LUND UNIVERSITY
School of Economics and Management

Erasmus Mundus Master in Economic Development and Growth

Tracing the Glass Ceiling for the Highly Educated across Professions. Evidence for Sweden 1970 – 1990.

Florencia Paz Cazzaniga

florencia.paz_cazzaniga.477@student.lu.se

Abstract: The Glass Ceiling is a proven and documented phenomenon for several countries. This paper tries to trace its existence of changing behaviour in the gender pay gap across the income distribution between the periods 1970 and 1990, and through a selection of professions for the highly educated individuals. This will show at the same time the transformation suffered by Swedish labor market between those 20 years, because of the affluence of higher educated individuals, especially women, into the work force; as well as the change in policies regarding childbearing. The analysis was done through a methodology that allowed for changes in the quality of the individuals, as well as analysing changes in the returns. Furthermore it allows for a deep understanding in what the explanations behind the glass ceiling are and what can be applied to the case under study.

JEL Key words: J16 O15. *Keywords:* Gender Discrimination, Income Distribution

EKHR92
Master thesis (15 credits ECTS)
June 2012
Supervisor: Maria Stanfors
Examiner: Anders Nilsson

A mi Tata,
siempre conmigo.

Acknowledgements

Even if this is written by my own two hands, the finalization of this work is nothing short of a group work. I have been blessed with an array of helpful people that has facilitated the elaboration and conclusion of such body of work, from technical aspects to academic ones, and of course, emotional support.

I will first like to thank the professors of the program for holding such excellence in their classes, who I believe had made me climb one step higher in the shoulders of the giants. In more detail, about what belongs to this work, I'll like to thank Prof. Nilsson, Prof. Scott, Ingrid Melau Prodel, and all the researchers that have made me feel like home in my short stay at the fourth floor; for lending me a hand on the technical issues, as well as academic ones when I was in doubt. Acknowledgements to Prof. Carrasco for helping me define the econometric background of my analysis, and giving me thoughtful advice in a more personal level.

I want to thank my Supervisor, Maria Stanfors for being patient with me, guiding my research and working around the kinks of my ideas even when my mind isn't in the best place. I also want to thank Prof. Ljungberg and Prof. Lobell for having their door open for me when I most needed it.

In a more personal matter, I'll like to thank from the bottom of my heart my friends, Verónica, Laura and Diana, because they kept my feet on the ground, and gave me the support that I needed not to give up when my knees felt in their most fragility. Ignacio, you are more than the brother I always asked for, and I am grateful I can count with you without thinking twice.

Finally, but not less important, I want to thank my parents, for raising me free, idealistic and strong as I never thought I could be. Thank you for giving me wings, and roots that I can take wherever I am. I'll always try to make you proud, no matter where the existence finds us.

Flor

Lund, June 2012.

Index

Acknowledgements 3
1. Introduction 5
2. Background 7
3. Data 14
3.1. Blau's Occupational Segregation Index 23
4. Methodology 24
4.1. *Quantile Regression* 25
4.2. *Decompositions* 26
5. Results 31
5.1. *Lawyers* 32
5.2. *Health Professionals* 34
5.3. *Accountants, Economists & Staticians* 36
5.4. *Engineers* 37
5.5. *Physicians* 39
5.6. *Dentists* 40
5.7. *Pharmacists* 42
5.8. *University Teachers* 44
6. Conclusions 46
References 48
Appendix I. Auxiliary Tables 53

1. Introduction

The Glass Ceiling is a "metaphor for the invisible barrier holding women and members of minority groups from attaining the top jobs in their chosen fields of employment." (SAGE Glossary) From a gender perspective, it will be the fact that the gender gap observed between the male and female income increases at the end of the right tail of the income distribution. The existence of these particular wage disparities between genders has been documented for different countries, as an example, Booth et al. (1998), Albrecht et al. (2003), Arulampalam et al. (2007), Weimberger (2011) among others. This issue yields major interest because under a situation of where individuals have the same relevant characteristics to their performance in the labor market, except for their genders, one of them is in clear disadvantage when talking about remuneration for their work.

Sweden has been chosen as the country for the analysis because of the characteristics of its labor force. Following Stanfors (2003) it can be seen that women have had a strong presence in their the labor market, early in the 1940s women started to incorporate into the work force through a part time scheme, with a high in the late 70s. Moreover, if one looks at the global participation (no matter how many hours they worked), by the 1970's, almost 60% of all women aged 16 to 64 worked, as well as half of all the mothers. By 1990, these ciphers have translated into 82% and 86% respectively. Also, the Swedish population was highly educated, even if there was some differences between school attainment for males and females. Again, from Stanfors work, it can be seen that for 1971, almost 40% of males aged 25-44 and 25% of those aged 45-64 had an upper secondary education, whereas this is true for 32% of women aged 25-44 and 16% of those 45-64. For higher education, data available shows that 11% of males and females aged 25-44 hold it and 6% and 5% of those in the 45-64 age bracket respectively. Nevertheless, it is also shown, that the trend was positive in education attainment, with the population moving upwards in their education achievement when analyzing cohorts by 2001.

At the same time, here specified was the data relevant for this thesis temporal framework, since according to Datta Gupta et al. (2006) even if

historically Sweden has been a world frontrunner in matters of childcare and childbearing policies, in 1977 there were put in place reforms that prolonged the parental leave and included fathers leave in such scheme. These policies are assumed to promote equal household labor between the genders; therefore, allowing women to ease on their responsibilities in the household and expend more time in their professional careers[1].

This means that there must be a shift in the participation of higher educated women before and after this reform, this is due to the fact that if the traditional models for human capital are applied, then most of the variables that are redeemed latent in the labor participation models for married women are now observed and controlled. Thus, as a way of working with data that has in a way removed part of the unobservable characteristics that influence the professional behavior of women, Sweden at this period seems to be a perfect candidate.

Moreover, the perseverance of the gender gap in Sweden might imply that the policies are not effective enough, or as Datta Gupta and Mandel (2006) suggests, although these policies have allowed for women to be incorporated in the labor force, actually they also refrain them from achieve higher income positions by means of segregation and paid work-force interruptions.

As a recap, the aim of this research will be to analyze the existence of the glass ceiling over eight different professions in the Swedish economy for the higher educated individuals, and in two points in time, 1970 and 1990, as well as the evolution of each gender income through these periods. This will mean that information will be more available on the participation of women in the economy, and tracing the evolution of their incorporation (and concentration) through different occupations. Being the idea behind this methodology to trace the evolution of the women's incorporation to the economy as well as understanding where the difference in the glass ceiling lies.

[1] Arulampalam et al. make a good summation of related policies in their work.

The remainder of this thesis is structured as it follows: in section 2 a compilation of relevant literature as well as useful concepts for the analysis will be made, taking into account the different perspectives used to board the same issues. Section 3 will make a summary description on the data used, variables chosen and transformation, as well as constructing an index to get the first insights on the query at focus. Section 4 will try to construct a simple explanation on the econometrical methodology employed for more profound examination. In section 5 the empirical results on the aforementioned model will be discussed, each chosen profession separately. Section 6 will encompass final thoughts in the subject, as well as a summary conclusion on the analysis presented.

2. Background

Extensive research has been done in the issue of the glass ceiling. There have been extensions to the subject in the field of observing differences in the income between races, migrants and natives, and gender. Even when not related to the last one, is important to analyze the variants into other types of individuals, since their methodology can be useful for the analysis that is aimed at this work.

The Gender Gap has been boarded in the beginning from two standpoints: one, the fact that women make their laboring hours allocation between two resources, work and the household, Becker (1985) the second standpoint will be developed on page 11. Because of this, women tend to work lesser hours and interrupt their work career in order to have children and take care of them, which translates into lower returns per working hour. On the demand side, because of this issue, statistical discrimination takes place, with hiring of women only taking place in certain occupations where experience is not as valuable and that have earnings – experience profiles rather flat, as explained by Goldin (2002). When observed across the distribution, then as it moves towards the higher earning parts of the population, the gender pay gap appears to increase, and this is the interpretation of the glass ceiling

materialized, but there's also the possibility that this gap also enlarges at the bottom of the distribution, thus being called a Sticky Floor, or Floor.

Lazear and Rosen (1990) trace the differential to the fact that there's discrimination where men with less skills are preferred to women for promotions, since women have the same abilities for the job, but women also have higher non-market abilities, the higher their non-market abilities (those related to the household), the highest ability for the job is required to enter, thus, only higher productivity women enter the labor market to compete with less able men, and finally women are less promoted and earn less than males. Booth et al. (2003) extended de analysis to try to capture the Sticky Floor effect as well, and modeled such behavior, by analyzing a model where women have the same ability to get promoted than males, but perceive smaller wage increases after promotions, thus the disadvantage does not rely in the fact that women do not have access to being promoted, but perceive lesser returns for such work.. Thus, since women face promotions, they have the same incentives than males to invest in their human capital, but since they face internal and external discrimination, they perceive lower returns.

Goldin (2002) and Blau and Hendricks(1979) traces some of the determinants in the differential to the wages between males and females into the theory of occupational segregation, that implies that women who work in a career where it exists a lower female representation will receive a higher wage than those that do so in a more female dominated one; thus, the augment of the female participation rate will bring down wages for both genders. Sorensen (1990) develops a model of crowding, where turning the focus in the demand of labor, where it dictates that having both genders equal qualifications to perform in the labor market, employers choose to discriminate against women, by excluding them from jobs that are viewed as "men's work". This causes that women flock towards those occupations where they are not discriminated against, and thus, creating "women's works", the excess of supply in such works provokes that the wages fall, whereas the protection on the supply of labor for the men's work augments their incomes. MacPherson and Hirsh (1995) later confirm that wages are lower in female occupations because of their skill related characteristics, as well as quality sorting in the occupations ,

and that occupational segregation accounts for 2/3 of the observed effect and one third lies in the individual's unmeasured skill and tastes.

Goldin develops a model of discrimination that tries to explain how the crowding takes place, which is how is defined which are men's and which women's work, with the approach that there exists statistical discrimination and unobservable productivity by women. Occupational segregation works in two levels into the participation of women in the labor force: one horizontal, in the sectors where they can be found (such as being more present in teaching / nursing professions) but also in an vertical level related to the nature of the works (across industries, women were found as secretaries, but not as much in the blue-collar activities or managerial ones). Hakim (1991) does an analysis on the latter, confirming that is in this level where most of the difference between earnings happens. Her findings for UK between the dates of 1979-1990 observe that segregation has fallen probably because of the higher participation in the labor force by women, as well as the fall in part time work modality.

England et al. (1988) prove that in those occupations were women tend to concentrate there are not low penalties as expected, but there's discrimination in pay towards all the individuals working in "pink" professions, strengthening the idea that the forces at play are more in the field of education and tradition than purely rational behavior of females. On this discussion, Dolado et al. (2003) analyze female occupational allocation for the European Union, as it observes that the increasing female participation in the labor market has been accompanied by breaching in the professions developed, especially in the higher educated females. The authors assess that occupational segregation is related to part-time working, thus, working flexibility is regarded as if contributes to the characterization of women's jobs, but this is due to labor market discrimination, and not a preferred choice by females.

In what respects Sweden, Nermo (1996) arrived at similar conclusions, and refuted the hypothesis that such effect was a consequence on the fact most women incorporated in the expanding public sector (hypothetically less segregated). The author even demonstrated that is this sector the most segregated in its tasks, so its expansion might as well mitigate

the downward trend in occupational segregation. He also states that even although segregation indexes were declining, there was still present strong concentration of women in certain occupational categories. Since his analysis was focused in the same period as is this paper, its conclusions can be extended into the work carried in this thesis. In a fashion, Meyersson et al. (2001) demonstrated that comparing with the U.S. and Norway, most of Sweden gender gap is explained for occupational segregation, while the gender gap tends to be smaller when controlling for type of occupation and employer. Albrecht et al. addresses this conclusion by saying that occupational segregation is the reflection of the glass ceiling, and that women earn less because they work at occupations that have lower wages.

Stanfors (2006) expands into the fact that the occupational segregation model is self-feeding itself through educational segregation by sorting into gender specific educations after finalizing primary school, and this translates later into occupational segregation. Going back to Sorensen, discrimination doesn't have to happen in a direct way from an employer, but can be the result of conditioning during the education phase. This is, crowding can be the effect from women being taught that certain occupations are women's work, and others are not gender appropriate, might condition female labor force to attain a reduced number of occupations, and thus, drive down their wages, increasing the gender pay gap. In the same optic, Haveman and Beresford (2012) argue that these cultural traditions are the ones behind the unobservable portion of the gender gap.

As information became clearer about the capabilities of women, firms were more open to hire women, thus participation rates grew in non-female predominant occupations. Claudia Goldin and Lawrence Katz (2011) also analyze that from a labor supply side, women decided to enter such occupations since flexibility costs that made difficult to marry professional and family life declined. With data from Harvard alumni they observed that high professional women have there's a hidden cost in their participation into the labor market that is given by workplace flexibility. In their sample, it appears that although these costs vary across professions, they appear to have decreased over time. Flexibility costs include costs related to family formation,

such as career interruption caused by pregnancies, part time and flexible hours. These penalties are stronger when the individuals are self-employed, such as professions with required office practices (doctors, dentists, lawyers, accountants, etc.) or retail sales (pharmacists). This type of employment, by its nature, is more flexible, but at the same time, the penalty costs go hand in hand with the amount of time not spent at work. Their work also analyses that even if penalties have decreased, women tend to shift towards those occupations with the lower costs. Thus this process becomes a viable explanation to the increase of women in the labor force and concentration in the different professions.

Until now, most of the analysis pointed to the fact that the Glass Ceiling is present because women perceive lower returns for the same type of work than males, and that they are less present in the high earning labor market because of occupational segregation and gender discrimination. However, another explication on the nature of the phenomenon relies in the belief that women and men are different at their core values. Niederle et al. (2008) find through a series of social experiments that women in the general population were more reticent to enter competitions and more risk adverse than males. Adams and Funk (2012) work is focused in female directors, and in their findings, it shows that these women tend to be more benevolent and concern but less power driven than their counterparts; but at the same time, contrary to women in the common population, female managers tend to take more risks. The authors determine that also are the costs of following the career path that cause a divergence in their values. So, if the costs are close between genders, (as is expected in more egalitarian societies such as Sweden) then these differential attributes will disappear, since being not risk adverse is a personality trait expected to be found in women who have to make their own way without a support (either social or institutional) in a non-gender conventional career. This last conclusion can be extended that since values are similar, women do not need to have special attributes in order to achieve a high earning profession, then the differential in returns should be awarded to the fact that they have different observable characteristics only.

