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Effects of Tertiary Expansion

**CROWDING-OUT EFFECTS AND LABOUR
MARKET MATCHES FOR THE HIGHER
EDUCATED**

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Effects of Tertiary Expansion

**Crowding-out effects and labour market matches for the higher educated
(Education Working Paper No. 10)**

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ABSTRACT

This paper examines crowding-out effects and the labour market match for the tertiary educated in 26 OECD countries, using attainment data and data on labour market outcomes from *Education at a Glance 2006*. A first-difference approach is applied on a three-period, pooled country-panel to examine the effects of changes in tertiary attainment levels against changes in labour market outcomes over time. The policy questions in this paper focus on the potential negative short-term effects that mismatches between the supply of and demand for higher-educated individuals might bring about.

There is no evidence in the current data suggesting any crowding-out effects of lower-educated from higher-educated individuals. On the contrary, there seems to be positive employment effects for individuals with less education in countries expanding their tertiary education. Labour market outcomes for the upper secondary educated appears to be less influenced by the expansion of tertiary education, but there is no indication that tertiary educated individuals, on average, are displacing (crowding out) upper secondary educated individuals from the labour market.

Similarly, the job market for the tertiary educated appears to be little influenced by the expansion of tertiary education. There are some indications that relative unemployment (relative to upper secondary) for the tertiary educated has been diluted to some extent, but this appears to be more related to the upper secondary educated, relatively speaking, strengthening their labour market positions vis-à-vis tertiary educated individuals in general. The earnings advantage (premium) for tertiary educated individuals in comparison with upper secondary educated individuals is still on the rise, which suggests that, on the whole, demand outstrips supply in most countries.

RÉSUMÉ

Cette étude examine l'adéquation sur le marché du travail des diplômés de l'enseignement tertiaire et les effets de progression du chômage chez les moins qualifiés dans 26 pays de l'OCDE, sur la base de données portant sur le niveau d'enseignement et la situation sur le marché du travail publiées dans l'édition 2006 de *Regards sur l'éducation*. Afin d'analyser les effets de l'évolution des taux d'obtention d'un diplôme tertiaire par rapport à l'évolution au fil du temps de la situation sur le marché du travail, une approche de différence première a été appliquée à un échantillon de pays mis en commun sur trois périodes différentes. Les questions d'action publique abordées dans cette étude se concentrent notamment sur les effets négatifs à court terme que peut occasionner une inadéquation de l'offre par rapport à la demande d'individus titulaires d'un diplôme de l'enseignement tertiaire.

Les données actuellement disponibles ne fournissent aucune preuve confirmant la thèse d'une mainmise des plus qualifiés sur l'emploi. À l'inverse, un effet positif sur l'emploi pour les individus moins éduqués semble s'instaurer dans les pays qui développent leur enseignement tertiaire. La situation sur le marché de l'emploi des titulaires d'un diplôme du deuxième cycle du secondaire paraît moins influencée par l'expansion de l'enseignement tertiaire, bien qu'en moyenne, aucun élément ne semble indiquer que les individus titulaires d'un diplôme tertiaire supplantent les diplômés du deuxième cycle du secondaire dans la course à l'emploi.

Dans le même ordre d'idées, le marché de l'emploi des diplômés du tertiaire semble peu influencé par l'expansion de l'enseignement tertiaire. Certains éléments indiquent que le taux de chômage relatif des diplômés du tertiaire (c'est-à-dire par rapport à celui des diplômés du deuxième cycle du secondaire) a connu un certain recul, mais ce phénomène paraît somme toute davantage imputable au renforcement par les diplômés du deuxième cycle du secondaire de leur position sur le marché du travail vis-à-vis des diplômés du tertiaire en général. L'avantage salarial des diplômés du tertiaire par rapport aux diplômés du niveau inférieur continue de progresser, ce qui suggère une distanciation générale de la demande par rapport à l'offre dans la plupart des pays.

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Introduction

Changes in trade patterns and skill requirements during the past several decades have contributed to a shift towards a more educated workforce within most OECD countries. Indeed, many countries have chosen to expand participation in tertiary education and in some countries attainment levels have risen sharply, more than doubling the level of labour force entrants with a tertiary-level qualification (OECD, 2006). However, the question remains for many countries how well the supply of tertiary qualifications matches the demand in the labour-market.

Drawing on data from *Education at a Glance 2006 (EAG 2006)* (OECD, 2006), this paper uses an analysis of the labour market outcomes by educational levels to provide an indication of the match between supply and demand for skills. Combining educational attainment data and labour market outcomes also provides an opportunity to examine possible crowding-out effects, *i.e.* are the higher educated displacing the lower educated from labour markets. The improving coverage of trend data on labour market outcomes such as employment, unemployment and earnings for different educational groups over time enhances the analytical possibilities and offers more than what could be achieved with using data from a single point in time.[1]

Data and methodology

EAG 2006 provides data on labour market outcomes including employment rates and unemployment rates, and relative employment and unemployment rates (relative to upper secondary educated) for different educational levels. Earnings data is less frequently reported and relative earnings are only used in this analysis to give indicative results. For data on employment rates, unemployment rates, etc. data are generally available for most countries from 1991 onwards, with some years having less coverage. This paper uses 1991, 1995, 2000 and 2004 as basic years to calculate changes because of their relatively good coverage among countries (OECD, 2006; Tables A8.3a and A8.4a). From these years, three periods of changes in labour market outcomes were constructed (1991-1995; 1995-2000; 2000-2004) and form the dependent variable in the statistical analysis.

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[1] The information is taken from *Education at a Glance 2006,* Indicators A1, A8 and A9. Data over time provides an opportunity to examine changes in educational attainments against changes in labour market outcomes which cancels out the influence of many unrelated factors which is typically a problem in cross-sectional estimates. Previous results from cross-sectional level data (NC2006:6) suggests that higher education does not generate any crowding-out effects. On the contrary, it appears that there are fairly strong complementarities between different educational attainment levels in terms of labour market participation. The most notable complementarities exist between the proportion of tertiary-educated individuals to employment opportunities for individuals with a lower level of education and between the proportion of graduates in advanced research programmes and employment opportunities for all other educational levels. It also appears that the proportion of individuals with upper secondary education in a country is related to employment opportunities for those with tertiary education. While these findings are confined to cross-sectional data (data in one point in time) the present investigation concerns changes in these variables and thus constitutes a statistically more refined method to detect any positive or negative labour market effects of higher education.

Attainment data is available for all 30 OECD countries with lower secondary, upper secondary and tertiary educated as main categories. Five-year age groups are used in this analysis to match the labour market outcome data. The data is based on age cohorts (groups) and some estimation of when individuals with different levels of educational attainment graduate and enter the labour market needs to be done in order to use the data in a first difference approach. The following entry years have been applied in transforming the age-grouped data into year-based data: lower secondary, 15 years-old; upper secondary, 20 years-old; and tertiary-educated entering the labour market at age 25. Changes in these attainment levels between periods are lagged to the labour market outcomes to allow for changes in educational attainment to have an impact on the employment variables and to allow for some inference of the direction of the relationship.[2]

Apart from attainment data, two economic time series are used in the analysis to explain labour market outcomes. GDP growth is matched in time with the labour market outcome variables to control for the positive impact of economic growth on employment. Similarly, productivity growth is matched in time with the outcome variables to account for the negative contemporaneous impact that increased productivity has on employment. In the short term, the contemporaneous impact of productivity on employment when holding economic growth constant is negative, since increasing productivity implies fewer workers for producing the same amount of goods. In the longer term, productivity growth is a main determinant of increasing employment as it is a foundation for having a competitive labour force in the global market. Including both economic and productivity growth in the analysis, however, allows for an investigation of how these two components have an impact on labour market outcomes for individuals with different levels of educational attainments.

