reported changes in segregation are due to genuine changes in the female

preferences to work in certain fields, or to changes in the importance/ weight of fields where they have traditionally worked. With this goal in mind, we follow Blau, Simpson and Anderson ´s (1998, BSA henceforth) decomposition method of the change in the segregation index over time, adapting it to our framework of cohorts. The decomposition yields a breakdown of the total change in the Duncan & Duncan segregation index between two consecutive periods (cohorts in our case) into two effects: (i) a *sex composition effect* within fields, holding constant the weights of fields, and (ii) a *field weight effect* due to changes in the field mix, holding constant the sex composition within fields.

The BSA decomposition works as follows. Denoting by M_{ic} (F_{ic}) the number of male (female) researchers in field *i* and cohort *c,* the female and male shares by cohort and field are defined as $f_{ic} = F_{ic} / (M_{ic+} F_{ic})$ and $m_{ic} = M_{ic} / (M_{ic+} F_{ic})$, respectively, whereas the field weight is defined as $\alpha_{ic}= (M_{ic+} F_{ic})/\Sigma_i (M_{ic+} F_{ic})$. Aggregating over all fields, notice that the Duncan & Duncan segregation index for cohort c can be expressed as $S_c =0.5\Sigma_i \left| (m_{ic} \alpha_{ic})-(f_{ic} \alpha_{ic}) \right|$. Let Scc´ denote the segregation index computed with female and male shares corresponding to cohort *c* and field weights corresponding to cohort *c´*. S. Then, letting c, c´=0,1, where "1" denotes the younger Ph.D. cohort and "0" the older cohort, it is straightforward to check that the difference between S_{11} and S_{00} satisfies

$$S_{11} - S_{00} = (S_{10} - S_{00}) + (S_{11} - S_{10}) \qquad (1)$$

where the first term in the RHS of (1) captures those changes due to the *sex composition effect*, namely the change in the index between cohorts 1 and 0 that would have occurred if the weight of each field had remained fixed at its level for cohort 0, while the *field weight effect* is estimated by the second term, that is, the change in the index if the gender shares had remained invariant at the level of cohort 1.

Table 3 reports the gender shares and field weights used in computing (1) across the 20 fields and 4 decade-cohorts. Table 4, in turn, displays the decomposition results. The main conclusion to be drawn is that the size of *field weight effect* is small when we compare the four consecutive cohorts.

Alternatively, the main driving force behind the reduction of gender segregation in fields of research over subsequent generations is the *sex composition* effect. Indeed, as can be inspected from the left panel of Table 3, the weights of the different fields have remained fairly stable over the four cohorts while the right panel shows that female shares in those fields have undergone very relevant changes. Finally, it worth noticing that the differences in segregation between the two most recent cohorts (2005-1996 y 1995-1986) are mostly due to four core fields in research, such as Micro, Macro & Mon. Econ. , Econometrics and Math & Quantitative Methods (JEL codes C1 to E) that traditionally have been dominated by men (see Figure 1). The changes in the sex composition of these fields amount to 62% of the 8.2 p.p. reduction in the segregation index.

Table 3

Proportion of women in each field of interest and field size weight, by Ph.D. cohorts

(Individual weights: 1/number of fields)