O'Neill and Polachek (1993) analyzed the behavior of the gender gap in wages for the US in 1980, observing a declining trend. The authors explained such behavior through the fact that both genders converged in the usual work related characteristics, namely work experience and schooling, but also includes in such the increase of women's returns as well as the declining wages in the blue collar occupations (where women are less present). Following, Blau and Kahn (2006) observe that this trend decreased as well for 1990, but this time, they attributed this behavior to the slow decentralization of women around traditional women's occupations as well as labor market discrimination provoked a slow convergence for the unexplained gender pay gap. But this did not answer at what happens across the distribution, but only the behavior of the mean income. Similarly, Fransen et al. (2012) did the same for the Dutch case, proving that the gender pay gap decreased between 1996 and 2006, but as well, the gap remains with women earning less than 20% than their males counterparts, in this case, through a decomposing analysis, the authors are able to pin-point the improvement to the fact that the characteristics assimilated between the groups, but the returns did not catch up as fast.

Studying more the wage gap across the distributions, Bertrand et al. (2010) developed their analysis for the Glass Ceiling under the scope of the financial and corporate sectors, observing that the gender gap between MBA graduates increases over time, starting at almost perfect equality. The authors emphasize that there's a penalty for career interruptions in this type of professions, and that there's differences in weekly hours labored between the genders, but also a high correlation of this behavior with the income perceived by the husbands. It will be interesting to confront these findings with the case of Swedish data, because, as stated before, the main issues analyzed in this paper are supposedly covered by policies regarding childbearing and child rising. Following this population, Scicchitano (2011) and Scicchitano and Biagetti (2011) prove the existence of both glass ceiling and sticky floors for the managerial work force of the UK and the Italian one, respectively.

For the Spanish case, De la Rica et al. (2005) were able to demonstrate that the behavior of the gender gap differs considerably

depending on the education of the women. They proved the existence of a ceiling glass just for the highly educated females, but in the case of the lower educated ones; the gap seemed to disappear across de quantiles. They based such observations on the fact that women's occupations with different levels of income change over the quantiles. In the case of low educated women, this serves in their favor since in those occupations that are better remunerated, the gender gap between men and women drops. For highly educated women, this effect works in the opposite since the penalty for interruptions increases for those occupations with higher wages.

Arulampalam et al. (2007) where able to extend this study and include 11 countries of Europe for the analysis of the glass ceiling and enriching it with the addition of the disaggregation in two sectors, public and private. They concluded that the gap is higher in the private than in the public sector, explaining as one of the causes the fact that entrance to some industries are driven by self-selection and trade unions and employers policies. The magnitude of the gaps differ greatly from country to country, which the authors attribute to each country's policy on childbearing and child care, and again, justify the existence of the glass ceiling on the fact that the penalties for career interruption are higher in occupations linked to better wages.

Focused on Sweden's problematic, Albrecht et al. (2003) analyses the issue for Sweden with two databases. Under an objective of finding if the gap is due to differences that lie in gender's characteristics or in the returns of such, the authors examine the gender gap at different points in the distribution, in three different points of time and through different cohorts. The authors conclude that most of the gap is explained by differences in the returns of the characteristics for each gender. Even if they find the existence of the glass ceiling, their results prove that these results are more important in Sweden than in the US, while the gender gap is more prominent in the US. They extend the analysis to explaining what might cause the different returns by saying that under the current policies, the retribution from parental leave is proportionally to the wage the parents had before the pregnancy. This issue in addition to the fact that the wage dispersion is low in Sweden incentivizes women not to invest in higher earning jobs, and instead proceed to work in lower qualified

ones that will allow them to expend more time with their families for similar earnings.

Following this last analysis, but having into consideration the discussion on the roots of the gender pay gap, the aim of this research is to find disaggregated evidence of the glass ceiling behavior for higher educated individuals in selected professions, and describe along the way the patterns observed in the income distribution, enriching the discussion with the different theories previously presented.

3. Data

The data employed for this research comes in hand from the Swedish Population and Housing Census (Folk- och bostadsräkningen). Censuses have been carried on in Sweden since 1860, with some interruptions. [2] The census has information on population, household composition, housing and income/labor market information. For this work Census data for 1970 and 1990 were used. This is a cross-sectional type of data, even if the same individuals might appear in both census, the variable that would allow for matching and thus constructing a longitudinal database are not available. This makes that the analysis here and forward would be done in the limits of cross-sectional data, and under the assumption that both populations are different.

The total population for 1970 was 8,081,229 and 8,590,630 for 1990[3]. From those, the population comprise at the working ages of 16 to 65[4] were 5.264.945 and 5.228.678 respectively. Since the census offered poor information on tenure, a further discrimination was done by choosing only people who worked in professions where the potential experience[5] was close to the actual experience. This issue is further explored in Section 4, but because

---

[2] Statistiska Centralbyrån *FoB 90*. http://www.appl.scb.se/scbdok/1990/scbdokBE0205_1990.PDF retrieved 2012-05-15.

[3] Population and Housing Census. Statistiska Sweden *Population Statistics* http://www.scb.se/Pages/TableAndChart____26041.aspx retrieved 2012-05-15

[4] In 1970 the age for retirement was 67 years, but after 1977 it was changed to 65, in order to make the databases comparables, the same age threshold was taken for both years. People younger than 16 were able to work, but this lower limit loses significance since the people here studied has to, at least, have a university degree, and this can only be achievable to people older than 16, since it has to be accounted for the years of education needed to comply.

[5] Potential experience is defined as Age – Years of Schooling – 6.

of such problems and the lack of information on actual tenure or experience by the Census, this paper focused their analysis in those occupation highly professionalized, where the individuals are prone to pursue a career in the same field relevant to their educative formation. Further on, from those individuals, only those with high education (more than university degree) were analyzed.

After doing so, the amounts of observations remaining for each year are 103616 individuals for 1970 and 273985 for 1990. It is noteworthy the process of high professionalization and education of the Swedish population: let's recall that whereas the total population grew by 6%, the sub-population chosen for the focused analysis almost tripled itself.

The main dimension of the analysis, Income, presented a series of challenges, since it was in nominal values and not expressed as full – time values or given the exact amount of hours worked[6]. Since this work will rely in a comparison between two periods of time, in order to be able to compare returns, it is necessary to work with real incomes. For this, nominal incomes (the ones reported in the census) were transformed into real incomes using the CPI for the corresponding years. CPI stands for Consumer's Price Index. Cost of living index, and excludes taxes and social benefits. 1949=100. CPI 1970 equals 236 and for 1990, 1187.[7]

In order to proceed with the analysis, the subpopulation that was chosen where the university graduates belonging to the following professions:

i). Lawyers, in which category were included:

- Judges, lawyers in court of justice;
- Prosecutors and senior police officers;
- Lawyers in Private Practice;
- Legal Advisers.

[6] In this matter, Stanfors (2003) addresses that part-time labor increased during the 1970s accompanying the entrance to the labor force of women, being a work method still patent in 1990s. A caveat arose when analysing the subpopulation chosen, part-time declaration was almost non-existant, and for the data in 1990, was already transformed into full-time incomes. Thus, to simplify, assumption that all incomes where in full time values was made.

[7] Statistics Sweden Consumer Price Index Statistics Sweden http://www.scb.se/Pages/TableAndChart 33896.aspx retrieved 2012-05-15

ii). Health Professionals. This category is the only one where all the professionals developing the labors here under described were included, no matter their education. This is because after 1977 the habilitation needed to perform was considered to belong to higher education, thus, if only those individuals reporting higher education achievement were considered, it will be a fictitious increase between the periods. At least, this category includes the following professions:

- Nurses;
- Midwives;
- Dental Nurses;
- Medic and Laboratory Assistants.

iii). Accountants, Economists and Staticians. This category included:

- Audit and Accounting Experts;
- Economists and Staticians.

iv). Engineers, including:

- Architects & Civil Engineers;
- Electrical Engineers;
- Mechanic Engineers;
- Chemical Engineers;
- Metallurgical & Mining Engineers;
- Other Engineers.

v). Physicians.

vi). Dentists.

vii). Pharmacists.

viii). University Teachers.

A first glance into the labor market, the median income, the mean income[8], and the amount of observations in each profession are

8 Median Income is the benchmark income at which half of the population earns more than it and half less. The mean income is the average income of the individuals considered in such sample.
The income chosen is the work related income perceived by each individual. At this point, incomes equal to zero crowns were included, since they are part of the population under study. In the regression analysis further explained in section 5, they will be excluded automatically, since the dependent variable is the logarithm of the income, and the logarithm of zero is not

presented in Table 1. Table 1.a introduces the discussion by analyzing the grouped labor force of university graduates of each occupation. Again, the effect of the inclusion of higher educated individuals in the chosen professions and to an extent the augmentation of the labor force for each group of occupations can be associated to the decrease of the real income. This effect is noticed in almost all professions chosen, with the exception being just two, with one of those registering an increase on the median income, but a small decrease in the mean income. Health professionals are notice for the fact that their workforce almost doubles, but their income increases as well, this might be evidence that the demand for profession was unsatisfied, thus when an excess of demand, an increase in the labor supply can yield positive movements for income and labor force.

Table 1.a: Summary Statistics Mean Income and Size

	Labor Force		Change
	70	90	
Lawyers			
Obs.	4591	10203	122,24%
Median Income	25608,9	21305,81	-16,80%
Mean Income	28698,04	23033,96	-19,74%
Health Professionals			
Obs.	52250	99858	91,12%
Median Income	9108,90	11617,52	27,54%
Mean Income	8857,07	11604,64	31,02%
Accountants, Economists & Staticians			
Obs.	4853	26806	452,36%
Median Income	18375	17784,33	-3,21%
Mean Income	20992,17	19366,1	-7,75%
Engineers			
Obs.	15817	83666	428,96%
Median Income	24134,32	17792,75	-26,28%
Mean Income	26096,03	18719,07	-28,27%
Physicians			
Obs.	9302	23804	155,90%
Median Income	44680,93	28828,98	-35,48%
Mean Income	43967,94	28845,67	-34,39%

defined in the real numbers, thus, if income is zero, the logarithm of the income takes the form of a missing value.

Dentists			
Obs.	5037	8349	65,75%
Median Income	26252,97	18306,66	-30,27%
Mean Income	27806,82	18078,85	-34,98%
Pharmacists			
Obs.	3309	5264	59,08%
Median Income	12881,78	14675,65	13,93%
Mean Income	15593,19	15555,66	-0,24%
University Teachers			
Obs.	8457	16035	89,61%
Median Income	19877,54	18222,41	-8,33%
Mean Income	21882,63	18913,86	-13,57%

Source: 1970 and 1990 FoB.

The average increase of the labor force in the population studied is 174%, with the lowest being Health Professionals with 20%, but here it must be accounted that the relative increase is hiding an absolute increase (which is the largest absolute one) of almost 40,000 people at this workforce. The largest relative increase is the one of the Accountants, Economists and Staticians, that quintuplicated itself, by augmenting the workforce by over 35000 people.

In order to further on the initial analysis, breaking down these summary statistics by gender, Table 1.b is added. The third supra column, Ratios, expresses the rate of participation of women in each of the occupations, whereas for Median income delivers the ratio between Males/Females median income. The Breach is defined as the ratio between the mean incomes of the ninth decile regarding the first decile. This measure is regarded as a raw approximation of income inequality.

Table 1.b: Summary Statistics by Gender Mean Income and Participation

	70		90		Ratio	
	Males	Females	Males	Females	70	90
Lawyers						
Obs.	4167	424	7292	2911	9,24%	28,53%
Mean Income	29654,80	19295,20	25249,99	17482,86	1,537	1,444
Median Income	26672,03	17358,47	23761,58	16158,38	1,537	1,471
Breach	3,34	4,44	2,96	2,80		

Health Professionals						
Obs.	3129	49121	5149	94709	94,01%	94,84%
Mean Income	10696,61	8963,983	14608,26	11457,46	1,193	1,275
Median Income	10319,66	8763,906	14422,43	11451,45	1,178	1,259
Breach	2,74	4,54	1,82	2,27		
Accountants, Economists & Staticians						
Obs.	4279	574	17041	9765	11,83%	36,43%
Mean Income	21955,86	13808,16	21699,10	15294,77	1,590	1,419
Median Income	19229,24	14036,23	20117,95	14658,80	1,370	1,372
Breach	3,81	4,14	3,00	2,65		
Engineers						
Obs.	15240	577	74256	9410	3,65%	11,25%
Mean Income	26492,61	15621,27	19240,87	14601,51	1,696	1,318
Median Income	24553,60	15502,54	18289,81	13917,44	1,584	1,314
Breach	3,21	4,58	2,47	2,48		
Physicians						
Obs.	7499	1803	15636	8168	19,38%	34,31%
Mean Income	46611,12	32974,47	31535,69	23696,16	1,414	1,331
Median Income	47405,51	33926,27	32173,55	22535,80	1,397	1,428
Breach	3,11	4,58	2,63	2,76		
Dentists						
Obs.	3540	1497	4846	3503	29,72%	41,96%
Mean Income	31529,24	19004,29	19890,44	15572,72	1,659	1,277
Median Income	29871,19	19446,61	19789,38	15551,81	1,536	1,272
Breach	2,55	2,94	2,27	2,43		
Pharmacists						
Obs.	616	2693	475	4789	81,38%	90,98%
Mean Income	30656,45	12147,60	24510,50	14667,47	2,524	1,671
Median Income	25609,11	12000,00	23959,56	14279,70	2,134	1,678
Breach	3,23	3,27	2,59	2,18		
University Teachers						
Obs.	6715	1742	10883	5152	20,60%	32,13%
Mean Income	23710,91	14835,01	20629,52	15289,72	1,598	1,349
Median Income	21998,73	14059,53	19924,18	15366,47	1,565	1,297
Breach	5,94	6,04	4,14	3,47		

Source: 1970 and 1990 FoB.

