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Economic gain from education in Iceland during the period 1985 to 1999.

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Economic gain from education in Iceland during the period 1985 to 1999

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Abstract

The human capital assumption predicts that the income of working individuals is related to the length of schooling and the length of experience in the labour market. Mincer used this as basis for estimating the return to investment in education. Mincer's method has been replicated for many countries over long periods of time. This paper reports results from experiments with using background information gathered by omnibus surveys conducted by the Social Science Research Institute of the University of Iceland during the period 1985 to 1999. We conclude that adding one year of schooling induces an increase in yearly salary (income) of wage earners by 4 to 8%.

Introduction

Statistics Iceland reports that some 101,000 out of 300,000 Icelanders attended school as of fall 2005. Of those almost 40,000 attended schools offering secondary or tertiary education. The number of Icelanders aged 17-24 was a bit short of 35,000 at that time. Hence, the proportion of Icelanders attending second and tertiary education as proportion of the "eligible" age groups is well in excess of 100%. We can therefore postulate that Icelanders of today do not subscribe to an old and frequently quoted saying stating that "Wisdom from books will not provide food on the table" (see Guðrún Kvaran (2003) for explanation). But how much does wisdom from books contribute to the amount of food on the table of an modern Icelander? Does it increase in proportion with the length of schooling? Are also other factors important for wage determination? Which factors? We will report some conclusions that can be drawn by use of omnibus surveys conducted by the Social Science Research Institute of the University of Iceland during the period 1985 to 1999. More exact reporting on data, methods used and numerical results is given in Finnbogi Rafn Jónsson (2006).

Education, age, sex and income

The dataset provided by the Social Science Research Institute contains information about respondents in the omnibus surveys conducted by the institute. Each sample was randomly drawn from the National Registry of Persons (Þjóðskrá). For surveys conducted in 1990 till 1995 and 1999 respondents were asked to convey age, main occupation, level of education, monthly salary (income)[2], including overtimepayment, hours worked, gender, line of

[1] I am in debt to Félagsvísindastofnun Háskóla Íslands for giving me access to their data. I am also in debt to Finnbogi Rafn Jónsson who had a first go at the data while writing his BS thesis. The calculation of years of education is based on Finnbogi's research. I am also in debt to my fellow participants in the project: CHANGING WAGE STRUCTURES AND WAGE NEGOTATION SYSTEMS: THE NORDIC MODEL UNDER HARD PRESSURE, financed by the Nordic Research Council. I am particularly indebted to Erling Barth and Rita Asplund. Remaining error are my sole responsibility.

[2] The respondents were asked about "tekjur", more detailed discussion is given below.

economic activity, type of household and geographic location. Level of education is not reported before 1990 but is approximated based on information about main occupation. Thus it is assumed that before 1990 teachers have 17 years of education, that carpenters and car mechanists have 14 years of education to name a few examples. First university degree is assumed to be equal to 17 years of education while a Master's degree is assumed to have required 19 years and a doctoral degree is assumed to have required 24 years of education. Hence, education is normalized by degrees. The respondents are asked about their "tekjur" for one month. The Icelandic Economics Dictionary translates "tekjur" as "revenue", "income" or "proceeds". The word "tekjur" does not have a very precise meaning, but would by most Icelanders be understood as "remuneration for labour before tax" independent of whether that income accrues due to salaried labour or labour supplied by a firms owner. "Tekjur" would not be considered to include transfers or capital income except if explicitly so stated. It would have been more precise to ask about "remuneration for employement by self or others", but would probably not be fully understood by a considerable proportion of the respondents. Other terms, as "laun" (e. salary, wages) could have prompted self-employed to exclude remuneration for their supply of labour in their own firm. Hence, the use of the term "tekjur" can be seen as an effort to employ a "folk" version of the term "remuneration for labour, before tax". Thus, the use of the term "tekjur" probably increases the number of respondents giving "correct" answers. But, as the term is a bit vague and imprecise its use may invite some respondents to include income that is not "remuneration for employment". In order to remind the reader that there is a degree of ambiguity in how the data is collected I have chosen to use the term "income" as translation of the term "tekjur". Table 1 gives overview of variables used in the analysis.

Table 1: Number of observations, means and standard deviation of selected variables (as reported or calculated) from the omnibus survays of the Social Science Research Institute for the years 1986, 1989, 1990, 1991, 1992, 1993, 1994, 1995 and 1999

Variable name	Regression sample*)			"Full sample"**)		
	# of obs	Mean	Std. Dev.	# of obs	Mean	Std. Dev.
Income(log)	19542	13.12	0.49	19635	13.12	0.49
Eduyears	19542	12.77	2.60	40870	12.24	2.53
Experience	19542	21.26	13.78	40870	22.74	15.63
experience2	19542	641.76	706.69	40870	761.23	877.96
Woman	19542	0.46	0.50	40860	0.50	0.50
Public	19542	0.24	0.43	40574	0.18	0.38
Bigreykjavik	19542	0.56	0.50	40870	0.55	0.50
Hours	19542	46.10	18.46	24003	46.53	18.91

*) Included are observations for which none of the reported variables are missing.

**)Included are all observations for which the variable is non-missing.

The dataset contains 40,870 observations. About half of the observations have non-missing values for the full set of variables used for the regression analysis reported below. Table 1 shows that the means and standard deviations of the selected variables in the "Regression sample" set are in general not much different from means and standard deviations for the same variables in the full sample. *Income (log)* is the logarithm of income corrected for workingtime, *eduyears* is the calculated length of education in years, *experience* is the

difference between age as reported by the respondent and calculated length of education. Further 6 years are decuted to take account of the fact that compulsory schooling starts at 6. (Note that young respondents were assumed to have to stay longer compulsory school than older respondents). *Woman* take the value of 1 if the respondent is woman and 0 if the respondent is man. *Public* takes the value 1 if the respondent works in the public sector, 0 else. *Bigreykjavik* takes the value 1 if the postal code is lower than 270, 0 else. *Hours* are as respondents report. Some of the years respondents were asked to report hours in first and second job. For those years the hours for both jobs are added together. The respondents in the "regression sample" are slightly more educated and have slightly less experience and work slightly less than those in the "full sample". Females are underrepresented in the "regression sample" as compared to the "full sample". The difference is small, however. Splitting the sample by years does not change the picture.

The standard deviation of log wages in the sample is 0.49. This measure, which is closely related to the coefficient of variation of the non-transformed wages, is sometimes used as measure of wage-dispersion. This measure is unit-free and can used to compare wage dispersion between countries. Per Lundborg reports the standard deviation of log wages for the other Nordic countries in Lundborg (2006). Iceland is a definite outlier in the sample of Nordic countries. Standard deviation of log wages is 0.25-0.3 for Sweeden, Denmark and Norway and about 0.4 for Finland. This measure is about 0.6 for the United States. (REFERANCE NEEDED).

We can use the information in the dataset to map how income varies by educational groups.

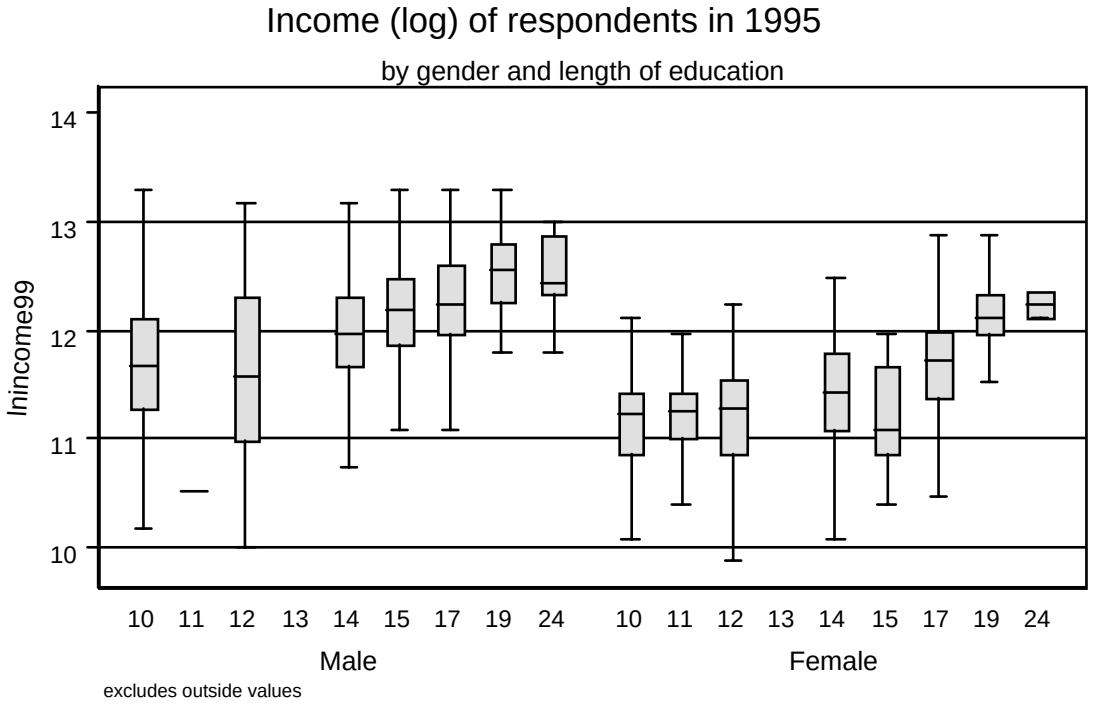

Figure 1: Log of income of respondents in 1995 by sex and length of education. On the vertical axis lnincome is log of reported total monthly wages of respondents in 1995 in 1999 prices. Income is not corrected for working time. On the horizontal axis length of education is measured in years by gender The higher border of the grey boxes indicates the value of the

75-percentile, the lower border indicates the value of the 25-percentile. The distance between the two border lines indicates the interquantile range. The line between the 75-percentile and the 25-percentile indicates the value of the median. The higher adjacent line is drawn for the value of the observation closest to being 1.5 times the interquatile range plus the 75-percentile. The lower adjacent line is drawn in similar way.

Figure 1 reveals that median income increases by length of education with the exception of males with most or least education. Average income of males with 10 years or less is higher than average income of males with 11 or 12 years of education. The median income of males with 24 years of education is less than the median income for males with 19 years of education but the numbers of observation are low (only 9 male respondents had an education of 24 years or more in 1995).

Reported income is usually influenced by length of the working week. Longer hours usually result in higher income, cet. par. Figur 2 maps how hours vary by length of education.

