DISCUSSION PAPER SERIES

IZA DP No. 1859

Do Men and Women-Economists Choose the Same Research Fields? Evidence from Top-50 Departments

Juan J. Dolado
Florentino Felgueroso
Miguel Almunia

November 2005

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

Do Men and Women-Economists Choose the Same Research Fields? Evidence from Top-50 Departments

Juan J. Dolado
Universidad Carlos III de Madrid, CEPR and IZA Bonn

Florentino Felgueroso
Universidad de Oviedo and CEPR

Miguel Almunia
Universidad Carlos III de Madrid

Discussion Paper No. 1859
November 2005

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
Email: iza@iza.org

IZA Discussion Paper No. 1859
November 2005

ABSTRACT

Do Men and Women-Economists Choose the Same Research Fields? Evidence from Top-50 Departments*

This paper describes the gender distribution of research fields chosen by the faculty members in the top fifty Economics departments, according to the rankings available on the Econphd.net website. 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 to 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 sizes of the department and field, while it decreases with their average quality. However, these patterns seem to be changing for younger female faculty members. 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: men and women-economists, research fields, gender segregation, path-dependence, tobit and probit models

Corresponding author:

Juan José Dolado
Department of Economics
Universidad Carlos III de Madrid
C./ Madrid, 126
28903 Getafe (Madrid)
Spain
Email: dolado@eco.uc3m.es

* We are grateful to Manuel Arellano for his insightful suggestions and to seminar participants at the 2005 CEPR-IZA *European Summer Symposium in Labor Economics* (ESSLE), CEMFI and FEDEA for useful comments. Many thanks also to Galina Hale for letting us know about her related and independent work. Sandro Diez-Amigo provided excellent research assistance. Financial support from the European Commission under the project *The Economics of Education and Education Policy in Europe* (MRTN-CT-2003-50496) is gratefully acknowledged.

"In the 1960s and 1970s a large fraction of (the relatively small representation of) female economists chose "women´s topics- female labor supply behavior, gender discrimination, economics of the family, etc. The fraction is smaller today, but such topics are still disproportionate among new female Ph.D.s" [**Daniel S. Hamermesh, 2005**]

1. Introduction

It has been widely documented that gender differences exist in the career paths of academics in most disciplines, including economics (see, e.g., Kahn, 1995). Despite women´s progress in academia, the academic job ladder in general is predominantly male-dominated. Some people may argue that this evidence corroborates the perception that there might be "glass ceilings" limiting female advances to the highest managerial and professional jobs. This opinion has been rationalized by several explanations: (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 the plausibility of these explanations differs 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 gradually overcome by empirical studies which use new micro-data sets containing detailed socio-economic characteristics of men and women in high-profile jobs.[1] Our paper aims at contributing to this literature by focusing on a novel topic: whether there are significant gender differences in the choice of research fields by economists working in distinguished departments.

As regards economics, 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) has generated a large number of studies, particularly in the US, on how the prospects of females academic economists

[1] 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.

have evolved over the last two decades, in parallel with women making great inroads in the economics profession.[2] The issues of women´s entry in graduate programs, their rate of success in completing Ph.D.s, 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.[3]

However, to the best of our knowledge, much less interest has arisen on 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 field 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 about this topic that we are aware of is Hale (2005). In this study, three waves (1983, 1993 and 2003) of a database of members of the AEA in ten of the top economics departments in the US are used to address the central question of whether there is path-dependence in the way women choose their fields. The basic finding is that there is favorable evidence about this phenomenon: 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 stresses the importance of efforts to increase gender diversity in fields where they are under-represented.

Our paper aims at extending this evidence in several ways. First, we have assembled a much larger database of faculty members of distinguished economics departments than Hale (2005). For that, we have used the list of rankings recently made available on the Econphd.net website

[2] More recently, similar initiatives have been launched by other well-known academic societies like the European Economic Association and the Royal Economic Society.

[3] See, e.g., Hansen (1991), Kahn (1993, 1995), Blank (1996), McDowell, Singel and Ziliak (1999), Booth, Burton and Mumford (2000), Ginther and Kahn (2004), and the references therein.

(www.econphd.net).[4] These rankings are among the most substantial in scope. Economics departments are ranked in an overall classification *(All Economics*) and in several sub-fields 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 in Kalaitzidakis, Mamuneas and Stengos (2003). 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.[5] 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 on a range of personal and departmental characteristics which again extend the ones used in Hale (2005). Thirdly, by including some of the top European departments in our sample, we extend the previous evidence based exclusively on U.S. departments. Finally, and most importantly, we extend the set of hypothesis that can be tested in order to explain female field choices. For that, we claim that women´s under-representation in certain areas of economics cannot be explained by conventional theories either based upon self-selection or discrimination. Instead, we speculate that a fruitful route to pursue is that based on recent experimental evidence about gender differences in performance in highly competitive environments. Women dislike competing with men in mixed-sex groups and, hence, perform better when they compete among themselves. This evidence leads to the path-dependence hypothesis analyzed by Hale (2005) but also to other interesting hypotheses related to the size and quality of fields and departments where they work, and to the evolution over time of gender segregation by field.

Our main findings can be summarized as follows. We confirm Hale ´s (2005) result that there is path dependence in women´s choices of fields, although this effect seems to be much weaker for those women-economists who graduated in

[4] Launched in 2003, Econphd.net is now one of the best-known non-department websites in Economics. It is run at the University of Melbourne, Dept. of Economics, and the Economic Theory Centre

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

the 1996-2005 decade. Further, we show that the share of women in a field at a given department increases with the size of the department and decreases with its average quality. Similar results hold when we deal directly with the quality of fields. Again, these patterns seem to be changing for the younger cohorts. Finally, we document how gender segregation by field has decreased over time, mainly due to the rise of the share of women in some fields where they were previously under-represented rather than to changes in the weights of certain fields.

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 the one surrounding research activities, 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 areas of specialization; it also analyzes how gender segregation by field has evolved over time. Section 4 presents some econometric evidence based on our dataset about the previous implications. Finally, Section 5 concludes. An Appendix with five sections offers a detailed description of the data.

2. Theories about the field choices of women-economists

There is an ample empirical literature showing that large gender differences prevail in competitive high-ranking positions, especially in terms of earnings gaps (see, e.g. Blau and Kahn, 2000 and Albrecht, Bjorklund and Vroman, 2003). Moreover, as discussed earlier, in parallel with this line of research there has been a new stream of studies documenting 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 assimilated to this kind of occupations, which require large human capital investments, the latter literature turns out to be the most relevant for this paper. The fact that women are under-represented in high-profile jobs has been rationalized by a number of theories which can be broadly classified into three categories.

The first two explanations are quite well known. The first one 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 (e.g., due to maternity leaves or some other family-care related issues) hampers their access and 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, an alternative rationalization about the under-representation of women in high-skilled occupations has been proposed (see, Gneezy, Niederle and Rustichini, 2003 and 2004, and Babcok and Laschever, 2003) which we believe is more plausible in the specific environment we analyze. It 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 certain competitive environments. Thus, the existence of *gender differences in competition* (GDC henceforth) may limit the chances of success for women when they compete with men for new jobs, promotions, research, etc.

Inspired by this type of literature, Gneezy, Niederle and Rustichini (2003) use controlled experiments to obtain a precise measure of performance which excludes self-selection, discrimination or expectation of discrimination in the environment, namely, the features which characterize the other two theories earlier discussed. Their experimental evidence confirms the previous conjecture about men and women differing in their ability or propensity to perform in competitive environments. Specifically, while there are no significant differences in their performances 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, it is also found that women have a higher chance of developing their skills and interests when

shielded from competition with men. That is, the performance of women also increases relatively to noncompetitive setups when they compete only against women in single sex groups. By contrast, they under-perform in mixed groups with men. Men ´s performance, on the other hand, does not significantly change between both types of group tournaments. Hence, the main conclusion to be drawn from these studies 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 successful in 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 view, the results of the above-mentioned experiments could be adapted to interpret gender differences in the choice of research topics. 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 subject to a much lower degree of competition. Consequently, the two conventional explanations are likely to be less plausible than GDC in our framework. In a strong academic environment, like the one prevailing in our sample of top departments, research excellence is a predominant characteristic. Both the allocation of faculty positions in prestigious departments and the promotion to tenured professorships on the basis of publications are rewards which take place in tournament-type environments, through highly competitive selection processes. In effect, only the best researchers, backed by excellent scores, get access to these top academic 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 a paper in a more mature field, even when both appear in the same journals. 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 direct prediction of the GDC theory would be that women-researchers would choose fields in which there are 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): *Under GDC, 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, we speculate that the results in Gneezy et al. (2003) could also be interpreted to draw three interesting additional implications of GDC that could 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 also 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 more likely that its researchers specialize in a few topics with high returns; otherwise, the department would not have reached its current prestigious status. Therefore, initially, one should expect women to prefer working in large top departments, where they can choose fields with lower competition, than in small top departments where specialization leads to a fiercer competition with men. In principle, this argument implies that researchers can choose the departments where they work, which is an arguable assumption. However, a similar reasoning for the relationship between the share of women in a field and the size and quality of this field could be applied, and this is less debatable. A larger field means that there are more subfields where women can accommodate without directly competing with men. Likewise, a higher-quality field is bound to be dominated by men and women will avoid it. Accordingly, the following two hypotheses could be further considered:

Hypothesis 2 (H2): *Under GDC, 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 department. A similar relationship should hold between the share of women in a field and the size of the field.*

Hypothesis 3 (H3): *Under GDC, 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. A similar relationship should hold between the share of women in a field and the size of the field.