The increase of the participation of women in the work force observed by Stanfors it is clearly reflected. Women Participation rates

increased in all the studied professions, in relative and absolute numbers with female professionals going from 58431 to 138407 individuals. That is, most of the proportional increase in the aggregated labor force for the occupations studied is driven by an increase in women's participation. It can be seen that for professions where the female participation grew considerably, median income decreased for both genders. This can be due as a pure quantitative effect of augment of total supply of labor, or also it can be attributed to a composition effect or as stated before, occupational segregation. This last hypothesis holds with the help of the evidence in the University Teachers and Pharmacists categories. These categories have a high proportion of women and between the years, it can be seen that after the augment in the labor force driven by the inclusion of women, male earnings decreased, whereas female earnings increased. According to the Segregation literature, this is an event expected in cases of occupational segregation, as women enter male intensive occupations; male wages go down, as female wages go up.

Intuitively, with the data here presented, something could be said about the income distribution functions for each gender and profession. From the measures available on central tendency, mean and median, since median is less than the mode, it can be said that the distributions are positively skewed, which is what is expected for the case of income. This means that the right tail is heavier than the left one.

Also, consistently for both periods, not only males have a higher median income than women, but also higher minimum and maximum income, which means that the income distribution functions for females, is shifted to the left corresponding to the male's one. Still, at the median, the income gap between genders has decreased for all the studied occupations with by 1990 none of median income for males being more than 1.5 times the median income of females. The fact that the distributions are shifted can be interpreted as evidence for vertical segregation.

If one accounts the breach as an approximation to income inequality, it can be seen that for circumspect to each gender, the breach has decreased over the period studied (being the category Male Lawyers the only

exception). Since these are the net income after taxes, this is mainly due to the tax reform that took place during the 1980s[9].

Table 2 is added to summarize the other control variables. As previously stated and more profoundly justified in Section 3 age is going to be used as a proxy for actual experience. Based on information on the educational title obtained, the proportions in each profession that had a University Degree, a Master or Lic. degree and Doctoral one were constructed.

Table 2: Age and Education

	70		90	
	Males	Females	Males	Females
Lawyers				
Mean Age	40	36	43	37
Foreign	3,53%	4,48%	2,89%	4,67%
University Degree	98,92%	100,00%	98,59%	98,76%
Master/Lic.	0,70%	0,00%	1,03%	1,17%
PhD	0,38%	0,00%	0,38%	0,07%
Health Professionals				
Mean Age	42	35	37	41
Foreign	7,93%	5,96%	8,41%	6,84%
University Degree	7,99%	57,51%	83,32%	72,82%
Master/Lic.	0,64%	0,51%	10,91%	8,30%
PhD	0,03%	0,00%	0,06%	0,01%
Accountants, Econo-mists & Staticians				
Mean Age	36	32	40	35
Foreign	6,33%	7,67%	5,25%	7,66%
University Degree	85,44%	86,06%	94,33%	97,81%
Master/Lic.	14,16%	13,94%	4,82%	2,01%
PhD	0,40%	0,00%	0,86%	0,18%
Engineers				
Mean Age	38	33	37	32
Foreign	14,02%	19,06%	7,27%	10,22%
University Degree	15,95%	23,40%	98,28%	97,84%
Master/Lic.	83,71%	76,60%	0,92%	1,51%
PhD	0,34%	0,00%	0,80%	0,65%

[9] For further explanation see Stanfors (2003).

Physicians				
Mean Age	40	38	43	41
Foreign	23,48%	25,35%	18,97%	19,00%
University Degree	5,76%	7,49%	1,31%	2,40%
Master/Lic.	83,45%	89,30%	77,95%	90,25%
PhD	10,79%	3,22%	20,74%	7,35%
Dentists				
Mean Age	39	38	45	41
Foreign	9,52%	17,10%	8,75%	13,59%
University Degree	0,08%	0,20%	0,45%	0,57%
Master/Lic.	99,01%	99,60%	96,47%	98,00%
PhD	0,90%	0,20%	3,07%	1,43%
Pharmacists				
Mean Age	41	35	45	45
Foreign	3,73%	5,31%	9,05%	4,57%
University Degree	9,42%	87,75%	15,37%	87,26%
Master/Lic.	88,31%	12,11%	78,53%	12,38%
PhD	2,27%	0,15%	6,11%	0,35%
University Teachers				
Mean Age	35	34	43	43
Foreign	11,54%	12,69%	13,23%	13,26%
University Degree	29,08%	48,56%	43,73%	70,07%
Master/Lic.	48,64%	45,46%	12,23%	9,74%
PhD	22,28%	5,97%	44,05%	20,23%

Source: 1970 and 1990 FoB.

Here is noteworthy the effect of the change on qualification for the required education to perform as a health professional: according to 1970 census, almost 10% of the males had a higher education, and by 1990, this had changed to almost 90%.

Another observation is the fact that some professions have a larger proportion of individuals with education beyond the university bachelor's degree, such as Physicians, Dentists, Pharmacists through both periods and Engineers for 1970. In general, the University Teachers is the category were PhD's are more present, by this strengthening the common view that such accomplishment is more common in academic fields than in strictly professional ones.

3.1. Blau's Occupational Segregation Index

To expand in the occupational segregation discussion, Duncan and Duncan (1955) created an Occupational Segregation Index for white and non-whites residences and Blau (1979) extended such analysis into the gender occupational segregation topic. The index can be interpreted as the proportion of women who would have to change their place of work to make all the proportions of women employed at each occupation equal. For calculations,

$$S_t = 0{,}5 * \sum_i |m_{it} - f_{it}|$$

where, S_t is the index at time t, m_{it} is the percentage of the total male labor force employed at time t in the i profession and f_{it} is the percentage of the total female labor force at time t employed in the i profession. The index can vary between 0 and 100, with 0 no segregation, and 100 perfect segregation. By constricting the analysis to the professions chosen, the Occupational Segregation Index yielded 81,48 for 1970 and 67,74 for 1990, which agrees with the observations by Dolado et al. for the rest of European Union for 1999. This can be interpreted as the fact that the female incorporation into the labor force had a somewhat homogeneous effect in the gender composition of the labor force, but the professions under study still maintained a strong occupational segregation in 1990. In this issue, it is noteworthy the high presence of women in the fields of Pharmacy and Health Professionals. A caveat arises in the issue that this reflects only on horizontal segregation, which means, it only allows to be seen the fact that genders are more concentrated in certain occupations. The data available do not allow for testing for private/public sector, but at this far, the conclusions here observed are in concordance with Nermo.

Combining this asseveration with the observations made the displacements of the functions from the range information before mentioned, it can be seen that indeed the hypothesis of Meyersson is confirmed, but also the development of Albrecht.

4. Methodology

The methodology to be applied is the use of Quantile Regression. This methodology allows for the effects of gender and other variables to change through the different quantiles of the income distribution, based under the idea that these effects are not constant throughout the distribution, and extending to the Glass Ceiling analysis, it allows for changes in the characteristics underlying the gender gap and therefore, it permits the identification of the phenomenon. In other words, with this methodology, the effect of the variables under study can be evaluated in different points of the distribution, not only at the mean, like Ordinary Least Squares does.

This procedure consists in two steps. First, a quantile regression is estimated with a semi-parametric technique for each year and each gender. Afterwards, the estimations between genders for each year (or between years for each gender, to see the evolution through time of the income distribution) are contrasted through the Oaxaca-Blinder decomposition to test if the differences are a consequence of differences in the coefficients (returns to the characteristics) or to differences in the characteristics in itself.

DiNardo et al. (1996) covered the same issue but through a kernel analysis. From the data for the US, the authors generated the kernel densities that best adjusted to their observations. Later, they contrasted the differences between the kernel densities by elaborating counterfactual analysis. This is also done for the Oaxaca-Blinder decompositions, but the main difference between the two approaches is that in the quantile regression, linear regressions are still being estimated, while DiNardo's analysis do not use this concept, and thus, cannot specify in the effect of the variables of interest in the income.

4.1. *Quantile Regression*

The structure behind the quantile regression estimation is as follows.

Let $(y_i, x_i), i = 1, \dots, n$ be a sample from the population, where x_i is a Kx1 vector of K regressors for each *i*. Then, it can be written that the relationship between $y_i$and x_i is:

$y_i = x'_i\beta_\theta + u_{\theta\,i}$ so that $Quant_\theta\,(y_i|x_i) = x'_i\beta_\theta$ (1)

The quantile regression assumes that x_i is lineal in the θ quantile; so $Quant_\theta\,(y_i|x_i)$ expresses the conditional value of y_i given the values of x_i and the fact that the y_i is observed in the quantile θ. A caveat arises with the issue that the distribution of $u_{\theta\,i}$is unknown and is only assumed that $Quant_\theta\,(u_{\theta\,i}|x_i) = 0$.

For a given quantile θ, since 0< θ<1, β_θ that will minimize the $\hat{u}_\theta$ is:

$$\min\left\{\sum_{i:y_i\geq x'_i\beta_\theta}\theta|y_i - x'_i\beta_\theta| + \sum_{i:y_i<x'_i\beta_\theta}(1-\theta)|y_i - x'_i\beta_\theta|\right\}$$

The estimated coefficients can be interpreted as the rates of return to the skills at the different quantiles of the income distribution.

Expanding on the $u_{\theta\,i}$, the problem that arises is that is unknown if the errors are independently identically distributed (i.i.d.) through the different quantiles, first of all, because it is unknown if their behavior is under the normal distribution, and second, usually when dealing with income, heteroskedasticity is present (variance is lower at the left of the distribution and greater at the right tale). The last is solved by analyzing the equation one quantile at the time, but still questions about the underlying distribution of the errors remain. Thus, bootstrapping is used to estimate the standard errors for the coefficients.

4.2. *Decompositions*

To see if there's discrimination between the genders, one easy answer is to analyze the difference among the mean income and observe if it responds to differences between the skills or if it does to reasons due to labor market discrimination (Borjas, 2010). This decomposition is known as the Oaxaca decomposition, and in raw terms can be expressed as:

$$\Delta\bar{y} = \overline{y^M} - \overline{y^F}$$

Where $\overline{y^M}$ and $\overline{y^F}$ are the mean expected values resulting from the regressions:

$y_i^M = x_i^{M\prime}\beta^M + u_i^M$; $y_i^F = x_i^{F\prime}\beta^F + u_i^F$.

With some algebraic manipulation,

$$\Delta\bar{y} = \overline{y^M} - \overline{y^F} = \overline{x^M}'\beta^M - \overline{x^F}'\beta^F = \overline{x^M}'\beta^M - \overline{x^F}'\beta^M - \overline{x^F}'\beta^F + \overline{x^F}'\beta^M$$

This can be also expressed as:

$$\Delta\bar{y} = (\overline{x^M} - \overline{x^F})'\beta^M + \overline{x^F}'(\beta^M - \beta^F)$$

Thus, the difference in the incomes can be decomposed into what is due to difference among the genders and what is responsibility of discrimination (the second term in the subtraction).But, as it can be seen, this decomposition allows for analysis only around the mean expected value. Borrowing from Melly (2005) and Machado and Mata (2005) this can be extended over quantile analysis. These models have been used to a variety of cases, such as two cross sectional data to observe changes in time[10] as well as cross-sectional analysis from a longitudinal dataset [11] to compare two populations in the same point of time. In this case, the aim will be to have both analyses, examining the gender gap in the two moments of time, as well as tracing the evolution through time of their income for each gender.

In order to proceed with such approach, once the quantile regressions coefficients are estimated, counterfactual densities are calculated (in

[10]Machado and Mata, and Melly employ this type of data in the form of samples from a Portugal's survey conducted by the Ministry of Employment, and US Current Population Survey, respectively for their publications

[11]Albrecht et al. use this approach to construct their analysis for the 1998 gender gap through different methodologies and Anton et al. do as well for studying the gap between immigrants and natives for Spain 2006.

the Oaxaca explanation, this will be $\overline{x^F}'\beta^M$, which is the expected income that a female with average characteristics would have perceive if she would have had the same returns as a her male counterpart). Following Machado and Mata (2005), and further on, Melly (2005) these counterfactuals are constructed taking into account the heteroskedastic errors. Melly, as DiNardo does, constructs its counterfactual densities with weights that allow for the distribution of skills to be constant across time (in the case of this thesis, also, gender). The approach is called to be semi-parametric, because even if there are assumptions that the quantiles satisfy a parametric restriction (that is that there's no covariance between the errors and the variables in *x*) no assumption is made on the distribution of such errors, and the covariates can affect all the conditional distribution.

Taken into example the general case of having two genders and wanting to construct the counterfactual densities to test their difference, under Melly's method, first computing the quantile regressions at each θ_j quantile (in this case it was computed for 100 equidistant quantiles-also called, percentiles). This yields:

$y_i^M = x_i^{M\prime}\beta_{\theta_j}^M + u_{\theta_j}^M$; $y_i^F = x_i^{F\prime}\beta_{\theta_j}^F + u_{\theta_j}^F$ for each gender at each quantile.

Then the counterfactual income distribution for females if the distribution of individual attributes were the same as males, by minimizing equation 1 over the distribution of *x* for males, using the coefficients estimated for women.

To separate the effects of the residuals from the coefficients, at each quantile the residuals' distribution conditional on *x* is estimated by $x\ \left(\hat{\beta}_{\theta_j} - \hat{\beta}_{0,5}\right)$ and a estimation is done over the distribution that would have existed if the median return to the characteristics would have been the same as for males but the residuals would have been distributed as for women, this will yield a vector of estimated coefficients which is $\widehat{\beta}_{\theta_j}^{median\ Males, residual\ Females}$ or $\widehat{\beta}_{\theta_j}^*$ to simplify. Therefore, the difference

observed between the distributions would have been given by changes in the coefficients since both characteristics and residuals are considered *ceteris paribus*.

