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Is there a return–risk link in education?

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Abstract

Using results for 16 countries, the positive relationship between return to education and the risk involved in this investment is studied. It seems that most of the countries fit the pattern well: higher risk–higher return and the tradeoff is rather large.

Keywords: Returns to education; Risk; Quantile regression

JEL classification: C29; I21; J24

1. Introduction

The positive correlation between expected return and risk is a well-studied subject in finance. In his doctoral dissertation, Markowitz developed the basic portfolio theory, which became known as the Capital Asset Price Model (CAPM) — see Markowitz (1952). In this model a linear relationship can be derived between risk and return.[1]

From this model we retain the idea that there is a positive relationship between return and risk and test it to education or the investment in human capital. So the question we answer in this paper is: is there a positive relationship between return to education and the risk of the investment?

We use micro data for 16 countries for the year 1995, or the available.[2] The paper is organized as follows. In the next section we present the variables used to measure returns to education and risk and their problems. In Section 3 the results are shown. Our conclusions appear in the last section.

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[1]For a discussion of the CAPM model see, for instance, Berndt (1991), and Campbell et al. (1997).

[2]For a description of the data-sets used see Pereira and Martins (2000).

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2. Returns and risk

To measure the returns to education, the Mincer (1974) equation was estimated for each country and the coefficient of education (corrected by the fact that it is a log-linear relationship) was then utilised. There are several problems with the use of this equation, including the following.

1. There are strong assumptions involved in deriving the equation (see, for instance, Asplund and Pereira, 1999).
2. The exogeneity of education in the Mincer equation (see, for instance, Card, 1999).

As we used data for 16 countries, the Mincer equation[3] seems a workable compromise and has been widely used.

To measure the risk of the investment we used the results of quantile regressions (Koenker and Bassett, 1978) on the Mincer equation. Instead of adjusting the equation through the average, we used quantile regression to estimate the equation through certain points of the distribution (quantiles). This has the advantage of giving the influence of the covariates at different points of the curve (Pereira and Martins, 2000).

We use the difference (dif) between the coefficient of education at the last decile and the first decile[4] as the measure of the risk (this difference is positive except in one case, so we used the absolute values of this difference (absdif) as an alternative), as we assumed that people do not know where they will end up in the distribution before entering the labour market (which generally occurs after they finish their studies).

The use of this difference has an advantage when compared with the variance of the OLS returns, as these returns are estimates themselves, and not verified values (as are the returns to assets used in CAPM estimates).

If there is a large difference in the estimated coefficients between the first and last decile, meaning that the return is much higher at the upper than at the lower decile, the individual faces a high risk, as the individual can end up at the lower decile. If the difference is small, there is almost no risk.

3. Results

Table 1 shows the results from previous estimations which are used in our analysis.

From the table we see that most of the results come from regressions using gross hourly wages as the dependent variable (see Harmon et al. (2001) for details), and are for the year 1995.

To show the positive relationship between return (ols) and risk, we start calculating the correlation coefficient between the return and risk. Its value is high -0.57.

From Table 1, we construct dummy variables for years (year$i = 1$ if year $= i$, zero otherwise), type of wage (net $= 1$, if net wages were used, zero otherwise). dif stands for the difference in returns

[3] $\log y = \alpha + \beta\ \text{educ} + \delta_1\ \text{exp} + \delta_2\ \text{exp}^2$ where y is the wage, educ is education and exp is experience in the labor market.

[4] The significance of the difference was tested for several countries and it was shown to be significantly different from zero, provided the sample was large enough.

Table 1
Returns to Education: OLS and Quantile results (the returns appear in %)

Country	Wages	Year	OLS return	First decile return	Last decile return	Dif between last and first
Austria	Net	1993	9.7	7.2	12.8	5.6
Denmark	Gross	1995	6.6	6.3	7.1	0.8
Finland	Gross	1993	8.9	6.8	10.1	3.3
France	Gross	1993	7.6	5.9	9.3	3.4
Germany	Gross	1995	8	7.5	7.8	0.3
Greece	Net	1994	6.5	7.5	5.6	−1.9
Ireland	Gross	1994	8.9	7.8	10.4	2.6
Italy	Net	1995	6.4	6.7	7.1	0.4
Netherlands	Gross	1996	7	5.3	8.3	3
Norway	Gross	1995	6	5.5	7.5	2.1
Portugal	Gross	1995	12.6	6.7	15.6	8.9
Spain	Gross	1995	8.6	6.7	9.1	2.4
Sweden	Gross	1991	4.1	2.4	6.2	3.8
Switzerland	Gross	1995	9.5	8.7	10.6	1.9
UK	Gross	1995	8.6	4.9	9.7	4.8
USA	Gross	1995	6.3	3.9	7.9	4

between the last and first decile, absdif for its absolute value and ols for the OLS Mincer equation coefficient corrected.