Notice, however, that the conjecture underlying H2 and H3 is bound to be more relevant for determining the field choices of the older female Ph.D. cohorts than for the corresponding 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", leading to decreasing returns over time in doing research about them. Since the basic prediction of GDC is that women prefer to compete in single-sex groups, in order to compete for positions with older female colleagues in a given department or field, younger female researchers may prefer to work in alternative more novel fields, which typically enjoy higher rewards than those chosen by their female predecessors. Thus, this phenomenon would imply larger gender diversity across fields, leading to the following additional hypothesis:

Hypothesis 4 (H4): *Gender segregation by field should decrease over time.*

3. Data

Data are 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 (see Appendix A). In this fashion, we extracted information on 1876 individuals out of which 284 are women (i.e, a share of 15.1%). Using JEL codes, fields were assigned based on the basis of the main bodies of published research and, in many instances, on self-reported information about main areas of interest. For some of the analysis, following Hale (2005), we grouped the disaggregate JEL codes in 10 main fields, with the tenth one capturing "other fields" ("Other" in short).[6] In some other instances, however, where less aggregation is more convenient,

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

we used finer lists of either 20 or 34 fields on which Econphd.net gives information about the quality of publications (see Appendix B for the aggregation procedures). At this stage, it is important to stress that, in most instances, either researchers report more than one area of specialization or their publications fall into several fields. Interestingly, on average, men and women report almost identically two fields of research (male avg. =1.88, female avg. =1.86). Hence, in the sequel, we will refer to this count as researcher-fields (in short "Rfs."), 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 10 fields considered in the coarser aggregation. Overall, our sample comprises 3666 Rfs. out of which 562 correspond to female Rfs. This yields a share of 15.3% (=562/3666) i.e., a very close percentage to the 15.1% obtained when individuals (=284/1876) rather than Rfs. are considered.

Table 1

Gender distribution by field

Field	(1) Number of Rfs.	(2) Distribution of Rfs. (%)		(3) % of Females (un-weighted)	
		Un-weighted	Weighted	Un-weighted	Weighted
1 Econometrics	393	10.7	11.7	12.7	12.6
2. Micro/Theory	629	17.2	19.0	12.0	12.3
3. Macro	422	11.5	11.3	15.2	14.4
4. International	239	6.5	5.9	16.7	16.8
5. Public Econ.	366	10.0	9.6	19.1	20.1
6. Labor	338	9.2	9.4	20.4	20.2
7. I.O.	299	8.2	7.6	17.4	18.1
8. Growth/Dev.	285	7.8	6.9	16.8	18.5
9. Economic History	103	2.8	3.0	17.5	15.1
10. Other	592	16.1	15.6	12.3	11.4
Total	**3666**	**100.0**	**100.0**	**15.3**	**15.1**

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. in a given field.[7] Thus, for example, Micro/Theory (17.2%),

[7] Since Rfs. are used as unit of measurement, the distributions can be either computed giving each Rf. observation the same weight (un-weighted) or alternatively weighting the observation

followed by "Other" (16.1%) and, at some distance, by Macro (11.5%) and Econometrics (10.7%), are the highest populated fields, whilst International (6.5%) and Economic History (2.80%) are the least populated. 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 (20.4%), Public Economics (19.1%) and Economic History (16.5%), whilst the three categories with the lowest share are Micro/Theory (12.0%), "Other" (12.3%), and Econometrics (12.7%).

In Table 2, we document the fraction of women with tenure (Full and Associate professorships are lumped together in this category) across fields. Overall, there are 1327 tenured faculty members (2581 Rfs.), which represent 70.7% of the 1876 individuals in the sample. By category, there are 1059 full professors, 268 associate professors and 549 assistant professors where women represent 8.3%, 20.5% and 25.7%, respectively. The overall number of tenured women is 143, i.e., a 10.7% of the sample. This fraction could be compared to the proportion that women represent among those students completing a Ph.D. degree in Economics, which in the U.S. was approximately 27% in 2002 (see CSWEP, 2004).

Table 2

Tenure distribution by gender

Field	(1) Number of Tenured Profs.	(2) Distribution of Tenured Profs.	(3) Prob. of tenure (all)	(4) Male - Prob. of tenure.	(5) Female - Prob. of tenure
Econometrics.	270	10.5	68.7	73.9	37.5
Micro/Theory	438	17.0	69.6	73.7	42.7
Macro	276	10.7	65.4	69.3	43.8
International	170	6.6	71.1	76.4	45.0
Public	265	10.3	72.4	75.7	58.6
Labor	233	9.0	68.9	73.6	50.7
I.O.	207	8.0	69.2	73.3	50.0
Dev/ Growth	210	8.1	73.7	77.2	56.3
Econ. History	80	3.1	77.7	80.0	66.7
Other	432	16.7	73.0	75.9	52.1
Total	**2581**	**100.0**	**70.4**	**74.3**	**49.1**

by the factor (1/# fields chosen by the researcher) (weighted). The ones in Tables 1 and 2 are un-weighted.

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 (2581) is larger than the number of tenured professors (1327) since, as mentioned before, faculty members have, on average, 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. 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 0.70 with small variability across fields. The field with the highest probability of getting tenure is Economic History (0.78) whilst the ones with the lowest probabilities are Macro and Econometrics, with probabilities 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 0.74. For a male researcher, Economic History (0.80) is again the field with the highest probability of getting tenure, whereas Macro is the one with the lowest probability (0.69). Lastly, Column (5) offers the corresponding probabilities for women. Their average promotion probability, 0.49, is about two-thirds of the one reported above for their male colleagues. Once more, Economic History (0.67) turns out to be the field with the highest probability of tenure, and Micro/Theory (0.43) and Econometrics (0.37) are the ones with lowest probabilities.

For comparative purposes with the 10-field aggregation procedure used in the previous two Tables, Figures 1a and b plot the proportion of women across fields, using more detailed lists of 20 and 34 fields, respectively. Again, the units of measurement are Rfs. As can be inspected, the distribution of the fraction of women with these finer classifications is fairly similar to that presented in column (3) of Table 1. According to Figure 1a (20 fields), 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 fractions (below 10%). Figure 1b (34 fields) offers a more detailed distribution where Wages and Inequality (including Gender Discrimination), Education, Health

and Demographics, Labor, and Social Choice and Public Goods, are the fields where women are more present whilst Mathematical Economics, Fluctuations and Business Cycles and Agricultural Economics are the ones where they are less present.

Figure 1a

Proportion of women in each field (20 fields)

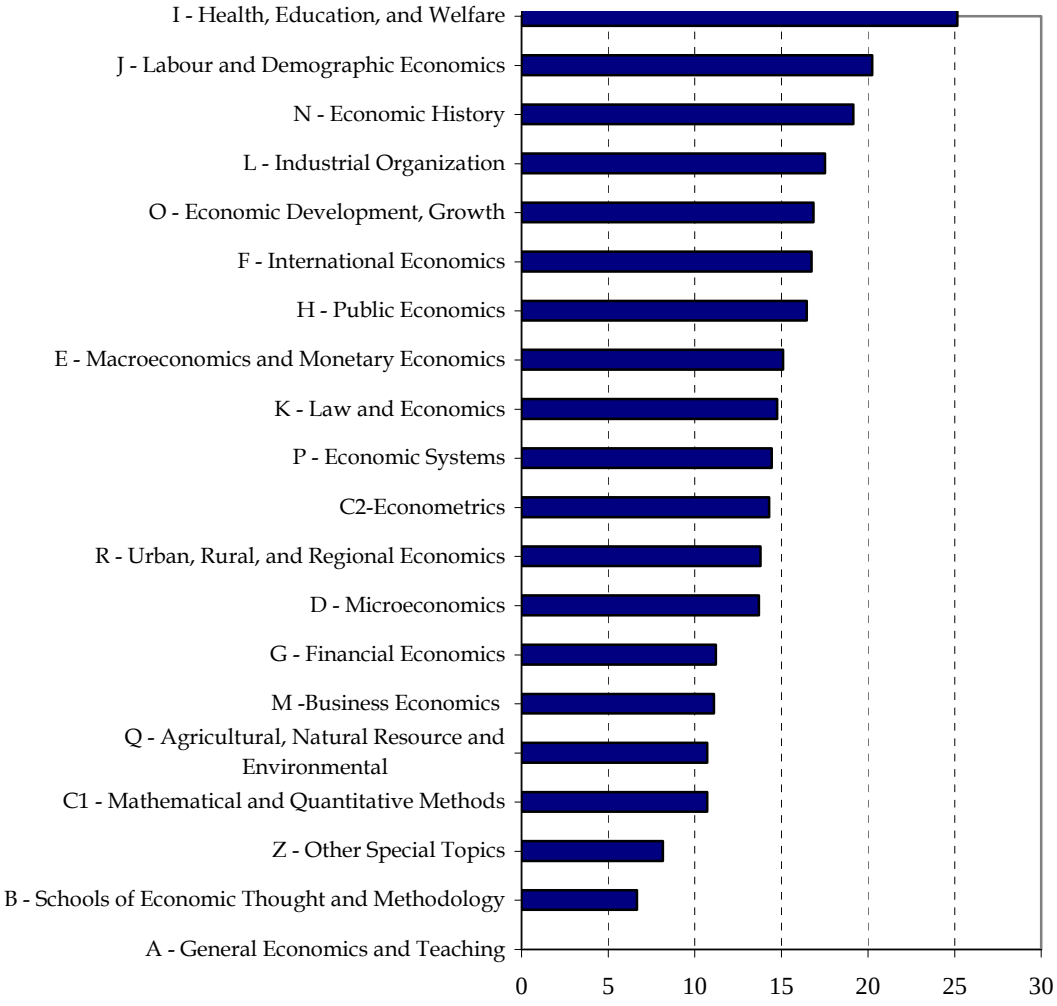
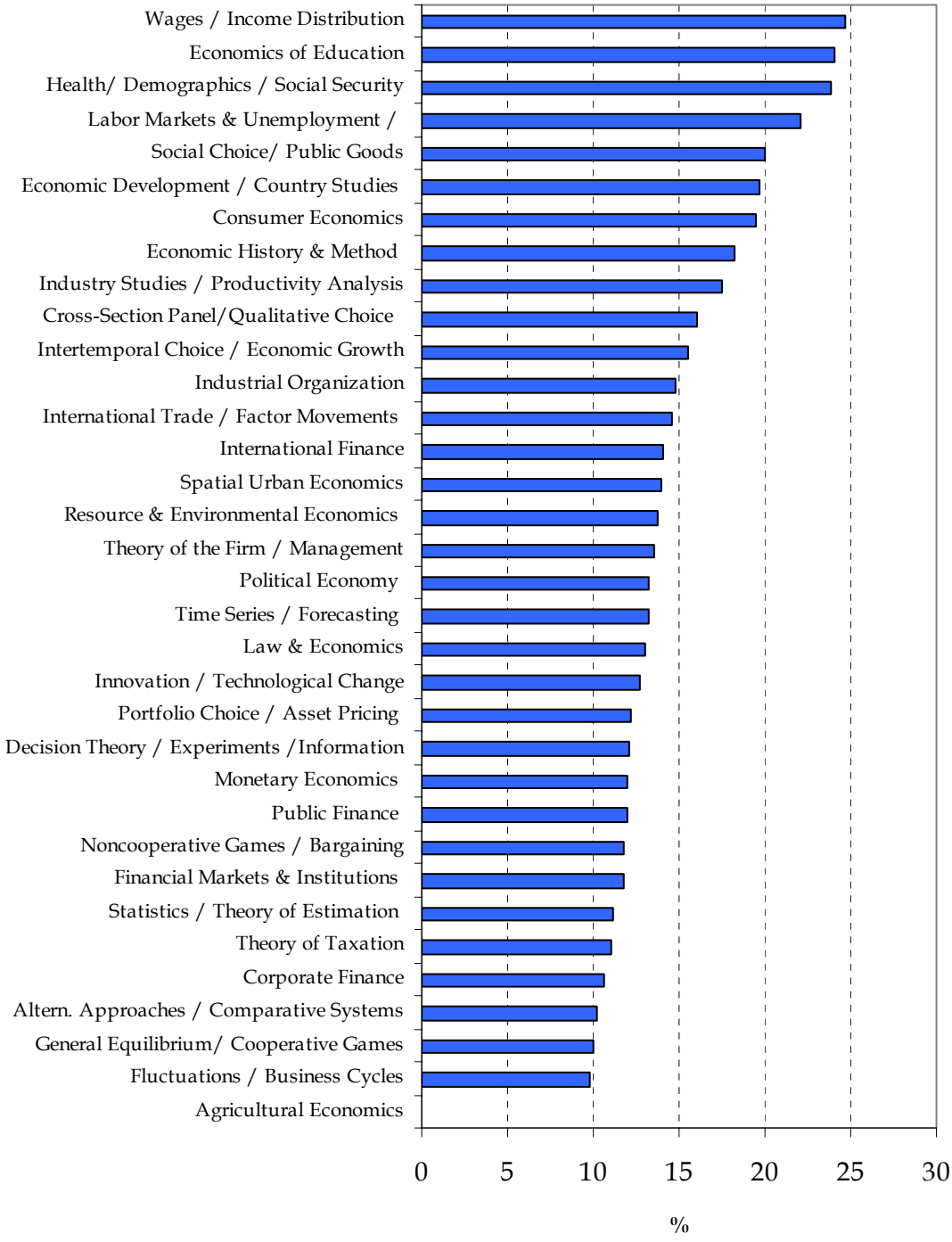