Afterwards, this counterfactual is added and subtracted so that the estimated income gap can mathematically be expressed as:

$$\hat{y}_i^M - \hat{y}_i^F = x_i^{M\prime}\hat{\beta}_{\theta_j}^M - x_i^{F\prime}\hat{\beta}_{\theta_j}^F$$
$$= (x_i^M - x_i^F)'\hat{\beta}_{\theta_j}^F + x_i^{M\prime}\left(\hat{\beta}_{\theta_j}^M - \hat{\beta}_{\theta_j}^*\right) + x_i^{M\prime}\left(\hat{\beta}_{\theta_j}^* - \hat{\beta}_{\theta_j}^F\right)$$

The difference between this procedure and standard the standard Oaxaca- Blinder for quantile regression, is that the mathematical formulation for the last one is:

$$x_i^{M\prime}\hat{\beta}_{\theta_j}^M - x_i^{F\prime}\hat{\beta}_{\theta_j}^F = (x_i^M - x_i^F)'\hat{\beta}_{\theta_j}^F + x_i^{M\prime}\left(\hat{\beta}_{\theta_j}^M - \hat{\beta}_{\theta_j}^F\right)$$

Where it can be seen that is not accounting for changes in the residuals, and thus, in case of heteroskedasticity, this effect will be included as part of the change in returns. Melly's decompositions are asymptotically equivalent to the results of Machado and Mata.

Usually, the standard parsimonious regression employed to model earnings is Mincer's "human capital earnings function" (Mincer 1974, Lemieux 2006) where the logarithm of the earnings is linear function of the individual's schooling and potential experience. In mathematical notation,

$$\ln(y_i) = \beta_0 + \beta_1 schooling_i + +\beta_2 experience_i$$
$$+ \beta_3(experience_i)^2 + u_{\theta_j}^{s,t};$$

Where y_i is earnings, and β_0 the expected logarithm of the earnings of an individual with no experience or education, $schooling_i$ is the individual's years of schooling and $experience_i$ is a variable accounting for the potential experience[12]. The quadratic expression on experience aims to reflect the concave nature of the curve.

[12] Which is at the same time is estimated as: Schooling = Age – Schooling – 6. The optimum variable to have in such a case is real experience, but this variable is usually hard to define as well as to find in the databases. This is due that first understanding has to be made on what experience means, if is participation in the labor market, then the formula for potential experience is a good estimation. If what one would like to capture is experience in the relevant field in which the individual works at the time of the question, then the information needed is

Since in the database available there's no information on the years of education but on the levels achieved, and due to the complication of accounting the years of education for post-graduate education, and for the matter of this study (highly educated professionals, which means that level of schooling is going to be somewhat homogeneous across the individuals in the data) then, instead of schooling and experience, age is going to be considered as a regressor. Lemieux notes that there's a difference on the earning's profiles towards these two variables mainly that the slopes of the age-earnings profiles are steeper for higher educated workers, whereas the potential experience-earnings profiles tend to just be upper parallel displacements for these individuals. But as Miller (1993) explains, being both proxies for time spent in the labor market, already there's a possibility of measurement errors, and thus, biasedness. Mainly, the issues to approximate actual experience by potential one lie in the fact that underlying assumptions are: i). There's no interruption of work / absenteeism from the job market during the working life of the individual after finalizing education; and ii). All the experience gained during those years has been in the same occupation, and even further, relevant to the occupation that the individual is developing at the point of survey. These are heroic assumptions for most of the population, but they do not hold especially for the case of married women under the traditional theory of Human Capital.

Even further, if one uses potential experience by estimating the years of schooling another error will be committed, since the variables available for Education are categorical, so no information about the amount of years spent studying, only the achieved title. Then another error of measurement is added, making potential experience a better candidate to be biased. Also, since the analysis here proposed will already be confined to higher educated, with the variability on the earnings will be a function purely on time spent at the labor force. Thus, using age as a regressor is a more straightforward solution to using a transformed variable as a proxy to time spent in the labor force.

Specifically, for the Quantile Regressions (and afterwards for the Melly's Decompositions) the equation estimated at each quantile will be:

---

related to "tenure", but even then is hard to define (Tenure in the company? Tenure in the position? Tenure in similar positions? Etc.)

$$\ln(y_i^{s,t}) = \beta_0^{s,t} + \beta_1^{s,t} age_i^{s,t} + \beta_2^{s,t} \left(age_i^{s,t}\right)^2 + \beta_3^{s,t} Foreign_i^{s,t} + \beta_4^{s,t} Single_i^{s,t} + \beta_5^{s,t} Children_i^{s,t} + u_{\theta_j}^{s,t};$$

$$\text{with } i = 1, \dots, N; s = \{Male; Female\}; t = \{1970; 1990\}$$

Where the dependent variable and the covariates are:

- $\ln(y_i^{s,t})$is a continuous numerical variable the natural logarithm of the net real income for the person *i,* of gender *s*, at time *t.*
- $age_i^{s,t}$is a discrete numerical variable and the age of the individual *i,* of gender *s*, at time *t.* As stated before, this variable is intended to be a proxy of the time spent in the labor market, and thus it will be expected for the accompanying coefficient to be positive.
- $\left(age_i^{s,t}\right)^2$is the square of age. The effect of this variable is expected to be negative as to show the curvature of the earnings profile.
- $Foreign_i^{s,t}$is a dummy variable that takes value 1 if the person was born in a country outside of Sweden and 0 if it is Swedish of birth, for the person *i,* of gender *s*, at time *t.* The coefficient associated to this variable is predicted to be negative, as it implies Friedberg (2000)[13] and others[14].
- $Single_i^{s,t}$is also a dummy variable, with value 1 for those individuals that don't have a partner cohabiting or married, and 0 for those who do, for the person *i,* of gender *s*, at time *t.* Under a model where there's equality between genders, this variable should not be significant for any sex, but under traditional theory in human capital (Becker 1985), is yield a positive coefficient in women, since married women have a different allocation of time

[13] Friedberg alludes that there's no perfect portability on human capital, so this can translate to the fact that an individual that emigrated will have lower earnings in his host country compared to a similar native with the same education and experience, due to the fact that human capital gained abroad is less valued that the one gained domestically.

[14] As cited in Anton et al. (2010) these theories board such as the fact that there might be labor market discrimination (Becker 1957), in the base of taste or statistical discrimination (Chiswick et al. 2009) or even that the fact that there's asymmetry in the labor market information and since immigrants are not as fluent in the customs and traditions that influence the positioning of the individual in the labor market, they have worse outcomes.

(housework consumes a higher share of their available daily hours) than unmarried females, thus the latter will tend to expend more hours at work, and will not be then penalized for having a living-in partner.

- $Children_i^{s,t}$ is a discrete numerical variable that accounts for the amount of children under the age 17 for those observations taken in 1970 and under the age of 15 for those appearing in 1990 that the individual *i,* of gender *s*, at time *t* fathered at the point of the census. In a similar fashion with the $Single_i^{s,t}$ the coefficient of interest shouldn't be significant if policies have been put in place to ensure a better articulation of women in the labor market. In the same nature as before, Becker (1987) states that since childcare folds mainly on women, the coefficient of this variable will have a negative effect on their earnings. Since the policies were made in the 1980's, this would be expected to have no significance for the data on 1990.

As a side note, it would have been preferred to have it disaggregated into one dummy for each level of higher education, expressing the highest degree achieved of education; but since there weren't enough individuals with PhD's or Magister/Lic. in certain occupations, in those regressions these variables were dropped because of non invertibility constraint, thus the analysis was cut short on further investigations for the effect of this variable.

5. Results

The intention of this section is to test the aforementioned relationship, to observe the existence of the glass ceiling in the different professions for the chosen subpopulations, as well as its evolution. Moreover, it will aim to conclude about the significance of the included variables in the estimated function and its effects.

In Appendix 1 the auxiliary tables for the quantile regression are reported at the first quartile (q25), the median (q50) and the third quartile

(q75). In all the cases, to have a significance analysis being done, given the difficulty of estimating the asymptotic variance, the standard errors were calculated through bootstrapping with twenty repetitions. Even if the number is low, given the amount of observations, the results yielded where robust.

In an aggregate commentary, it is noteworthy the high significance of the estimations in all the regressions. The model proves to be robust, with only one regression having no significant variables. Age has the positive expected value in all the regressions, and income is increasing at a decreasing rate on it, even if the curvature is very low(almost lineal), it was below -0.0003 in one of the 120 quantile regressions . It is also noteworthy the fact that the variable accounting for being born outside of Sweden is non-significant in almost all the regressions, probably due to the issue that those where very few individuals in the studied subpopulation.

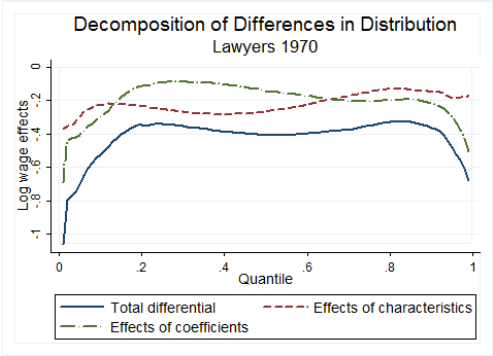
In order to present the decomposition between the genders, and also between years for each gender, below follows the analysis for each profession.

5.1. *Lawyers*

Following the previous section on what was expected from the quantile regressions estimations, it can be seen that the regression for the 1970's has coeffiecients with less significance than the regressions for the nineties. The amount of children has a smaller effect when moving upwards in the distribution, even losing significance. For the 1970 regressions, it seems that having a higher degree does not influence income. This is probably due to the fact that such a large proportion of the labor force is graduated. Civil status does not bear any significant consequence for women over their income except for the regression in the median. Age (as a proxy for experience, as it was already explained) has a positive effect, implying in average an increase of 14% in the earnings per extra year of experience per males, and 15% for women. The earnings profile presents the curvature expected, since the coefficients for age squared are negative. A remark must be done since the contributions for experience are lower in the 1990s than in the 1970s.

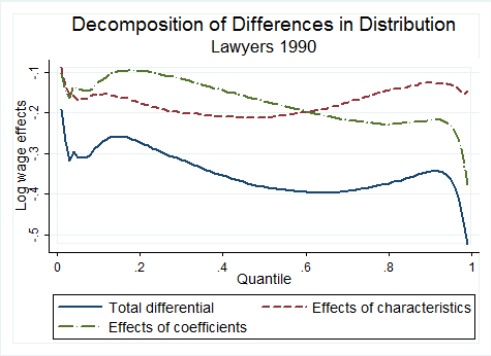
The Melly Decompositions will be presented in graphs. The blue line is the total difference between the estimations for each group. The red line represent the amount of such differential that is explained by different characteristics among the two groups while the blue line reflects the differences in the returns perceive given the characteristics ceteris paribus (it can be interpreted as discrimination).

Fig.1



Source: 1970 FoB.

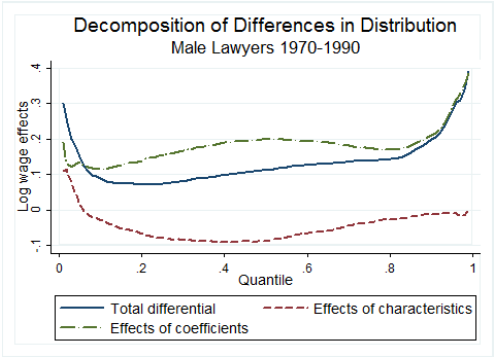
Fig.2



Source: 1990 FoB.

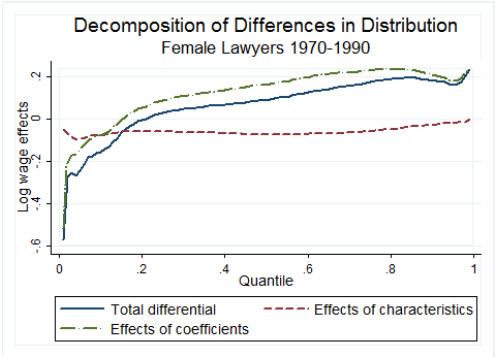
For the Gender gap, it can be seen that the effect on the difference of the characteristics is slightly larger for the lowest deciles than for the higher ones. In what defines on the effect of the coefficients, it can be seen that the behavior changed dramatically between the years. In 1970 there's evidence of a floor, this is up to the second decile, as women perceived lower returns for the same characteristics than men. After the ninth decile it displays evidence of glass ceiling. This last observation maintains in the nineties, where it can be perfectly clear how the gender pay gap that is a consequence of differences in the returns earned for equal work increases as it moves to higher quantiles. .

Fig.3



Source: 1970 and 1990 FoB.

Fig.4



Source: 1970 and 1990 FoB.

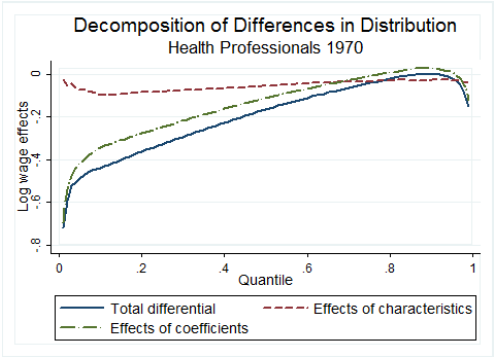
When analyzing the evolution of the incomes the decomposition measured the change from 1990 to 1970, going backwards in time, so the interpretation can be a little counterintuitive, by thinking that positive changes are actually decreasing changes and vice versa. It can be seen that for women, almost 10% of the improvement in their income it can be accounted for changes in the characteristics, while males have suffer a worsening of such in the lower quantiles, with the change afterwards being close to zero.

The returns have decreased in general, but in the case for women, the lowest quantiles actually suffered an improvement, bringing inequality between quantiles down (returns for lowest quantiles increased, while for higher decreased), while the opposite holds for males (lowest quantiles decreased more than higher ones).

