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FISCAL CONSOLIDATION AND CRISIS IN THE EU: EXPLORING LONG-RUN SUPPLY-SIDE EFFECTS THROUGH EDUCATION¹

Lorenzo Serrano*
Ángel Soler*
Laura Hernández**

Abstract

The aim of this paper is to analyze the possibility of long-run supply-side effects of fiscal consolidation on output through its effect on the education sector and human capital accumulation. It examines the effect of crisis and public expenditure austerity on European dropout rates and analyzes the effects of educational attainment on participation in the labour market, employability and labour productivity using EU-LFS and EU-SILC microdata. Some estimates of long-run impacts on output based on those results are provided for different scenarios. The analysis is carried out for the EU as a whole and also for those countries especially affected by fiscal consolidation. The results show that fiscal consolidation might affect negatively educational attainment when public expenditure on education is reduced. However, also as a result of the economic crisis, job opportunities for young people drastically decrease in the fiscal consolidation countries. This reduces the opportunity cost of studying, extending schooling, reducing dropout rates and fostering human capital accumulation. All in all, the latter effect would dominate any negative long-run supply-side effect from a lower level of public spending on education in the case of the EU countries.

Key words: Fiscal consolidation, education, dropout rates, human capital, labour market participation, unemployment, productivity.

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* L. Serrano and A. Soler: Universitat de València and Ivie.

** L. Hernández: Ivie.

1. Introduction

As a result of the recent economic crisis, many European countries have gone through a period of great budgetary difficulties. Falling production and rising unemployment led to strong and persistent budget deficits in many of them with the consequent impact on the levels of public debt. The sustainability of public finances was called into question in some countries, leading to very significant increases of their interest rate premia in the debt markets.

This risk led to the adoption of austerity measures and fiscal consolidation programs across the EU that were more intense in those countries most affected by the crisis and the problems in the public accounts.

There is a widespread concern about the possible negative effects that these fiscal consolidation measures may have had not only on the level of production in the short term but also in the prospects for long-term growth. In this regard, both the magnitude of the fiscal adjustment and its composition may be relevant. There is a risk that some of the measures to contain government spending may have adversely affected some of the engines of economic growth in the long term, such as human capital accumulation.

To the extent that the containment of public spending had affected expenditure on education, this could have slowed the accumulation of human capital, with long term negative effects on productivity, output and living standards. The reason is that human capital has positive effects on the probability of participation in the labor market, employability of active people and labor productivity. Therefore, if fiscal consolidation reduces spending on education and that reduction slowed down training choices, a part of the population would be characterized by lower participation, more employability problems and lower productivity for a long time. These effects would persist until the moment in which those population cohorts reached retirement age.

However, we should keep in mind that fiscal consolidation is linked precisely to the deep economic crisis experienced. Fiscal consolidation was considered necessary because of the effects of the economic crisis in public deficit, especially the effects linked to job losses (reducing tax receipts and increasing social benefits payments). Nevertheless, one of the determining factors in the decision to continue studying is precisely the situation in the labor market. During periods of very high unemployment, especially youth unemployment, the opportunity cost of studying falls because the probability of finding a job, even one unsatisfactory, drops dramatically.

The aim of this paper is to analyze the impact of budgetary measures on economic growth through its effect on education choices and human capital accumulation, but taking into account that those measures are adopted within an economic crisis and high youth unemployment scenario. Without those conditions it would not have been any substantial fiscal consolidation to begin with.

This analysis may be especially interesting because this is a rare field in which the last crisis could have some long-run positive effects, fostering accumulation of human capital by reducing dropping out and extending schooling precisely in those countries more affected by the crisis and for that reason also by fiscal consolidation policies (due to the lower probability of employment for young people there). The net total effect on education could be even positive due to the combined effects

of fiscal consolidation and crisis. Therefore, fiscal consolidation might be less harmful than expected, especially if combined with changes affecting the intangible inputs used by the education sector.