With this approach it is possible to construct a panel based on the three periods in which data are available. Taken together the pooled first difference regressions include somewhere between 71 and 76 country years for which the impact of changes in educational attainment can be estimated. See Annex 1 for model specification and the reasoning behind the inclusion of the variables in the regression.

Results

Table 1 shows the tertiary attainment levels as well as differences in attainment levels for those entering the labour market in two recent periods, based on 5 year age groups. In the first column, countries are ranked by differences in the tertiary attainment of those entering the labour market in 1995-99 (30-to-34-year-olds) and 1990-94 (35-to-39-year-olds). The third column estimates the increase in educational attainment over the last two decades by comparing attainment levels of those entering the labour market in 1995-99 (30-to-34-year-olds) with those entering in 1975-79 (50-to-54-year-olds). The remaining columns show the distribution over time of tertiary attainment levels.

When examining the effects of education on labour market outcomes, potential confounding factors include country specific changes such as labour market interventions and regulatory changes that might influence the outcomes of different educational groups within a country. One way to account for these is to establish groups of countries that smooth out random changes. Table 1 is divided into three groups of countries based on their respective ranking in changes of tertiary attainment levels between 1995-99 and 1990-94 (column 2). The averages for these groups are shown at the bottom of the table.

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[2] This means that, for instance, the cohort of 30-to-34-year-olds with lower secondary education entered the labour market between 1985 and 1989; those with upper secondary education entered in 1990-1994; and tertiary educated between 1995 and 1999. This is arguably a very coarse way of measuring the impact of increases in education on labour market outcomes, but as time series on graduation rates are short and changes of education need to be lagged in relation to labour market outcomes to allow for graduates to get a foothold in the labour market, attainment data is at the present the only alternative.

Table 1. Attainment of tertiary education, by age

Percentage point change between periods and proportion (%) of those entering the labour market with tertiary education

Labour market entry years	Rank	Percentage point change between 1990-94 and 1995-99	Percentage point change between 1975-79 and 1995-99	1995-99	1990-94	1985-89	1980-84	1975-79	1970-74	1965-69
France	1	9.7	18.0	35.5	25.8	21.4	18.3	17.5	15.5	12.9
Korea	2	7.9	32.8	46.2	38.3	28.7	18.6	13.4	10.7	8.4
Ireland	3	7.4	19.1	38.5	31.1	26.6	23.5	19.4	16.9	14.2
Spain	4	5.4	18.1	35.9	30.5	26.0	20.9	17.8	13.4	11.2
Belgium	5	5.0	15.9	39.9	34.9	31.8	26.6	24.0	21.7	17.8
Sweden	6	4.9	9.3	41.8	36.9	34.4	33.3	32.5	29.4	24.6
Australia	7	4.6	6.5	35.8	31.2	31.0	32.1	29.3	24.6	20.8
Poland	8	4.4	9.0	20.9	16.5	12.5	12.0	11.9	12.4	12.1
Canada	9	3.8	13.1	54.3	50.5	44.0	41.5	41.2	37.2	31.0
United Kingdom	10	3.3	5.9	32.9	29.6	29.5	27.9	27.0	23.2	21.4
Denmark	11	3.1	6.9	38.6	35.5	31.9	34.3	31.7	28.8	25.4
Italy	12	2.7	4.5	15.4	12.7	11.1	11.0	10.9	8.5	5.7
Portugal	13	2.4	7.5	16.5	14.1	11.4	10.6	9.0	7.7	5.7
Netherlands	14	2.2	5.3	32.9	30.7	28.7	29.8	27.6	25.2	21.5
Norway	15	2.1	10.7	39.0	37.0	31.1	30.3	28.3	24.5	21.5
New Zealand	16	1.9	2.5	28.2	26.3	25.9	25.6	25.7	20.8	18.2
Austria	17	1.5	4.4	21.1	19.6	20.0	18.4	16.7	15.6	14.1
Slovak Republic	18	1.2	1.2	12.9	11.7	13.0	13.9	11.7	10.8	7.9
United States	19	1.1	-0.1	41.1	40.0	38.9	40.2	41.2	38.8	32.7
Turkey	20	0.9	1.1	9.6	8.6	6.7	9.0	8.5	7.5	5.5
Switzerland	21	0.9	5.9	32.9	32.0	29.7	28.7	27.0	23.5	20.3
Mexico	22	0.1	4.4	18.0	17.9	18.2	15.9	13.6	9.4	7.4
Germany	23	-0.3	0.9	26.7	27.0	26.6	26.5	25.8	23.7	21.9
Finland	24	-0.3	12.9	43.3	43.6	36.2	34.7	30.4	26.3	24.1
Czech Republic	25	-0.6	1.3	12.7	13.3	14.4	13.1	11.4	10.2	10.2
Greece	26	-2.5	7.4	24.9	27.4	22.0	20.1	17.5	13.3	9.6
Top 9 countries		5.9	15.8	**38.8**	**32.9**	**28.5**	**25.2**	**23.0**	**20.2**	**17.0**
Middle 8 countries		2.4	6.0	**28.1**	**25.7**	**23.7**	**23.5**	**22.1**	**19.3**	**16.7**
Bottom 9 countries		0.1	3.9	**24.7**	**24.6**	**22.8**	**22.5**	**20.8**	**18.2**	**15.5**
Mean all countries		2.8	8.6	**30.6**	**27.8**	**25.1**	**23.7**	**22.0**	**19.2**	**16.4**

Note: Age cohorts are translated into labour market entry years by assuming a graduation age of 25 years. For instance 30-to-34-year-olds are assumed to have entered the labour market in 1995 to 1999 and 60-to-64-year-olds have entered in 1965 to1969. Countries are ranked after increases in educational attainment among those entering the labour market between 1995 to 1999 (30-to-34-years-old) and 1990 to 1994 (35-to-39-years-old). "Top 9 countries" refers to the group of countries that have increased tertiary education most; "Middle 8 countries" refers to the group of countries that have experienced modest increases in tertiary education; "Bottom 9 countries" refers to the group of countries that have increased their tertiary education least over the period.

From Table 1 it is apparent that many countries have expanded their tertiary education substantially over the past two decades, with some countries more than doubling the tertiary attainment levels of those entering the labour market. Korea stands out with 3.5 times as many individuals attaining higher education in 1995-99 compared with 1975-79. Two countries that have had about the same tertiary attainment levels over the past two decades are the United States and Germany, with the former having a substantially higher initial level of people with tertiary education. Furthermore, those countries that increased tertiary education in the 1990s are also those that had increased their tertiary education levels over the previous decade. A more striking observation of the consistency with which countries do or do not expand tertiary education is the fact that in the 1960s (today's cohort of 60-to-64-year-olds) tertiary attainment levels among the country groups were virtually the same whereas large differences in attainment levels are shown in more recent cohorts.