5.2. *Health Professionals*

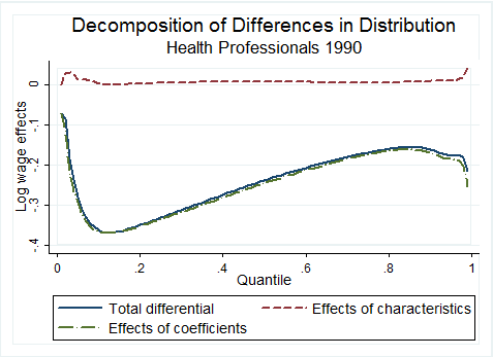
Again, all the coefficients estimated were significant, except for the Children with no significant effect on the male incomes for the 1970 Census; and civil status for men. Experience is better rewarded in the highest paying jobs than in the lowest. Being single has a higher return for women, this might indicate that single females tend to dedicate more to work than those who have a partner (the estimation is positive). Having children presents negative effect on the mother's income, but this effect is greatly reduced between the seventies and the nineties.

Fig.5



Source: 1970 FoB.

Fig.6

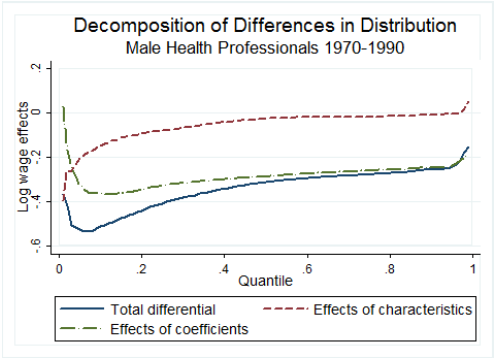


Source: 1990 FoB.

Analyzing the decompositions between genders for each period, again, it can be seen that the effect of the characteristics is almost constant and close zero but a little larger for the higher quantiles than the lower ones in the case of the 90s. This means that if females had the same returns to their characteristics than males, their income would be larger. Still, returns to females are lower than those to males for each quantile, and they drive the total differential.

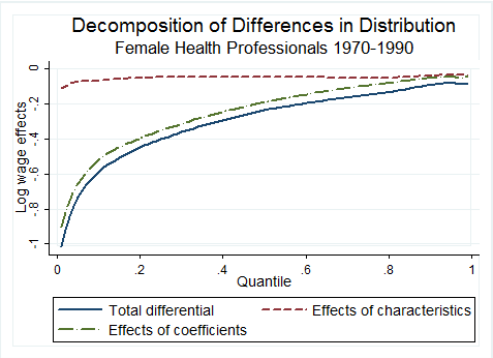
For both periods there's evidence of a strong floor effect. This is, the gender gap is larger at the bottom of the distribution than at the gap, even if in the 90 this relationship is reversed in the very top.

Fig.7



Source: 1970 and 1990 FoB.

Fig.8



Source: 1970 and 1990 FoB.

In the case of the evolution of the income for males, the proportion of the change due to the characteristics show that males have improved their characteristics through the years, with those in the lowest quantiles having improved more than those in the highest. This is also true for

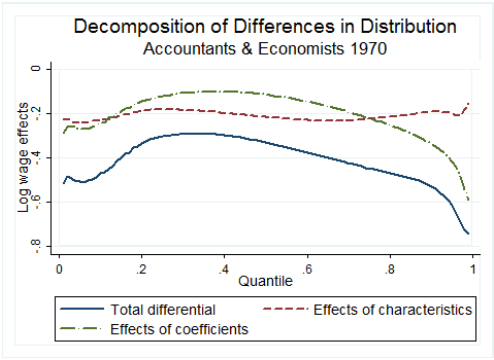
their returns, which has suffered a constant improvement throughout the whole distribution, with this being a little less for the lowest quantiles, so, in the total effect, the whole distribution has observed an improvement in their returns.

In the case of women, the characteristics are not as noted, with a light improvement for all the quantiles. About the effect of the coefficients, For women, the returns have improved the most for the lowest quantiles, which can be interpreted as an improvement in inequality.

5.3. *Accountants, Economists & Staticians*

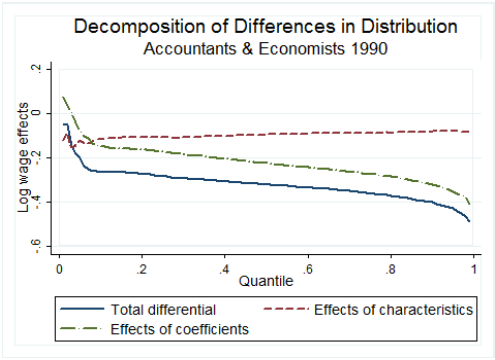
Quantile regression shows that Males consistently are more rewarded than females for experience in the 70s, but this is reversed in the 90s, as well as not penalized for having children (or even awarded), but single men have in average 7% less earnings than those who are married, effect that is not observed in the case of women. In this case, being born abroad in the 90s reports a negative effect, as far as lowering a 25% the earnings with respect to a native for those men in the first quartile of the distribution, ceteris paribus.

Fig.9



Source: 1970 FoB.

Fig.10



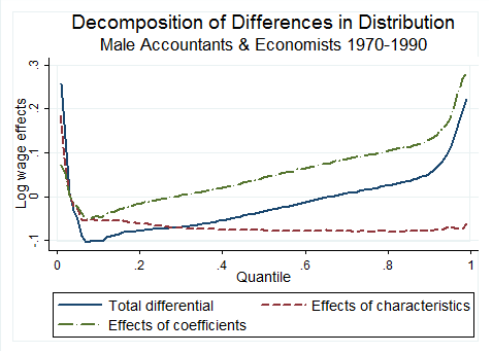
Source: 1990 FoB.

Melly's decomposition shows that for 1970 the difference in returns is larger at the extremes of the distribution, which is evidence for the glass ceiling phenomenon but, that appears only after the 80th quantile. Women at the very upper tail receive up to 60% less income than males accounting for the same characteristics. The differential due to characteristics between genders

is constant, and accounts that if women and men would perceive the same returns for their characteristics, women will receive 20% less of the income of males, completely due to the fact that they have worse characteristics (with these being the ones considered in the regression).

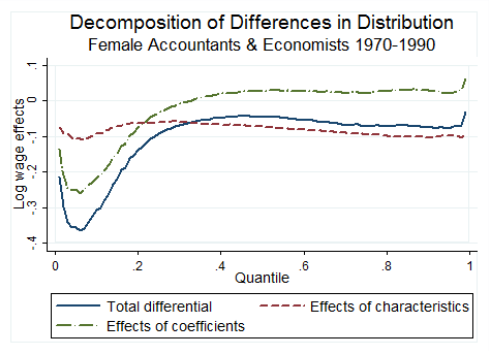
For the 1990, this behavior has fully developed into a perfect example of Glass Ceiling, with the gender pay gap increasing constantly as it moves across the distribution towards the higher quantiles, but the gap at this stage is less than in the 70s .

Fig.11



Source: 1970 and 1990 FoB.

Fig.12



Source: 1970 and 1990 FoB.

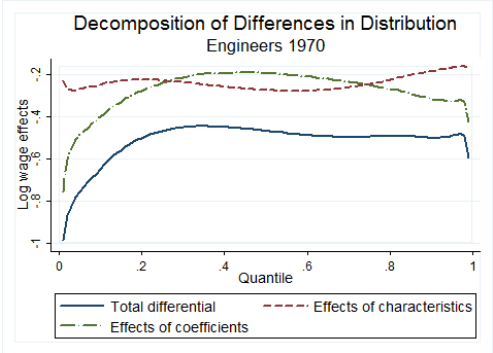
Similar to what has been already discussed, males observed a deterioration in the returns in the analyzed period (especially for those of higher income), while women's improved (particularly at the lowest bound of the distribution), that fits into Goldin's theory, from going from an occupation with 1/9 female/male ratio to over 1/3.

5.4. *Engineers*

From the quantile regressions, can be seen that the only variable that is not significant is the civil status one for females at any period. The effect of the childbearing policies appear since children have a positive effect on males by the 70s, but this is drastically change into significant negative ones for the 90s, while for females the coefficient, even if it is negative, decreases. Still is always more penalized for the case of women than males (this can be observed as a differential in the labor division around the household, children in women

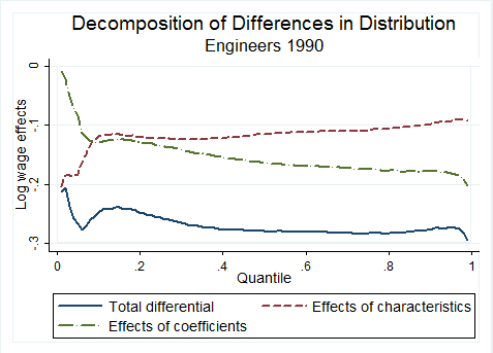
have a bigger impact because they tend care for them more time comparatively than males[15]).

Fig.13



Source: 1970 FoB.

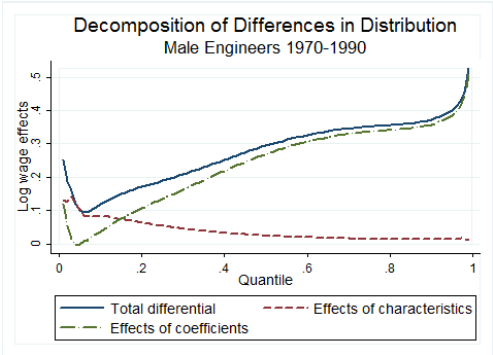
Fig.14



Source: 1990 FoB.

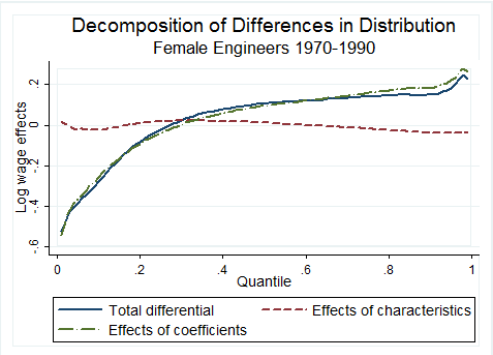
Confirming the patterns observed previously, when analyzing the decompositions, a floor pattern appears for 1970 while evidence for the ceiling glass in the nineties. The proportion of the differential between the incomes that is responsibility of the difference in characteristics in negative throughout the distributions, which is interpreted that given the characteristics of each gender, if they would have the same returns for them, women will consistently earn less income than men. In the case of 1990, this differential will be lower when more at the bottom of the distribution the individual is.

Fig.15



Source: 1970 and 1990 FoB.

Fig.16



Source: 1970 and 1990 FoB.

[15] See Williams and Deci (2012) for a complete discussion on motherhood and work, as well as Becker (1985).

The characteristics of the labor force have decreased in the case of males, while for females have improved. of both genders have improve in the years. The returns for males have dramatically decreased, with this being worse at the top of the distribution, whereas the returns for women at least increased for those below the 50th percentile, while it had the same fate as males' for the upper percentiles, but not being quite as harsh. This effect can be considered as an egalitarian force that provoked the returns to come closer through the distributions.

5.5. *Physicians*

Goldin and Katz (2011) addresses this profession as well, attributing the increase of females in medicine to the fact that this entry has not been homogeneous through the science, but, for the case of the US, women tend to concentrate in certain specialties, such as Ob-Gyn, Pediatrics, Dermatology, and stay away of more time consuming (for on-call urgencies, surgeries, etc.) ones, on the liking of Surgical specialties, Neurology, Cardiology etc. Women tend to look for specialties that allow for weekly working fewer hours, and more flexibility on their practice time.

In the quantile regression analysis, Motherhood is only penalized in the 1990s, while fatherhood is awarded, but this coefficient lost significance as well as size between the periods. For men, being married is an asset that increases their incomes, while this is the opposite for women.

Fig.17

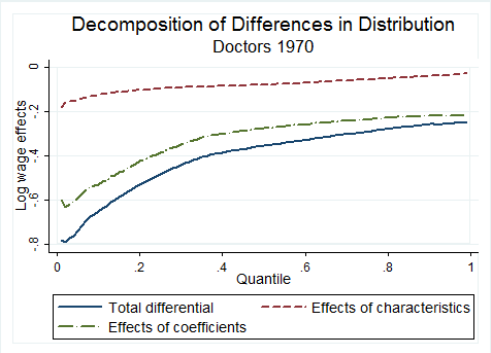
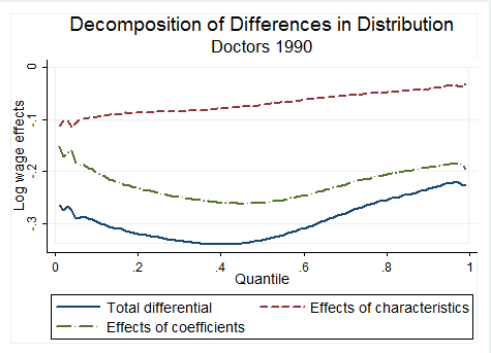


Fig.18

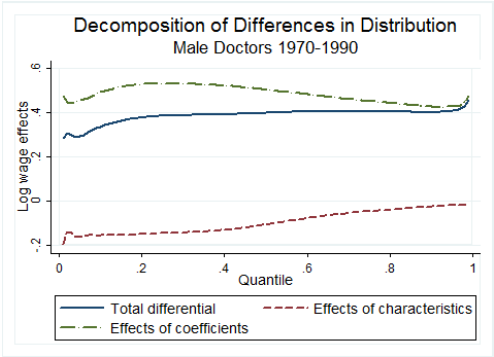


Source: 1970 FoB.

Source: 1990 FoB.

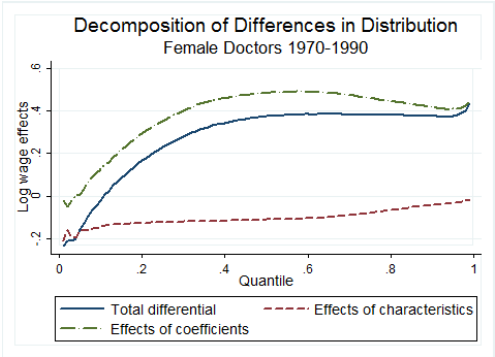
Doctors also present the same observations as the other professions: a floor pattern in the 1970 and a slight glass ceiling for 1990 (if comparing the low quantiles with the medium-high ones). For both years the characteristics yield more responsibility for the gap at the beginning than at the end of the distribution..