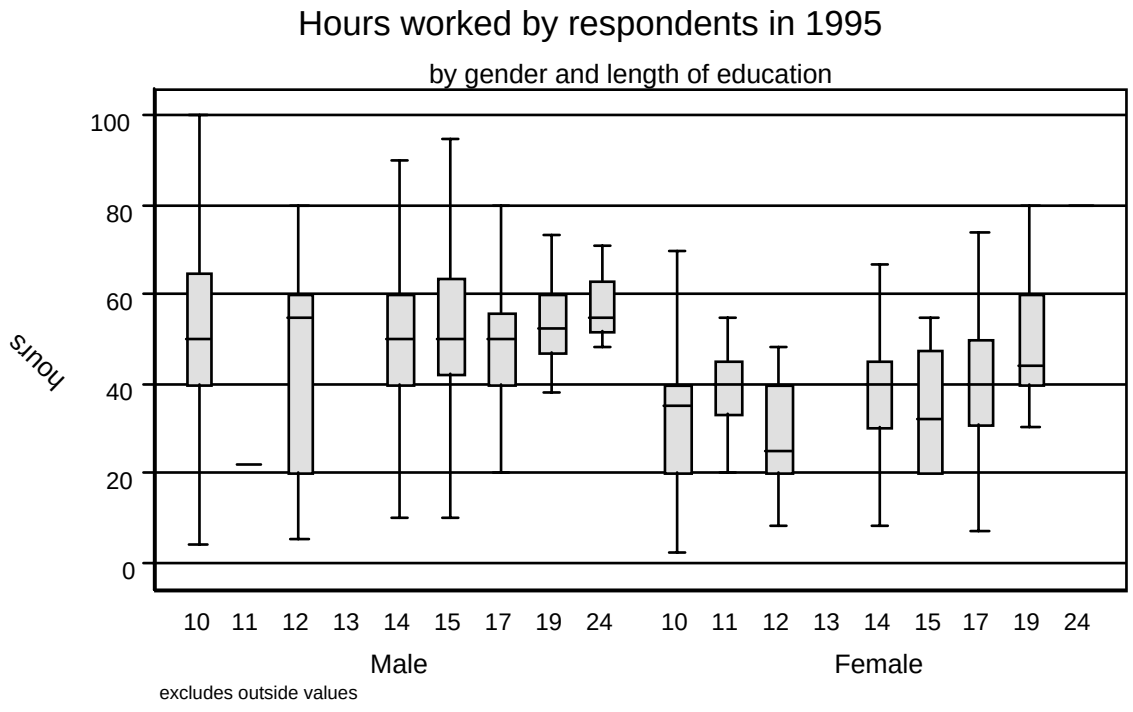

Figure 2: Weekly working hours of respondents by gender and length of education in 1995

Figure 2 gives the distribution of weekly working hours by gender and length of education. It is obvious that both those factors influence the length of the working week. The figure also shows that the median hours for males are higher than the median hours for females regardless of the length of education. The median length of the work week seems to be rather independent of education in the case of males. The median length of the working week varies in a non-linear way with education in the case of females. There seems to be some

tendency in the direction of more educated women working longer than less educated women. The pattern of the interquantile range is different for males and females. This range seems to narrow slightly with education for males but to widen for females. In the statistical analysis below, the income of each respondent is standardized to monthly income (160 hours per month, equal to 40 hours per week).[3] Figure 3 shows how income varies by gender and length of education when reported income is corrected for length of the work week.

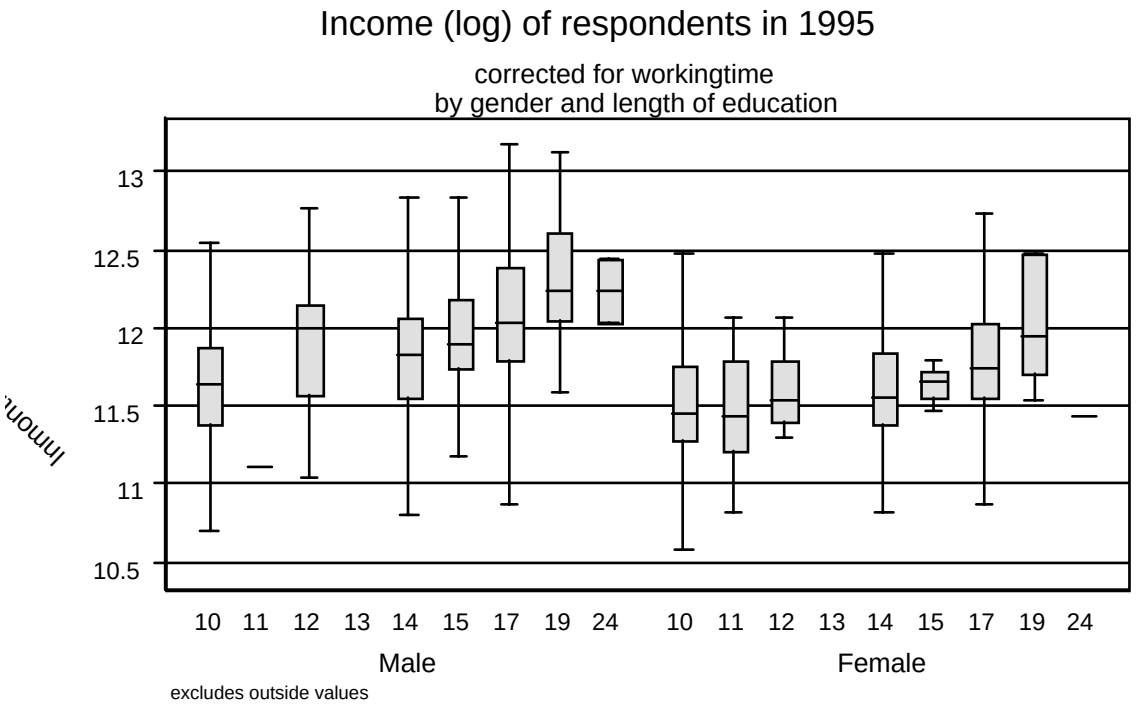

Figure 3: Log of income of respondents in 1995 by gender and length of education, corrected for length of the working week

The median income by length of education is a bit lower when corrected for length of the working week than for reported income. There is one exception however, males with 12 years of education seem to have higher median income when income is corrected for the length of the work week. Their median income is also higher than the median income of males with 14 years of education, a reversal of the situation when income is not corrected for length of the work week. This is a consequence of the long working hours of this educational group as compared to other educational groups. Otherwise the pattern of the income

[3] It has been conventional wisdom in Scandinavia for some time that Icelanders have two or more jobs each. Icelanders have, when asked, been quite happy to support this view often supported by ancedotes about their own labour market experience. The Social Science Institute did some of the years ask the respondents to report number of hours worked in main job and number of hours worked in extra job. Now, assume that holding two jobs implies working 40 hours a week in main job and at least 20 hours a week in the extra job. Using a variation of this criteria we can prove the conventional wisdom of two jobs per persons to be just a myth. For the years the Social Science Institute asked respondents to report hours worked in main job and in extra job only 160 male repondents worked more than 50% as many hours in the extra job as compared with the main job.

distribution by gender and length of education seems similar whether corrected for length of the working week or not. Adding two or three years to the basic education of 10 years does not add much in terms of improved income distribution. The income distribution improves however, when education increases in excess of 14 years.

Reported income, hours and income corrected for hours for respondents with less than 12 years of education

Figures 4 to 6 shows the age-profile of income income corrected for hours and hours for the least educated in 1995 by gender.

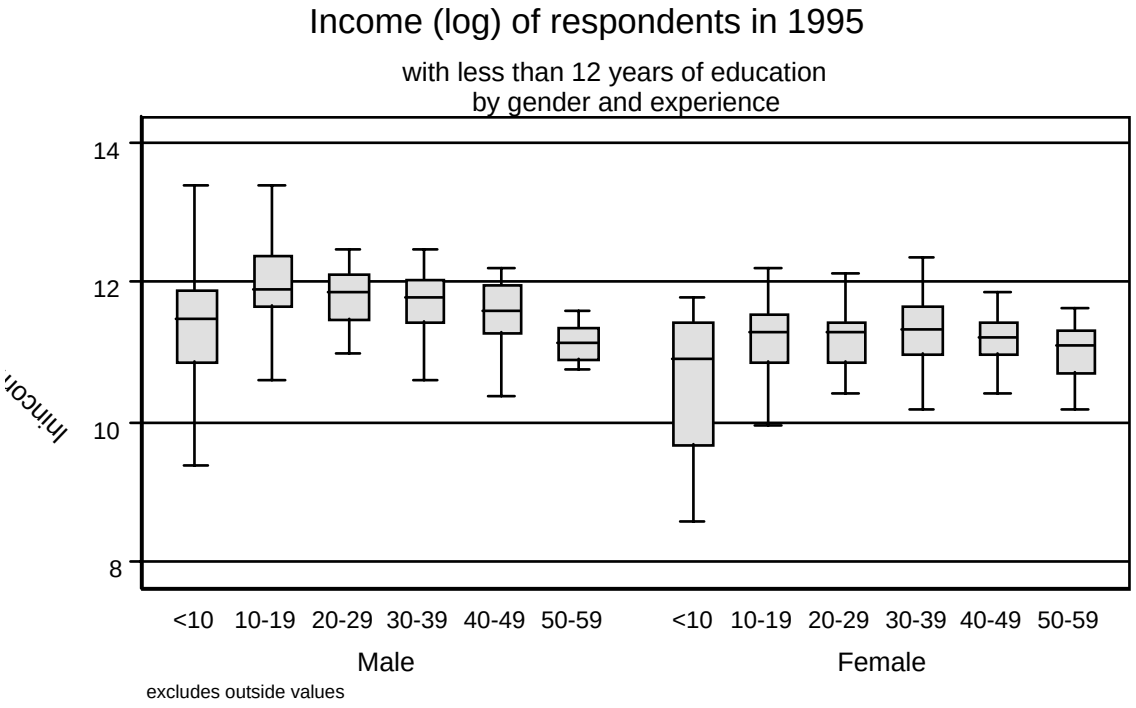

Figure 4:. Income of respondents in 1995 with less than 12 years of education by gender and experience. For explanation see caption for Figure 1

Figure 4 shows that for a given length of education (less than 12 years) , the median income (indicated by the line in the middle of the grey boxes) increases with potential experience, until a maximum is reached after 20 to 30 years of potential experience. This pattern is evident for both male and female respondents. The pattern is also repeated for the 25th and 75th percentiles (as can be seen by comparing the higher [75th percentile) and lower (25th percentile) edge of the grey boxes as experience of respondents is increased.). The interquantile range is relatively bigger for those with least potential experience. Noteworthy is that the median income of males in the group with longest potential experience is lower than the median income of the male entrants with shortest potential experience.

Interestingly the relationship between median income and potential experience changes when income is corrected for length of working time as cam be seen in Figure 5.

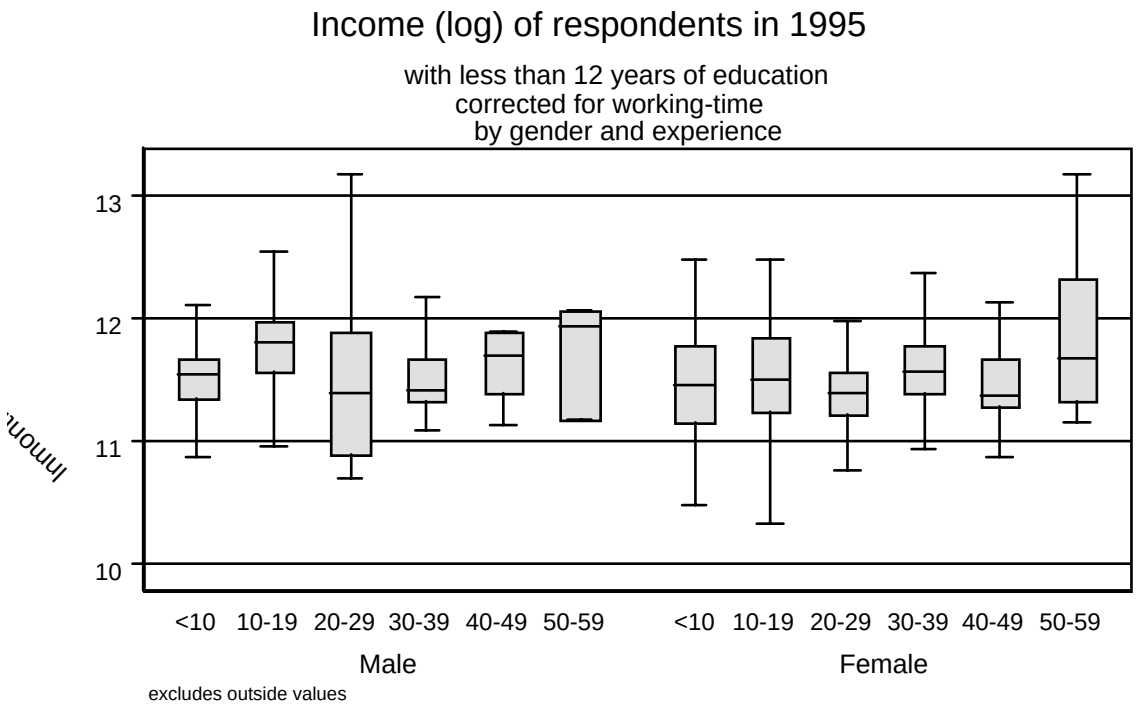

Figure 5: Logarithm of income in 1995 corrected for working time for respondents with less than 12 years of education, by gender and expierence, for explanation see caption for Figure 1.