In order to do that we examine the effect of crisis and fiscal consolidation on the education sector; the effects on human capital accumulation and through it on activity rates, employability and productivity and, finally, we estimate the long-run impact on output under different assumptions. The analysis is carried out for the EU as a whole and for some groups of countries and specific countries especially affected by fiscal consolidation. Section 2 begins with a brief review of some preliminary issues generally related to the effects of fiscal consolidation and discusses the definition of fiscal consolidation adopted in this paper. Section 3 provides an overview of the effects of crisis on the labour market, the impact of fiscal consolidation on public expenditure on education, and the evolution of education across the EU countries. Section 4 examines the effect of both crisis and fiscal consolidation on education choices. Section 5 analyzes the effect of educational attainment on activity rates, employability and labour productivity. Section 6 offers some estimates of the long-run impact on output per capita under different scenarios. Finally, section 7 presents the main conclusions.

2. Fiscal consolidation: effects and definition

Economic theory points to the possibility of both positive and negative effects as a result of a more austere fiscal policy. On the one hand, negative standard Keynesian demand effects due to less public expenditure or higher taxes would depress output at least in the short-run. On the other hand, some positive non-Keynesian demand effects or positive supply side effects are also contemplated (Feldstein, 1982). Consumer's expectations and lower interest rates might have so great a positive effect on private demand as to increase aggregate demand even in the short-run (Giavazzi and Pagano, 1990; Alesina et al., 1998a; Alesina and Ardagna, 2010). On the supply side, the positive effect would depend on the particular mix of spending cuts and taxes. Spending cuts might reduce reservation wage, moderating wages and fostering profits and private investment (Alesina and Ardagna, 2010). They might also make possible lower taxes with positive effects on the supply side (increasing labour supply and capital accumulation). Although some of these positive effects are short-run effects, most of them would take place on the long-run.

Therefore, from a theoretical point of view, the total net effect could be either positive or negative, being the net result of negative standard Keynesian demand effects and potentially positive non-Keynesian demand effects and/or supply side effects. Furthermore, the sign may well depend on the particular characteristics of the fiscal consolidation program and also on the specific economic situation and institutional features of the country (Jordá and Taylor 2013, Alesina et al. 2015).

Empirical results are also mixed. For example, Alesina et al. (1998b), Perotti (1999), Ardagna (2004), Alesina and Ardagna (2010), Alesina et al. (2002) and Kleis and Moessinger (2015) find evidence favourable to the existence of positive effects. On the contrary, Blanchard and Perotti (2002), Mountford and Uhlig (2009), Perotti (2013), Hernández de Cos and Moral-Benito (2013), Guajardo et al. (2014) and Alesina et al. (2015) among others obtain results which do not support those positive effects.

The aim of this paper is to focus on a very specific aspect of that vast field. We will consider the potential supply side effects of fiscal consolidation through human capital accumulation when fiscal consolidation affects public expenditure on education.

There are two main approaches in the literature to define fiscal adjustment (Kleiss and Moessinger, 2015). One of them postulates a quantitative definition based on changes in fiscal indicators. In this quantitative approach the particular definition of fiscal adjustment may differ. For instance, a certain arbitrary minimum threshold for some fiscal indicator on a year or over a longer period can be used to define fiscal consolidation. Also the fiscal indicator may differ: cyclically adjusted primary balance, primary balance, unadjusted budget balance data, debt reductions, etc. The other one relies on a qualitative definition based on the evaluation of policymaker's intentions and actions. This evaluation tends to rely on policy documents, such as in Romer and Romer (2010) or Devries et al. (2011).

Our approach for an operative definition of fiscal adjustment is tailored to the special characteristics of the recent EU experience. Two different criteria have been considered to define fiscal consolidation.

The first definition of fiscal consolidation is based on the existence of an Excessive Deficit Procedure (EDP) by the European Commission. We have considered as fiscal consolidation countries those with a long EDP (since at least 2009 or close to that date) and still open. The group includes eight EU countries: Ireland, Greece, Spain, France, Cyprus, Portugal, Slovenia and UK.

The second definition is based on the existence of a serious problem of Public Debt Crisis (DC countries). This group includes five EU countries: Ireland, Greece, Spain, Italy and Portugal. All of them experienced serious problems to float government bonds, in some cases even a complete impossibility to do it, and a huge increase of their risk premia compared with German bonds.