	f_i = share of women in each field					α_i = field size weight				
	Total	Before 1976	1976-1985	1986-1995	1996-2005	Total	Before 1976	1976-1985	1986-1995	1996-2005
Total	14,4	4,9	10,7	18,0	23,5	100,0	100,0	100,0	100,0	100,0
A - General Economics and Teaching	0,2	0,4	-	0,0	0,0	0,2	0,5	0,0	0,1	0,1
B - Schools of Economic Thought and Method.	18,8	25,0	0,0	-	0,0	0,3	0,9	0,1	0,0	0,1
C1 - Mathematical and Quantitative Methods	9,9	0,0	9,4	6,3	21,6	7,2	4,4	8,2	7,2	8,5
C2-Econometrics	13,9	0,0	11,6	13,5	22,9	11,5	8,4	11,1	13,4	12,5
D - Microeconomics	12,7	2,6	7,9	11,0	23,5	12,6	9,1	14,1	13,3	13,6
E - Macroeconomics and Monetary Economics	14,6	6,1	8,3	18,3	21,7	11,2	10,9	10,0	11,3	12,1
F - International Economics	16,4	9,3	7,7	23,6	25,0	5,9	6,8	5,2	5,7	5,9
G - Financial Economics	10,8	2,8	4,8	20,0	14,8	5,3	4,3	5,8	5,9	5,3
H - Public Economics	15,6	3,3	14,0	23,8	21,9	6,0	7,0	6,7	4,4	5,8
I - Health, Education, and Welfare	23,8	5,6	20,8	38,9	35,1	3,8	4,2	3,3	4,3	3,3
J - Labor and Demographic Economics	19,6	9,5	9,8	23,9	28,2	9,1	10,0	7,7	8,5	10,0
K - Law and Economics	13,8	4,0	8,3	25,0	22,2	1,4	2,8	1,1	1,4	0,6
L - Industrial Organization	16,9	0,0	17,2	17,6	27,6	6,8	4,0	7,5	7,5	7,9
M -Business Economics	10,0	0,0	-	50,0	-	0,2	0,5	0,0	0,3	0,0
N - Economic History	17,3	5,9	40,0	15,4	42,9	2,6	5,4	2,5	1,7	1,2
O - Economic Development, Growth	16,4	5,6	15,7	17,9	28,6	6,9	8,0	6,8	7,2	5,7
P - Economic Systems	13,3	4,9	11,1	18,2	25,0	4,6	5,7	4,5	4,3	4,0
Q – Agricultural and Environmental Econ.	8,7	3,6	13,6	6,7	20,0	2,0	3,0	2,5	1,4	1,5
R - Urban, Rural, and Regional Economics	12,3	13,6	0,0	10,0	22,2	1,5	2,6	1,7	1,1	0,8
Z - Other Special Topics	5,7	0,0	0,0	12,5	16,7	1,1	1,5	1,1	0,9	1,0

Table 4
BSA Decomposition of changes in segregation

1996-2005/1986-1995			1986-1995/1976-1985			1976-1985/before 1976		
	Field			Field			Field	
Sex comp	weight	Total	Sex comp	weight	Total	Sex comp	weight	Total
-8.2	-2.5	-10.7	0.2	0.0	0,2	-7,5	-1.8	-9.3

4. Methodology and results

In order to test the hypotheses discussed in section 2, we use two alternative econometric approaches. The first one is based on cohorts and departments and does not take into account the distribution of researchers across fields. The second one, by contrast, focuses on individual choices of fields.

4.1 Cross-section estimation across departments

In the first approach, we start by analyzing the aggregate determinants of the gender composition first across departments, in a cross section regression, and next across departments and cohorts, using panel estimation. The idea of the cross-section estimation is to regress the share of faculty members in each department denoted by f_d with d=1, 2,.., 50, on relevant covariates related to the various hypotheses. These are the size of the department (*size*), its research quality (*qual*) -- proxied by the index provided by Econphd.net about the equivalent of great papers produced each department over the ten year period (1993-2003). Specifically the estimated regression is:

$$f_d=\beta_0+ \beta_1 * size + \beta_2 * qual+ \varepsilon_d \,, \qquad (2)$$

where the error term ε_d is assumed to be *i.i.d.* across departments. Since the dependent variable (f_d) lies between 0 and 1, we have used a Tobit regression model that allows for both left and right censoring, so that f_d is censored between 0 and 1. In this framework we abstract from H1 and H4, and therefore focus on H2 and H3. According to H2, the female share in each department should be positively related to the size of the department, and therefore the relevant null hypothesis is $\beta_1>0$. Alternatively, H3 predicts a negative relationship between the fraction of women and the quality of the departments. Hence the corresponding null is $\beta_2 <0$. Further, to test for possible differences between North-American and European institutions, we also included as an additional regressor in (2) a dummy variable (US-CAN), which takes a value of 1 for the departments in US and Canada, and 0 otherwise.