Figure 1b

Proportion of women in each field (34 fields)



3.2 Ph.D. cohorts

In this section, we analyze the distribution of the Top 50 Departments by gender and age. The issues we wish to address are whether younger female generations are joining these departments at a higher rate than their older

colleagues, and in general how the different accession rates have evolved over time. Since a sizeable proportion of researchers do not report date of birth on their web pages, we use the year of completion of their Ph.D. dissertations as a proxy for age. Thus, Ph.D. cohorts are used in the sequel, where the corresponding cohorts are either defined in terms of five half-decade spells in some cases or four decade spells in others.

Figure 2 shows the current distribution of faculty members by Ph.D. cohorts, namely, the proportion that faculty members who graduated in a given cohort represent of the current size of the departments (as of 2005). Thus, for example, more than 25% of women-economists in these departments graduated in the last cohort (2001-2005) while less than 2% did in the cohort 1971-1975. There is a clear rise in the participation of women in the younger cohorts. By contrast, the distribution for men exhibits a much flatter slope, with a slight increase from 6% to less than 15%. Thus, young women-economists are entering these distinguished departments at a much higher rate than their older colleagues. Figure 3, in turn, displays the fraction of women in each at the time of graduation. It shows that almost 70% of women in our sample have completed their thesis after 1990. This implies that female graduates make a growing share of the supply of young researchers recruited by economics departments in the academic job market.

Figure 4 depicts the evolution of the quality of fields over different cohorts, by gender and tenured/ non-tenured positions. This time four decade-cohorts are used in the horizontal axis. Tenured male professors choose fields with higher quality which exhibits a monotonic rise across cohorts. Non-tenured male professors choose fields of lower quality although there is a steep rise between the second and third cohorts. Female tenured professors do not differ much in their choices from the latter, except for the younger cohort where quality experiences a large reduction. Interestingly, young non-tenured women´s fields exhibit a much higher quality than those chosen by their tenured colleagues. In line with H4, a possible interpretation of this phenomenon is that, in order to seek promotion to tenure, they choose more competitive fields than their female predecessors - indeed of almost the same quality as the younger cohort of non-tenured male professors.