Finally, since both definitions are somewhat arbitrary and open to discussion, a number of specific countries have been considered individually: Ireland, Greece, Spain, France, Italy, Portugal, UK, Bulgaria and Romania. Bulgaria and Romania, despite not fitting any of the two previous criteria, did experience substantial real reductions in their public expenditure on education as we will see below.

We are confident that no significant episode is being left out of the analysis following this wide ranging strategy. Our aim is to obtain meaningful evidence even if the inclusion of each particular country within the fiscal consolidation group may be considered open to debate.

Furthermore, another group of 7 European countries has been defined as a benchmark. Those countries are characterized by a much more positive performance in terms both of economic growth and (no) need of fiscal austerity. We consider them as non-fiscal consolidation (NFC) countries: Belgium, Netherlands, Germany, Austria, Denmark, Finland and Sweden.

3. Crisis, fiscal consolidation and education: some stylized facts in the EU.

Crisis and job opportunities

Some of the biggest impacts of the crisis occurred in the labour market. The EU as a whole experienced a large increase in the unemployment rate, although with a very different intensity across countries. The decline in employment opportunities, especially in the case of the young people, has been particularly marked in the countries most affected by the crisis. The consequence has been a rise in youth unemployment particularly strong in those countries affected by fiscal consolidation (Table 1).

In the EU-28 as a whole, the youth unemployment rate rose by more than 6 pp between 2007 and 2014 up to 22.2%, a rate not much higher than the one existing at the turn of the century. Nevertheless, the increase was much greater in the fiscal consolidation countries. In the case of EDP countries, the rise was by 16.6 pp to an average rate of 33.5% in 2014, well above that existing in 2000 when it almost matched the average of the EU. The case of Public Debt Crisis countries is even more evident. The increase was 23 points for this group, with a rate reaching 41.4% in 2014, more than doubling that of 2000. Those evolutions are completely different from those followed by the group of NFC countries, whose average rate has grown only by 2.5 pp after the crisis, from 13.2% in 2007 to 15.7% in 2014.

Looking only at the years after the beginning of the period of fiscal consolidation policies, the period 2009-2014, the picture is very similar. In the EU as a whole, the rate rose by 1.9 pp only, even decreasing in the particular case of the NFC countries. On the contrary for both EDP and DC countries much of the increase in youth unemployment materialized during the fiscal consolidation period. For EDP countries the average increase after 2009 was 9.2 pp and for DC countries 13.8 pp.

The individual performance was particularly negative in the case of some particular fiscal consolidation countries. The youth unemployment rate grew between 2007 and 2014 by nearly 30 points in Greece and by more than 35 points in Spain (a country showing rates above 50% at the end of period). Croatia, Cyprus, Italy and Portugal are other countries where the youth unemployment rates exceed 34% in 2014. By contrast, other countries such as Germany or Austria show rates around 10% or below that level.

Actually, the behaviour of fiscal consolidation countries is similar to the whole of the EU until the start of the crisis. The aftermath is progressively much more negative, with stronger increases in the fiscal consolidation countries. Only after 2013 some signs of improvement can be observed. Therefore, the last crisis is characterized in those countries by a persistent high youth unemployment rate which, besides, moves away from that of other countries, especially during the fiscal consolidation period. The performance of the Non-Fiscal Consolidation club is very different, being also very similar to the years previous to the crisis.

Table 1. Youth unemployment rates (%)