Fig.19



Source: 1970 and 1990 FoB.

Fig.20



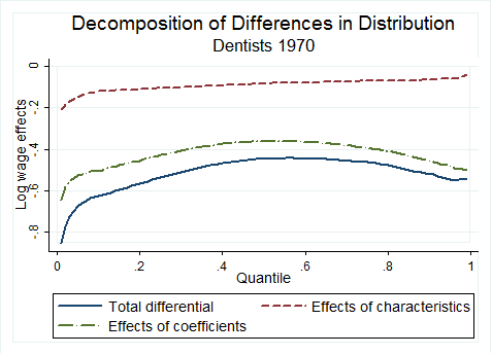
Source: 1970 and 1990 FoB.

When analyzing the behavior of both genders through time, it can be seen that the returns for males and females have decrease in the 1990. This change observes an improvement in inequality for the distribution of females, since the worse change is suffered in females at the right side of the distribution, while the change in the worsening in the returns of males is close to constant at 40% throughout the distribution .

5.6. *Dentists*

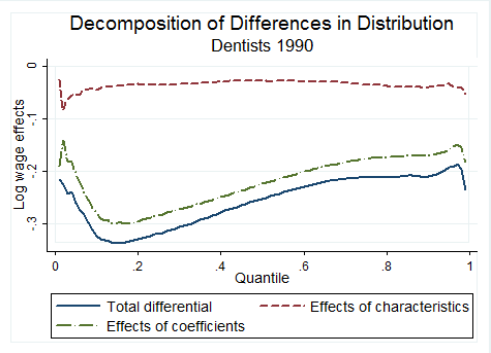
Quantile Regression yields that experience was better rewarded in the 1970 than in the 1990, and in the lowest quantiles than in the higher ones. Also, the effect of bachelorhood is similar to the ones observed before, negative for males, positive for females. Having children is also detrimental for women (and is more penalized at the lower of the distribution than at the top), repeating the fact that the coefficient loses magnitude in the 90s respect to the 70s, as well as losing significance form males, perhaps again showing a positive effect on the policies.

Fig.21



Source: 1970 FoB.

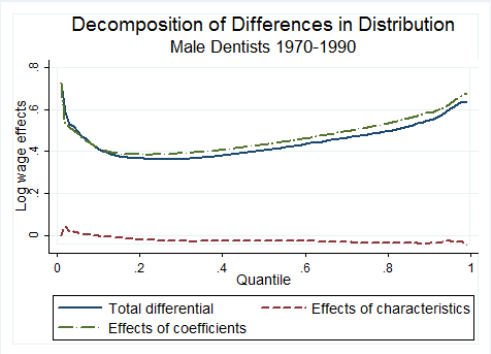
Fig.22



Source: 1990 FoB.

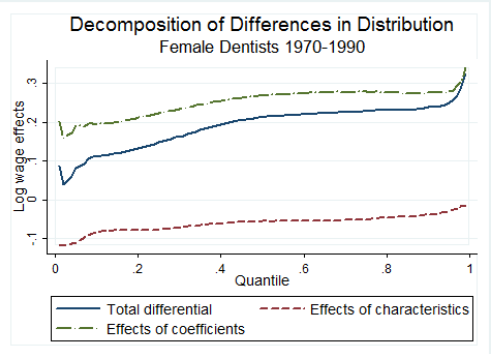
The decompositions demonstrate once again that there was indication of floor and glass ceiling in the 1970, but with the inverse behavior for the 1990, with the gap being larger between the 10th and 70th quantile.

Fig.23



Source: 1970 and 1990 FoB.

Fig.24



Source: 1970 and 1990 FoB.

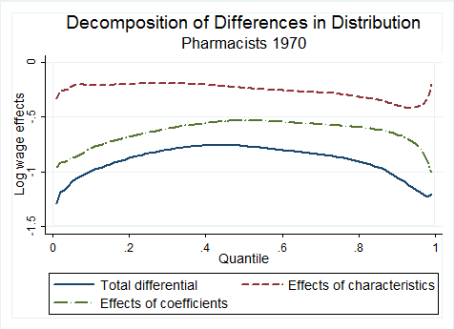
The genders behavior in time, corresponds exactly with the one described for the case of Physicians, worsening returns for both genders, but in this case, this effect is bigger at the right tail, so the egalitarian effect can be seen in both instances.

5.7. *Pharmacists*

Stanfors (2007) presented in her paper that the feminization of Pharmacies was a process that took over the whole labor market defined in a pharmacy, from lower end jobs until managerial positions, with this happening after 1970. This is clearly reflected by the changes in the labor force where higher educated women more than doubled between 1970 and 1990 while males almost halved at the same time.

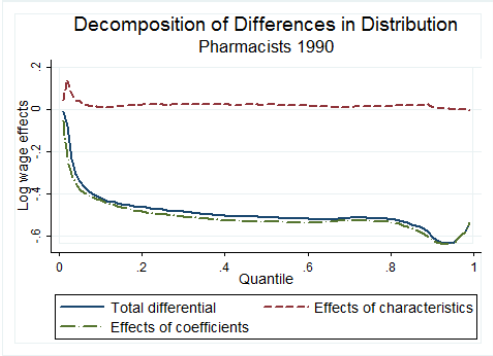
The quantile regression analysis presents similar results towards civil status as those already observed, men are valued to be married, while women are so for being single. In what respects to children, motherhood is again penalized, but less in the 90s.

Fig.25



Source: 1970 FoB.

Fig.26

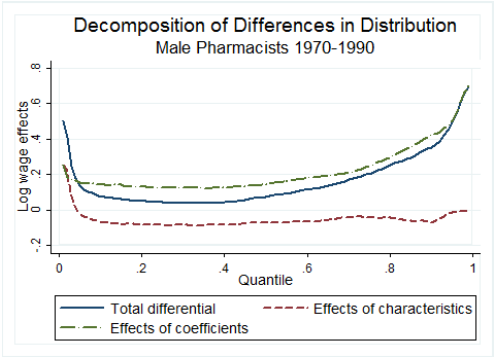


Source: 1990 FoB.

Even if it was a highly feminized industry, the behavior of the gender gap is similar to what has been already observed. For the 1970, there's presence of floor and glass ceiling for the highest part of the distribution (after the 95th percentile), differential in characteristics account for women earning almost 50% less than men, whereas differential on returns yield alarming results of incomes being 100% less for women in respect to men. According to Stanfors' study most men at this point where pharmacists, while women were concentrated in the dispenser activities, so for this period, even if there was a strong presence of women, occupational segregation took place, with women earning less than men because they develop different occupations under the same profession.

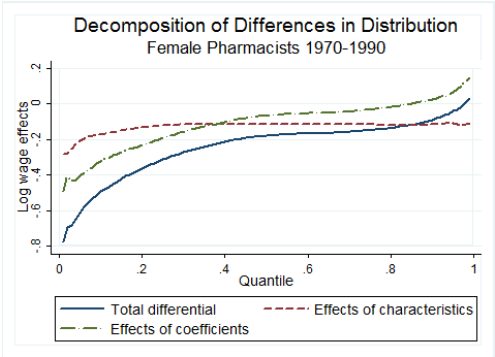
For the 1990, the glass ceiling is also present, but the differentials are clearly lower than for the 1970, the gap seems to be overall more narrow (at the top of the distribution, women earn 60% less than their males counterparts, compared with the results observed before). Also, the effect of characteristics has almost disappear, which means that virtually all of the income differentials is caused by difference in the returns.

Fig.27



Source: 1970 and 1990 FoB.

Fig.28



Source: 1970 and 1990 FoB.

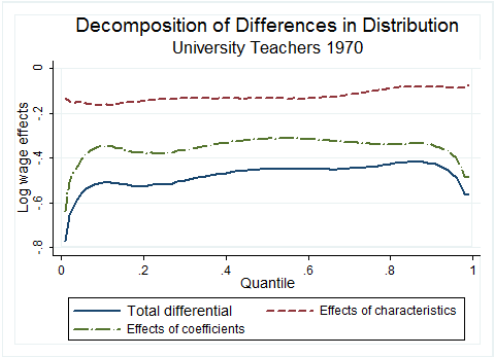
This feminization effect can be seen in the genders evolution through time. Male Pharmacists show a clear decrease in their returns. Wwomen have a general improvement in their incomes, with increases in their returns up to those in the 70% while those in the top a slight deterioration. In a related note, characteristics improved for both genders.

5.8. *University Teachers*

Studies like the one developed by Williams and Deci (2012) cite the complications of advancing in an academic career at a University. Even if the study is restricted to the US, it makes a good description of the process of achieving tenure and dealing simultaneously with personal projects of the sphere of family formation, that account for the occupational segregation observed in such profession, with more female presence in the lower steps of the teaching hierarchy and less in the tenured positions.

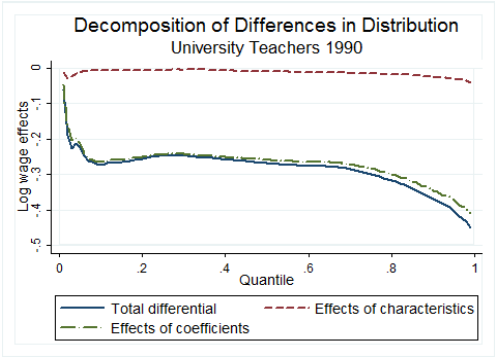
Even so, it is noteworthy the expansion of women in this ambit. Quantile Regressions shows as results that experience is less rewarded in the higher quantiles, as well as children are less penalizing in the same sense. In a consistent fashion, the children's coefficient has decreased between the periods for women. Having a partner only rewards males, and has no effect on females.

Fig.29



Source: 1970 FoB.

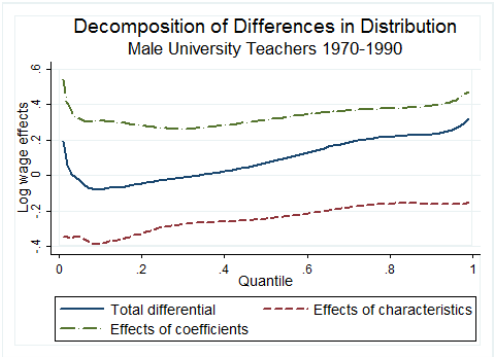
Fig.30



Source: 1990 FoB.

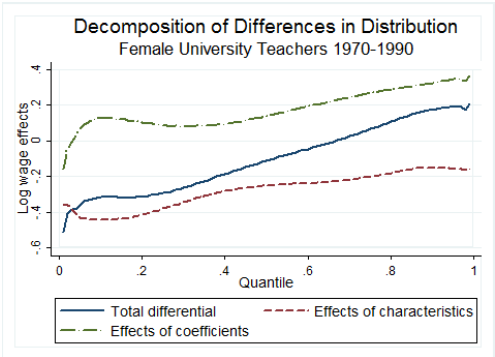
For the 1970, it can be observed that the differences in the incomes that are explained by differences in returns are somewhat constant around -40%, except for the extremes of the distribution, where the values are lower, thus showing a floor and glass ceiling at the endings. The glass ceiling is more evident for the 1990 distributions with women in the uppermost tail earning almost 40% less than their male counterparts.

Fig.31



Source: 1970 and 1990 FoB.

Fig.32



Source: 1970 and 1990 FoB.

The genders evolution, moreover, show a similar story, both genders show that the change in characteristics accounts for an improvement in their earnings, while their returns have clearly deteriorated, but as in other categories, more so for those in the right tail of the distribution.

6. Conclusions

As it was said, the glass ceiling phenomenon is of great interest because it states that differences in income are generated based solely on the gender of the individual. Several studies have been conducted on this issue for the developed world, trying to test and explain its existence, evolution and causes.

Sweden was chosen because of the characteristics of its labor market. With higher historical proportion of women participating in the labor force, as well as highly educated females incorporating in the labor market. As a bonus, it allowed for introspection in effects of policies made in between the two periods analyzed, policies on parental leave and childcare regarded a progressive towards gender equality, designed to help women incorporate into the labor force and decrease the gender disparities in the labor market through solving them in the household. Then, using data from this country allowed centering the analysis on the gender pay gap between the highly educated individuals in selected professions.

In this matter, the first conclusion that comes is an accolade and summary of the analysis explained in the previous section. That is, there is evidence of the existence of two distinct phenomena in the data. First is that there it can be observed a pattern of floors in the data for the 1970, which is, women at the lower quantiles earn less than their male equivalents when controlling for characteristics. The second one follows the observations of De La Rica et al. for higher educated individuals, thus, the glass ceiling is fully present in the 1990, but also can be traced to the 1970 for some professions.

Even more, this is not only an effect that can be analyzed in the tails, but throughout the distribution, women systematically have lower returns than males in each point of the distributions. Some explanations to this phenomenon were analyzed, and it was shown that at least, there was proof of horizontal occupational segregation, that is, the incorporation of women in the labor force was not homogeneous for all the professions, but they concentrated in certain ones. With the data available, questions of vertical segregation could not be answered, since there was no information on the type

of occupation the individual carried on, but with the aide of previous research when available, this issue was considered.

Even if the glass ceiling was proven to be a global factor across all professions, differences between them arose, with different pattern on specialization and labor force incorporation being taken into account. Some professions had also a qualitative change on their labor force, and the Methodology for Decompositions employed allowed for its study.

This paper also evaluated the evolution of each gender's retribution between the periods considered. It was proven that the high influx of women into the labor force provoked a fall in the returns perceived by males, but reinforced those of women.

With this analysis, it could be seen that as soon as women entered the labor force, differentials were born between the returns from each gender. The questions of how the glass ceiling was formed, as well as more insights in the articulation of women in certain professions were addressed, proven at first with basic quantitative analysis, as well as an intuitive but mathematically complex econometrical model.

On a side note, this work also permitted to analyze the effect of the policies abovementioned, showing that even if negative effect that motherhood has on the earnings could not be eliminated; it was indeed mitigated, and even in some cases provoked a negative effect of fatherhood for the subpopulation analyzed.