Labour market effects of increases in higher education

Table 1 demonstrates that there is substantial variation between countries in how their higher education systems have evolved over time. Identifying how the supply of skills matches labour-market demand is a main concern for any education system. Overly large increases in educational attainment within the labour force might result in inefficiencies in the short term, while too little provision of education might constrain economic and social development. Access to employment data for the different educational levels over time provides an opportunity to examine displacement effects of education, as well as investigating potential labour market effects within the group of higher educated individuals.

The analysis in this paper focuses on unemployment. Using employment rates instead produces similar but generally less pronounced differentials. Relative unemployment rates are included in that these time series provide some indication of shifts in the relative strength of groups with different levels of educational attainment. Relative unemployment rates are also more forceful in the sense that shifts in general unemployment rates are eliminated in these time series.

Are there any crowding-out effects linked to higher education?

Individuals with a higher level of education might secure employment at the expense of employment opportunities for those with lower levels of education, without this necessarily leading to a more effective utilisation of skills. Such effects are often referred to as crowding-out or displacement effects. One way to investigate potential crowding-out effects is to examine unemployment and relative unemployment rates for less-educated individuals to see whether the supply of higher qualifications spills over to lower skill jobs. Employing Equation 1 (see Annex 1) in this setting involves having the change in labour market outcomes for the upper or lower secondary educated as the dependent variable while examining changes in attainment levels for higher educated individuals.

Lower secondary

The association between expansion of tertiary education and labour market outcomes for lower educated individuals in different countries is shown in Figure 1 where changes in tertiary educated entering the labour market between the periods 1990-94 and 1995-99 is plotted against changes in lower secondary unemployment rates with 5 years lag (change between 1995 and 2004). These data come from indicators A1 and A8. The figure suggests that, without accounting for other potentially influential factors, increases in tertiary educational attainment are associated with improved labour market outcomes for less educated individuals. This relationship becomes even stronger if outliers are removed from the figure.

Figure 1. Changes in tertiary education and changes in unemployment for lower secondary educated adults: late 1990s and early 2000s

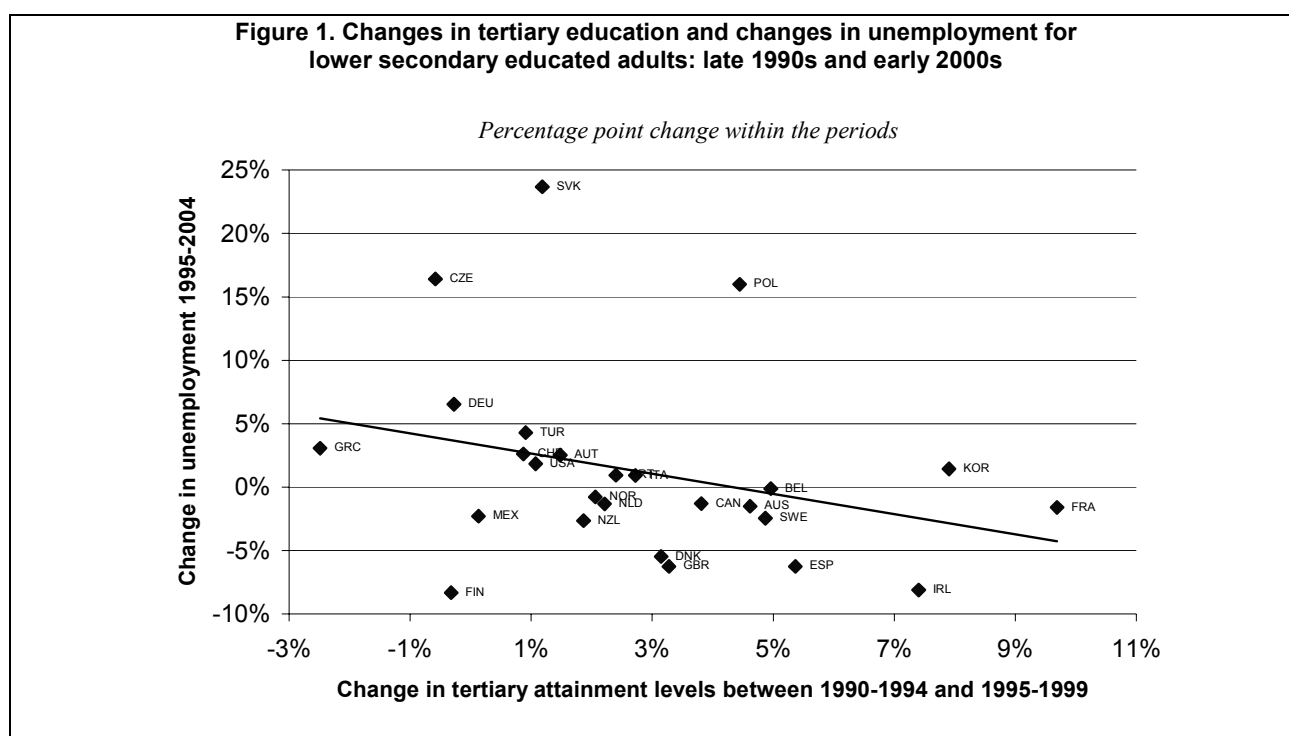*Percentage point change within the periods*

Table 2 shows the results of estimating Equation 1 with unemployment rates for lower secondary educated as the dependent variable (OECD, 2006; Table A8.4a). The results indicate that increases in tertiary educational attainments are associated with decreases in unemployment rates for those with lower secondary education (model 1-3 in Table 2). Once GDP and productivity growth are accounted for, these effects are no longer statistically significant except for the initial level (t_{10}- t_{15}) of the tertiary educated, which still is associated with decreases in unemployment during the period. The fact that having a high level of tertiary educated individuals in a country is positively related to labour market outcomes for individuals with lower levels of education corroborates the previous results on cross-sectional data (NC2006:6).

On a general note, all the tables show that labour market outcomes are strongly dependent on growth and productivity during the measurement period and this dependence is substantially more pronounced for those with lower secondary education and supper secondary education, in comparison to those with tertiary education. That higher educated individuals' unemployment rates are less sensitive to growth suggests that firms may be less inclined to lay off workers in whom they have made large human capital investments. In the labour market, most training and human capital investments are geared towards higher educated individuals for whom firms then are willing to bridge temporary adverse economic conditions.