Column (1) in Table 5 reports the estimated coefficients of this regression. We find strongly significant positive and negative effects of the *size* and *quality* of the department, respectively, on the fraction of women in each department. The larger is the department, controlling for its quality, the lower is the fraction

of women, and the higher the quality of the research output of a department, for a given size, the lower is that proportion. Hence, both H2 and H3 receive some support from these cross-section results. As for the US-CAN dummy, we find an insignificantly positive coefficient (t-ratio=1.2) yielding somewhat weak evidence that the females shares are higher in North-America than in Europe.

4.2 Panel estimation across departments and cohorts

In order to get some evidence about H1 with this approach, we use a panel regression approach to model the fraction of female researchers across Ph.D. cohorts (4) and departments (50), again with the dependent variable being censored between 0 and 1. Since *size* and *qual* do not have cohort variation, the only variable which varies across both dimensions is the share of women of the previous cohort which work in a given department ($SW_{d,c-1}$). The model specification is then

$$f_{dc}=\beta_0+ \beta_1 * size_d + \beta_2 * qual_d+ \beta_3 * SW_{d,c-1} +\varepsilon_{dc} , \qquad (3)$$

where the error term ε_{dc} is again assumed to be i.i.d. Notice that the inclusion in (3) of $S_{d,c-1}$ allows us to test a slightly different version of H1 which we denote as *path dependence by gender*, instead of *path dependence by field*. Since the aggregate analysis so far does not yet consider variation across fields, this variant of H1 states that women prefer departments where other women have had previously a significant presence. In our case this last variable refers to their female researchers belonging to older Ph.D. cohorts who, therefore, are likely to have joined the department before their younger colleagues. Accordingly, the hypothesis of interest in this case is $\beta_3<0$.

Column (2) in Table 5 reports the estimates of model (3) which is estimated in a panel setting with random effects by maximum likelihood. As in the cross-section approach, the estimated coefficients on *size* and *qual* are significantly positive and negative, reinforcing our previous cross-section evidence in favour of H2 and H3. With regard to the estimated coefficient on the past share of women it turns out to be strongly significant and positive, yielding therefore support to the view that there is indeed gender path dependence in the way women apply to economics departments.

Table 5

Determinants of the proportion female members in Top 50 departments
Two-limit tobit regressions (censored at 0 and 1)

Variable	(1) f_d	(2) f_{dc}
Size	0.002***	0.005***
	(0.0007)	(0.0019)
Qual	-0.001***	-0.001*
	(0.0003)	(0.0006)
US-CAN	0.018	0.021
	(0.015)	(0.018)
$S_{d,c-1}$	-	0.567***
		(0.219)
Constant	0.079***	-.002
	(0.025)	(0.079)
No. Obs	50	143
Log likelihood	85.109	-22.091
Pseudo R2	0.1738	0.1543

(1) Tobit regressions, (2) Random-effects tobit regressions

Note: Asterisks denote level of significance: * 10%, ** 5%, *** 1%

Table 6

Determinants of the proportion female members in Top 50 departments by phd cohort
Two-limit tobit regressions (censored at 0 and 1)