Figure 2

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

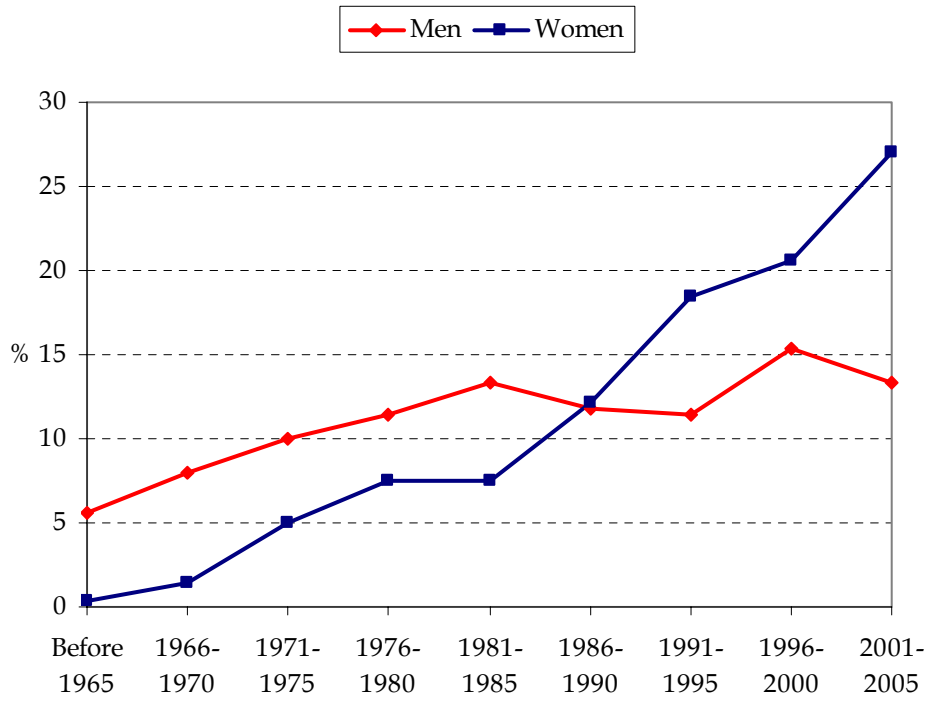


Figure 3

Proportion of female members for each Ph.D. cohort

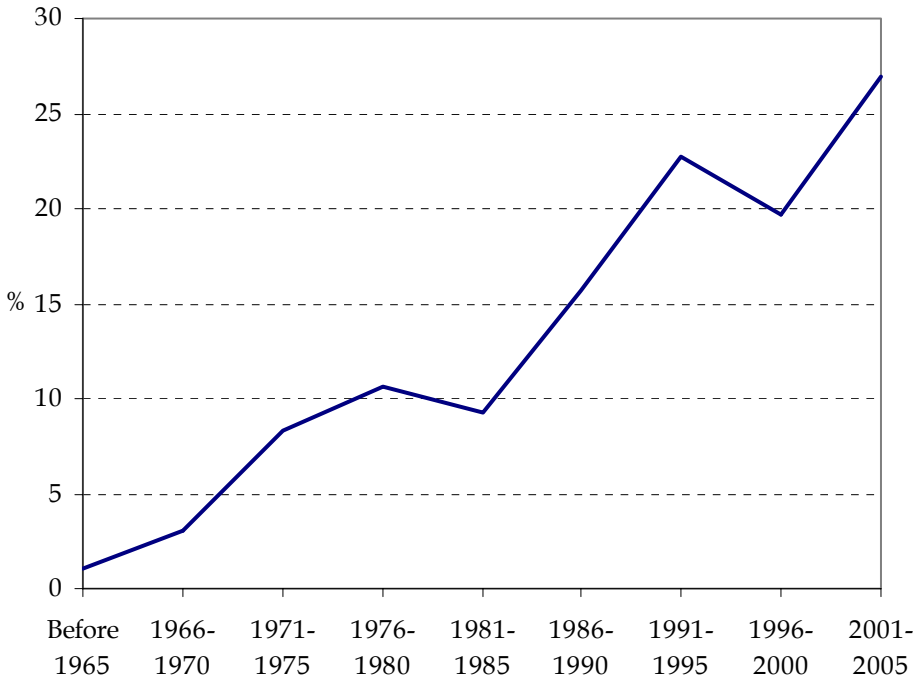
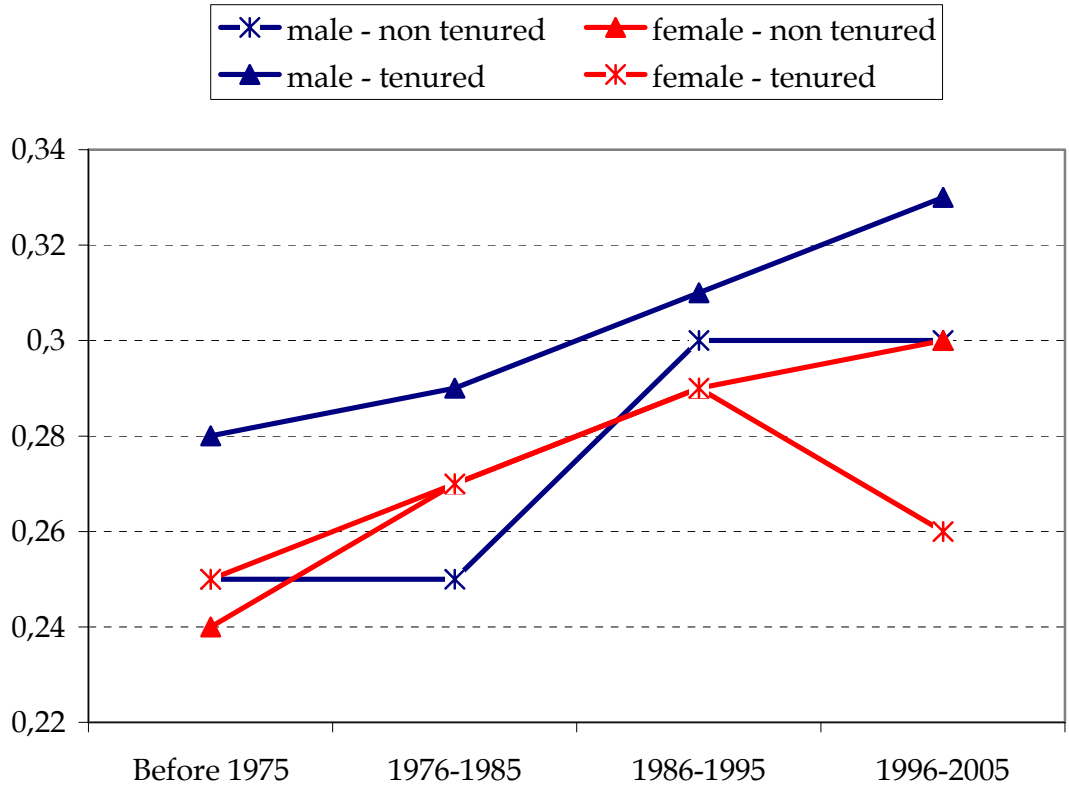


Figure 4

Field Quality by gender, Ph.D. cohort and tenure/non-tenure



3.3 Gender Segregation by field

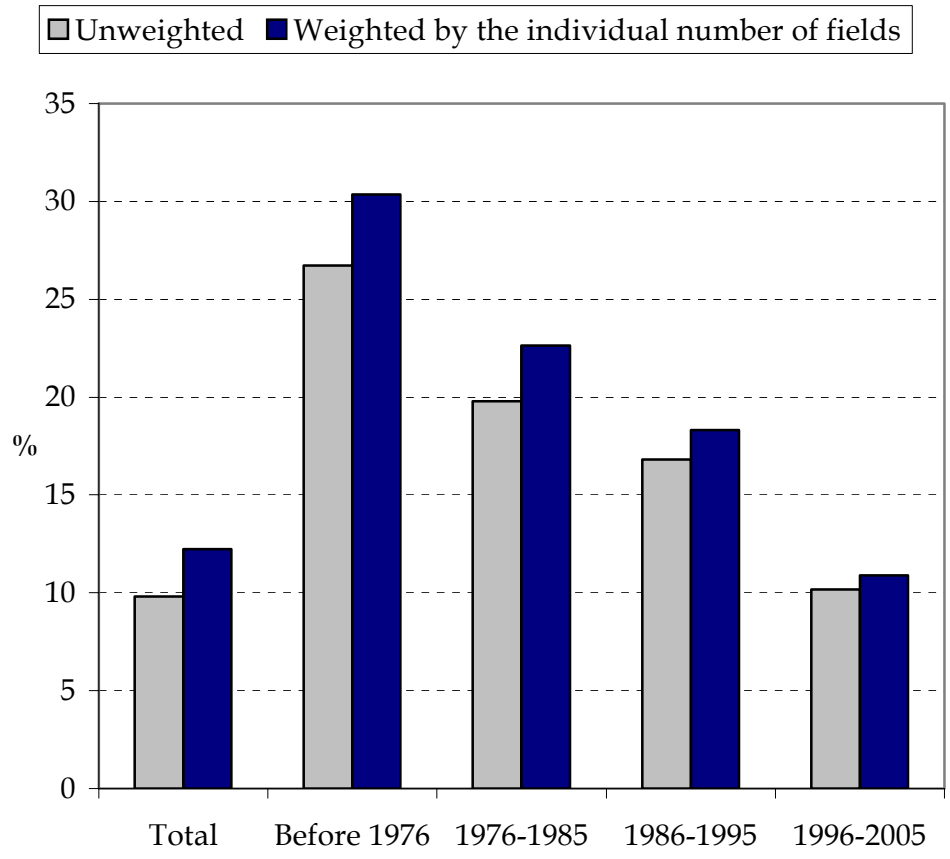
In the previous sections we have presented descriptive evidence documenting the advance of women faculty in the top 50 departments and how this steady advance has experienced a rapid acceleration since the 1990s. In order make a deeper analysis about the determinants of these changes, we provide in this section some new evidence about the evolution of segregation by gender in the different fields. To do so, we use again the four decade-cohorts.

Preliminary evidence on this issue can be obtained by computing the well-known Duncan and Duncan (1955) segregation index (DDS index, henceforth) across the different fields by cohort.[8] Figure 5 depicts the evolution of the DDS

[8] The DDS index is defined as $S_c = 0.5\Sigma_i \left| m_{ic} - f_{ic} \right|$, where m_{ic} (f_{ic}) is the proportion of male (female) faculty members in field *i* for Ph.D. cohort *c*. This index, expressed as a percentage, can

index for the 20-fields classification, computed both in its un-weighted (in grey bars) and weighted (in black bars) versions, for the overall sample (Total bars) and for each of the four Ph.D. decade-cohorts.

Figure 5
Segregation index by Ph.D. cohort



As can be inspected, the same picture appears in either version of the DDS index: gender segregation by field has experienced a fairly steady reduction over time. Notice, however, that the fall in segregation with respect to the previous cohort is stronger for those researchers who graduated in the cohorts 1976-1985 and 1996-2005. While for each of these two cohorts segregation fell by almost 7 percentage points, it only decreased fell by 3.5 p.p. for the intermediate 1986-1995 cohort. Both features are somewhat consistent with the evidence presented in Figures 2 and 3 where the early 1990s was the only period in the

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.

sample where the steady rise in the shares of women completing a Ph.D. and/or becoming a faculty member experienced a slowdown. Hence, this preliminary evidence provides again some support in favor of H4, namely that younger female cohorts experience lower segregation by field than older cohorts, a hypothesis which will be further examined in section 4 below.

When all cohorts are pooled, the value of the overall DDS index is in the range 10-13%, depending on whether observations are weighted or not. 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 academic labor market, this lower value yields some support to the view that the highly competitive environment in which academic research activities operate leads to a much lower degree of segregation in these jobs than in alternative skilled 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. 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 DD 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 $p_{ic} = F_{ic} / (M_{ic+} F_{ic})$ and $q_{ic} = M_{ic} / (M_{ic+} F_{ic})$, 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 DD index for cohort c can be expressed as

$$S_c = 0.5\Sigma_i \left| (q_{ic}\,\alpha_{ic}/\,\Sigma q_{ic}\,\alpha_{ic}) - (\,p_{ic}\,\alpha_{ic}\,/\,\Sigma p_{ic}\,\alpha_{ic}) \right|.$$

Let Scc´ denote the segregation index computed with female and male shares corresponding to cohort *c* and field weights corresponding to cohort *c´*. Then, using the notation c, c´=0, 1, where "1" denotes the younger Ph.D. cohort and "0" the older cohort, the difference between S_1 and S_0 (or S_{11} and S_{00} with this new notation) satisfies

$$S_1 - S_0 = (S_{10} - S_{00}) + (S_{11} - S_{10}). \qquad (1)$$

The first term in the RHS of (1) captures those changes due to the *sex composition effect* i.e., 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 second term yields the *field weight effect* i.e., the change in the index if the gender shares had remained invariant at the level of cohort 1.

Table 3 displays the results from decomposition (1) across 20 and 34 fields, respectively, and 4 decade-cohorts. For illustrative purposes, Tables A1 and A2 in Appendix C present the gender shares and field weights used in the computation of the decomposition using 20 fields, as well as the corresponding contributions of each effect by field. Since the results with the un-weighted and weighted versions of the DDS index are similar, only results for the former are reported.

Table 3
BSA decomposition of changes in DDS index

	1976-1985/before 1976			**1986-1995/1976-1985**			**1996-2005/1986-1995**		
	Sex comp	Field weight	Total	Sex comp	Field weight	Total	Sex comp	Field weight	Total
UDDS (20)	-4.4	-2.6	**-6.9**	-2.4	-0.6	**-3.0**	-6.1	-0.5	**-6.6**
WDDS (20)	-4.4	-3.4	**-7.7**	-4.1	-0.2	**-4.3**	-6.4	-1.0	**-7.4**
UDDS (34)	-6.2	-2.1	**-8.3**	-3.9	-0.2	**-4.1**	-6.8	-1.2	**-8.0**
WDDS (34)	-6.0	-2.5	**-8.5**	-4.0	-0.3	**-4.3**	-7.1	-1.3	**-8.4**

Note: UUDS and WDDS denote the un-weighted and weighted version of the DDS index; the numbers in parentheses are the number of fields.