Table 2. Pooled panel estimates of changes in educational levels and changes in unemployment rate for lower secondary educated (lagged effects)						
	Model 1	Model 2	Model 3		Model 4	Model 5
Dependent Variable:	Change in UnEmp(t_0 -t_5) Lower Sec Edu	Change in UnEmp(t_0 -t_5) Lower Sec Edu	Change in UnEmp(t_0 -t_5) Lower Sec Edu		Change in UnEmp(t_0 -t_5) Lower Sec Edu	Change in UnEmp(t_0 -t_5) Lower Sec Edu
Intercept	0.017*** (2.76)	0.005*** (3.29)	0.018** (2.46)		0.017** (2.13)	0.04*** (3.05)
Δ UppSecAttain (t_5-t_{10}) -(t_{10}-t_{15})			-0.06 (-0.46)		0.05 (0.57)	0.03 (0.34)
Δ TertAttain (t_5-t_{10}) -(t_{10}-t_{15})	-0.34** (-2.20)	-0.28* (-1.99)	-0.35** (-2.20)		-0.12 (-0.84)	-0.09 (-0.68)
TertAttain level (t_{10}-t_{15})		-0.12*** (-2.66)				-0.08** (-2.02)
Δ GDP(t_0-t_5)					-0.02*** (-7.69)	-0.02*** (-7.14)
Δ PROD(t_0-t_5)					0.02*** (5.31)	0.02*** (5.54)
R2 adj	0.04	0.11	0.03		0.49	0.51
F stat.	4.43**	5.73***	2.30		17.86***	15.78***
Durbin Watson	2.25	2.21	2.23		2.07	2.11
Obs.	76	76	76		71	71

Note: Please refer to Annex 1 for econometric specification. Heteroskedasticity-consistent standard errors (White), T-statistics in parentheses.

*** denotes significance 1 % level

** denotes significance 5 % level

* denotes significance 10 % level

Relative unemployment rates (for those with upper secondary education) provide an indication of whether the lower educated lose ground in the labour market when the supply of highly educated individuals increases.[3] Using relative unemployment rates can be seen as a way of making the test more sensitive, in the sense that it is independent of general labour market trends and thus focuses on the relative strength in the labour market between groups with different levels of education. Examining changes in relative unemployment rates is essentially a zero-sum game, where gains in labour market outcomes for one educational category is balanced out by lost ground for the other educational categories. Table 3 shows the results, with relative unemployment as the dependent variable. Increases in upper secondary and tertiary educated individuals are associated with large positive effects for lower secondary educated irrespective of GDP or productivity growth. That relative unemployment rates decrease when upper secondary and tertiary attainments increase suggests either that more educated individuals create jobs for the lower educated or that when increasing numbers of people attain more education, the supply of lower educated individuals is not enough to meet demand.

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[3] Relative unemployment rates are calculated by using data from *EAG 2006,* Table A8.4a.

	Model 1	Model 2	Model 3		Model 4	Model 5
Table 3. Pooled panel estimates of changes in educational levels and changes in relative unemployment rate for lower secondary educated (lagged effects)						
Dependent Variable:	Change in Rel UnEmp(t_0 -t_5) Lower Sec Edu	Change in Rel UnEmp(t_0 -t_5) Lower Sec Edu	Change in Rel UnEmp(t_0 -t_5) Lower Sec Edu		Change in Rel UnEmp(t_0 -t_5) Lower Sec Edu	Change in Rel UnEmp(t_0 -t_5) Lower Sec Edu
Intercept	0.03 (0.55)	0.06 (0.49)	0.08 (1.46)		0.01 (0.09)	0.07 (0.33)
Δ UppSecAttain (t_5-t_{10}) -(t_{10}-t_{15})			-3.43*** (-2.92)		-3.58*** (-2.79)	-3.63*** (-2.75)
Δ TertAttain (t_5-t_{10}) -(t_{10}-t_{15})	-2.34 (-1.51)	-2.28 (-1.47)	-2.99* (-1.90)		-4.09** (-2.31)	-4.02** (-2.29)
TertAttain level (t_{10}-t_{15})		-0.12 (-0.31)				-0.19 (-0.41)
Δ GDP(t_0-t_5)					0.05 (0.18)	0.05 (1.38)
Δ PROD(t_0-t_5)					-0.02 (-0.49)	-0.03 (-0.56)
R2 adj	0.01	0.00	0.09		0.10	0.08
F stat.	2.09	1.06	4.77**		2.87**	2.29*
Durbin Watson	2.49	2.49	1.71		1.77	1.78
Obs.	76	76	76		71	71

Note: Please refer to Annex 1 for econometric specification. Heteroskedasticity-consistent standard errors (White). T-statistics in parentheses. Relative unemployment rates refer to unemployment rates for lower secondary educated in relation to upper secondary educated (used as a base).

*** denotes significance 1 % level

** denotes significance 5 % level

* denotes significance 10 % level

Figure 2 shows the evolution of unemployment for the grouping of countries into portfolios with high, mid, and low (no) expansion of tertiary education (see table 1 for grouping of countries). The trends in relative unemployment rates for those with lower secondary education in the figure below indicate a similar story to that shown in Table 2 and Table 3: the groups of countries with increases in tertiary education have faired better in terms of relative unemployment rates for the lower educated compared with the group of countries with no expansion of higher education.

On the whole, these results suggest that the increases in tertiary and secondary education thus far has not been to the disadvantage of the lower educated but on the contrary is being beneficial in terms of creating new jobs or lowering the competition for jobs with lower skill requirements. Much points towards the former being the more prominent factor as previous results on cross-sectional data (NC2006:6) indicated large complementarities between lower and higher educated individuals in labour market outcomes.

**Figure 2. Relative unemployment rate of adults with lower secondary attainment:
average for groups of countries, by tertiary enrolment growth in the 1990s**

Lower secondary unemployment rate as a ratio of upper secondary unemployment rate
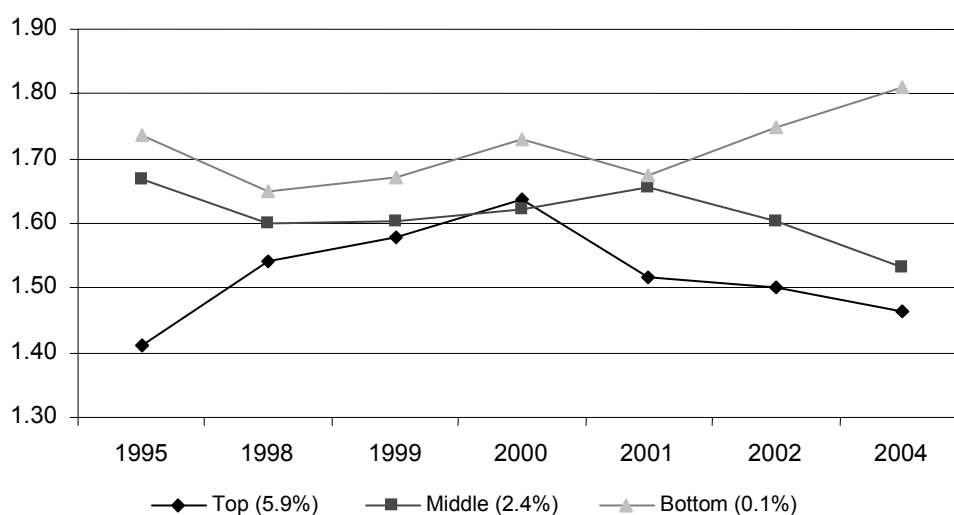
Note: "Top group" refers to the nine countries that have increased tertiary education most; "Middle group" refers to the eight countries that have experienced modest increases in tertiary education; "Bottom group" refers to the nine countries that have increased their tertiary education least over the period.