Figure 5 shows the monthly wage standardized to 160 hours a month. Hours worked obviously varies with age and is different for males and for females. Figure 5 shows how working hours vary with age by gender.

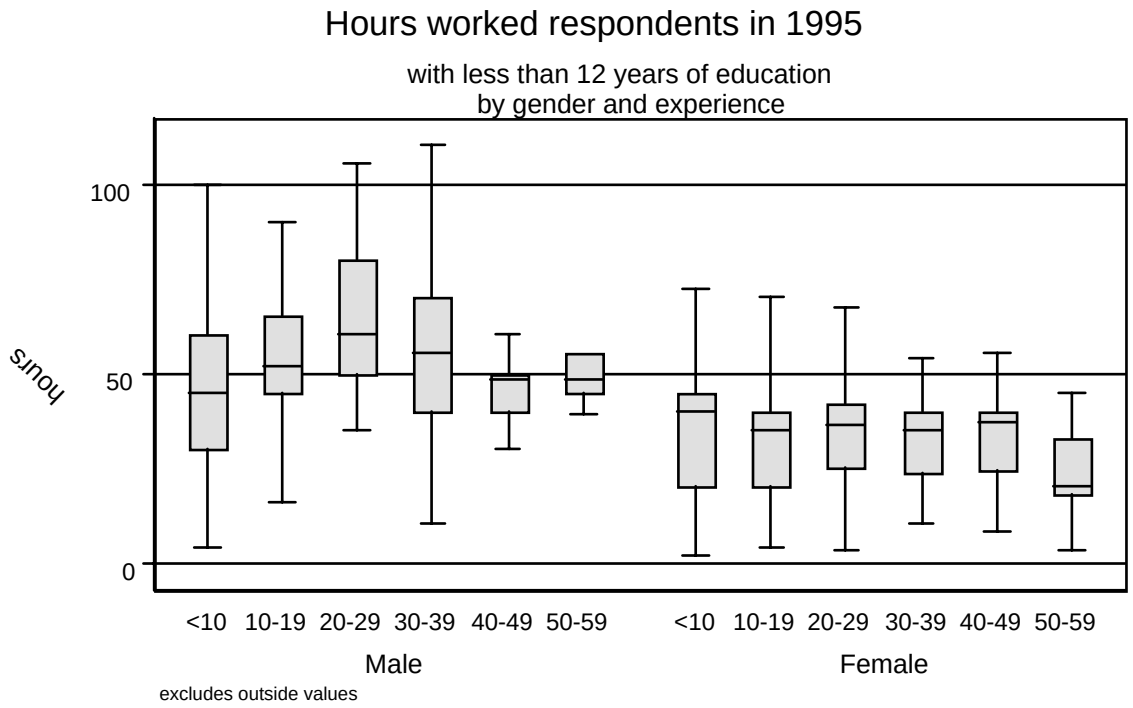

Figure 6: Hours worked per week in 1995 by the least educated

Comparing Figures 4, 5 and 6 reveals that considerable part of the difference in monthly income (salaries, wages) is due to difference in length of the working week for the least educated. Men with 20 to 29 years of potential work experience work longer hours than those with shorter or longer potential experience. Note also that men with 20 to 29 years of potential experience have higher monthly median income corrected for working hours than men with more or less potential experience. It is possible that those men are responding to demand pressure when working more hours than similarly educated men with more or less potential experience.

There is considerably less variation in working hours for the least educated women by potential experience than it is for men. It is tempting to interpret the relatively flat development of the median income corrected for hours for men and women in Figure 5 as suggesting that the accumulation of human capital due to potential experience in the labour market does not result in increase in hourly or monthly wages (or more precisely, income corrected for hours).

It should be kept in mind, however, that the results are for cross sectional data. Hence, those with 50-59 years of potential work experience are approximately 10 years older than those with 40-49 years of potential work experience. Same applies to comparison of other experience-groups. The situation of the goup of people with 50-59 years of potential experience in 1995 does not necessarily predict the situation of those with 40-49 years of potential experience in 1995 when they become the holders of 50-59 years of potential experience in 2005.

Reported income, hours and income corrected for hours for respondents with 12–14 years of education

Figures 7, 8 and 9 show reported income, hours worked per week and income corrected for hours for respondents with 12-14 years of education.

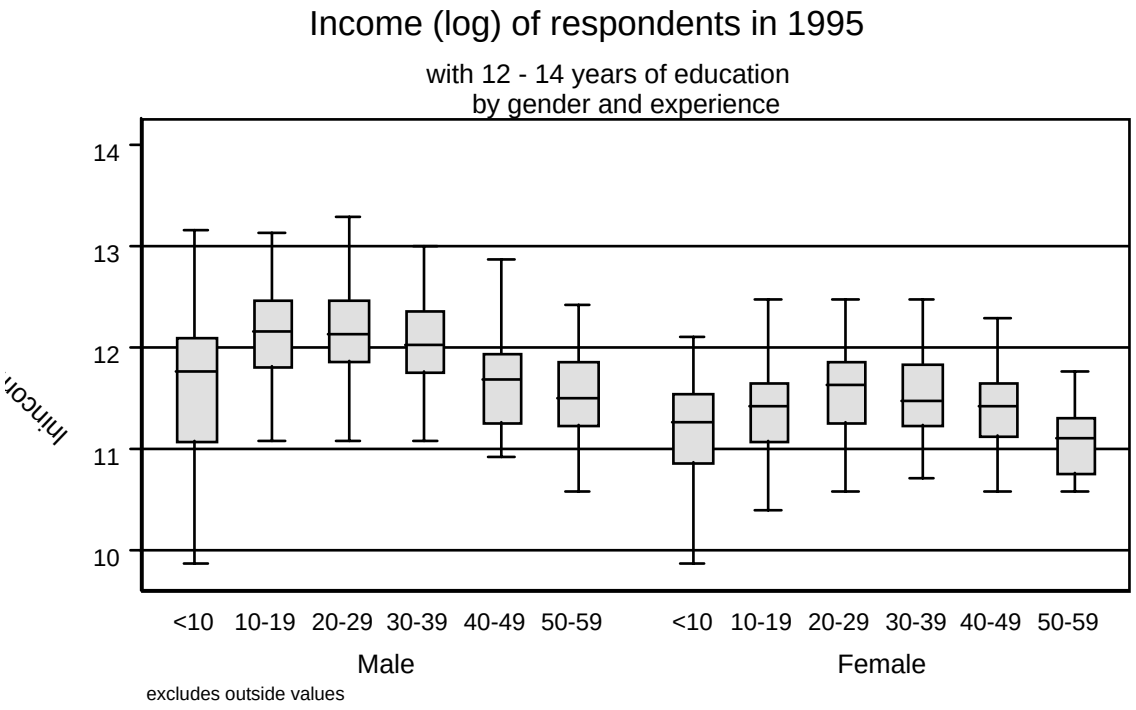

Figure 7: Income of respondents in 1995 with 12-14 years of education by gender and experience

Figure 7 shows how, for those having completed 12 to 14 years of education, the median income increases with experience until a maximum is reached after 20-30 years of potential experience. This pattern is repeated for both male and female respondents. The pattern is also repeated for the 25th and 75th percentiles. Figure 8 show income for the same groups when income is corrected for the length of the woking week.

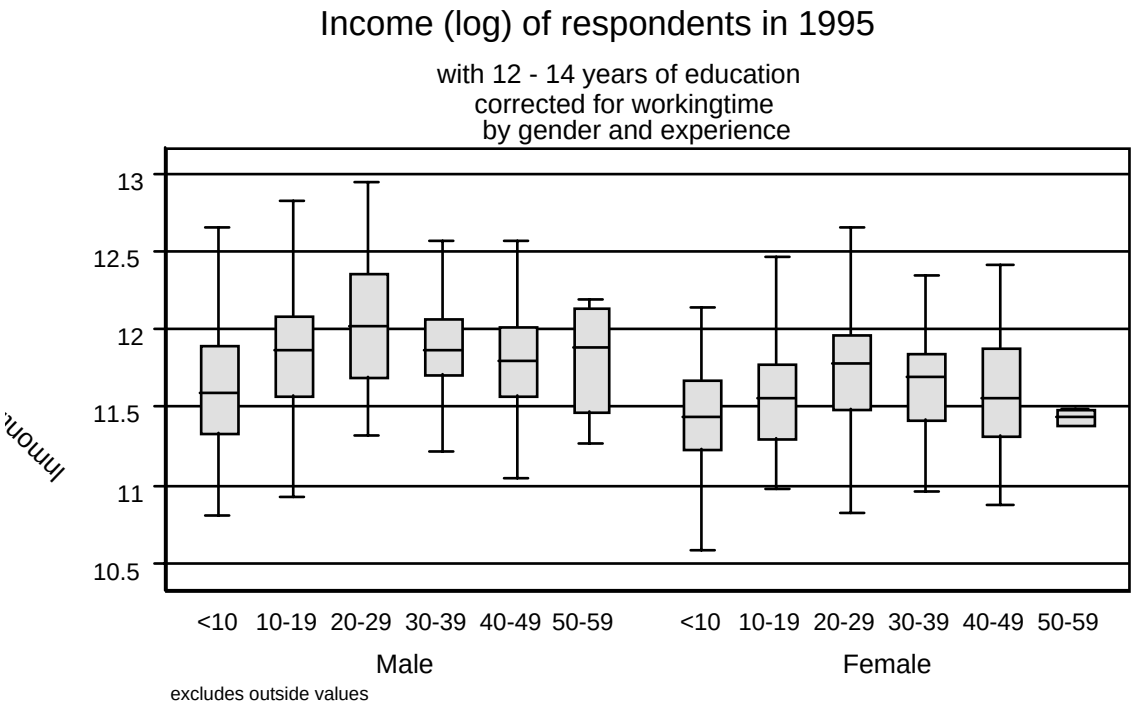

Figure 8: Logarithm of income in 1995 corrected for working time for respondents with 12-14 years of education, by gender and expierence, for explanation see caption for Figure 1

It is interesting to compare how income varies by potential experience for those with less than 12 years of education (as seen in figures 4 and 5) and the same information for respondents with a bit more education. The median income showed a pattern of an inverted U for the uncorrected income of the least educated (figure 4). This pattern disappered when income was corrected for hours worked (figure 5). Interestingly, for the respondents with 12-14 years of education the inverted U shape for the median and the 25th and the 75th percentile is still visible for both uncorrected and corrected income. (There is an exception for the males with most potential experience). It is thus a clear indication that education affects how potential experience affects salaries (income corrected for hours).