The main conclusion to be drawn from this Table is that the contribution of the *sex composition* effect is much larger than that of the *field weight* effect. This is particularly the case for the two cohorts after 1986, whereas the relative contribution of the two effects in explaining the change in segregation between

the cohort 1976-85 and the previous one is more balanced. Indeed, as can be observed in the right panel of Table A1, the field weights (α_i´s) have remained fairly stable over the four cohorts -with the exceptions of Econometrics and Microeconomics which have increased by almost 4 percentage points. On the contrary, the left panel shows that female shares in many fields have undergone very relevant changes with a common upward trend. This is particularly the case of fields like Health, Education & Welfare, I.O., Business Economics, and Growth/Development where the female shares (p_i´s) have increased by more than 20 percentage points. Finally, as shown in Table A2, it is worth noticing that the differences in segregation between the two most recent cohorts (2005-1996 and 1995-1986) are mostly due to Labor Economics, and two core fields in research - such as Microeconomics and Math. And Quant. Methods- that traditionally had been strongly male-dominated fields (see Figure 1a). The changes in the sex composition of these fields amount to 82% of the 7.4 p.p. reduction in the segregation index. In the previous two cohorts, on the contrary, the fall in segregation was mostly due to the *sex composition* effect in more female-oriented fields- like Health, Education and Welfare, Labor Economics and Economic History. Hence, this evidence again points out to a change in the pattern of field choices among younger women-economists.

4. Econometric evidence

In order to test the hypotheses discussed in section 2, we use two alternative econometric approaches. The first one relies upon aggregating information the level of cohorts and departments or fields, ignoring therefore the distribution of individual researchers across fields. The second one, by contrast, focuses on individual choices of fields.

4.1 Cross-section estimation across departments and fields

We start by analyzing the aggregate determinants of the gender composition first across departments and across fields, in a cross section regression, to then examine the joint variation across departments/fields and cohorts in the next section using panel estimation. The idea of the cross-section approach is to regress the share of female faculty members in each department and in each field (pooling all cohorts), denoted by F_d (d=1,..,50) and F_f (f=1,..,34), respectively, on relevant covariates related to the various hypotheses. As regards departments, these are the size of the department ($size_d$), and its

research quality ($qual_d$) -- proxied by the ratio between the equivalent of great papers produced in each department, as provided by Econphd.net, over the ten year period (1993-2003) and the size of the department. With regard to fields, they are the size of the field ($size_f$) - proxied by the number of researchers in the top 50 departments who work in the field- and a field quality index ($qual_f$) – obtained similarly as the ratio between the equivalent of great papers for each field and the number of researchers who have published a paper in that field. Specifically the estimated regressions are:

$$F_d=\beta_0+ \beta_1 * size_d + \beta_2 * qual_d+ \varepsilon_d \,, \qquad (2)$$

$$F_f=\beta_0+ \beta_1 * size_f + \beta_2 * qual_f+ \varepsilon_f \,, \qquad (2')$$

where the error terms (ε_d and ε_f) are assumed to be *i.i.d.* across departments/fields. Since the dependent variables lie between 0 and 1, we have used a Tobit regression model that allows for both left and right censoring of F_d and F_f in the range [0,1]. In this framework, by ignoring the cohort dimension, we just wish to obtain preliminary evidence on whether some of the main implications of the GDC theory remain valid at the department/field level. Specifically, we will just focus on testing H2 and H3 and, therefore, abstract from H1 and H4 which involve separate information about previous cohorts. According to H2, the female share in each department/field should be positively related to the size of the department/field, and therefore the relevant hypothesis to test is $\beta_1>0$. Alternatively, H3 predicts a negative relationship between the fraction of women and the quality of the department/field. Hence the corresponding hypothesis of interest is $\beta_2 <0$. Further, to test for possible differences between North-American and European institutions, we also include -as an additional regressor in (2) - a dummy variable (NA) which takes a value of 1 for the departments in US and Canada, and 0 otherwise. [9]

Columns (1) in Tables 4a and b report the estimated coefficients of this regression for departments and fields, respectively. In general, we find strongly significant positive and negative effects of the *size* and *quality* of the department/field on the corresponding fraction of women. The larger is the

[9] This dummy variable may also capture different affirmative action efforts across the two continents in the recruiting of women.

department/field, controlling for its quality, the lower is the fraction of women, and the higher the quality of a department/ field, for a given size, the lower is that fraction. Hence, both H2 and H3 receive some support from these cross-section results. As for the NA dummy, we find a positive estimated coefficient, yet only significant at 15% level (t-ratio=1.5) yielding somewhat weak evidence that, *ceteris paribus*, the females shares are higher in North-America than in Europe.

Table 4a
Determinants of the female shares in departments.
Two-limit tobit regressions (censored at 0 and 1)

	(1)	(2)
Variable	$\mathbf{F_d}$	$\mathbf{F_{dc}}$
$\mathbf{Size_d}$	0.002***	0.005***
	(0.0007)	(0.0019)
$\mathbf{Qual_d}$	-0.011***	-0.012*
	(0.003)	(0.006)
NA dummy	0.018	0.022
	(0.012)	(0.013)
$\mathbf{SW_{d,c-1}}$	-	0.567***
		(0.219)
No. Obs	50	150
Pseudo R2	0.1748	0.154

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

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

Table 4b
Determinants of the female share in fields.
Two-limit tobit regressions (censored at 0 and 1)

	(1)	(2)
Variable	$\mathbf{F_f}$	$\mathbf{F_{fc}}$
$\mathbf{Size_f}$	0.003***	0.008***
	(0.001)	(0.002)
$\mathbf{Qual_f}$	-0.008**	-0.011*
	(0.004)	(0.006)
$\mathbf{SW_{f,c-1}}$	-	0.660**
		(0.315)
No. Obs	34	102
Pseudo R2	0.349	0.298

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

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

4.2 Panel estimation across departments/fields and cohorts

To obtain some preliminary evidence about H1 with this approach, we use a panel regression to model the fraction of female researchers across Ph.D. decade-cohorts (3) and departments (50), on the one hand, and across cohorts and fields (34), on the other.[10] The dependent variables are again censored between 0 and 1. Since *size* and *quality* do not have cohort variation, the only variable which varies across both dimensions is the share of women of the previous decade-cohort who work in a given department ($SW_{d,c-1}$) or carry out research in a given field ($SW_{f,c-1}$). The model specifications are then

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

$$F_{fc}=\beta_0+ \beta_1 * size_f + \beta_2 * qual_f+ \beta_3 * SW_{f,c-1} +\varepsilon_{dc} , \quad (3´)$$

where the error terms are assumed to be i.i.d. Notice that the inclusion of the variable $SW_{d,c-1}$ in (3) allows us to test a slightly different version of H1 which we denote as *path dependence by gender*, instead of *path dependence by field*. Accordingly, this variant of H1 states that women prefer departments (rather than specific fields) 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 $\beta_3<0$.

Columns (2) in Tables 4a and 4b present the results from estimating (3) in a panel setting with random effects by maximum likelihood. Like in the cross-section approach, the estimated coefficients on *size* and *quality* are significantly positive and negative, respectively, reinforcing our previous cross-section evidence in favour of H2 and H3. As for the estimated coefficient on the past share of women in the department, it turns out to be positive and strongly significant, yielding therefore support to the view that there is gender path dependence in the way women apply to economics departments and choose research fields. Finally, the coefficient on the NA dummy in the departments´ regression is now significant at the 10% level

[10] The first cohort is excluded because we lack information about the previous share of women in the fields or departments.

We next investigate whether the above panel regression results remain unaltered when we allow for different coefficients across cohorts. To do this, in Tables 5a and 5b we report the estimates obtained when equations (3) and (3´) are estimated separately for each cohort. In each panel we report two sets of estimates. The RHS ones correspond to the case where all past cohorts are pooled together. So, for example, the share SW_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.

Table 5a
Determinants of the female share in departments by Ph.D. 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**	0.008 ***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)
Qual	-0.005	-0.003	-0.021**	-0.025***	-0.021**
	(0.004)	(0.004)	(0.010)	(0.009)	(0.010)
NA dummy	0.012	0.059	0.149 **	0.153**	0.139
	(0.070)	(0.068)	(0.062)	(0.075)	(0.108)
SW_{dc} (all older cohorts)	0.273		0.709 ***		0.523***
	(0.403)	-	(0.269)	-	(0.069)
SW_{dc} (86-95)	-	-0.523***	-	-	
		(0.182)			
SW_{dc} (76-85)	-	0.571***	-	0.377**	-
		(0.171)		(0.165)	
SW_{dc} (< 1976)	-	0.245	-	0.367***	-
		(0.297)		(0.043)	
No. Obs.	50	50	50	50	50
Pseudo R2	0.199	0.213	0.208	0.2027	0.273

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

Table 5b
Determinants of the female share in fields by Ph.D. cohort
Two-limit tobit regressions (censored at 0 and 1)

	F_f (c=96-05)		F_f (c=86-95)		F_f (c=76-85)
$Size_f$	0.007	-0.005	0.010***	0.008**	0.012 ***
	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)
$Qual_f$	0.004	0.003	-0.003***	-0.002**	-0.004**
	(0.005)	(0.002)	(0.001)	(0.001)	(0.002)
SW_{fc} (all older cohorts)	0.198		0.573 ***		0.732***
	(0.223)	-	(0.269)	-	(0.249)
SW_{fc} (86-95)	-	-0.469***	-	-	
		(0.182)			
SW_{fc} (76-85)	-	0.576***	-	0.637***	-
		(0.178)		(0.193)	
SW_{fc} (< 1976)	-	0.134	-	0.503***	-
		(0.312)		(0.043)	
No. Obs.	34	34	34	34	34
Pseudo R2	0.274	0.349	0.291	0.312	0.256