	f_d (c=96-05)		f_d (c=86-95)		f_d (c=76-85)
Size	0.003*	-0.002	0.005***	0.005**	0.011 ***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)
Qual	-0.001	-0.001	-0.002**	-0.002***	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
US-CAN	0.012	0.059	0.149 **	0.153**	-0.139
	(0.070)	(0.068)	(0.062)	(0.075)	(0.108)
S_d (older cohorts)	0.273		0.709 ***		0.523***
	(0.403)	-	(0.269)	-	(0.069)
S_d (86-95)	-	-0.523***	-	-	
		(0.182)			
S_d (76-85)	-	0.571***	-	0.377**	-
		(0.171)		(0.165)	
S_d (before 1976)	-	0.245	-	0.367***	-
		(0.297)		(0.043)	
Constant	0.127	0.351***	-0.001	0.045	-0.223
	(0.114)	(0.108)	(0.094)	(0.113)	(0.189)
Observations	50	50	50	50	50
Pseudo R2	0.1993	0.2131	0.2082	0.2017	0.2732

Note: Asterisks denote level of significance: * 10%, ** 5%, *** 1%

We also investigate whether the panel regression results shown above remain unaltered when we allow for different coefficients across cohorts. To do this, in Table 6 we report the estimates obtained when regression model (3) is estimated separately for each cohort. In each panel we report two sets of estimates. The RHS ones correspond to the case where past cohorts are lumped together. So for example, the share S_d for the most recent Ph.D. cohort (1996-2005) represents the average fraction of women in a given department who belong to all the previous cohorts. In the LHS panels, by contrast, we allow for different slopes of each of the shares in the past cohorts, which in the example above would correspond to 1986-95, 1976-85 and before 1976. The results are very interesting since they provide similar evidence to that reported above in relation to H2, H3 and the variant discussed earlier of H1 for the two older cohorts. However, different results obtain for youngest cohort. For this group of young women economists, the coefficients on *size* and *qual*, although correctly signed, are not statistically significant and the coefficient on the share of women in the preceding cohort (1986-1995) is negative and significant, in stark contrast with the significantly positive effects obtained for the other two older cohorts. Thus, there seems to be a break in the path dependence by gender for younger women economists, which somewhat supports the conclusion of H4 about the decline in gender segregation which has been discussed in section 3.3.

4.3 Probit estimation of individual field choices

In this section we report evidence about the modeling of the probability that an individual chooses a given field. The most natural framework would be a multinomial logit. However, since we have more that one field per individual, this is not possible. For this reason, we estimate probit models for each field separately, where the dependent variable is the probability that an individual chooses a given field. All Ph.D. cohorts have been pooled in each probit model and we report three different specifications for each field. In specification (a) the covariates are: a gender dummy (female=1); the research quality scores of the field in the current department to which the individual belongs and that in the department where he/she completed the Ph.D.; and the fraction of male and female researchers in the current department who work in that field, to capture the degree of specialization of the faculty. In this regression, as well as in the other specifications discussed below, a constant term and cohort dummies have also been included.

The first row of Table 7 reports specification (a). The variable capturing the proportion of faculty members in a given field appears always highly significant, indicating that, for any field, the stronger is the department in a given discipline the higher is the probability that an individual will chose that field. The coefficient on the gender dummy points out a larger propensity of women to choose fields such as Economic History, Health, Education and Welfare , I.O., and Labor Economics, and a lower propensity to choose Econometrics, Microeconomics and , Financial Economics, in line with results the results about the allocation of women across fields discussed in section 3.1 The coefficients on the quality of the departments of destination and origin are only strongly significant and positive for Econometrics, Health , Labour and Macro.

In specifications (b) and (c), we seek to test H1 by adding to the above-mentioned set of explanatory variables the fraction of women working in a given field at a given department and its interaction with the female gender dummy. If the coefficient on this interaction term is positive, this will be an indication that women care more than men about the share of women in the specific, in line with the path dependence hypothesis. The share of women in the same cohort in included in specification (b) whilst the corresponding share for the previous cohorts appears in specification (c). For this reason, the sample used in this last specification only includes individuals who have completed their thesis after 1985.

As can be observed, there is strong evidence of path dependence in all cases, although it is stronger when considering the fraction of women in the same cohort.