Source: OECD, *Education at a Glance 2006,* Indicators A1 and A8.

Upper secondary

Table A1 in Annex 2 shows the results of estimating Equation 1 with changes in unemployment rates for upper secondary as the dependent variable (OECD, 2006; Table A8.4a). The results suggest that GDP growth and productivity growth are the main determinants of unemployment rates and that increases in tertiary education have virtually no influence on unemployment rates for those with upper secondary education. The initial level of tertiary educated individuals in a country is associated with improved unemployment rates for upper secondary individuals, but this relationship disappears once GDP and productivity growth are accounted for. These two latter components have a substantial instant impact on the unemployment rates for upper secondary educated individuals.

Figure 3 shows the evolvement of unemployment rates for lower secondary educated in the groups of countries with high, mid and low (no) expansion of tertiary education. As upper secondary education is used as the denominator in the calculations of relative unemployment, the figure also provides an overview of how unemployment rates have evolved for the baseline in this paper. Unemployment rates for individuals with secondary education have gone down somewhat within countries where tertiary attainment has expanded, whereas unemployment rates have increased in countries where it has not. This indication that unemployment rates for the upper secondary educated are going down in countries expanding their tertiary education systems together with the previous regression results (Table A1 Annex 2) suggests that the tertiary educated are not, on average, displacing the upper secondary educated in the labour market.

Figure 3. Unemployment rate of adults with upper secondary attainment: average for groups of countries, by tertiary enrolment growth in the 1990s
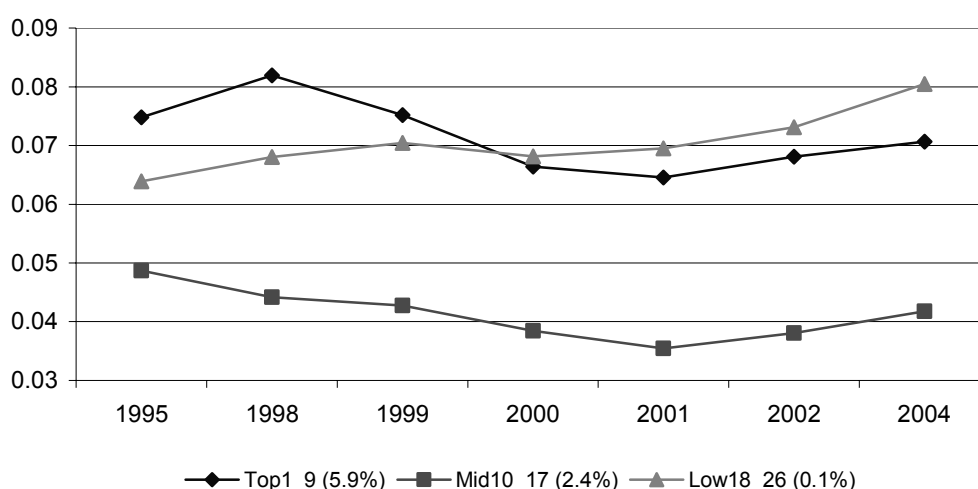
Note: "Top group" refers to the nine countries that have increased tertiary education most; "Middle group" refers to the eight countries that have experienced modest increases in tertiary education; "Bottom group" refers to the nine countries that have increased their tertiary education least over the period.

Source: OECD *Education at a Glance 2006,* Indicators A1 and A8.

Does supply match demand for higher educated individuals?

While there is little evidence for an argument that higher educated individuals displace lower educated ones in the labour market, there might still be some negative effects of increasing attainment levels within the group of higher educated individuals. Decreasing earnings and increasing unemployment rates among higher educated individuals can be interpreted as a signal for slowing demand for higher educated individuals or a too large influx of highly educated individuals to the labour market. By the same token, increasing earnings and falling unemployment rates can be interpreted as demand outstripping supply. Table A2 in Annex 2 summarizes the results of applying the first difference model (Equation 1) to the pooled panel of country data on unemployment rates for tertiary educated (OECD, 2006; Table A8.4a). The dependent variable is the change in unemployment rate for tertiary educated individuals between t and t_{-5}.

When controlling for changes in GDP growth and productivity, increases in tertiary attainment levels appear to be associated with rising unemployment rates for those with tertiary education. However, in light of the fact that there is no impact of changes in attainment when growth and productivity are not accounted for, this result appears to be largely driven by the link between education, on the one hand, and productivity and growth, on the other. In other words, the positive influence of higher education on productivity and growth is subsumed in the two economic measures and the net impact of more tertiary educated results in higher unemployment because of a stronger signal from the economic measures. Note also the substantially lower (less significant) impact of GDP and productivity growth on unemployment rates for individuals with tertiary education than for those with lower and upper secondary education.

Table 4 shows the results of relative unemployment rates of tertiary educated individuals. High GDP growth generates higher relative unemployment and high productivity growth generates lower relative unemployment.

	Model 1	Model 2	Model 3		Model 4	Model 5
Table 4. Pooled panel estimates of changes in educational levels and changes in relative unemployment rate for tertiary educated (lagged effects)						
Dependent Variable:	Change in Rel UnEmp(t_0 -t_5) Tertiary Edu	Change in Rel UnEmp(t_0 -t_5) Tertiary Edu	Change in Rel UnEmp(t_0 -t_5) Tertiary Edu		Change in Rel UnEmp(t_0 -t_5) Tertiary Edu	Change in Rel UnEmp(t_0 -t_5) Tertiary Edu
Intercept	0.08*** (3.72)	0.15*** (3.25)	0.08*** (3.50)		0.12*** (2.99)	0.24*** (3.42)
Δ UppSecAttain (t_5-t_{10}) -(t_{10}-t_{15})			0.28 (0.68)		-0.05 (-0.13)	-0.16 (-0.39)
Δ TertAttain (t_5-t_{10}) - (t_{10}-t_{15})	-0.74 (-1.12)	-0.58 (-0.83)	-0.69 (-1.06)		-0.86 (-1.32)	-0.72 (-1.14)
TertAttain level (t_{10}-t_{15})		-0.30* (-1.88)				-0.38** (-2.13)
Δ GDP(t_0-t_5)					0.02* (1.92)	0.02** (2.07)
Δ PROD(t_0-t_5)					-0.05*** (3.14)	-0.06*** (-3.59)
R2 adj	0.01	0.03	-0.00		0.09	0.13
F stat.	1.56	2.31	0.93		2.72**	3.15**
Durbin Watson	1.69	1.63	1.69		1.52	1.48
Obs.	76	76	76		71	71

Note: Please refer to Annex 1 for econometric specification. Heteroskedasticity-consistent standard errors (White). T-statistics in parentheses. Relative unemployment rates refer to unemployment rates for tertiary educated in relation to upper secondary educated (used as a base). Note that model 4 and 5 might suffer from omitted variables as the d-statistics are low in these two regressions.