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

The results provide similar evidence to that reported above in relation to H2, H3 and the variant of H1 discussed earlier for the two older cohorts. However, strongly different results obtain for youngest cohort. For this group, the coefficients on *size* and *qual*, although sometimes 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 women entering traditionally male dominated fields, as reflected in the decline in gender segregation over time 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, given that there is more than one field choice per researcher, this is not feasible. Instead, we first estimate probit models for each field separately, pooling the last three Ph.D. decade-cohorts in each

regression.[11] The dependent variable is the probability that an individual chooses a given field. Specifically, the model we consider is

$$P^f_i=\lambda' x_i + \theta_0 SW^f_i + \theta_1 SW^{fd}_i * \mathbf{1}(fem)+\theta_2 SW^{fd}_i * \mathbf{1}(fem) * \mathbf{1}(96\text{-}05) +\varepsilon_i \qquad (4)$$

where the dependent variable, P^f_i, is the probability that an individual *i* chooses field *f*; x_i is a vector of individual-specific covariates; SW^{fd}_i is the share of women in the previous cohort working in a given field at the department where the individual is affiliated; **1**(fem) is a female gender dummy interacted with the previous variable; and **1**(96-05) is another dummy variable -which takes the value one for the last cohort (1996-2005) and zero otherwise- which is doubly interacted with **1**(fem) and SW^f_i . The covariates included in x_i are: the gender dummy as an intercept; cohort dummies; the research quality scores of the field both at the department of destination and at the department of origin where the individual graduated; 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. A positive coefficient (θ_1) on the first interaction term in (4) will provide indication that women care more than men about the share of female colleagues in the department who work in a specific field, in accord with the path dependence hypothesis. Thus the hypothesis of interest in this case is $\theta_1>0$. Likewise, a negative sign of the coefficient (θ_2) on the second double interaction term will indicate that path dependence decreases for the youngest female cohort. Hence, in such a case we expect $\theta_2<0$.

The results are reported in Table 6 in the form of marginal effects. The chosen fields are those in Table 1, where "Other" has been further disaggregated into Financial Economics, Health Education & Welfare, and "Other2" which gathers the remaining subfields in that category. Thus, there are twelve probit models.

[11] As in Table 5, the first cohort is excluded.

Table 6
Determinants of field choices (Marginal effects, Probit regressions)

Field	Gender	Field - Qual. Current Dept.	Field - Qual. Phd Dept.	% of faculty in field f	% of female faculty in field f, older cohorts)	(% of female faculty in field f, older cohorts) x (female dummy)	(% of female faculty in field f, older cohorts) x (female dummy) x (96-05 dummy)
1. Econ. History	0.033**	0.011	0.002	0.074***	0.021	0.079***	-0.049***
	(0.016)	(0.008)	(0.002)	(0.015)	(0.099)	(0.099)	(0.099)
2. Econometrics	-0.138**	0.012**	0.005***	0.101***	0.058	0.132	0.068*
	(0.067)	(0.006)	(0.001)	(0.024)	(0.189)	(0.189)	(0.037)
3. Micro/ Theory	-0.105***	0.033***	0.004**	0.093***	-0.032	0.120	0.082***
	(0.031)	(0.002)	(0.002)	(0.014)	(0.338)	(0.238)	(0.028)
4. Labor	0.098**	-0.002	0.004***	0.155***	0.149*	0.277**	-0.152**
	(0.044)	(0.001)	(0.001)	(0.056)*	(0.081)	(0.131)	(0.071)
5. I.O.	0.049**	0.002	0.001	0.106***	-0.036	0.177***	-0.102***
	(0.024)	(0.002)	(0.001)	(0.041)	(0.260)	(0.060)	(0.036)
6. Public Econ.	0.038**	0.003	0.002	0.101***	-0.009	0.168***	-0.162***
	(0.019)	(0.002)	(0.002)	(0.032)	(0.164)	(0.054)	(0.164)
7. Macro.	-0.072**	0.004**	0.002**	0.106***	0.030	0.065	0.046
	(0.035)	(0.002)	(0.001)	(0.0.32)	(0.037)	(0.317)	(0.032)
8. Growth/Dev.	0.060*	-0.005*	0.008***	0.104***	-0.077	0.028	0.028
	(0,038)	(0.003)	(0.002)	(0.034)	(0.204)	(0.204)	(0.204)
9. Int. Econ.	0.011	0.000	0.000	0.099***	0.018	0.126*	-0.078*
	(0.021)	(0.001)	(0.001)	(0.003)	(0.069)	(0.069)	(0.045)
10. Fin. Econ.	-0.034***	-0.004	0.004**	0.060***	-0.017	0.039	0.084*
	(0.014)	(0.003)	(0.002)	(0.027)	(0.084)	(0.084)	(0.044)
11. Hth, Ed & Wel.	0.078***	0.028	0.084	0.101***	0.019	0.162***	-0.102***
	(0.023)	(0.002)	(0.002)	(0.141)	(0.164)	(0.064)	(0.043)
12. Other2.	0.028	0.006	0.003	0.101***	0.029	0.143**	-0.082***
	(0.019)	(0.006)	(0.002)	(0.041)	(0.123)	(0.066)	(0.034)

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

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, Micro/Theory, Macro, 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 index of the departments of destination and origin are generally positive but only strongly significant for Econometrics, Micro/Theory and Macro. The variable capturing the proportion of faculty members in a given field appears always highly significant. It indicates that, for any field, the stronger is the department in a given discipline

the higher is the probability that an individual chooses that field. Lastly, the estimated coefficients on the first interaction term supports H1 in most of the fields where the proportion of women in higher (see Figure 1a). By contrast, the negative coefficients on the second interaction term for those fields point to weaker path dependence. This last result, in combination with the significant and positive estimated coefficients for Econometrics, Financial Economics and Micro/Theory yield some support to H4, according to which the younger female cohorts are moving to traditionally male-dominated fields.

A shortcoming of the separate probit estimation of equation (4) for each field is that it does not take into account the potential correlation among the residuals of the different equations. It seems likely that the disturbances may be correlated for closely related fields, e.g., Macro and Growth/Development or Micro and I.O. In that case, a seemingly unrelated regression (SUR) estimation of the system could provide more efficient estimates. However, to our knowledge, this SUR procedure is not available for probit models. For this reason, we adopt the following admittedly crude approach. First, we estimate (4) using linear probability models (LPMs) for each of the 12 fields and, after computing the covariance matrix of the residuals, next implement SUR in the LMP system of equations.[12] The correlation matrix of the residuals is presented in Table A3 of Appendix D with the largest correlations appearing in bold figures. Although none of them is very large, the overall results make sense. For example, the residual for Micro is positively correlated with the residuals for I.O. and Public Economics, while the residuals for Macro exhibit the same positive correlation with those of Growth/ Development, International Economics and Financial Economics. Interestingly, the largest positive correlation is found to be the one between the residuals of Labor and Health, Education and Welfare.

Table A4 in Appendix E presents the results of this exercise. Since the errors in LPMs are heteroskedastic with variances that depend on the regression coefficients, heteroskedasticity-consistent standard errors (HC s.e.) are reported. Comparing the results to those in Table 6 yields a similar interpretation in terms

[12] The largest proportion of observations violating the implicit restriction that the estimated probabilities lie in the interval [0,1] in each equation was lower the 6.2%.

of mean marginal effects. Thus, accounting for the correlations of the residuals does not seem to change our previous conclusions.

5. Conclusions

Recent experimental work has provided evidence in favor of the existence of gender differences in attitudes towards competing in mixed-sex groups which may limit the advance of women to high levels of professional jobs. In this study, we have drawn some implications from this theory in order to explain gender differences in the distribution of research fields among academic economists. For that, we have assembled a new database with detailed information about fields of specialization and other professional characteristics of the current faculty members from top-50 economics departments in the world, according to the rankings available on the Econphd.net website.

We document that there are large difference between men and women-economists in terms of choices of research fields. Besides identifying "female fields", we analyze how gender segregation by field has evolved across Ph.D. cohorts. Evidence is provided in favor of path-dependence in female choices, namely, the probability that a woman-economist chooses a given field is positively related to the share of women in that field. This result confirms previous evidence by Hale (2005) using a smaller data set of 10 distinguished U.S. departments. Further, the fraction of women in a given field or department is positively related to the size of the field/department and negatively related to its quality, measured by publications in highly prestigious journals. There is also evidence, however, that for recent cohorts, the previous results are much weaker and that the differences between men and women in each field are narrowing.

Many interesting questions remain. For example, it would be interesting to know directly from the faculty members in our sample which factors led them to choose a specific research field. With this goal in mind, we have distributed a questionnaire to a matched sample (by cohort and departments) of men and women asking them about various reasons behind their choices (genuine social interest, expectations of academic or economic success, specialization of the department of origin, etc.) as well as some family circumstances at the time of completing their Ph.D. dissertations (civil status, number of children if any,

etc.). At the time of completing this draft of the paper we have got replies from 122 male and 125 female professors. Analyzing how this information relates to the evidence reported here is in our research agenda.