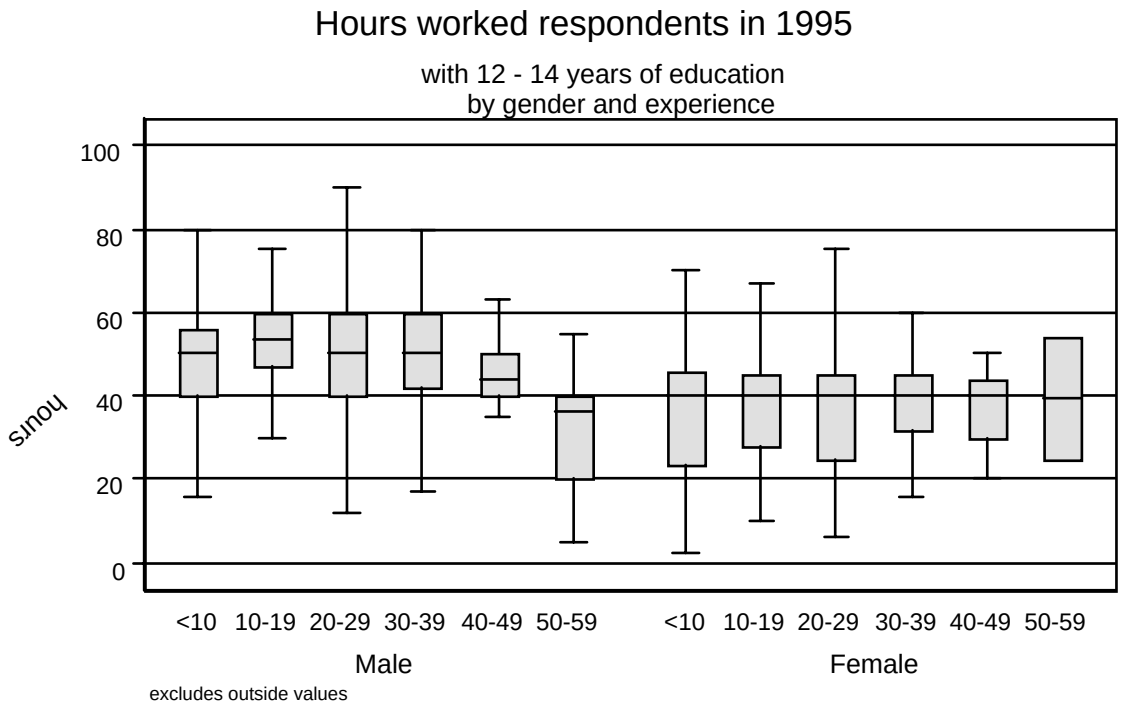

Figure 9: Hours worked by respondents with 12-14 years of education in 1995 by gender and potential experience

Figure 9 shows how hours worked vary by gender and length of potential experience. The median and the percentiles have a pattern of inverted U for males. The difference in median hours per week is not big, however. Median length of the work week is flat at 40 hours a week for the females. The median is thus approximately 10 hours lower for females than for males. The interquantile range (length of the greyed areas) is also bigger in the case of females than is the case for males. The over all pattern revealed in figure 9 is similar to the overall pattern revealed in figure 6 (hours worked by those with least education). Hence, men seem to respond to higher wages during the mid part of their working life by increasing their supply of hours. The same is not evident for women with 12-14 years of education.

Reported income, hours and income corrected for hours for respondents 15–17 years of education

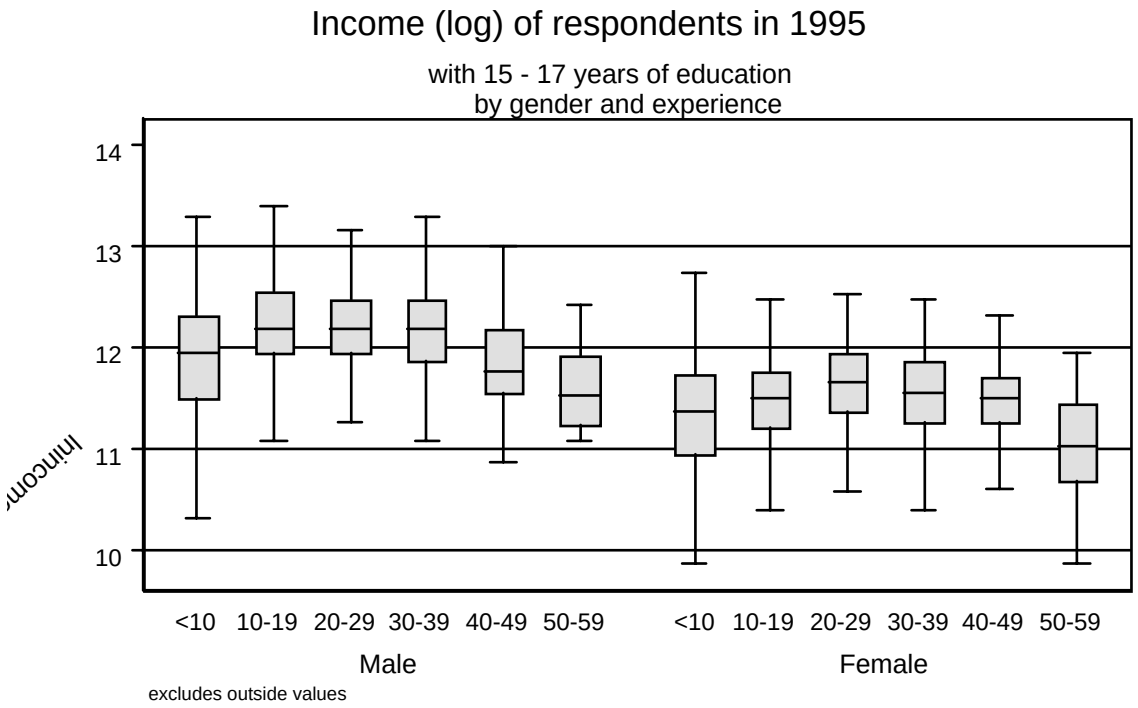

Figure 10: Income of respondents in 1995 with 15-17 years of education by gender and experience

Figure 10 shows how income of those with 15-17 years of education varied by gender and potential experience. The pattern is similar as before, the same inverted U-shaped relation between the median and the 25th and the 75th percentil and the same difference in the size of the median. Both patternes are repeated when income is corrected for length of the workweek, as can be seen in Figure 11:

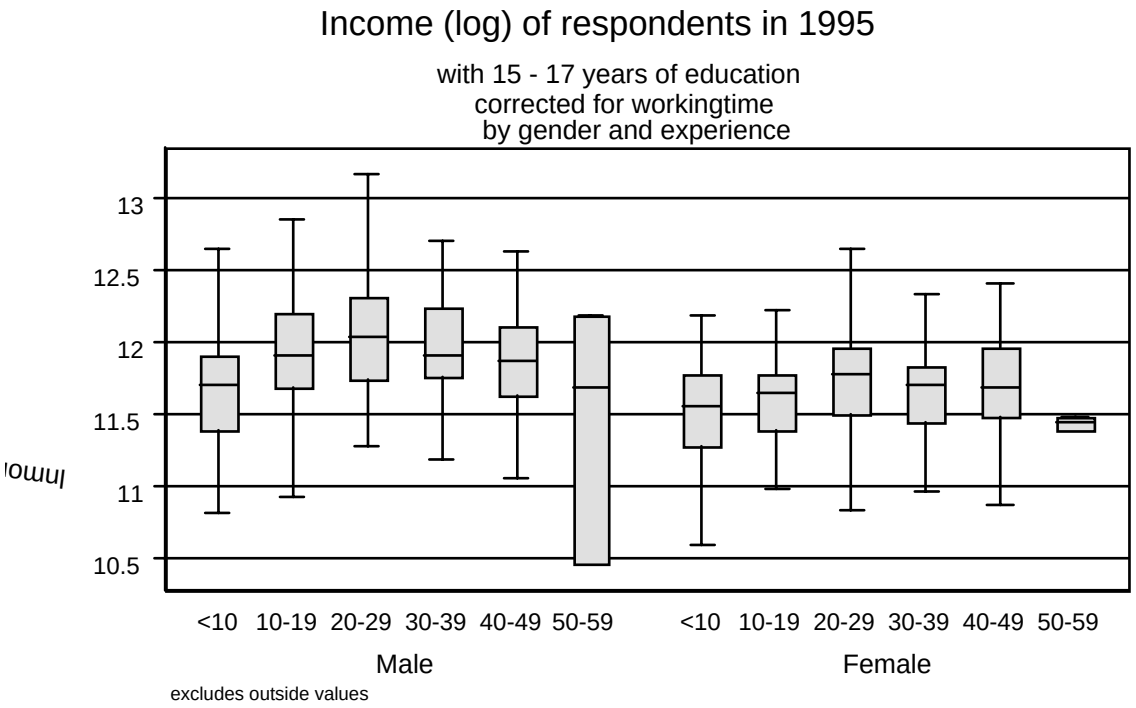

Figure 11: Logarithm of income in 1995 corrected for working time for respondents with 15-17 years of education, by gender and expierence

Figure 12 shows how hours worked by respondents with 15-17 years of education varied by gender and experience in 1995:

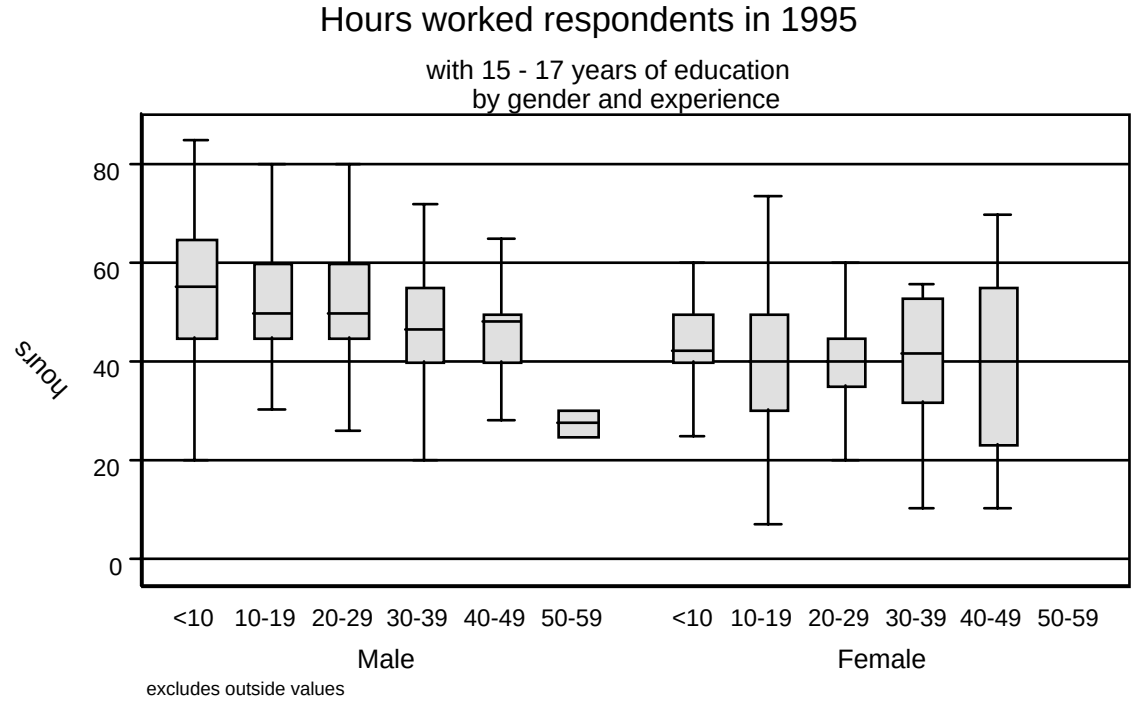

Figure 12: Hours worked by respondents with 15-17 years of education in 1995 by gender and potential experience

The pattern of working time for male respondents with 15-17 years of education is different from the pattern for those with lesser education. Working hours seem to fall with increase in potential experience. The least expierenced work longest hours, the most experienced work fewer hours. Men with 15-17 years of education do not respond to higher wages by increasing supply of hours it seems. The same effect is not apparent for the females. The median working week is 40 hours just as for the least educated. The fact has not been focused on in earlier work on the Icelandic labour market (at least not to the knowledge of the present author).

Reported income, hours and income corrected for hours for respondents 18 years of education or more

Figures 13 to 15 show how reported income, hours and reported income corrected for hours varies with potential experience by gender.