*** denotes significance 1 % level

** denotes significance 5 % level

* denotes significance 10 % level

At first these results appear counterintuitive. However, because gains in labour market outcomes for one educational category are offset by lost ground in the other educational categories, these results in fact suggest that productivity growth indeed has a substantially greater negative impact on employment prospects for lower-educated workers than on higher-educated workers. Similarly, GDP growth is more important for those with lower levels of education and their employment opportunities than for higher educated workers. The results also suggest that having a high initial level of tertiary educated individuals is associated with a relative improvement of the unemployment rate for tertiary educated individuals during the period. As noted above, this result might suggest that labour market outcomes for tertiary educated have been more positive in technological advanced countries than in countries with a lower-skilled workforce.

Trend data on relative unemployment rates for individuals with tertiary education provides an additional way to examine whether the expansion of tertiary education is in line with demand (Figure 4). Relative unemployment rates for the tertiary educated have increased during this period for all three groups (high, mid or no expansion). This deterioration in relative unemployment rates for individuals with tertiary education seems, however, to be unrelated to whether countries have expanded their tertiary education or not, as there is no clear-cut pattern among the three groups. However, the result that relative

unemployment rates have moved up for those with tertiary education together with the previous indication that unemployment rates for those with upper secondary education are going down in countries expanding their tertiary education (Figure 3) suggests that the upper secondary educated, relatively speaking, are strengthening their labour market positions vis-à-vis individuals with tertiary education.

Figure 4. Relative unemployment rate of adults with tertiary level attainment: average for groups of countries, by tertiary enrolment growth in the 1990s
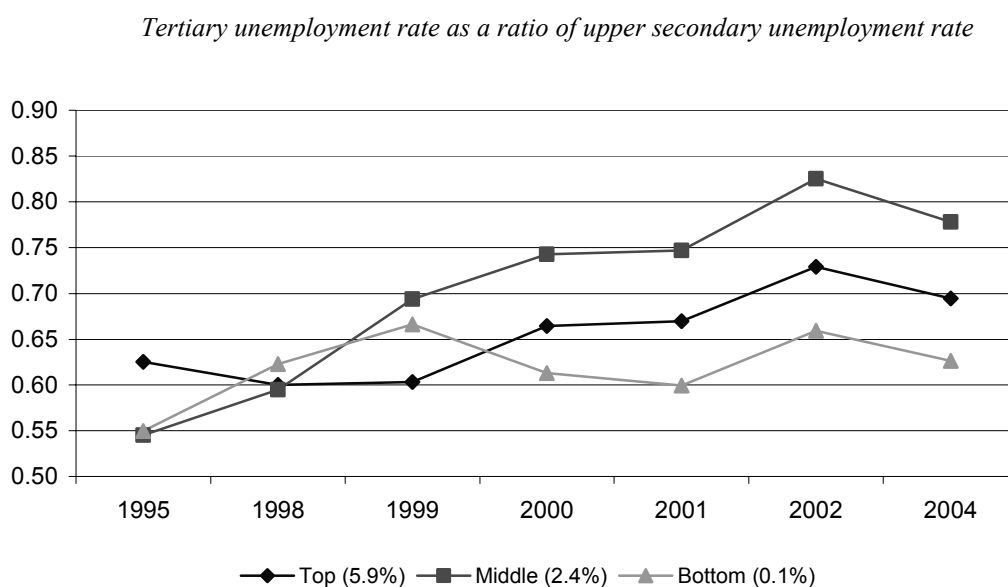
Tertiary unemployment rate as a ratio of upper secondary unemployment rate

Note: "Top group" refers to the nine countries that have increased tertiary education most; "Middle group" refers to the eight countries that have experienced modest increases in tertiary education; "Bottom group" refers to the nine countries that have increased their tertiary education least over the period.

Source: OECD *Education at a Glance 2006,* Indicators A1 and A8.

Unemployment rates do not capture the possibility that higher-educated individuals are forced to migrate to less skilled jobs with less pay or whether employers are taking an advantage of the increased supply of the higher educated by offering lower wages. In this sense falling relative earnings for higher-educated individuals might indicate that supply outstrips demand and increasing relative earnings can be seen as a sign that the higher educated are in short supply. The availability of trend data on relative earnings constitutes a serious drawback, considering the potential analytical conclusions that can be drawn from good country coverage with access to data over time. For example, plotting relative earnings for tertiary educated individuals over time constitutes a quick but important indication of mismatches in supply and demand for different educational categories.

Figure 5 shows the changes in relative earnings (relative to upper secondary) between 1997 and 2004 for countries providing some data points within this interval (OECD, 2006; Table A9.1a). For countries without data for 1997 or 2004 the following/preceding year with data was used to calculate the change. These figures need to be interpreted with caution since for some countries the time span is four rather than seven years. To alleviate this problem annualised changes are shown in the chart. Country specific changes of labour market regulations, etc., might also play a role in altering relative earnings which further underscore the need for caution in interpreting country specific changes in Figure 1. Countries are ranked

in accordance to the increase in tertiary educated entering the labour market (using same ranking and groups as in Table 1).

Figure 5. Annual changes of relative earnings for tertiary educated between 1997 and 2004
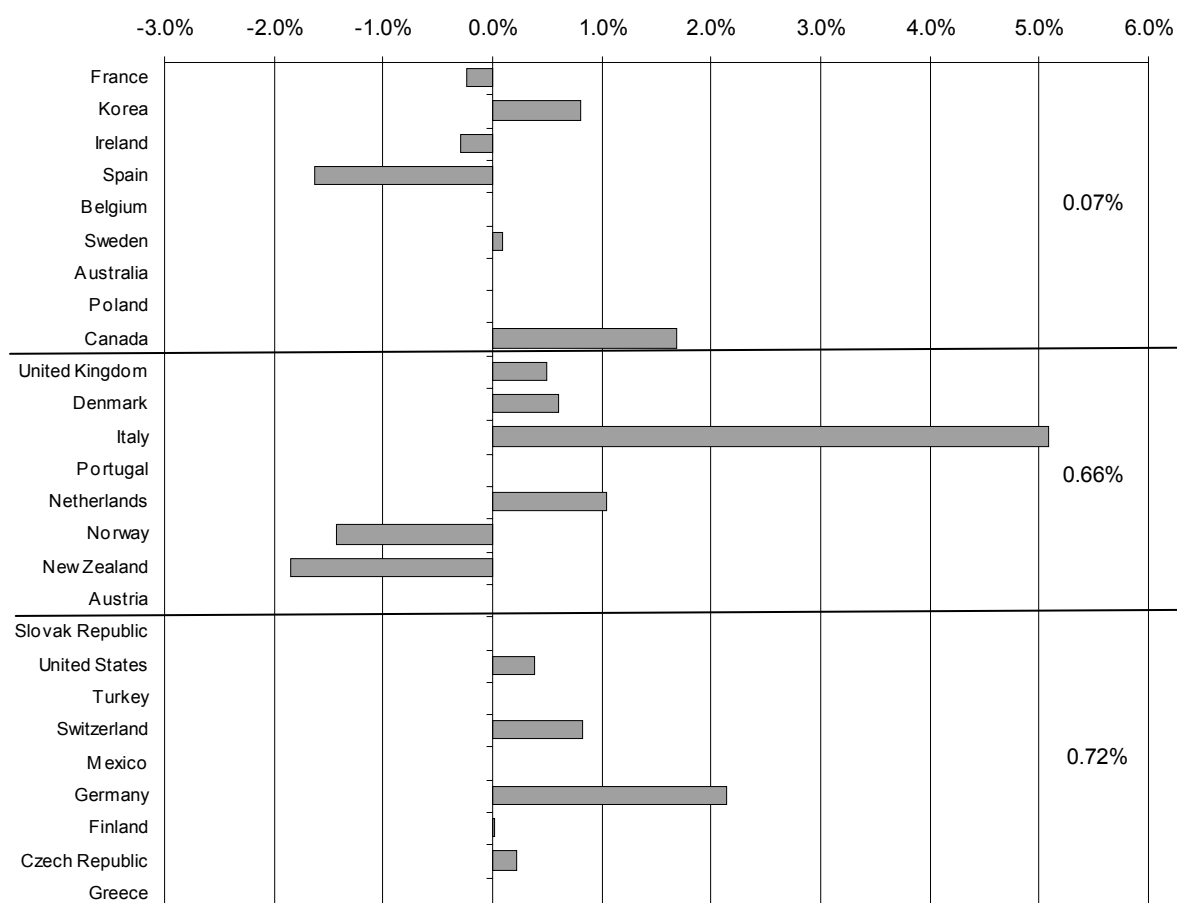
Note: The figure shows annual changes in relative earnings (relative to upper secondary educated) between 1997 and 2004. Annual changes are used to adjust for shorter time spans in some countries. Missing data for 9 of 26 countries.