References

1. Albrecht J., Bjorklund, A, and S. Vroman (2002), "Is There a Glass Ceiling in Sweden ?", *Journal of Labor Economics*, 21, 145-177.
2. Babcock, L. and S. Laschever (2003), *Women Don´t Ask: Negotiation and the Gender Divide*, Princeton University Press.
3. Bertrand, M. and K. Hallock (2001), "The Gender Gap in Top Corporate Jobs", *Industrial and Labor Relations Review*, 55, 3-21.
4. Black, S. and P.E. Strahan (2001), "The Division of Spoils: Rent-sharing and Discrimination in a Regulated Industry", *American Economic Review*, 91, 814-831.
5. Blank, R. (1996) "Report on the Committee on the Status of Women in the Economics Profession", *American Economic Review*, 86, 502-506.
6. Blau, F., Simpson, P. and D. Anderson (1998), " Continuing Progress?: Trends in Occupational Segregation in the United States over the 1970s and 1980s" *Feminist Economics*, 4, 29-71
7. Booth, A., Burton, J. and K. Mumford, (2000) "The Position of Women in UK Academic Economics" *Economic Journal*, 110, 312-334.
8. CSWEP (2004), " Report of the Committee on the Status of Women in the Economics Profession", *American Economic Review*, 94, 525-33.
9. Dolado, J., Felgueroso, F. and J.F. Jimeno (2001), "Female Employment and Occupational Changes in the 1990s: How is the EU Performing Relative to the U.S.?", *European Economic Review*, 45, 875-889.
10. Dolado, J., Felgueroso, F. and J.F. Jimeno (2004), "Where Do Women Work?: Analyzing Patterns in Occupational Segregation By Gender", *Annales d'Economie et de Statistique*, 71-72, 293-315.
11. Ginther, D. K. and S. Kahn (2004), "Women in Economics: Moving Up or Falling Off the Academic Career Ladder ", *Journal of Economic Perspectives,* 18, 193-214.
12. Gneezy, U., Niederle, M, and A. Rustichini (2003), "Performance in Competitive Environments: Gender Differences", *Quarterly Journal of Economics*, 118, 1049-1074.
13. Gneezy, U., and A. Rustichini (2004), "Gender and Competition at Young Age", *American Economic Review*, 94, 377-381.

14. Goldin, C. and C. Rouse (2000), "Orchestrating Impartiality: The Impact of Blind Auditions on Female Musicians" *American Economic Review*, 90, 715-742.
15. Hale, G. (2005) "How Do Women-Economists Choose their Field? : Evidence of Path-dependence" Yale University (mimeo).
16. Hamermesh, D. S. (2005) "An Old Male Economist´s Advice to Young Female Economists", *CSWEP Newsletter*, Winter (2005).
17. Hansen, W.L. (1991), "The Education and Training of Economics Doctorates", *Journal of Economic Literature,* 29, 1054-1087.
18. Kahn, S. (1993), "Gender Differences in Academic Career Paths of Economics", *American Economic Review (P&P),* 83, 52-56.
19. Kahn, S. (1995), "Women in the Economics Profession", *Journal of Economic Perspectives,* 9, 193-206.
20. Kalaitzidakis, P., Mamuneas, T. and T. Stengos, (2003), "Rankings of Academic Journals and Institutions in Economics", Journal of the European Economic Association, 1, 1346-66.
21. McDowell, J.M., Singell, L.D., and J.P. Ziliak (1999), "Cracks in the Glass Ceiling: Gender and Promotion in the Economics Profession", *American Economic Review (P&P),* 89, 392-396.

Appendix A

List Top 50 academic institutions (Econphd.net), % of female faculty members and Econphd.net quality index

	Department	Size	% of women	Qual.
1	Harvard University	52	15.4	210.7
2	University Chicago	28	14.3	159.3
3	Massachusetts Institute of Technology (MIT)	36	11.1	136.8
4	University California – Berkeley	62	12.9	134.9
5	Princeton University	60	16.7	118.3
6	Stanford University	39	7.7	114.3
7	Northwestern University	46	17.4	112.9
8	University Pennsylvania	30	10.0	110.9
9	Yale University	45	15.6	108.9
10	New York University	42	7.1	105.1
11	University California - Los Angeles	48	20.8	94.9
12	London School of Economics (LSE)	56	16.1	94.9
13	Columbia University	39	15.4	93.2
14	University Wisconsin - Madison	34	17.6	69.5
15	Cornell University	34	14.7	68.6
16	University Michigan - Ann Arbor	65	21.5	68.0
17	University Maryland - College Park	37	16.2	67.4
18	University Toulouse I (Sciences Sociales)	48	10.4	65.3
19	University Texas - Austin	39	10.3	62.1
20	University British Columbia	30	13.3	61.6
21	University California - San Diego	37	21.6	61.4
22	University Rochester	23	17.4	58.0
23	Ohio State University	39	10.3	57.7
24	Tilburg University	44	9.1	56.8
25	University Illinois (Urbana-Champaign)	38	7.9	56.6
26	Boston University	31	9.7	56.0
27	Brown University	29	10.3	52.8
28	University California - Davis	28	25.0	49.3
29	University Minnesota	25	20.0	48.8
30	Tel Aviv University	24	8.3	48.0
31	Oxford University	58	17.2	47.8
32	University Southern California	23	8.7	46.7
33	Michigan State University	37	21.6	45.1
34	Warwick University	47	19.1	44.8
35	Duke University	35	14.3	43.8
36	University Toronto	59	15.3	42.5
37	University Amsterdam	32	21.9	42.0
38	Penn State University	27	22.2	41.9
39	University Cambridge	42	23.8	38.6
40	Carnegie Mellon University	38	15.8	38.0
41	University North Carolina - Chapel Hill	31	12.9	37.8
42	Boston College	28	17.9	37.3
43	California Institute of Technology (Caltech)	16	12.5	37.3
44	Texas A&M University	34	17.6	37.0
45	European University Institute	12	0.0	36.0
46	University Carlos III Madrid	38	16.7	35.7
47	University College London	35	8.6	35.3
48	University Essex	39	25.6	34.8
49	Indiana University	32	15.6	34.2
50	Hebrew University	25	0.0	33.9

Appendix B

* The 10 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 20 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)

* The 34 fields correspond to the descriptors in Econphd.net where there is an index of quality of publications. In terms of JEL descriptors they are defined as follows.

1. Economic History & Method (A, B00-B49,N)
2. Alternative Approaches / Comparative Systems (B50-B59, P00-P59)
3. Statistics / Theory of Estimation (C00, C10-C16, C19, C20, C30, C40-C41, C44-C45, C49)
4. Cross Section, Panel, Qualitative Choice Models (C21, C23-C29, C31, C33-C39, C42-C43, C50-C52, C59, C80-C89)
5. Time Series / Forecasting (C22, C32, C53)
6. General Equilibrium Theory / Cooperative Games / Mathematical & Comp. Economics (C60-C63, C65, C67-C69, C71, D50-D52, D57-D59, D84)
7. Noncooperative Games / Bargaining & Matching (C70, C72-C73, C78-C79, D83)
8. Decision Theory / Experiments/Information Economics (C90-C93, C99, D00, D80-D82, D89)
9. Consumer Economics (D10-D12, D14, D18-D19, Z00, Z10-Z13)
10. Labor Markets & Unemployment / Working Conditions / Industrial Relations

(D13, J20-J23, J28-J29, J32-J33, J40-J45, J48-J49, J50-J54, J58-J59, J60-J65, J68-J69, J80-J83, J88-J89, M50-M55, M59)
11. Wages / Income Distribution (D30-D31, D33, D39, J15-J16, J30-J31, J38-J39, J70-J71, J78-J79)
12. Health Care / Demographics / Social Security (I00, I10-I12, I18-I19, I30-I32, I38-I39, J00, J10-J14, J17-J19, J26)
13. Economics of Education (I20-I22, I28-I29, J24)
14. Theory of the Firm / Management (D20-D21, D23, D29, L20-L25, L29, L30-L33, L39, M00, M10-M14, M19, M20-M21, M29, M30-M31, M37, M39, M40-M42, M49)
15. Industry Studies / Productivity Analysis (D24, L60-L69, L70-L74, L79, L80-L86, L89, L90-L99)
16. Industrial Organization (D40-D46, D49, L00, L10-L16, L19, L40-L44, L49, L50-L52, L59)
17. Innovation / Technological Change (O30-O34, O38-O39)
18. Social Choice Theory / Allocative Efficiency / Public Goods (D60-D64, D69, D70-D71, H00, H40-H43, H49)
19. Political Economy (D72-D74, D78-D79, H10-H11, H19)
20. Theory of Taxation (H20-H26, H29, H30-H32, H39)
21. Law & Economics (K00, K10-K14, K19, K20-K23, K29, K30-K34, K39, K40-K42, K49)
22. Intertemporal Choice /Economic Growth (D90-D92, D99, E20-E21, F40, F43, F47, F49, O40-O42, O47, O49)
23. Fluctuations / Business Cycles (E00, E10-E13, E17, E19, E22-25, E27, E29, E30-32, E37, E39)
24. Monetary Economics (E40-E44, E47, E49, E50-E53, E58-E59)
25. Public Finance (E60-E66, E69, H50-H57, H59, H60-H63, H69, H70-H74, H77, H79, H80-H82, H87, H89)
26. International Finance (F30-F36, F39, F41-F42)
27. International Trade / Factor Movements (F00-F02, F10-F19, F20-F23, F299
28. Economic Development / Country Studies (O00, O10-O19, O20-O24, O29, O50-O57)
29. Spatial, Urban Economics (R00, R10-R15, R19, R20-R23, R29, R30-R34, R38-R39, R40-R42, R48-R49, R50-R53, R58-R59)
30. Financial Markets & Institutions (G00, G10, G14-G15, G18-G19, G20-G24, G28-G29)
31. Portfolio Choice / Asset Pricing (G11-G13)
32. Corporate Finance (G30-G35, G38-G39)
33. Resource & Environmental Economics (Q00-Q01, Q20-Q21, Q24-Q26, Q28-Q29, Q30-Q33, Q38-Q39, Q40-Q43, Q48-Q49)
34. Agricultural Economics (Q10-Q19, Q22-Q23)