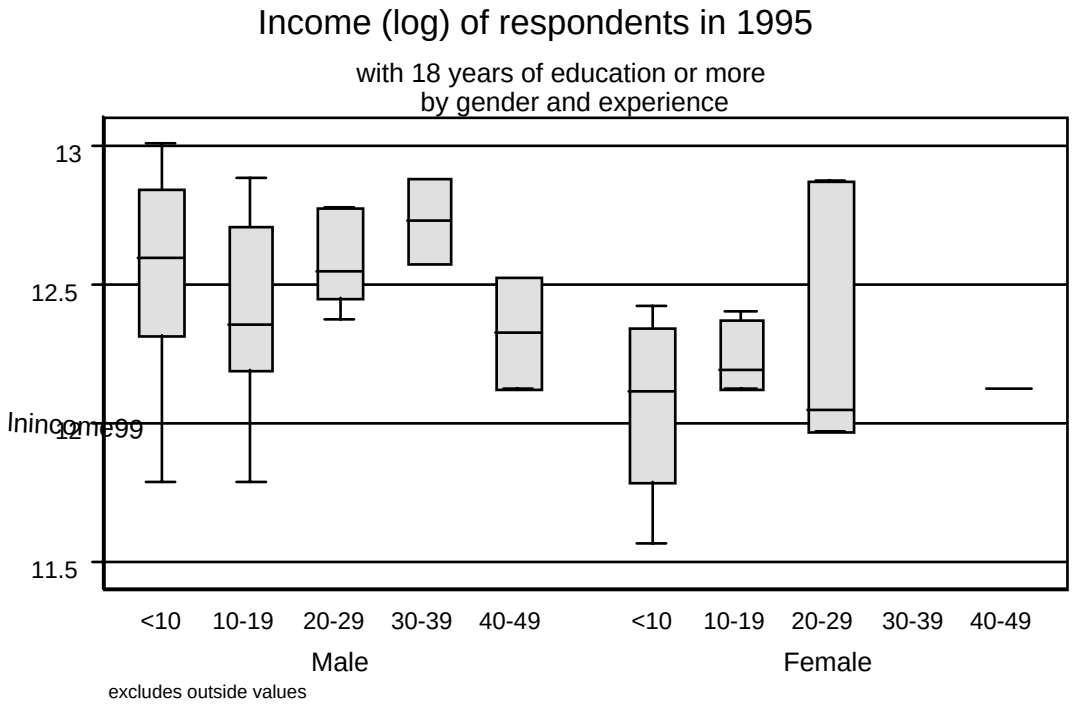

Figure 13: Logarithm of income of respondents in 1995 with 18 years or more of education by gender and experience

Figure 13 shows that the median income for males is highest for those with 30 to 39 years of potential experience. We also note that those with least potential experience have higher income than those with 10-19 years of potential experience. Median income for females is highest for those with 10-19 years of potential experience. Note also that the interquantile range is quite big for females with 20 til 29 years of potential experience.

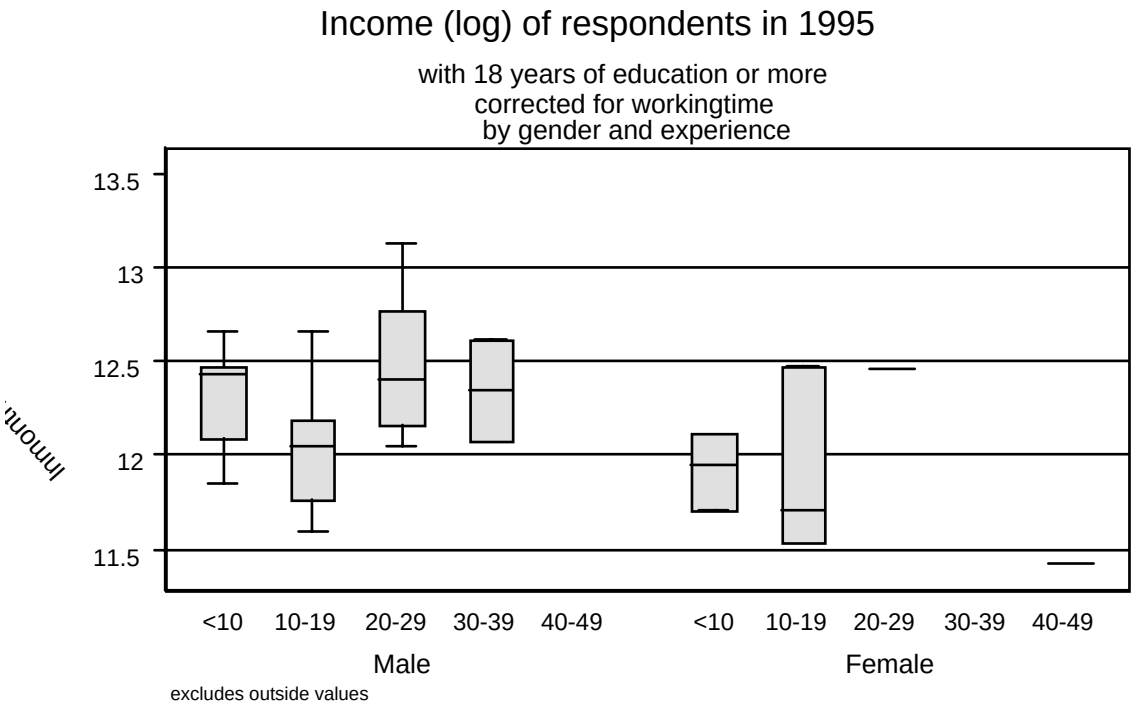

Figure 14: Logarithm of income in 1995 corrected for working time for respondents with 18 years or more of education, by gender and expierence

Figure 14 shows a similar picture as figure 13. The most educated and least experienced males are highly paid. But the distribution is skewed as the median is quite close to the thired quantile. We also note that the median is higher for males than for females in both the experience groups where there are observations for both sexes.

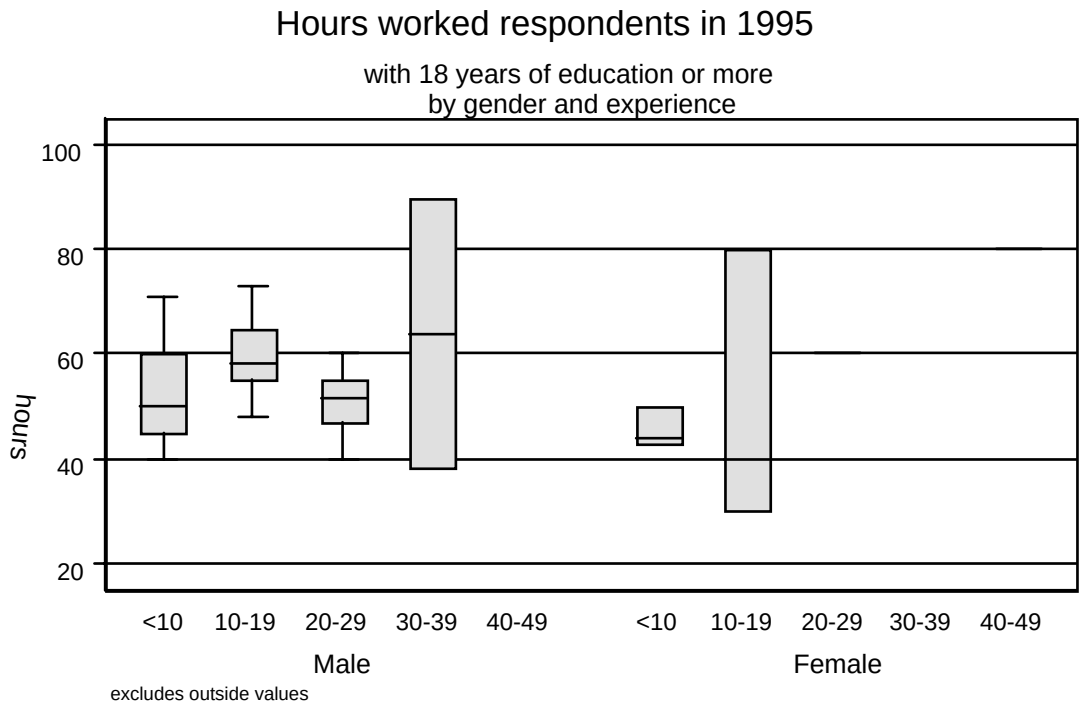

Figure 15: Hours worked by respondents with 18 years or more of education in 1995 by gender and potential experience

Figure 15 shows that the lest experienced males do not work as much as those with 10-19 years of potential experience even if the first group is better paid than the second. It is also noteworthy that it is the males with most potential experience that work the longest hours. Moreover, comparing figure 14 and 15 reveals that it seems that there is an inverse relationship between salary (income corrected for hours) and hours for men.

Comparing the educational groups reveals an interesting difference between those groups and also an interesting difference by gender. Males with less than 15 years of experience seem to respond to increase in monthly salary by increasing hours worked. They work many hours when their pay is high. For males with 15 to 17 years of education there seems to be little connection between monthly salary and hours worked and the relationship between monthly salary and hours worked is negative for males with 18 years of education or more. Men with less than 15 years of education tend work manually. Men with more education tend to be white-collar workers. The direct link between output and labour input that is usually present in blue-collar work-places is not as evidently present in white-collar workplaces. Blue-collar workers tend also to be remunerated by the hour, while white-collar workers tend to be remunerated with a fixed wage and bonuses not directly tied to number of hours spent in the work-place. Those facts can possibly explain the difference by educational groups for males. Mechanisms similar for those at work for males seems not to be working for the females. Their supply of hours does not seem to be affected by wages. One could speculate that the least educated females do work in work-environment that is different from the work-environment of the least educated males. But the fact is that many of the least educated females work in the health sector where remuneration is very much by the hours. This difference in patterns is thus still something of a mystery.

Figures 1-15 clearly show that there is a link between income whether corrected for hours or not, and education and experience. The next section gives a brief introduction to the theory of human capital. That theory has been used to explain the pattern observed.

Theories about the effect of education and experience on income

The fact that people with more education seem to earn more than people with less education induced economists like Gary Becker, Jacob Mincer and Theodore Schultz to develop the idea of education as an instrument to enhance the productive capability of individuals. Hence, when a person goes to school he or she is acting much like a firm investing in capital. Hence, it became natural to us the term "human capital" for the productive capacity of a person. They also suggested that experience at the workplace could increase the amount of human capital, see Becker (1965), Mincer (1958) and Schultz (1961). The human capital theory states that education increases the productivity and earnings capacity of individuals. Hence, education can be viewed as an investment, as already stated. Firms invest in means of production in order to earn a return that is at least as good as if the same wealth had been invested in some alternative activity (bank securities, say). An individual in schooling has to pay for educational material and admission. However, the biggest cost item is foregone earning, as the individual must usually reduce his/her supply of labour during the period of school attendance. It is obvious that a person will not undertake schooling unless faced with increasing income prospects, given the setup of the human capital theory. It also follows that the longer education a person has undertaken, the higher should his/her earnings be.

The early writers on human capital theory realized that human capital could be invested in also outside schools. People learn by doing at the workplace. A positive correlation between income, schooling and, to some extent, experience could thus be explained by the idea of human capital. But age-profiles of income decline after middle age. Does that imply that too much experience is bad? Note also that human capital depreciates just as other forms of capital. Assume that rate of depreciation is constant and note that as individuals have fewer years left to earn income they reduce investment in human capital. This implies that human capital builds up at a slower and slower rate until, at a given point, the depreciation is faster than gross investment in human capital. At that point the human capital embodied in a person declines at a faster and faster rate. Hence, productivity and income follow a hump like pattern as observed in the age-profiles of the figures shown above.