Source: OECD *Education at a Glance 2006,* Indicators A1 and A9.

There is a substantial variation between countries in how the relative earnings for tertiary educated have evolved over time. Despite this variation, the overall picture suggests that in the group holding countries with large expansions of their tertiary education (above the first line) relative earnings for tertiary educated has been stable during the period, whereas it has increased by 0.66 % per year in the middle portfolio, and increased with 0.72 % per year in the group of countries which did not expand their tertiary education system. These results are intuitive in the sense that they support the notion that supply influences relative earnings in their expected direction and indicate that for most countries higher educated workers still appear to be in short supply as the skill premium is still on the rise. These differences in the changes of relative earnings between the groups are not significant due to the large variation within each group and hence the finding can most be viewed as indicative while still intuitive.

Conclusion

This paper examines crowding-out effects and the labour market match for the tertiary educated in 26 OECD countries, using attainment data and data on labour market outcomes from *EAG 2006* (Indicators A1, A8 and A9). A first-difference approach is applied on a three-period, pooled country-panel to examine the effects of changes in tertiary attainment levels against changes in labour market outcomes over time. The policy questions in this paper focus on the potential negative short-term effects that mismatches between the supply of and demand for higher-educated individuals might bring about.

There is no evidence in the current data suggesting any crowding-out effects of lower-educated from higher-educated individuals. On the contrary, there seems to be positive employment effects for individuals with less education in countries expanding their tertiary education. For instance, expansion of upper secondary and tertiary education is associated with large positive effects for the lower secondary educated, regardless of GDP or productivity growth. That relative unemployment rates decreases when upper secondary and tertiary attainments increases suggest that either higher-educated individuals create jobs for the lower educated or that the expansion of higher education creates a short supply of less-educated individuals.

Labour market outcomes for the upper secondary educated appears to be less influenced by the expansion of tertiary education, but there is no indication that tertiary educated individuals, on average, are displacing (crowding out) upper secondary educated individuals from the labour market. A combination of rising unemployment rates among those with upper secondary education and falling relative earnings among those with tertiary education can be seen as a sign that too many individuals with higher education are entering the labour market, but, on average, this is not what the current data shows. In contrast, it appears that the upper secondary educated have strengthened their labour market positions in countries expanding their tertiary education as unemployment rates and earnings have, on average, evolved in positive directions there.

In relation to crowding-out effects, employment effects in different sectors play some role in making these migrations less likely to occur. Occupations that are set aside for those with specific upper secondary certificates is one example where the tertiary educated will have little chance of displacing the upper secondary educated. Apart from jobs locked in by requirements of an upper secondary vocational certification, most jobs are up for competition and since a substantial amount of jobs are created in, or disappear from, different industries, this opens up opportunities for employers to substitute the upper secondary educated with relatively inexpensive higher educated individuals if they are in excess supply. If countries are producing too many higher educated individuals and people are not finding jobs in their fields of study, it is likely that many will have to settle for jobs below their skill level and thus end up competing for jobs with lower-educated individuals.

The job market for the tertiary educated appears to be little influenced by the expansion of tertiary education. There are some indications that relative unemployment (relative to upper secondary) for the tertiary educated has been diluted to some extent, although not statistically significantly so, over the past 10 years, but this appears to be more related to the upper secondary educated, relatively speaking, strengthening their labour market positions vis-à-vis tertiary educated individuals. The earnings advantage (premium) for tertiary educated individuals in comparison with upper secondary educated individuals is still on the rise, which suggests that, on the whole, demand outstrips supply in most countries. While the available earnings data is scarce, there are some indications that the earnings premium is rising faster in countries not expanding or moderately expanding their tertiary education, suggesting too little supply. A short supply of the higher educated is unwanted in most circumstances as it might put a drag on potential growth. Furthermore, it in all likelihood also increases earnings inequalities in countries. These results need, however, to be interpreted with caution because of limited country coverage and short time series.

These time series and panel data results on changes in educational attainments and changes in labour market outcomes largely corroborates previous results on cross-sectional data with a less sophisticated analytical approach to the subject (NC2006:6). Other findings indicate that there are considerable differences between countries in terms of how their tertiary educational systems have evolved over time. There are strong trajectory patterns in which countries have expanded their tertiary systems. Countries that have increased their tertiary education in recent years have done so largely since the 1960s.

Not surprisingly, labour market outcomes are also highly dependent on growth and productivity, with a negative instant influence of productivity growth and a positive impact by economic growth during the measurement period. However, this dependence is substantially more pronounced for those with low and upper secondary education in comparison with tertiary educated individuals. While the growth and productivity effects of higher education is outside the scope of this investigation, there are some indirect indications in the present study that tertiary education plays a key role in creating the conditions for economic growth and productivity growth, which is in line with most research on this topic.

In conclusion, there is very little evidence to argue for an oversupply of higher educated individuals in the current dataset. Much of the results presented in this paper suggest that lower-educated individuals benefit from the expansion of tertiary education and that increasing levels of those with tertiary education in recent years have been absorbed by the labour market. In addition, when dividing the panel up and estimating the first difference model for each period, the statistical analysis shows that the positive effects are more pronounced in recent periods. This suggests that, contradictory to any argument of a too rapid expansion of higher education, the benefits documented in this paper are largely driven by increases in higher education attainment in more recent years.