Appendix C

Table A-1

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

(Individual weights: 1/no. of fields)

	p_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	**15.1**	**4.7**	**9.7**	**19.5**	**22.9**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
A - General Economics and Teaching	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.1	0.1
B - Schools of Economic Thought and Method.	4.3	7.0	0.0	0.0	0.0	0.3	0.9	0.2	0.1	0.2
C1 - Mathematical and Quantitative Methods	10.1	0.0	5.7	5.5	18.9	6.8	3.5	7.6	7.2	8.3
C2-Econometrics	12.6	0.0	8.7	13.9	19.7	11.6	8.9	10.1	13.0	13.7
D – Microeconomics	13.6	3.4	7.1	14.2	22.6	12.6	9.7	13.5	13.6	13.3
E - Macroeconomics and Monetary Economics	14.3	5.2	7.6	19.4	20.0	11.3	10.6	10.8	10.6	12.6
F - International Economics	16.9	6.5	4.4	26.7	26.7	5.8	6.7	5.4	5.5	5.9
G - Financial Economics	11.1	2.8	6.9	18.7	12.8	5.3	4.5	5.8	5.8	5.0
H - Public Economics	16.2	3.9	9.6	31.5	21.9	5.7	6.4	6.4	4.7	5.6
I - Health, Education, and Welfare	25.5	11.1	19.6	35.6	36.7	4.0	5.2	3.6	4.5	3.1
J - Labour and Demographic Economics	20.0	8.4	14.0	29.7	25.9	9.2	11.1	7.9	8.8	9.3
K - Law and Economics	13.2	8.0	5.5	22.4	23.6	1.3	2.6	1.1	1.2	0.6
L - Industrial Organization	18.4	2.3	14.4	19.7	26.6	7.3	5.4	7.2	7.4	8.6
M -Business Economics	12.6	2.0	4.1	24.5	0.0	0.2	0.5	0.1	0.4	0.0
N - Economic History	16.7	3.7	27.8	16.8	35.4	2.7	5.1	3.2	1.9	1.2
O - Economic Development, Growth	18.7	6.3	14.8	20.8	31.8	6.7	6.9	6.8	7.4	5.8
P - Economic Systems	13.1	1.2	6.1	20.1	22.3	4.5	5.0	5.1	4.4	3.7
Q – Agricultural and Environmental Econ.	9.6	3.1	8.0	9.6	23.1	1.9	2.7	2.4	1.3	1.3
R - Urban, Rural, and Regional Economics	10.5	14.2	0.0	7.5	23.1	1.4	2.5	1.7	1.0	0.8
Z - Other Special Topics	7.4	0.0	0.0	16.1	12.5	1.1	1.4	1.1	1.1	1.1

Table A-2

BSA decomposition of changes in DDS index

(Individual weights: 1/no. of fields)

	1976-1985/before 1976			1986-1995/1976-1985			1996-2005/1986-1995		
	Sex comp	**Field weight**	**Total**	**Sex comp**	**Field weight**	**Total**	**Sex comp**	**Field weight**	**Total**
Total	**-4.4**	**-3.4**	**-7.7**	**-4.1**	**-0.2**	**-4.3**	**-6.4**	**-1.0**	**-7.4**
A - General Economics and Teaching	0.0	-0.2	-0.2	0.1	0.0	0.1	0.1	0.0	0.1
B - Schools of Economic Thought and Method.	0.3	-0.4	-0.1	0.0	0.0	0.0	0.0	0.1	0.1
C1 - Mathematical and Quantitative Methods	-1.0	0.9	-0.1	1.6	-0.1	1.5	-2.3	0.0	-2.3
C2-Econometrics	-1.0	-0.2	-1.2	1.2	0.6	1.8	-1.0	-0.1	-1.1
D - Microeconomics	0.2	0.4	0.6	0.2	0.1	0.3	-2.0	-0.2	-2.2
E - Macroeconomics and Monetary Economics	0.9	-0.2	0.7	-1.2	0.0	-1.3	1.0	0.0	1.0
F - International Economics	0.8	-0.5	0.3	-0.3	0.0	-0.4	-0.7	0.1	-0.6
G - Financial Economics	-0.2	0.1	-0.1	-0.8	0.1	-0.8	1.6	-0.3	1.3
H - Public Economics	-0.4	-0.2	-0.6	2.5	-0.7	1.8	-1.6	0.0	-1.7
I - Health, Education, and Welfare	-4.0	-0.7	-4.7	-0.2	0.4	0.3	-0.6	-0.5	-1.1
J - Labour and Demographic Economics	-2.2	-0.4	-2.6	0.7	0.2	0.9	-2.2	0.2	-2.0
K - Law and Economics	-0.3	-0.4	-0.7	-0.2	0.0	-0.1	-0.1	0.0	-0.1
L - Industrial Organization	-0.2	0.7	0.5	-1.9	-0.1	-1.9	0.6	0.2	0.9
M -Business Economics	0.0	-0.2	-0.2	0.1	0.3	0.4	-0.4	0.0	-0.4
N - Economic History	3.3	-0.6	2.7	-3.0	-0.1	-3.1	0.5	-0.2	0.3
O - Economic Development, Growth	0.6	0.2	0.8	-1.7	0.0	-1.7	1.5	-0.3	1.2
P - Economic Systems	-0.8	-0.1	-0.9	-0.9	-0.1	-1.0	0.1	-0.1	0.0
Q – Agricultural and Environmental Econ.	-0.2	-0.1	-0.3	0.5	-0.3	0.2	-0.4	0.0	-0.4
R - Urban, Rural, and Regional Economics	-1.2	-0.4	-1.7	-0.3	-0.3	-0.6	-0.4	0.0	-0.4
Z - Other Special Topics	0.1	-0.2	-0.2	-0.5	0.0	-0.5	0.2	0.0	0.2

Appendix D

Table A3

Correlation matrix of residuals (LPMs)

	1. Econ. Hist	**2.** Etrcs.	**3.** Micro/Th.	**4.** Labor	**5.** I.O.	**6.** Pub.Econ.	**7.** Macro	**8.**Growth/Dev.	**9.** Int. Econ.	**10.** Fin. Econ.	**11.** H, E &Wel.	**12.** Other2
1. Econ. Hist.	1.000											
2. Etrcs.	-0.102	1.000										
3. Micro/Th.	-0.129	-0.174	1.000									
4. Labor	-0.056	-0.060	-0.113	1.000								
5. I.O.	-0.094	-0.166	**0.327**	-0.127	1.000							
6. Pub.Econ.	-0.066	-0.142	**0.324**	0.006	0.061	1.000						
7. Macro	0.012	-0.051	-0.172	-0.057	-0.193	-0.074	1.000					
8.Growth/Dev.	0.067	-0.160	-0.159	-0.048	-0.019	0.115	**0.245**	1.000				
9. Int. Econ.	-0.035	0.016	-0.138	-0.132	-0.035	0.121	**0.287**	-0.069	1.000			
10. Fin. Econ.	-0.063	-0.046	-0.055	-0.032	0.008	0.081	**0.343**	0.055	-0.058	1.000		
11. H, E &Wel.	0.005	-0.023	0.205	**0.365**	0.095	-0.007	0.123	-0.029	0.075	0.123	1.000	
12. Other2	-0.127	0.098	-0.072	0.145	-0.065	-0.005	0.102	-0.045	0.098	-0.007	0.078	1.000

Appendix E

Table A4
Determinants of field choices (SUR- LPMs, HC s.e)

Field	Gender	Field - Qual. Current Dept.	Field - Qual. Phd Dept.	% of faculty in field f	% of female faculty in field f, older cohorts)	(% of female faculty in field f, older cohorts) x (female dummy)	(% of female faculty in field f, older cohorts) x (female dummy) x (96-05 dummy)
1. Econ. History	0.026***	0.021	0.004	0.071***	0.032	0.067**	-0.042***
	(0.011)	(0.018)	(0.003)	(0.035)	(0.087)	(0.032)	(0.019)
2. Econometrics	-0.156**	0.037***	0.007***	0.098***	0.055	0.112	0.063**
	(0.071)	(0.008)	(0.002)	(0.016)	(0.157)	(0.157)	(0.031)
3. Micro/ Theory	-0.163***	0.045***	0.008**	0.113***	-0.041	0.113	0.109***
	(0.042)	(0.007)	(0.003)	(0.014)	(0.264)	(0.283)	(0.032)
4. Labor	0.112***	-0.012	0.007***	0.160***	0.138*	0.254***	-0.148**
	(0.041)	(0.008)	(0.002)	(0.056)*	(0.078)	(0.098)	(0.073)
5. I.O.	0.067**	-0.006	0.003	0.098***	-0.042	0.176***	-0.132***
	(0.032)	(0.005)	(0.002)	(0.014)	(0.212)	(0.068)	(0.028)
6. Public Econ.	0.034***	0.008	0.002	0.121***	-0.011	0.181***	-0.134***
	(0.012)	(0.005)	(0.002)	(0.016)	(0.117)	(0.021)	(0.054)
7. Macro.	-0.005**	0.008***	0.004***	0.136***	0.018	0.049	0.061**
	(0.027)	(0.003)	(0.001)	(0.045)	(0.029)	(0.096)	(0.029)
8. Growth/Dev.	0.063*	-0.009	0.007***	0.095***	-0.083	0.032	0.032
	(0.036)	(0.005)	(0.003)	(0.017)	(0.178)	(0.127)	(0.132)
9. Int. Econ.	0.053*	0.006	0.007**	0.078***	0.021	0.109*	-0.062***
	(0.027)	(0.005)	(0.003)	(0.0.134)	(0.176)	(0.049)	(0.037)
10. Fin. Econ.	-0.045***	-0.007	0.006**	0.071***	-0.009	0.052	0.078**
	(0.020)	(0.005)	(0.003)	(0.0032)	(0.077)	(0.077)	(0.037)
11. Hth, Ed & Wel.	0.108***	0.019	0.063	0.122***	0.023	0.174***	-0.123***
	(0.025)	(0.012)	(0.043)	(0.0172)	(0.138)	(0.023)	(0.040)
12. Other2.	-0.031	0.011	0.011	0.114***	0.021	0.167***	-0.073***
	(0.021)	(0.008)	(0.009)	(0.0.153)	(0.151)	(0.071)	(0.033)

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