Based on the ideas and observations accounted for above one can establish the so-called Mincer equation:

$$\ln E = \beta_0 + \beta_1 S + \beta_2 X + \beta_3 X^2 \qquad (1)$$

E is income, S is number of years in school and X is the number of years that the individual has been active in the labour market. Given appropriate information the parameters of the equation can be estimated by econometric methods. The parameter β_1 has been interpreted as the return to education as, according to the human capital theory, it accounts for the relative impact of one year extra schooling on yearly income. The parameters β_2 and β_3 account for the effect of experience on income. It is sometimes assumed that the parameter

β_0 varies for different employee groups: men and women, married and unmarried, public servants and people working in the private sector.

Effect of adding one year of education to one's portfolio

Quantile regression is used to estimate the parameters of Equation 1 for each year we have data. Figure 16 shows the return to education for the 10th , 50th (median) and 90th percentiles. There is little difference in the return to education across the percentiles examined with the exception of the 90th percentile in 1993. But by and large the return to education seems to be in the range of 4 to 6% of increase in income for each additional year of education.

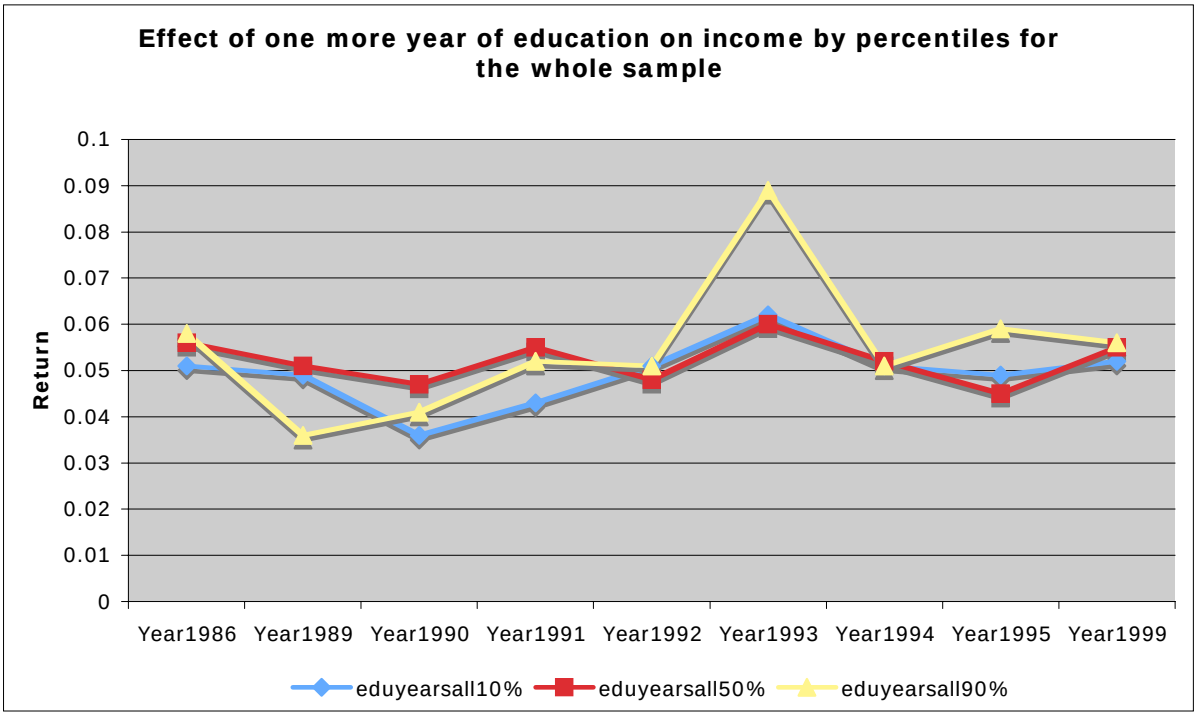

Figure 16: Effect of one more year of education on income by percentiles for the whole sample

The coefficients are all higly significant ($p<0.001$) and the standard error of the estimates vary from 0.003 to 0.012. The standard errror of the estimate is smallest for the 50th percentile (varies between 0.003 and 0.006). The standard error of the estimate for the 90th percentile in 1003 is 0.009.

We can split the sample by gender and estimate the return to education separately for males and females.

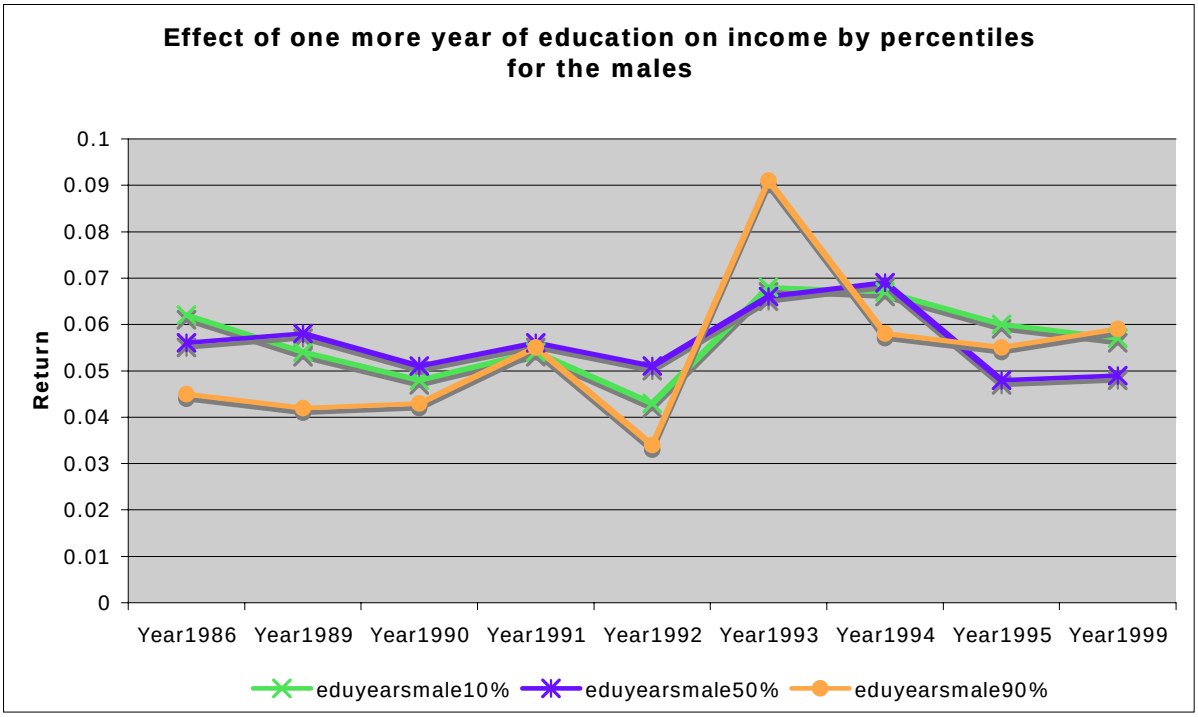

Figure 17: Effect of one more year of education on income by percentiles for men

Figure 17 shows that the picture for males is very similar to the picture for the whole sample. All the estimated coefficients are significant at the 99.9% level with exception of the coefficients for the 90th percentile for 1995 (significant at 95% level) and 1999 (significant at 99% level).

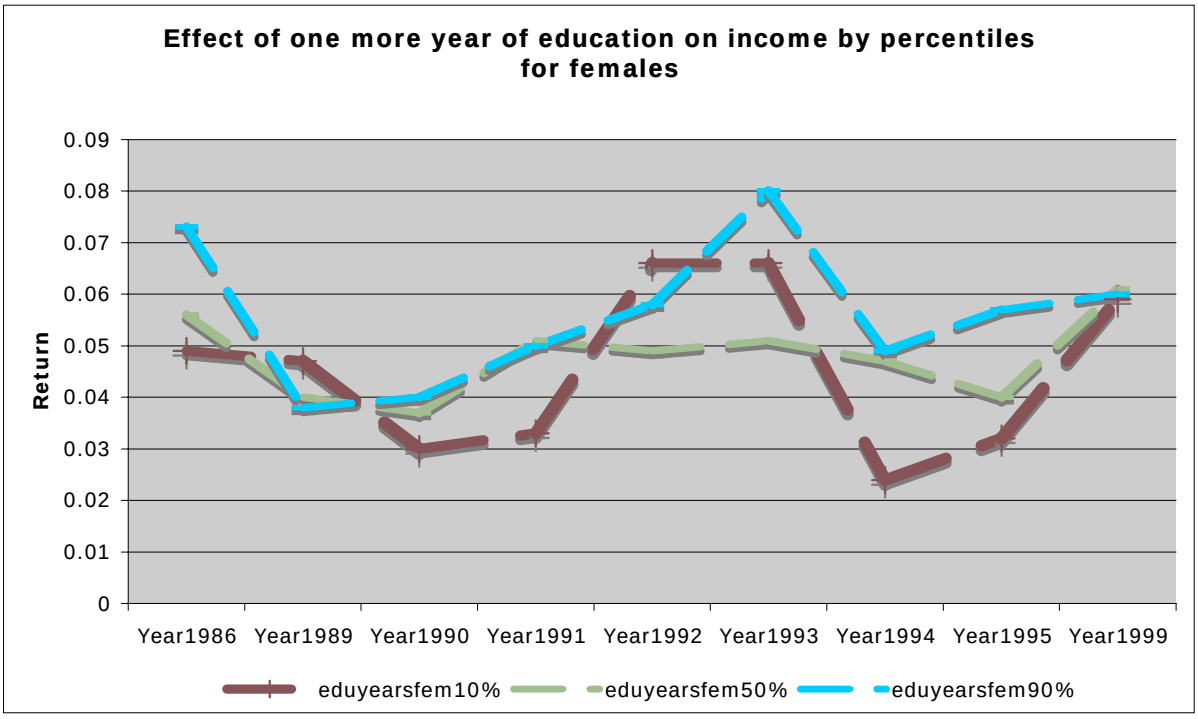

Figure 18: Effect of one more year of education on income by percentiles for females

Figure 18 shows that the development of the return to education has been somewhat different for females as compared to males. We also see that there is more cyclicality in the return to education for those in the 10th and the 90th percentile than for the median, indicating that ordinary regression analysis would mask the difference in the return to education between the highest and the lowest earners among women during the period under investigation.
The estimated coefficients are all significant at the 99.9% level except for the 10th percentile coefficients for 1994 (significant at 95% level), for 1995 (not significantly different from zero) and 1999 (significant at 99% level).

Effect of gender on income generation

An ever-returning question in the public debate in Iceland has been if the gender of an income earner does in itself influence the wage paid. It is asked whether or not a woman and a man of equal education and experience are rewarded in the same manner for their labour market participation. It should be possible to cast some light on that question with data of the kind that we have access to. The problem with our data is, however, that we do not have access to actual work experience in the labour market as we have had to estimate the length of experience by assuming that all years since termination of last degree are spent on the labour market. We know that this is not correct, as women are more likely than men to have spent some of time since graduation from school unattached to the labour market. The gender variable is thus likely to pick up effects related to absence from the labour market in addition to the possible effect of gender on wage the formation process.