Plenty of work remains to be done in this field, but with the procedure here developed, it exhausted the information that was available from these census, with the positive aspect that since it was dealing with this type of data, no sampling errors where assumed, as well as the results reflect the whole of the population under scrutiny for the point of time analyzed

.

References

Adams Renée B. and Funk Patricia (2012) "Beyond the Glass Ceiling: Does Gender Matter?", *Management Science,* Vol. 58, No. 2 (Feb.) pp. 219-235.

Albrecht James, Björklund Anders and Vroman Susan (2003) "Is There a Glass Ceiling in Sweden*?" Journal of Labor Economics* , Vol. 21, No. 1 (Jan.), pp. 145-177

Antón José Ignacio, Muñoz de Bustillo Rafael and Carrera Miguel (2010) "Labor Market Performance of Latin American and Caribbean Immigrants in Spain" *Journal of Applied Economics.* Vol 13, No. 2 (November), 233-261

Arulampalam Wiji, Booth Alison L. and Bryan Mark L. (2007) "Is There a Glass Ceiling over Europe? Exploring the Gender Pay Gap across the Wage Distribution*" Industrial and Labor Relations Review* , Vol. 60, No. 2 (Jan.), pp. 163-186

Becker Gary S. (1957), The economics of discrimination, Chicago, Chicago University Press.

---------- (1985) "Human Capital, Effort, and the Sexual Division of Labor" *Journal of Labor Economics*, Vol. 3, No. 1, Part 2: Trends in Women's Work, Education, and Family Building (Jan.), pp. S33-S58

Bergmann Barbara R. (1971) "The Effect on White Incomes of Discrimination in Employment" *Journal of Political Economy*, Vol. 79, No. 2 (Mar. - Apr.), pp. 294-313

Bertrand Marianne, Goldin Claudia, and Katz Lawrence F. (2010) "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors." *American Economic Journal: Applied Economics*, , 2(3) pp. 228–55.

Biagetti Marco and Scicchitano Sergio (2011) "A note on the gender wage gap among managerial positions using a counterfactual decomposition approach: sticky floor or glass ceiling?", *Applied Economics Letters*, Vol. 18, No. 10, pp. 939-943

Blaise Melly (2005) "Decomposition of differences in distribution using quantile regression" *Labor Economics*, Vol. 12, No. 4, pp. 577-590.

Blau Francine D. and. Hendricks Wallace E. (1979) "Occupational Segregation by Sex: Trends and Prospects" *The Journal of Human Resources* , Vol. 14, No. 2 (Spring), pp. 197-210

Blau Francine and Kahn Lawrence M. (1996) "Wage Structure and Gender Earnings Differentials: An International Comparison" *Economica*, New Series, Vol. 63, No. 250, Supplement: Economic Policy and Income.

---------- (2006) "The U.S. Gender Pay Gap in the 1990: Slowing Convergence" *Industrial and Labor Relations Review,* Vol. 60, No. 1 (October) pp. 45-66.

---------- (2003) "A sticky floors model of promotion, pay, and gender" *European Economic Review*, Vol. 47, No.2 (April) pp. 295-322

Booth Alison, Marco Francesconi and Jeff Frank (1998) "Glass Ceiling or Sticky Floors?". *CEPR Discussion Paper no. 1965*. London, Centre for Economic Policy Research.

---------- (2003) " A Sticky Floors Model of Promotion, Pay, and Gender,", *European Economic Review*, Vol. 47, No. 2, pp. 295-322

Borjas George J. Labor Economics, Irwin McGraw-Hill, 2010. (Fifth Edition)

Buchinsky Moshe (1998) "Recent Advances in Quantile Regression Models: A Practical Guideline for Empirical Research". *Journal Of Human Resources*, 33(1), 88-126.

Cameron Adrian Colin and Trivedi Pravin K. (2009) Microeconometrics using Stata, Stata Press 1st Ed, ISBN 9781597180481.

Chernozhukov Victor, Fernández-Val Iván and Melly Blaise (2009) "Inference on counterfactual distributions" *CEMMAP working paper CWP09/09*.

Chiswick Barry and Paul W. Miller (2009), "The international transferability of immigrants' human capital", *Economics of Education Review* **28** pp.162-69.

Datta Gupta Nabanita, Smith Nina and Verner Mette (2006)" Child Care and Parental Leave in the Nordic Countries: A Model to Aspire to?." Germany: *IZA Discussion Paper No. 2014*.

De la Rica Sara, Dolado Juan J., and Llorens Vanesa (2005)"Ceiling and Floors: Gender Wage Gaps by Education in Spain." Germany: *IZA Discussion Paper No. 1483*.

DiNardo John, Fortin Nicole M. and Lemieux Thomas (1996) "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach" *Econometrica* , Vol. 64, No. 5 (Sep.), pp. 1001-1044

Dolado Juan J., Felgueroso Florentino and Jimeno Juan F.(2003) "Where Do Women Work?: Analysing Patterns in Occupational Segregation by Gender*" Annals of Economics and Statistics / Annales d'Économie et de Statistique*, No. 71/72, Discrimination et inégalités / Discrimination and Unequal Outcome (Jul. - Dec.), pp. 293-315

Duncan Beverly and Duncan Otis Dudley (1955) "A Methodological Analysis of Segregation Indexes" *American Sociological Review*, ISSN 0003-1224, 04/1955, Volume 20, Issue 2, pp. 210 - 217

England Paula, Farkas George, Barbara Kilbourne Stanek and Dou Thomas (1988) "Explaining Occupational Sex Segregation and Wages:

Findings from a Model with Fixed Effects" *American Sociological Review*, Vol. 53, No. 4 (Aug.), pp. 544-558

Fortin Nicole, Lemieux Thomas and Firpo Sergio "Decomposition Methods in Economics" Handbook of Labour Economics Volume 4, Issue PART A, 2011, Pages 1-102

Frasch Karie, Goulden Marc and Mason Mary Ann (2011) "Keeping Women in the Science Pipeline" *The ANNALS of the American Academy of Political and Social Science,* ISSN 0002-7162, Volume 638, Issue 1, (Nov.), pp. 141 - 162

Friedberg Rachel M. (2000) "You Can't Take It with You? Immigrant Assimilation and the Portability of Human Capital" *Journal of Labor Economics*, 2000, vol. 18, no. 2 pp. 221- 251.

Fransen Eva, Plantenga Janneke and Vlasblom Jan Dirk (2012) "Why do women still earn less than men? Decomposing the Dutch gender pay gap, 1996–2006" Applied Economics, 2012, Vol.44, pp. 4343–4354

"Glass Ceiling." *The SAGE Glossary of the Social and Behavioral Sciences*(2009) Ed. Larry E. Sullivan, R. Burke Johnson, Cynthia Calkins Mercado, and Karen J. Terry. Thousand Oaks, CA: SAGE. 220. SAGE Reference Online. Web. 25 Feb. 2012.

Goldin Claudia (2002) "The Rising (and then Declining) Significance of Gender" *NBER Working Paper No. 8915*.

Goldin Claudia and Katz Lawrence F. (2011) "The Cost of Workplace Flexibility for High-Powered Professionals" *The ANNALS of the American Academy of Political and Social Science*, ISSN 0002-7162, Volume 638, Issue 1, (Nov.), pp. 45 - 67

Hakim Catherine (1992) "*Explaining Trends in Occupational Segregation: The Measurement, Causes, and Consequences of the Sexual Division of Labour" European Sociological Review,* Vol. 8 No. 2, (Sept.), pp. 127-152.

Haveman Heather A. and Beresford Lauren S. (2012) "If You're So Smart, Why Aren't You the Boss? Explaining the Persistent Vertical Gender Gap in Management" *The ANNALS of the American Academy of Political and Social Science*, Vol.639 pp.114-130.

Lazear Edward P. and Rosen Sherwin (1990) "Male-Female Wage Differentials in Job Ladders" *Journal of Labor Economics*, Vol. 8, No. 1, Part 2: Essays in Honor of Albert Rees (Jan.), pp. S106-S123

Lemieux Thomas "The "Mincer Equation" Thirty Years after Schooling, Experience, And Earnings" Jacob Mincer A Pioneer of Modern Labor Economics, 2006, ISBN 0387291741, pp. 127 – 145.

Machado José A.F. and Mata José (2005) "Counterfactual Decompositition of Changes in Wage Distributions using Quantile Regression" *Journal of Applied Econometrics*, Vol. 20, No. 4, pp. 445-465.

Macpherson David A. and Hirsch Barry T. (1995) "Wages and Gender Composition: Why do Women's Jobs Pay Less?" *Journal of Labor Economics*, Vol. 13, No. 3 (Jul.), pp. 426-471

Mandel Hadas and Semyonov Moshe (2006) "A Welfare State Paradox: State Interventions and Women's Employment Opportunities in 22 Countries *" The American Journal of Sociology*, (May), Vol. 111, No. 6, pp. 1910 - 1949

Meyersson Milgrom Eva M; Petersen Trond, Snartland Vemund (2001) " Equal Pay for Equal Work? Evidence from Sweden and a Comparison with Norway and the U.S." *Scandinavian Journal of Economics* 103(4), pp. 559-583.

Melly Blaise (2005) "Decomposition of differences in distribution using quantile regression Labour Economics No.12 pp. 577–590

Mincer Jacob (1974) Schooling, Experience and Earnings. Columbia University Press ISBN: 0-870-14265-8

Miller Carole (1993) "Actual Experience, Potential Experience or Age, and Labor Force Participation by Married Women" *Atlantic Economic Journal*, ISSN 0197-4254, Volume 21, Issue 4, (Dic.), pp. 60 - 66

Niederle Muriel, Segal Carmit and Vesterlund Lise (2008) "How Costly is Diversity? Affirmative Action in Light of Gender Differences in Competitiveness" *NBER Working Paper 13923*.

Nermo Magnus (1996) "Occupational Sex Segregation in Sweden, 1968-1991" *Work and Occupations*, ISSN 0730-8884, Volume 23, Issue 3, (Aug.), pp. 319 – 332

O'Neill June and Polachek Solomon (1993) "Why the Gender Gap in Wages Narrowed in the 1980s" *Journal of Labor Economics*, Vol. 11, No. 1, Part 1: Essays in Honor of Jacob Mincer (Jan.), pp. 205-228.

Scicchitano Sergio (2012) "The male–female pay gap across the managerial workforce in the United Kingdom: a semi-parametric decomposition approach", *Applied Economics Letters*, Vol. 19, No.13, pp.1293-1297

Sorensen Elaine (1990) " The Crowding Hypothesis and Comparable Worth" *The Journal of Human Resources*, Vol. 25, No. 1 (Winter), pp. 55-89

Statistiska Centralbyrån FoB 90. http://www.appl.scb.se/scbdok/1990/scbdokBE0205_1990.pdf retrieved 2012-05-15

Statistiska Centralbyrån *FoB 70* http://www.scb.se/statistik/BE/BE0205/_dokument/BE0205_DO_1970.pdf retrieved 2012-05-15.

Statistics Sweden Population Statistics http://www.scb.se/Pages/TableAndChart 26041 .aspx retrieved 2012-05-15

Statistics Sweden Consumer Price Index http://www.scb.se/Pages/TableAndChart 35667 .aspx retrieved 2012-05-15.

Stanfors Maria (2003) Education, Labor Force Participation and Changing Fertility Patterns – A study of Women and Socioeconomic Change in Twentieth Century Sweden. Lund Studies in Economic History Vol. 22, Almqvist & Wiksell International, ISBN 9122020004

---------- (2006) "Educational segregation and the meaning of education to women in twentieth century Sweden" *XIV International Economic History Congress, Helsinki 2006 Session 19.*

---------- (2007) "Feminization and Professionalization of Pharmacies in Sweden" *Business History Conference. Business and Economic History On-line : Papers Presented at the BHC Annual Meeting*, ISSN 1941-7349, 08/2007, Volume 5, p. 1

Weinberger Catherine J. (2011) "In Search Of The Glass Ceiling: Gender And Earnings Growth Among U.S. College Graduates In The 1990s" *Industrial and Labor Relations Review,* Vol. 64, No. 5 (October), pp. 949 - 980.

Williams Wendy M. and Ceci Stephen J. (2012). "When Scientists Choose Motherhood." *American Scientist* 100, no. 2: pp. 138-145.

Appendix I. Auxiliary Tables

Table 3

Lawyers

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.141***	0.186***	0.094***	0.088***
	(0.012)	(0.053)	(0.004)	(0.009)
age2	-0.001***	-0.002**	-0.001***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
Foreign	0.316	0.152	-0.225**	-0.294***
	(0.210)	(0.108)	(0.086)	(0.068)
Single	-0.106***	0.014	-0.123***	-0.021
	(0.019)	(0.102)	(0.012)	(0.024)
Children	0.032***	-0.048	0.003	-0.106***
	(0.008)	(0.052)	(0.006)	(0.013)
Constant	6.342***	5.643***	7.553***	7.677***
	(0.333)	(0.926)	(0.093)	(0.187)
Quantile 50				
age	0.136***	0.144***	0.098***	0.087***
	(0.005)	(0.016)	(0.003)	(0.005)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.165	0.412*	-0.091*	-0.179***
	(0.189)	(0.199)	(0.037)	(0.038)
Single	-0.055***	0.023	-0.076***	-0.027*
	(0.011)	(0.045)	(0.012)	(0.011)
Children	0.028***	-0.017	0.012***	-0.080***
	(0.005)	(0.023)	(0.003)	(0.009)
Constant	6.722***	6.383***	7.551***	7.785***
	(0.228)	(0.299)	(0.070)	(0.094)
Quantile 75				
age	0.147***	0.137***	0.106***	0.093***
	(0.007)	(0.014)	(0.004)	(0.006)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.163	0.526*	-0.015	-0.108**
	(0.148)	(0.245)	(0.030)	(0.041)
Single	-0.024	0.009	-0.068***	-0.010
	(0.015)	(0.025)	(0.010)	(0.017)
Children	0.037***	-0.026	0.030***	-0.049***
	(0.008)	(0.024)	(0.005)	(0.009)
Constant	6.589***	6.454***	7.499***	7.703***
	(0.211)	(0.335)	(0.078)	(0.124)
N	**4114**	**415**	**7167**	**2837**

Standard Errors in parenthesis.