We performed OLS estimation with White standard errors (as the dependent variables are estimates, themselves) and obtained the following results (Table 2 or Table 3).

The coefficients all have the expected signs, even though one of them is not significantly different from zero at a 10% level. This is the case of return found when using net wages instead of gross wages; where, as expected, a lower value appears (due to the progressivism of most income tax systems).

Table 2
Regression with robust standard errors

Number of obs = 16
$F(5,9) = 1957.53$
Prob > $F = 0.0000$
R-squared = 0.9831
Root MSE = 1.3989

ols	Coef.	Robust S.E.	t	$P>\|t\|$	[95% Conf.	interval]
net	−0.0594735	0.4831846	−0.123	0.905	−1.152513	1.033566
dif	0.5565127	0.169201	3.289	0.009	0.1737533	0.939272
year91	1.985252	0.642964	3.088	0.013	0.5307662	3.439737
year93	6.471456	0.9839524	6.577	0.000	4.245601	8.697311
year94	7.534957	0.2900354	25.979	0.000	6.878851	8.191063
year95	6.490306	0.7973708	8.140	0.000	4.686527	8.294084
year96	5.330462	0.5076031	10.501	0.000	4.182184	6.47874

Table 3
Regression with robust standard errors

					Number of obs = 16 $F(5,9) = 51.57$ Prob > $F = 0.0000$ R-squared = 0.9818 Root MSE = 1.4512	
ols	Coef.	Robust S.E.	t	$P > \|t\|$	[95% conf. interval]	
net	−0.5700131	0.5674445	−1.005	0.341	−1.853662	0.7136356
absdif	0.56264	0.1762516	3.192	0.011	0.1639312	0.9613489
year91	1.961968	0.6697562	2.929	0.017	0.446874	3.477062
year93	6.616513	0.9744813	6.790	0.000	4.412083	8.820943
year94	6.719066	0.86393	7.777	0.000	4.764721	8.673412
year95	6.529603	0.7854792	8.313	0.000	4.752726	8.306481
year96	5.31208	0.5287549	10.046	0.000	4.115953	6.508207

We cannot reject the hypothesis that the years 1993, 1994 and 1995 have the same coefficient at any reasonable significant level, which is a side conclusion that seems interesting in itself, meaning that the risk-free alternative return was constant over this time period.

The main findings are therefore the positive relationship between return and risk and that the tradeoff is rather high. There seems to be a positive compensation to 'be received' to face the risk of the investment in education; for a 2% increase in risk (measured the way we did) there is a 1% increase in the average return to education.

In Appendix A we show the results of the regressions if we control for differences in financing.[5] The results seem to be robust to the change in specification.

To avoid the problem of linearity that is implicit in the results above, we performed the following exercise. We ordered the countries by decreasing values of return and by increasing values of risk. We then added the order values. If there was an inverse ordering, the sum would always be 17. We obtained the results shown in Table 4.

The average yielded the value of 17. Five out of the 16 countries add 16 or 17, and most of the results are within one standard error of the average.

The outliers are the cases of Switzerland, Germany (both: high return and low risk) and the US and Sweden (both: low return and relatively high risk). For the rest, the more risk individuals face, the higher their average return is, in a certain range.

4. Conclusions

The fact that there is a positive relationship between the return to education and the risk involved in the decision taken was expected, as finance theory predicts. Again education appears to be an investment having properties similar to investments in other assets.

This paper uses a particular measure of risk: the difference in returns in different deciles, to confirm

[5] We thank an anonymous referee for the suggestion.