In the future it might be interesting to focus on labour market outcomes among the younger population, as the potential impact of expanding tertiary education could be foreseen to be more influential (easier to detect impact). The current analysis is somewhat blunt in this respect, as changes in educational attainment among those entering the labour market are matched against changes in labour market outcomes for the total workforce. Note, however, that a cohort matching design of the younger population in all likelihood would encounter difficulties associated with transition problems in different countries. Further refinements could also include examinations of the dispersion of earnings within the group of higher educated as there are some debate on whether increasing returns to higher education is driven by a few well paid individuals shifting the returns for the whole group of tertiary educated. There are clear indications in this paper that productivity and growth have an impact on labour market outcomes for the higher educated differently and it would therefore be interesting to examine the potential impact of higher education on each of these two economic outcomes in more detail. A key issue is also to consolidate the current dataset to include more countries with earnings and employment data over time to achieve better statistical estimates as well as provide more countries with information on how their current higher educational system matches the demand for skills.

ANNEX 1

The trend data on attainment levels, unemployment rates and relative unemployment rates in *Education at a Glance 2006* allow for estimating a difference model with three periods and between 71 and 76 countries in each regression depending on the country coverage on individual data points. In summary, the following model is applied to gauge the effects of changes (increases) in educational attainment on labour market outcomes (subscripts for attainment levels are suppressed):

$$LM_{(t0)} - LM_{(t-5)} = \alpha_1 + \beta_1 \left(\overline{EDU}_{(t5-t10)} - \overline{EDU}_{(t10-t15)} \right) + \beta_2 \overline{EDU}_{(t10-t15)} + \beta_3 \overline{GDPG}_{(t0-t5)} + \beta_4 \overline{PROD}_{(t0-t5)} \quad (1)$$

where LM is labour market outcomes (employment, unemployment, and relative employment and unemployment) at time (t); EDU is the educational level in the cohort entering the labour market at time (t); GDPG is the average change in GDP in the labour market outcome period; and PROD is the average change in productivity during the same period.

The change in labour market outcome between, for example, 2004 and 2000 is matched against: the change in educational attainment of those entering the labour market in the periods (1999 to 1995) and (1994 to1990); the initial level educational for those entering the labour market 1994 to1990; the average growth in GDP during 2004 and 2000; and the average productivity growth during 2004 and 2000. Attainment levels do not match perfectly with the outcome measures but as noted before the labour market entry years are somewhat coarse estimates from the beginning. The reason behind the inclusion of educational level of the previous cohorts entering the labour market in the model is that the level of education is likely to be influencing the changes in educational attainment as well as economic growth and productivity growth in a country. The level of education can also be seen as a proxy for industry composition or technological development in that higher education might say something on how advanced countries are in these respects.

Similarly, productivity growth and GDP growth are included in that these two variables largely determine labour market outcomes and to be able to gauge the net effect of education these two components are incorporated in the model. This specification might be too restrictive in the sense that productivity and growth dominates changes in educational attainments and in particular since attainments are lagged against labour market outcomes. Therefore, the forthcoming tables show both the full model as well as results without controlling for productivity and economic growth.[4]

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[4] There is a strong relationship between economic growth and productivity growth but this dependence is nicely disentangled in the regression results of this paper. Note also that lagged GDP growth and productivity growth have very little predictive power of labour market outcomes, which largely are a result of cyclical patterns in economic growth.

While a first difference approach generally gives robust results to confounding factors, a problem is often deciding on the lag structure, i.e. how far back in time one should stretch in attainment data to best capture the impact of education on labour market outcomes. Several different lag structures have been elaborated on in the analytical work and the above describe structure appears to produce more robust results, though similar results are in most cases obtained by using different lags.

ANNEX 2

Table A1. Pooled panel estimates of changes in educational levels and changes in unemployment rate for upper secondary educated (lagged effects)						
	Model 1	Model 2	Model 3		Model 4	Model 5
Dependent Variable:	Change in UnEmp(t_0 -t_5) Upper Sec Edu	Change in UnEmp(t_0 -t_5) Upper Sec Edu	Change in UnEmp(t_0 -t_5) Upper Sec Edu		Change in UnEmp(t_0 -t_5) Upper Sec Edu	Change in UnEmp(t_0 -t_5) Upper Sec Edu
Intercept	0.007** (2.04)	0.022*** (2.93)	0.006 (1.44)		0.012** (2.46)	0.019** (2.03)
Δ UppSecAttain (t_5-t_{10}) -(t_{10}-t_{15})			0.06 (0.60)		0.10 (1.42)	0.09 (1.38)
Δ TertAttain (t_5-t_{10}) -(t_{10}-t_{15})	-0.09 (-0.82)	-0.05 (-0.53)	-0.07 (-0.67)		0.13 (1.30)	0.14 (1.39)
TertAttain level (t_{10}-t_{15})		-0.06** (-2.18)				-0.02 (-89)
Δ GDP(t_0-t_5)					-0.01*** (-7.28)	-0.01*** (-6.93)
Δ PROD(t_0-t_5)					0.01*** (5.47)	0.01*** (5.14)
R2 adj	-0.00	0.03	-0.01		0.45	0.45
F stat.	0.62	2.06	0.57		15.18***	12.24***
Durbin Watson	1.73	1.68	1.73		1.66	1.67
Obs.	76	76	76		71	71

Note: Please refer to Annex 1 for econometric specification. Heteroskedasticity-consistent standard errors (White), T-statistics in parentheses.

*** denotes significance 1 % level

** denotes significance 5 % level

 * denotes significance 10 % level

Table A2. Pooled panel estimates of changes in educational levels and changes in unemployment rate for tertiary educated (lagged effects)						
	Model 1	Model 2	Model 3		Model 4	Model 5
Dependent Variable:	Change in UnEmp(t_0-t_5) Tertiary Edu	Change in UnEmp(t_0-t_5) Tertiary Edu	Change in UnEmp(t_0-t_5) Tertiary Edu		Change in UnEmp(t_0-t_5) Tertiary Edu	Change in UnEmp(t_0-t_5) Tertiary Edu
Intercept	0.006*** (3.04)	0.017*** (3.36)	0.005** (2.20)		0.011*** (3.32)	0.018** (2.33)
Δ UppSecAttain (t_5-t_{10}) -(t_{10}-t_{15})			0.07 (1.07)		0.06 (1.42)	0.06 (1.32)
Δ TertAttain (t_5-t_{10}) -(t_{10}-t_{15})	-0.02 (-0.38)	0.00 (0.04)	-0.01 (-0.16)		0.11** (2.05)	0.11** (2.23)
TertAttain level (t_{10}-t_{15})		-0.04** (-2.50)				-0.02 (-1.23)
Δ GDP(t_0-t_5)					-0.01*** (-5.31)	-0.01*** (-4.85)
Δ PROD(t_0-t_5)					0.01*** (2.83)	0.00** (2.31)
R2 adj	-0.01	0.05	-0.00		0.31	0.32
F stat.	0.12	3.03**	0.91		8.94***	7.65***
Durbin Watson	1.73	1.62	1.71		1.62	1.62
Obs.	76	76	76		71	71

Note: Please refer to Annex 1 for econometric specification. Heteroskedasticity-consistent standard errors (White), T-statistics in parentheses.

*** denotes significance 1 % level

** denotes significance 5 % level

* denotes significance 10 % level

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