* p<0.05, ** **p<0.01 *** p<0.001

Table 4
Health Professionals

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.239***	0.095***	0.090***	0.068***
	(0.052)	(0.004)	(0.011)	(0.002)
age2	-0.003***	-0.001***	-0.001***	-0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Foreign	-0.131	0.231***	-0.094**	0.018**
	(0.198)	(0.058)	(0.033)	(0.005)
Single	-0.081	0.313***	-0.022*	0.117***
	(0.114)	(0.013)	(0.010)	(0.004)
Children	0.037	-0.261***	-0.013**	-0.114***
	(0.059)	(0.007)	(0.005)	(0.002)
Constant	4.862***	6.801***	7.613***	7.822***
	(0.835)	(0.105)	(0.224)	(0.033)
Quantile 50				
age	0.126**	0.051***	0.050***	0.048***
	(0.040)	(0.001)	(0.003)	(0.001)
age2	-0.002**	-0.001***	-0.001***	-0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Foreign	0.023	0.079	-0.031*	0.034***
	(0.178)	(0.042)	(0.016)	(0.004)
Single	-0.024	0.148***	-0.004	0.100***
	(0.066)	(0.005)	(0.008)	(0.002)
Children	0.051	-0.212***	-0.005	-0.094***
	(0.029)	(0.004)	(0.004)	(0.001)
Constant	6.937***	8.130***	8.520***	8.363***
	(0.629)	(0.043)	(0.062)	(0.018)
Quantile 75				
age	0.102**	0.041***	0.049***	0.040***
	(0.039)	(0.001)	(0.003)	(0.001)
age2	-0.001*	-0.000***	-0.001***	-0.000***
	(0.001)	(0.000)	(0.000)	(0.000)
Foreign	-0.219	0.035	-0.010	0.034***
	(0.192)	(0.022)	(0.009)	(0.003)
Single	-0.015	0.065***	0.003	0.061***
	(0.025)	(0.002)	(0.008)	(0.002)
Children	0.046	-0.107***	-0.005	-0.079***
	(0.033)	(0.003)	(0.004)	(0.001)
Constant	7.824***	8.516***	8.628***	8.655***
	(0.659)	(0.026)	(0.066)	(0.010)
N	**270**	**27998**	**5058**	**93711**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001

Table 5
Accountants, Economists and Staticians

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.141***	0.156***	0.118***	0.102***
	(0.010)	(0.043)	(0.003)	(0.005)
age2	-0.002***	-0.002**	-0.001***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
Foreign	0.310	-0.032	-0.246***	-0.130***
	(0.203)	(0.119)	(0.022)	(0.019)
Single	-0.127***	-0.064	-0.115***	0.018
	(0.024)	(0.055)	(0.010)	(0.009)
Children	0.046***	-0.178**	-0.003	-0.141***
	(0.010)	(0.065)	(0.005)	(0.006)
Constant	6.371***	6.540***	7.279***	7.428***
	(0.247)	(0.770)	(0.062)	(0.088)
Quantile 50				
age	0.122***	0.142***	0.112***	0.105***
	(0.007)	(0.030)	(0.004)	(0.004)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.088	0.271*	-0.137***	-0.073***
	(0.241)	(0.136)	(0.021)	(0.014)
Single	-0.064***	-0.043	-0.106***	-0.001
	(0.016)	(0.035)	(0.009)	(0.006)
Children	0.042***	-0.110*	0.000	-0.130***
	(0.007)	(0.044)	(0.006)	(0.006)
Constant	7.136***	6.729***	7.534***	7.565***
	(0.296)	(0.577)	(0.074)	(0.065)
Quantile 75				
age	0.134***	0.125***	0.120***	0.117***
	(0.007)	(0.014)	(0.004)	(0.003)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.068	0.225	-0.100***	-0.079***
	(0.180)	(0.151)	(0.015)	(0.011)
Single	-0.068***	-0.027	-0.129***	-0.001
	(0.013)	(0.029)	(0.010)	(0.010)
Children	0.040***	-0.044	-0.003	-0.106***
	(0.005)	(0.024)	(0.005)	(0.007)
Constant	7.189***	7.149***	7.580***	7.486***
	(0.211)	(0.265)	(0.067)	(0.053)
N	**4216**	**559**	**16700**	**9567**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001

Table 6
Engineers

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.137***	0.203***	0.096***	0.095***
	(0.004)	(0.026)	(0.001)	(0.004)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.030	-0.500	-0.145***	-0.166***
	(0.039)	(0.337)	(0.007)	(0.015)
Single	-0.202***	0.067	-0.069***	0.017
	(0.020)	(0.084)	(0.003)	(0.009)
Children	0.049***	-0.188**	-0.007***	-0.145***
	(0.003)	(0.061)	(0.001)	(0.008)
Constant	6.796***	5.997***	7.707***	7.633***
	(0.093)	(0.560)	(0.019)	(0.071)
Quantile 50				
age	0.137***	0.114***	0.093***	0.110***
	(0.003)	(0.019)	(0.001)	(0.002)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.037	-0.298	-0.115***	-0.107***
	(0.034)	(0.241)	(0.008)	(0.018)
Single	-0.087***	0.004	-0.058***	0.013
	(0.010)	(0.038)	(0.003)	(0.011)
Children	0.037***	-0.137***	-0.005***	-0.112***
	(0.003)	(0.030)	(0.001)	(0.005)
Constant	6.962***	7.726***	7.856***	7.513***
	(0.058)	(0.415)	(0.012)	(0.035)
Quantile 75				
age	0.137***	0.129***	0.095***	0.119***
	(0.004)	(0.027)	(0.001)	(0.002)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.016	-0.107	-0.089***	-0.077***
	(0.048)	(0.234)	(0.006)	(0.013)
Single	-0.059***	0.026	-0.060***	0.005
	(0.006)	(0.041)	(0.004)	(0.007)
Children	0.036***	-0.053	-0.004**	-0.099***
	(0.004)	(0.034)	(0.001)	(0.004)
Constant	7.079***	7.408***	7.919***	7.434***
	(0.081)	(0.557)	(0.014)	(0.035)
N	**15091**	**562**	**73057**	**9185**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001

Table 7
Physicians

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.176***	0.261***	0.154***	0.127***
	(0.012)	(0.027)	(0.005)	(0.005)
age2	-0.002***	-0.003***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.032	-0.122	-0.134***	-0.051**
	(0.023)	(0.107)	(0.010)	(0.018)
Single	-0.179***	0.178***	-0.131***	-0.003
	(0.041)	(0.046)	(0.009)	(0.014)
Children	0.047***	-0.002	0.003	-0.027***
	(0.006)	(0.020)	(0.003)	(0.007)
Constant	6.465***	4.504***	6.387***	6.767***
	(0.238)	(0.554)	(0.115)	(0.110)
Quantile 50				
age	0.123***	0.184***	0.133***	0.115***
	(0.006)	(0.014)	(0.003)	(0.005)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.017	-0.026	-0.075***	-0.031*
	(0.022)	(0.042)	(0.006)	(0.014)
Single	-0.125***	0.105***	-0.087***	-0.006
	(0.018)	(0.024)	(0.005)	(0.010)
Children	0.027***	-0.014	0.005*	-0.033***
	(0.004)	(0.009)	(0.002)	(0.005)
Constant	7.815***	6.409***	7.028***	7.235***
	(0.127)	(0.310)	(0.056)	(0.096)
Quantile 75				
age	0.103***	0.114***	0.120***	0.126***
	(0.004)	(0.014)	(0.003)	(0.004)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.041	0.036	-0.064***	-0.033**
	(0.023)	(0.037)	(0.007)	(0.012)
Single	-0.079***	0.071**	-0.064***	-0.005
	(0.015)	(0.024)	(0.005)	(0.006)
Children	0.019***	-0.008	0.005	-0.029***
	(0.003)	(0.008)	(0.003)	(0.003)
Constant	8.434***	7.982***	7.451***	7.199***
	(0.077)	(0.282)	(0.062)	(0.075)
N	**7398**	**1782**	**15359**	**8005**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001

Table 8

Dentists

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.108***	0.156***	0.114***	0.124***
	(0.010)	(0.018)	(0.008)	(0.008)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.159*	0.010	-0.271***	-0.158***
	(0.065)	(0.145)	(0.048)	(0.036)
Single	-0.168***	0.175***	-0.052***	0.055*
	(0.041)	(0.042)	(0.014)	(0.027)
Children	0.033***	-0.138***	0.003	-0.103***
	(0.005)	(0.018)	(0.007)	(0.012)
Constant	7.593***	6.506***	7.292***	6.913***
	(0.209)	(0.440)	(0.159)	(0.162)
Quantile 50				
age	0.102***	0.079***	0.067***	0.073***
	(0.008)	(0.010)	(0.005)	(0.008)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.137**	0.118**	-0.142***	-0.081***
	(0.051)	(0.044)	(0.029)	(0.017)
Single	-0.140***	0.092***	-0.038***	0.042***
	(0.024)	(0.022)	(0.009)	(0.013)
Children	0.037***	-0.099***	0.002	-0.094***
	(0.007)	(0.017)	(0.004)	(0.007)
Constant	7.893***	8.142***	8.419***	8.123***
	(0.160)	(0.181)	(0.116)	(0.166)
Quantile 75				
age	0.109***	0.086***	0.059***	0.055***
	(0.010)	(0.010)	(0.006)	(0.008)
age2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.256*	0.159*	-0.080***	-0.061**
	(0.107)	(0.066)	(0.017)	(0.019)
Single	-0.130***	0.053**	-0.054***	0.022*
	(0.038)	(0.021)	(0.013)	(0.010)
Children	0.037***	-0.071***	-0.000	-0.077***
	(0.007)	(0.008)	(0.005)	(0.007)
Constant	7.780***	8.144***	8.671***	8.599***
	(0.215)	(0.188)	(0.122)	(0.145)
N	**3513**	**1477**	**4773**	**3441**

Standard Errors in parenthesis.

* p<0.05, ** **p<0.01 *** p<0.001

Table 9
Pharmacists

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.032**	0.152***	0.105***	0.081***
	(0.010)	(0.020)	(0.019)	(0.006)
age2	-0.000	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.594*	0.503	-0.537***	-0.057
	(0.278)	(0.401)	(0.146)	(0.029)
Single	-0.243**	0.240***	-0.201***	0.119***
	(0.091)	(0.036)	(0.051)	(0.014)
Children	0.044***	-0.274***	-0.039	-0.098***
	(0.012)	(0.021)	(0.027)	(0.007)
Constant	9.440***	5.713***	7.542***	7.636***
	(0.397)	(0.526)	(0.436)	(0.144)
Quantile 50				
age	0.042***	0.072***	0.087***	0.058***
	(0.009)	(0.007)	(0.013)	(0.003)
age2	-0.000	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.451*	0.130	-0.322***	-0.042
	(0.212)	(0.571)	(0.073)	(0.029)
Single	-0.176**	0.154***	-0.169***	0.109***
	(0.057)	(0.012)	(0.043)	(0.011)
Children	0.010	-0.198***	-0.017	-0.085***
	(0.010)	(0.012)	(0.018)	(0.005)
Constant	9.237***	7.796***	7.998***	8.265***
	(0.311)	(0.599)	(0.269)	(0.071)
Quantile 75				
age	0.048***	0.057***	0.104***	0.052***
	(0.013)	(0.007)	(0.028)	(0.004)
age2	-0.000	-0.000***	-0.001**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.248*	0.212	-0.270***	-0.060**
	(0.116)	(0.406)	(0.044)	(0.020)
Single	-0.091	0.078***	-0.143***	0.080***
	(0.055)	(0.013)	(0.036)	(0.010)
Children	0.022	-0.147***	-0.035	-0.063***
	(0.015)	(0.012)	(0.021)	(0.008)
Constant	8.910***	8.092***	7.764***	8.486***
	(0.299)	(0.430)	(0.544)	(0.086)
N	**788**	**2801**	**473**	**4740**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001

Table 10
University Teachers

	70		90	
	Males	**Females**	**Males**	**Females**
Quantile 25				
age	0.186***	0.154***	0.169***	0.139***
	(0.009)	(0.021)	(0.005)	(0.009)
age2	-0.002***	-0.002***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.084	0.095	-0.246***	-0.141***
	(0.172)	(0.314)	(0.028)	(0.037)
Single	-0.231***	0.088	-0.137***	0.008
	(0.033)	(0.052)	(0.009)	(0.017)
Children	0.056***	-0.072*	0.017***	-0.041***
	(0.008)	(0.031)	(0.005)	(0.011)
Constant	5.435***	5.727***	5.505***	5.908***
	(0.244)	(0.487)	(0.120)	(0.173)
Quantile 50				
age	0.145***	0.164***	0.104***	0.091***
	(0.005)	(0.010)	(0.005)	(0.007)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	0.058	0.023	-0.137***	-0.057**
	(0.073)	(0.241)	(0.014)	(0.019)
Single	-0.115***	0.036	-0.103***	0.003
	(0.018)	(0.036)	(0.008)	(0.010)
Children	0.048***	-0.045*	0.007	-0.041***
	(0.005)	(0.019)	(0.003)	(0.008)
Constant	6.639***	6.122***	7.279***	7.360***
	(0.127)	(0.312)	(0.112)	(0.170)
Quantile 75				
age	0.131***	0.150***	0.080***	0.073***
	(0.004)	(0.012)	(0.003)	(0.003)
age2	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Foreign	-0.051	-0.085	-0.116***	-0.038*
	(0.143)	(0.271)	(0.015)	(0.016)
Single	-0.091***	-0.010	-0.093***	-0.004
	(0.013)	(0.035)	(0.009)	(0.011)
Children	0.051***	-0.030	0.008	-0.028***
	(0.006)	(0.017)	(0.005)	(0.005)
Constant	7.282***	6.885***	7.954***	8.022***
	(0.161)	(0.275)	(0.058)	(0.055)
N	**6585**	**1705**	**10597**	**5053**

Standard Errors in parenthesis.
* p<0.05, ** **p<0.01 *** p<0.001