Table 4
Ranking of returns and risk

	OLS	Rank 1	Diff	Rank 2	Sum
Portugal	12.6%	1	8.9%	16	17
Austria	9.7%	2	5.6%	15	17
Switzerland	9.5%	3	1.9%	5	8
Ireland	8.9%	4	2.6%	8	12
Finland	8.9%	5	3.3%	11	16
Spain	8.6%	6	2.4%	7	13
UK	8.6%	7	4.8%	14	21
Germany	8.0%	8	0.3%	2	10
France	7.6%	9	3.4%	10	19
Netherlands	7.0%	10	3.0%	9	19
Greece	6.5%	11	−1.9%	1	12
Denmark	6.6%	12	0.8%	4	16
Italy	6.4%	13	0.4%	3	16
US	6.3%	14	4.0%	13	27
Norway	6.0%	15	2.1%	6	21
Sweden	4.1%	16	3.8%	12	28
Average					17
S.D.					5.5

the theory. Therefore, part of the difference of returns in different countries is due to different risks which the individuals face. This appears in a very surprising and intriguing way in the ranking analysis undertaken, as most countries' results are within a standard error of the value we would obtain if there were an inverse ordering between returns and risk.

The tradeoff return–risk is high as a 2% increase in risk results in a 1% increase in average return. More studies are needed for different groups of countries and years to test the robustness of these results.

At this stage using the argument that returns to education in a country are very high to press for increase in student fees can be rather misleading and if accepted can destroy existing equilibriums with unknown consequences.

Why different countries show different risk is surely an open question and part of our research agenda.

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Appendix A

As shown in Asplund and Pereira (1999) — Introduction — there should be a negative relationship between the amount of state support to students and the Mincerian return to education.

To control for the difference in state support for students (financing) we used the average direct support per student per month divided by the estimated expenditure per student per month as it appears in Daniel et al. (1999) Table V. See Table A.1.

We run the regressions above for the 12 countries we had information on state support, controlling and not for financing and obtained the following results (Table A.2).

Table A.1
State support for education (financing appears in %)

Country	Financing
Austria	10
Denmark	49
Finland	37
France	–[a]
Germany	7
Greece	2
Ireland	18
Italy	2
Netherlands	39
Norway	–
Portugal	4
Spain	4
Sweden	58
Switzerland	–
UK	31
USA	–

[a] Data not available.

Table A.2
Regressions with robust standard errors

	Coeff.	*t*-value	Coeff.	*t*-value
dif	0.4978072	6.186	0.5716725	4.411
year91	4.56652	4.776	1.927644	3.914
year93	8.724262	12.358	6.9714	9.696
year94	8.616383	17.929	7.715257	18.850
year95	7.891754	18.729	6.861542	10.468
year96	7.092256	10.699	5.284983	13.593
net	−1.368064	−3.282	−0.4306854	−1.009
financing	−0.0406584	−2.832		
No. obs.	12		12	
R-squared	0.9990		0.9960	

As expected countries with lower support show higher returns as the return obtained in the Mincer equation does not take into consideration the costs incurred by the family and therefore it is smaller the larger the percentage not paid by the family (paid by the state).

The coefficient of net appears significantly different from zero when we control for financing.

The coefficient of dif is very similar in the regressions with and without control for financing, therefore we can conclude that risk and financing are independent explanations for the variations in return to education. The results for the 12 countries do not diverge from the ones obtained for the 16 countries.

References

Asplund, R., Pereira, P., 1999. An introduction to the reviews. In: Asplund, R., Pereira, P. (Eds.), Returns to Human Capital in Europe: a Literature Review. ETLA, Helsinki, pp. 1–12.

Berndt, E.R., 1991. The Practice of Econometrics: Classic and Contemporary. Addison-Wesley, Reading, MA.

Campbell, J.Y., Lo, A.W., MacKinlay, A.C., 1997. The Econometrics of Financial Markets. Princeton University Press, Princeton.

Card, D., 1999. The causal effect of education on earnings. In: Ashenfelter, O., Card, D. (Eds.). Handbook of Labour Economics, Vol. 3. North-Holland, Amsterdam, Chapter 30.

Daniel, H.-D., Schwarz, S., Teichler, U., 1999. Study costs, student income and public policy in Europe. European Journal of Education 34 (1), 7–21.

Harmon, C., Walker, I., Westergard-Nielsen, N. (Eds.), 2001. Education and Earnings in Europe: A Cross Analysis of Returns to Education. Edward Elgar.

Koenker, R., Bassett, G., 1978. Regression quantiles. Econometrica 46, 33–50.

Markowitz, H.M., 1952. Portfolio selection. Journal of Finance 7 (1), 77–91.

Mincer, J., 1974. Schooling, Experience and Earnings. NBER, New York.

Pereira, P., Martins, P., 2000. Does education reduce wage inequality? Quantile regressions evidence from fifteen European countries. IZA, Bonn, Discussion paper 120.