	2000	2007	2014	2007-2014	2009-2014
Belgium	16,7	18,8	23,2	4,4	1,3
Bulgaria	33,7	14,1	23,8	9,7	8,7
Czech Republic	17,0	10,7	15,9	5,2	-0,7
Denmark	6,2	7,5	12,6	5,1	0,8
Germany	8,7	11,8	7,7	-4,1	-3,4
Estonia	23,9	10,1	15,0	4,9	-12,4
Ireland	6,9	9,1	23,9	14,8	-0,1
Greece	29,1	22,7	52,4	29,7	26,7
Spain	23,2	18,1	53,2	35,1	15,5
France	31,5	19,5	24,2	4,7	0,6
Croatia	37,0	25,2	45,5	20,3	20,3
Italy	26,2	20,4	42,7	22,3	17,4
Cyprus	9,9	10,2	36,0	25,8	22,2
Latvia	22,4	10,6	19,6	9,0	-13,7
Lithuania	30,0	8,4	19,3	10,9	-10,3
Luxembourg	6,6	15,6	22,3	6,7	5,8
Hungary	11,9	18,1	20,4	2,3	-6,0
Malta	13,7	13,5	11,8	-1,7	-2,7
Netherlands	8,2	9,4	12,7	3,3	2,5
Austria	5,6	9,4	10,3	0,9	-0,4
Poland	35,1	21,6	23,9	2,3	3,3
Portugal	12,5	21,4	34,7	13,3	9,4
Romania	16,5	19,3	24,0	4,7	4,0
Slovenia	16,3	10,1	20,2	10,1	6,6
Slovakia	37,3	20,6	29,7	9,1	2,1
Finland	21,4	16,5	20,5	4,0	-1,0
Sweden	10,5	19,2	22,9	3,7	-2,1
United Kingdom	12,2	14,3	16,9	2,6	-2,2
EU-28	19,3	15,9	22,2	6,3	1,9
EDP countries	19,7	17,0	33,5	16,6	9,2
DC countries	19,6	18,3	41,4	23,0	13,8
NFC countries	11,0	13,2	15,7	2,5	-0,3

Note: Youth unemployment refers to the share of the labor force aged 15-24 without work but available for and seeking employment.

Source: Eurostat and own elaboration.

Figure 3 shows how the pattern of youth unemployment is common to the countries most affected by fiscal consolidation, especially Greece and Spain. All experience an initial strong increase with the onset of the crisis and a subsequent worsening during the fiscal consolidation period.

The unemployment data clearly show a fundamental feature of European case: fiscal consolidation coincides in space and time with a situation of very low job prospects for young people of school age.

Fiscal consolidation and public expenditure on education

As can be seen (Table 2), there is no evidence for fiscal consolidation affecting public expenditure on education before the last crisis or during its initial phase.¹ Data actually show that a general increase of public expenditure on education was the initial reaction to the economic slowdown as part of the packages of fiscal stimulus applied across the EU to fight against recession. Public expenditure on education grew in real terms for the EU a whole from 2007 to 2009. It also grew in both those countries later more affected by fiscal consolidation (EDP countries, 3.6%; DC countries, 2.6%) and those in the opposite situation (NFC countries, 3.9%). In fact, Bulgaria, Greece, Spain and Portugal are among the European countries where public expenditure on education grew more during this initial phase after the crisis.

After 2009, with the apparition of serious budgetary problems this pattern suffers a dramatic change. The level of public expenditure on education fell in the countries affected by the need of fiscal consolidation, the sustainability of their public sectors being at risk. The decrease is especially visible in the Debt Crisis countries (-7.1% from 2009 to 2014). For the EDP countries the reduction is more moderate (-4%) but still more intense than in the EU as a whole (-1.5%). This evolution contrasts sharply with the Non-Fiscal Consolidation countries experience, characterized by a 2.9% increase in real terms over the same period.

The biggest reductions take place in Bulgaria, Romania, Ireland and Spain (with decreases ranging from 12% to 15%) and Italy (-6.1%). Greece, Portugal, Cyprus, Slovenia and the UK are other countries included in some of our fiscal consolidation groups which also experience a reduction. Finland is the only country considered as not affected by fiscal consolidation according to our criteria with a decrease over the period (and a noticeable one too). France, although pertaining to the EDP group, is also a peculiar case, with a substantial increase of its public expenditure on education.

As we have seen, most of fiscal consolidation countries did cut their public expenditure on education. That policy might indeed have affected human capital accumulation with negative effects which could be highly persistent, reducing the prospects for GDP in the long-term.