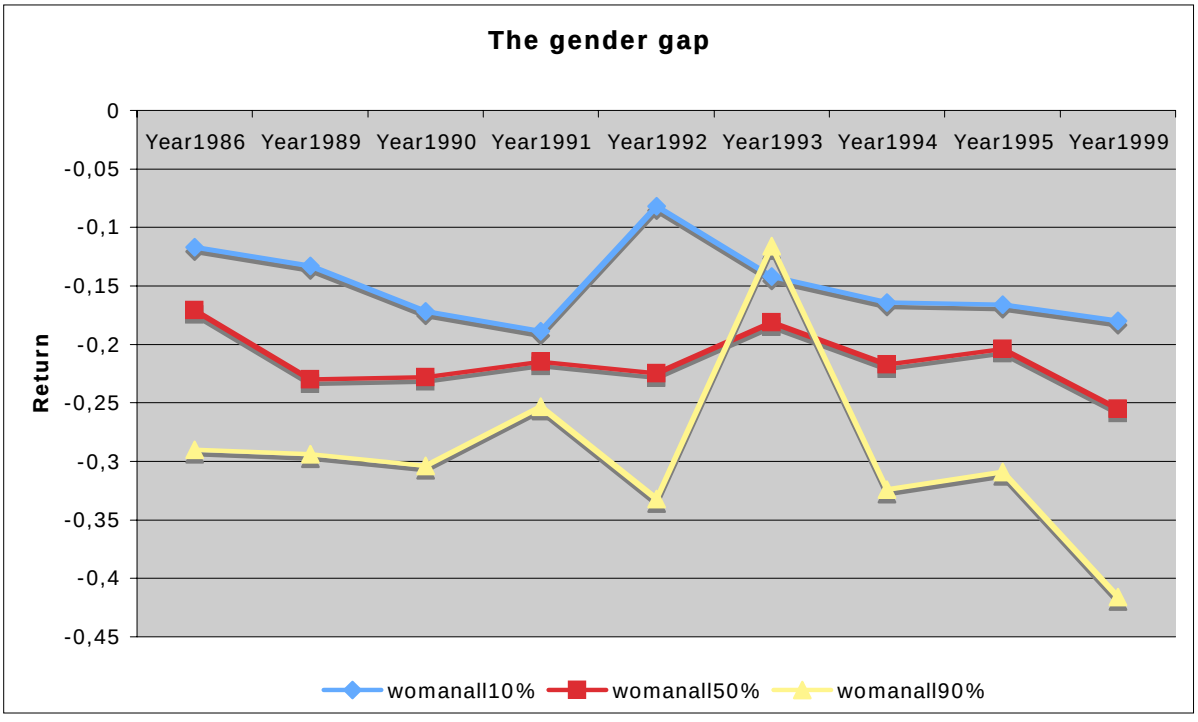

Figure 19: Difference in log-wages of men and women by percentiles

Figure 19 shows that the difference in median wages between men and women of equal footing, as manifested in the data, is estimated to be in the order of 18 to 26%. The difference is smaller for the 10th percentile and larger (with one exception) for the 90th percentile. The gender coefficients are significant at the 99.9% level with the following exceptions: For the 10th percentile the coefficient for 1992 is not significantly different from zero and for 1999 the coefficient is significant at 95% level. For the 90th percentile the coefficient for 1993 is significant at 95% level. The difference between wages of males and females could, however, be partly caused by systematic bias in the data. It should be pointed out that we use potential experience to estimate the effect of experience on wage formation. This can cause a systematic bias in the data as the difference between potential work experience and actual experience is probably correlated with gender.

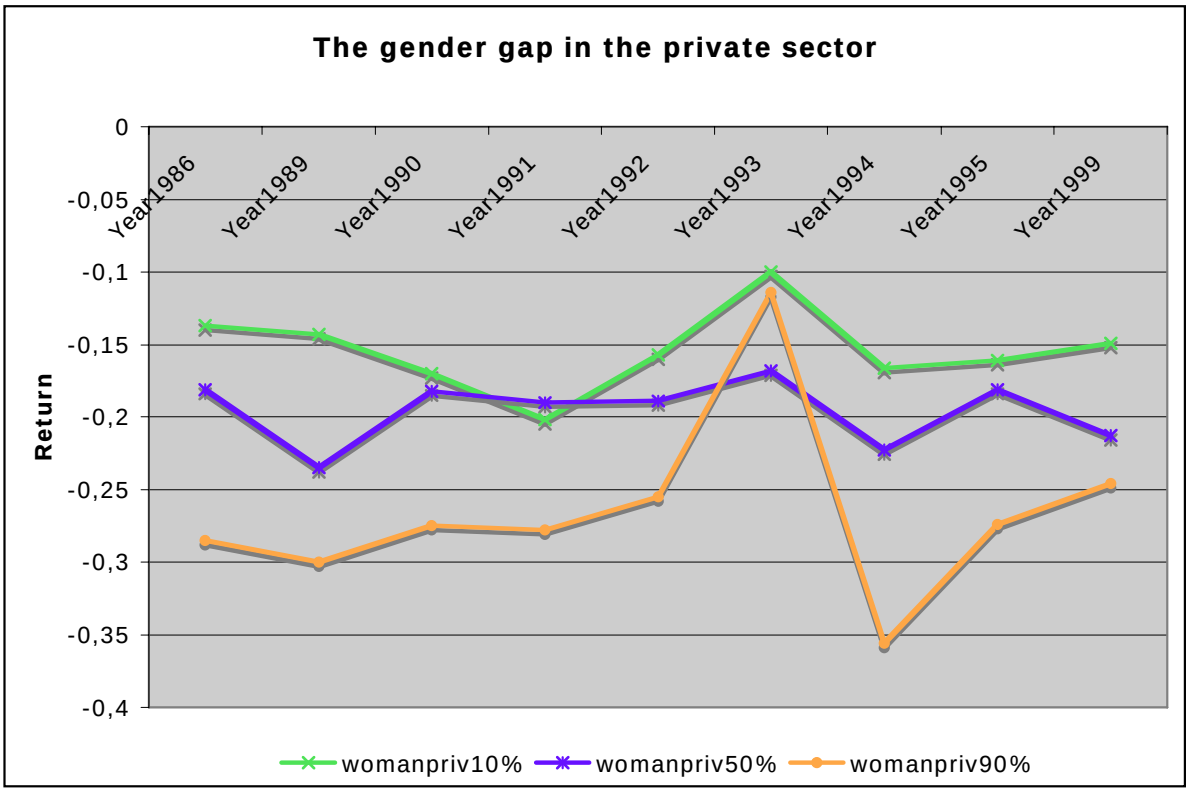

Figure 20: The gender gap in the private sector

Figure 20 shows the gender gap in the private sector. Note that there is hardly any trend in the development of the gender gap in the private sector. The coefficients are significant at the 99.9% level with some exceptions. The 10th percentile coefficients are not significantly different from zero for the years 1992, 1993 and 1999. For 1994 the coefficient is significant at the 99% level while significant at the 95% level for 1995. The 50th percentile coefficients are all significant at the 99.9% level. The 90th percentile coefficients are significant at the 99.9% level for the years 1986, 1989, 1990 and 1991. They are significant at the 99% level for the years 1992, 1995 and 1999. The coefficient for the year 1993 is significant at the 95% level.

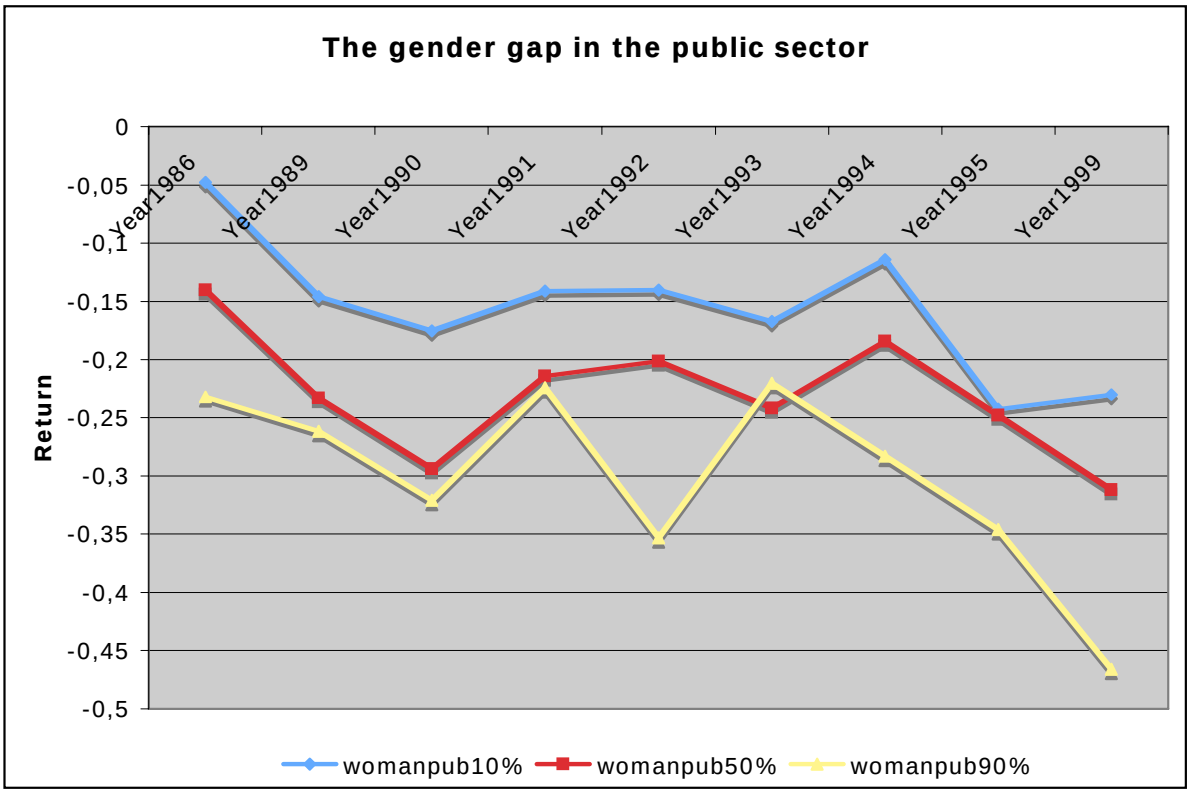

Figure 21: The gender gap in the public sector

There seems to be a trend towards an increasing gender gap in the public sector. Note that this happens during a time of privatization and of less centralized public sector bargaining. The coefficients for the 10th percentile regressions are not significantly different from zero for the years 1986, 1994 and 1999. They are significant at the 95% level for the years 1989, 1992 and 1995. The coefficient for the year 1990 is significant at the 99.9% level. For the 50th percentile regressions most of the coefficients are significant at the 99.9% level. Exceptions are the coefficients for the years 1986 (95% level) and 1994 (99% level). For the 90th percentile the coefficients for the years 1986 and 1993 are significant at the 99% level. All other years the coefficients are significant at the 99.9% level.

An alternative formulation was tested. The income generation mechanism was formulated as:

$$\ln E = \beta_0 + \beta_1 S + \beta_2 X + \beta_3 X^2 + \beta_4 F + \beta_5 P + \beta_6 F * P + \varepsilon \qquad (2)$$

Here F is equal to 1 if the respondent is a female, zero otherwise. P is equal to 1 if the respondent is living with a partner. Dummies for public or private employment and for living in the capital area were added as before. We can interpret the coefficients in the following way: β_4 gives the wage gap for unmarried women compared to unmarried men. $\beta_4 + \beta_6$ yields the wage gap for married women compared to married men. β_5 is the marriage premium for men, while $\beta_5 + \beta_6$ provides the marriage premium for women. The return to schooling is not much affected by reformulating the problem in this way. But the gender variable is reduced in value and is no longer significant.