Table 7.
Determinants of fields
Probit regressions

Equation	Gender	Field - Qual. Current Departm.	Field - Qual. Phd Departm.	Proportion of faculty members in field i	(Proportion of women in field i, same cohort) x (female) (field i)	(Proportion of women in field i, older cohort) x (female) (field i)
Econ..History						
(a)	0,156***	-0,018	0,021	4,562***		
	(0,037)	(0,019)	(0,016)	(0,681)		
(b)	0,170***	-0,091**	0,020	3,785***	2,328***	
	(0,070)	(0,041)	(0,026)	(1,230)	(0,530)	
(c)	0,152***	-0,110***	0,035	5,105***	2,176***	1,544*
	(0,062)	(0,043)	(0,029)	(1,488)	(0,620)	(1,021)
Econometrics						
(a)	-0,135*	0,003***	0,015***	3,923***		
	(0,093)	(0,006)	(0,005)	(0,601)		
(b)	-0,123**	-0,019**	0,024***	4,084***	2,315***	
	(0,084)	(0,008)	(0,007)	(0,914)	(0,477)	
(c)	-0,143**	-0,021**	0,025***	3,978***	3,147***	2,285**
	(0,082)	(0,009)	(0,007)	(1,058)	(0,681)	(0,788)
Micro/Theory						
(a)	-0,242**	-0,001	0,009	2,893***		
	(0,104)	(0,006)	(0,006)	(0,315)		
(b)	-0,520*	-0,001	0,016	2,892***	3,001***	
	(0,320)	(0,008)	(0,008)	(0,439)	(0,520)	
(c)	-0,831*	-0,001	0,013	2,771***	3,268***	2,127**
	(0,490)	(0,009)	(0,009)	(0,460)	(0,589)	(1,003)
Macro						
(a)	-0,036	-0,002	0,012	3,215***		
	(0,117)	(0,012)	(0,011)	(0,639)		
(b)	-0,727	-0,009	0,035**	2,674***	4,521***	
	(0,388)	(0,017)	(0,017)	(0,948)	(0,814)	
(c)	-0,551	-0,006	0,041**	3,335***	5,244***	1,316*
	(0,578)	(0,019)	(0,019)	(1,025)	(1,028)	(0,856)
Int. Econ.						
(a)	0,088	-0,001	0,003	5,523***		
	(0,133)	(0,019)	(0,018)	(1,085)		
(b)	-0,368	-0,016	0,024	6,615***	2,306***	
	(0,424)	(0,033)	(0,025)	(1,722)	(0,621)	
(c)	0,699	-0,033	0,028	6,849***	2,477***	1,285**
	(0,648)	(0,051)	(0,029)	(2,043)	(0,774)	(0,639)