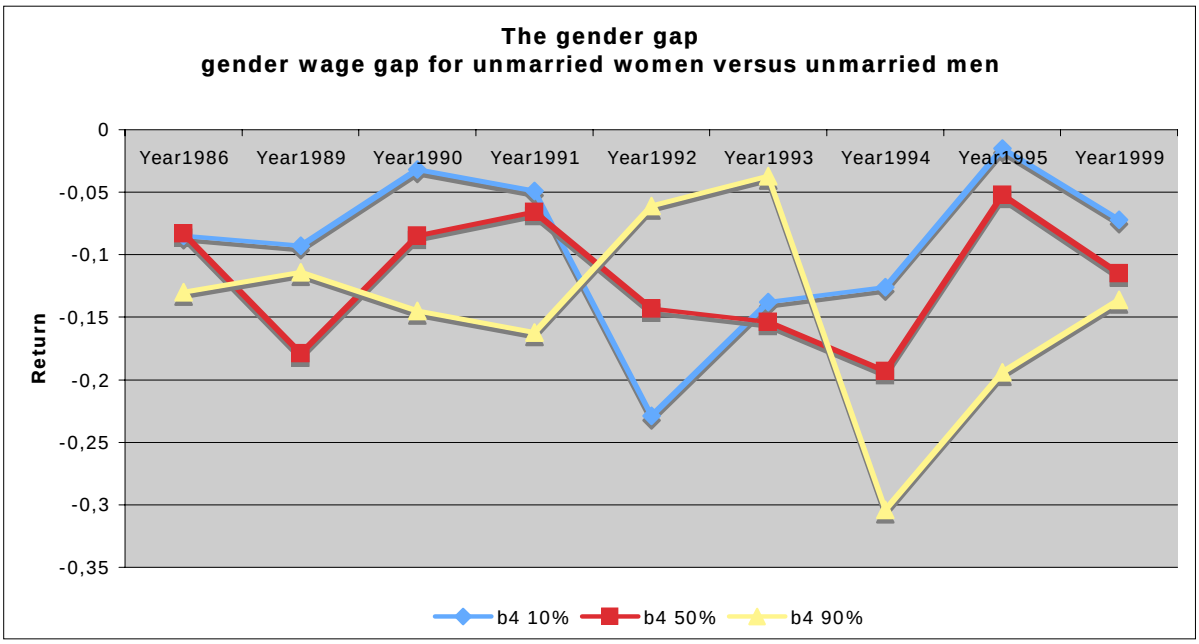

Figure 22: The gender gap for unmaried women compared to unmarried men

Figure 22 indicates that the gender wage gap for unmarried woman as compared to unmarried men is in the range of 5 to 20% for the median and varies over a wider range for the 10th and the 90th percentile. It should be noted that most of the reported coefficients are not significantly different from zero at the 95% level.

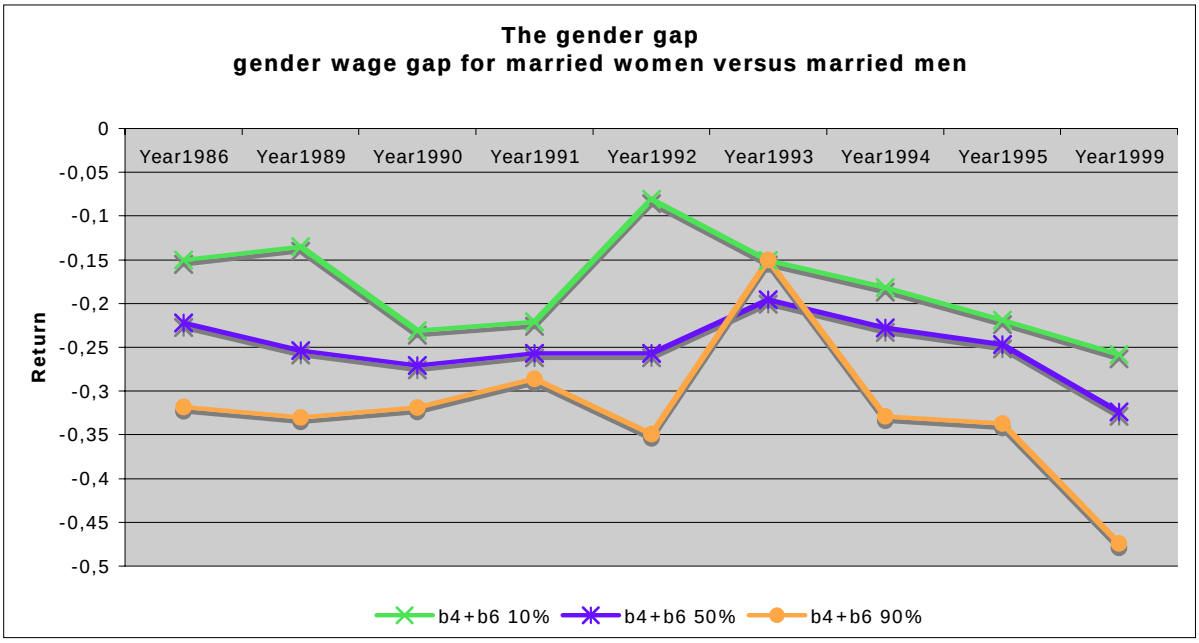

Figure 23: The gender wage gap for maried women versus married men

Figure 23 shows the estimated gender wage gap for married women as compared to married men. Being a female seems to be more of an obstacle late in the period for the 90th percentile. Again, the results are generally not significant.

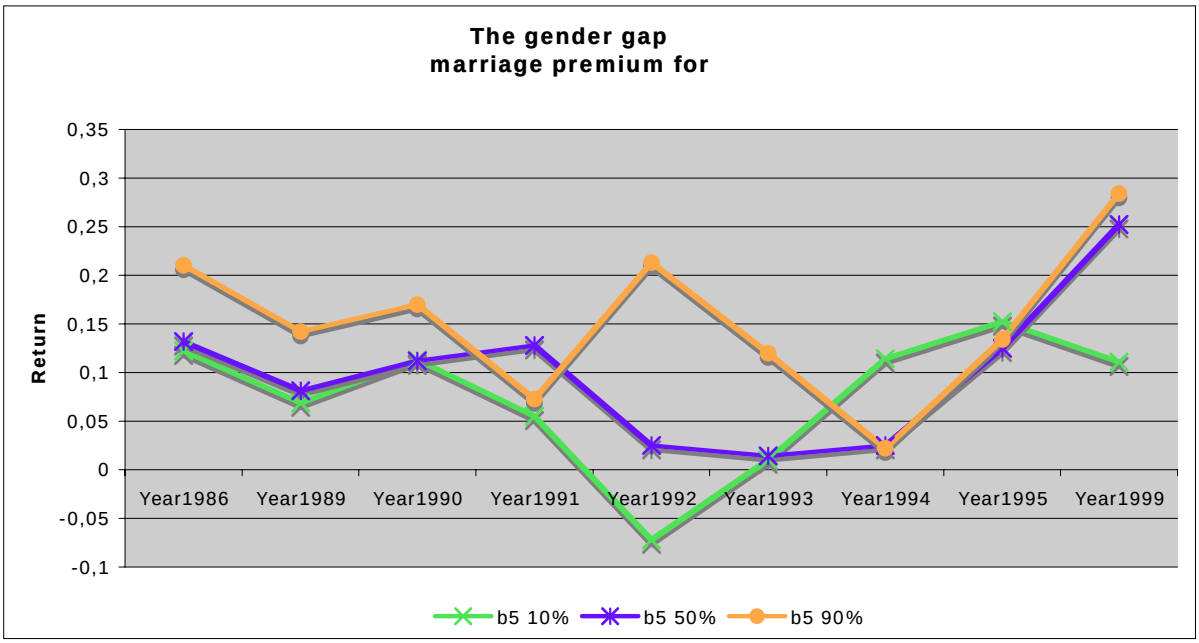

Figure 24: The gender wage gap, marriage premium for men

Married men seem to earn more than unmarried men. The marriage premium for men varies from year to year and seems often to be higher for those in the 90th percentile. But the results are generally not significantly different from zero.

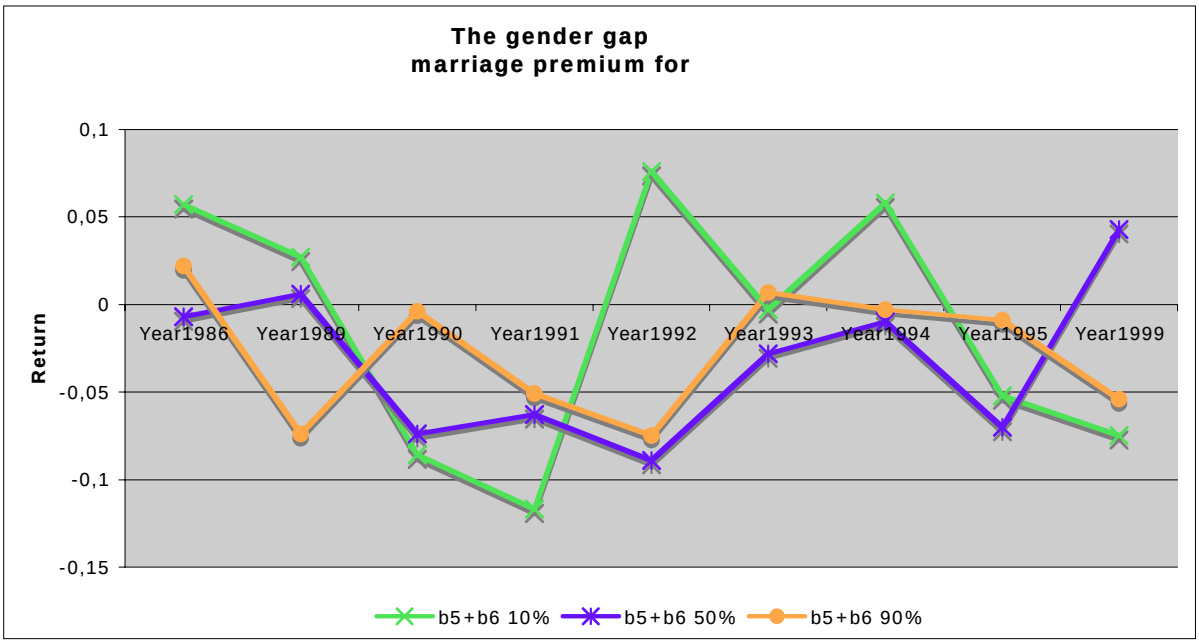

Figure 25: The marriage premium for women

Figure 25 indicates that it may or may not be beneficial in terms of wages for women to be married. Again the coefficients are in general not significant at the 95% level.

It should be stressed that effect of gender on wages is probably biased in the dataset as explained above. It is thus possible that the significant gender coefficient according to the formulation in equation (1) is really a confirmation that there is a significant difference between the labour market attachment of subgroups of males and subgroup of females after graduation from school. One possibility is that the labour market attachment of married men is different from the labour market attachment of married women, single men and single women. Similarly for the labour market attachment of single men, single women and married women. The insignificanse of the coefficients according to formulation (2) indicates that much more research is warranted into this matter. Most pressing is to aquire better data.

Discussion and conclusion

The effort to use Mincer equations to estimate the return to education has been criticized, see for example Heckman, Lochner et al. (2003). It has been pointed out that the equation measures the return to an increasing number of years in school, not to increasing expenditure on schooling and that there need not be a direct link between those two. It has also been pointed out that the individuals do not know with certainty what the income will be for those acquiring a given education at the time the schooling decision is taken. Lastly it is pointed out that there is a premium for finishing a degree as compared to being in school a given number of years without finishing (the so-called sheep-skin effect).

This criticism is quite valid. We believe, however, that we have taken some care to avoid the worst pitfalls as the length of education is defined with respect to the most recent degree finished. Secondly, education in Iceland has been offered more or less free of charge until recently. Hence, admission fees do not vary much from institution to institution (in tertiary education?) so that the number of normalized years for a degree should reflect well the costs perceived by a prospective student at the time s/he enrolls in a study field. Furthermore, the Icelandic Study Loan Fund offers income contingent loans which greatly reduce the risk associated with choice of studies, see Chapman (2006).

The conclusion of this study is that one-year of schooling increases yearly income by 4 to 8%. Iceland does not stand out among other European countries in this respect. The return to schooling seems to be slightly higher for women than for men, but we could wish for better data for making more exact statements about the difference in pay between men and women and the role of education investments and their gender-specific returns in this context.

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