Table 7 (bis)
Determinants of fields
Probit regressions

Equation	Gender	Field - Qual. Current Departm.	Field - Qual. Phd Departm.	Proportion of faculty members in field i	(Proportion of women in field i, same cohort) x (female) (field i)	(Proportion of women in field i, older cohort) x (female) (field i)
Public						
(a)	0,207*	-0,004	0,003	4,206***		
	(0,112)	(0,010)	(0,009)	(0,808)		
(b)	0,199	-0,018	-0,007	2,666**	2,118***	
	(0,318)	(0,018)	(0,014)	(1,264)	(0,506)	
(c)	0,309	-0,010	0,016	2,637*	1,807***	1.689*
	(0,392)	(0,022)	(0,019)	(1,586)	(0,555)	(1,010)
Health, Ed. & Welfare						
(a)	0,213***	-0,004***	0,015***	7,242***		
	(0,063)	(0,010)	(0,008)	(1,230)		
(b)	0,166***	0,039*	0,014	6,933***	1,966***	
	(0,065)	(0,024)	(0,013)	(2,726)	(0,483)	
(c)	0,266***	0,045	0,037**	12,410***	2,521***	2,241***
	(0,101)	(0,031)	(0,019)	(4,350)	(0,787)	(0,632)
Labor Econ.						
(a)	0,146***	-0,004	0,013*	3,711***		
	(0,051)	(0,010)	(0,008)	(0,607)		
(b)	0,308**	-0,016	0,020*	2,443***	1,926***	
	(0,153)	(0,016)	(0,012)	(0,903)	(0,371)	
(c)	0,251***	-0,007	0,017	2,472***	1,967***	1.670***
	(0,120)	(0,018)	(0,014)	(0,989)	(0,418)	(0,428)
I.O.						
(a)	0,221***	-0,001	0,016**	4,198***		
	(0,047)	(0,007)	(0,007)	(0,561)		
(b)	0,312***	0,001	0,011***	2,713***	1,920***	
	(0,067)	(0,011)	(0,010)	(0,933)	(0,411)	
(c)	0,271***	0,003	0,006	1,832	3,016***	2.604***
	(0,059)	(0,013)	(0,013)	(1,377)	(0,817)	(0,955)
Dev/ Growth						
(a)	-0,39***	-0,006	0,009	4,300***		
	(0,157)	(0,009)	(0,008)	(0,596)		
(b)	-0,317	0,005	0,013	2,343**	1,407***	
	(0,494)	(0,015)	(0,012)	(0,973)	(0,384)	
(c)	-0,538	0,021	-0,039*	0,242	2,482**	2,369**
	(0,671)	(0,030)	(0,023)	(2,888)	(1,066)	(1,428)

5. Conclusions

[TO BE COMPLETED]

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Appendix

* The ten fields chosen here correspond to the following aggregations of JEL codes:
Econometrics: C1 to C5, and C8,
Micro/ Theory: C0, C6, C7, C9 and D
Macro: E
International: F
Public: H
Labor: J
I/O: L
Dev/ Growth: O
Econ. History: B and N
Other: A (General Economics and Teaching), G (Financial Economics), I (Health, Education and Welfare), K (Law and Economics), M (Business Economics), Q (Agricultural Economics), R (Urban and Regional Economics), and Z (Other Special Topics)

* The twenty fields correspond to the 19 main descriptors in JEL, where descriptor C has been disaggregated into C(1) (Mathematical and Quantitative Methods, and Game Theory) and C(2) (Econometrics, Programming and Data Collection)

List of Top 50 academic institutions (Econphd.net)
(1) Harvard University, (2) University of Chicago, (3) Massachussetts Institute of Technology, (4) University of California Berkeley, (5) Princeton University, (6) Stanford University, (7) Northwestern University, (8) University of Pennsylvania, (9) Yale University, (10) New York University, (11) University of

California Los Angeles, (12) London School of Economics, (13) Columbia University, (14) University of Wisconsin-Madison, (15) Cornell University, (16) University of Michigan at Ann Arbor, (17) University of Maryland-College Park, (18) Université Toulouse I Sciences Sociales, (19). University of Texas at Austin, (20) University of British Columbia, (21) University of California San Diego, (22) University of Rochester, (23) Ohio State University, (24) Univesiteit van Tilburg, (25) University of Illinois-Urbana Campaign, (26) Boston University, (27) Brown University, (28) University of California Davis, (29) University of Minnesota, (30) Tel Aviv University, (31) Oxford University, (32) University of Southern California, (33) Michigan State University, (34) University of Warwick, (35) Duke University, (36) University of Toronto, (37) Universiteit van Amsterdam, (38) Pennsylvania State University, (39) Cambridge University, (40) Carnegie Mellon University, (41) University of North Carolina at Chapel Hill, (42) Boston College, (43) California Institute of Technology, (44) Texas A&M University, (45) European University Institute, (46) Universidad Carlos III de Madrid, (47) University College London, (48) University of Essex, (49) Indiana University, (50) Hebrew University.