However, two circumstances should be taken into account. First, as we have seen, the decreases come in most countries after significant increments during the first years of crisis. In fact, the final level of real public expenditure on education is similar to the 2007 levels for the EDP countries. Secondly, the post-crisis levels are higher than the 2000 levels in almost all the countries considered (Italy being the only exception). The pre-fiscal consolidation period was actually a peak level for public expenditure on education in real terms in almost all countries. Both facts are relevant points to have in mind when considering the potential negative effects of the fiscal consolidation policies on human capital accumulation and output per capita in the long term in the EU.

¹ See European Commission/EACEA/Eurydice (2013) for a more detailed and comprehensive review of the funding of education in Europe and the impact of the economic crisis up to 2012.

Table 2. Public Expenditure on Education at constant prices (2007=100)

	2000	2009	2013	2014	Var (%) 2009-2014*
Belgium	95,6	100,7	109,8		9,0
Bulgaria	81,5	107,2	91,4		-14,7
Czech Republic	78,7	102,1	105,8	102,3	0,2
Denmark	96,9	108,5	114,1	117,7	8,5
Germany	94,9	105,0	110,0		4,8
Estonia	75,9	92,9	91,5	97,3	4,7
Ireland	75,8	92,8	82,1	80,9	-12,8
Greece		104,4	104,4	102,2	-2,1
Spain	75,9	109,3	95,7	95,8	-12,4
France	96,1	103,1	106,8	108,6	5,3
Croatia		102,0	104,7	102,7	0,6
Italy	93,2	95,7	89,3	89,9	-6,1
Cyprus		112,5	109,2		-2,9
Latvia	67,8	92,1	91,6	97,9	6,3
Lithuania		102,2	99,5	103,7	1,4
Luxembourg	76,1	110,1	123,9	124,0	12,6
Hungary	85,3	96,2	95,1	104,2	8,3
Malta	89,6	100,8	125,3	132,1	31,1
Netherlands	84,6	104,6	102,3	103,7	-0,8
Austria	94,9	105,2	107,3	104,3	-0,8
Poland		99,3	112,1	115,0	15,8
Portugal	96,1	110,8	108,7		-1,9
Romania	73,5	93,1	78,4	80,2	-13,8
Slovenia	81,5	102,2	100,2	101,8	-0,4
Slovakia	61,1	102,6	115,1	115,5	12,6
Finland	98,0	99,8	96,8	94,4	-5,4
Sweden	97,4	103,9	103,5	107,5	3,4
United Kingdom	83,3	102,4	98,2	98,3	-4,0
EU28		101,8	100,2		-1,5
EDP countries	84,5	103,6	99,4	99,4	-4,0
DC countries	85,1	102,6	96,0	95,3	-7,1
NFC countries	94,6	103,9	106,2	106,9	2,9

Note: 2014 data from budgets, in cursive variations 2009-2013 for those countries without any budget data.

Source: Eurostat, Eurydice and own elaboration.

School choices and human capital accumulation

Both job opportunities and public resources allocated to education may influence the investment decisions in human capital of the population after reaching the ending age of compulsory education. Both factors affect the cost-benefit calculations which underlie the post-compulsory schooling choices made by the students and their families. The scarcity of job opportunities for young people reduces the cost opportunity of studying instead of searching a job/working and fosters education. More public resources might also reduce the cost of studying for individuals with similar results.

A first aspect to consider has to do with the decision to continue studying at the upper secondary level of education or, on the contrary, leave education after compulsory education. The early dropout rate from education is the standard indicator to analyze this question. It is defined as the share of the population aged 18 to 24 with at most lower secondary education and not in further education or training. This indicator refers to both people who failed and dropped out of school and those who did not fail but left education without continuing. Both are considered as early leavers from education.²

Table 3 shows the evolution of early dropout rates for all EU countries. The post-crisis period is characterized by a decreasing trend in almost all of them. The reduction of early leaving from education has been especially intense in the fiscal consolidation countries. Both the EDP countries and the Debt Crisis countries have experienced a deeper fall in dropout rates than the NFC countries since 2007. Most of those reductions took place during the post-2009 fiscal consolidation period, with a reduction of 5.6 p.p. for the EDP countries and 7.3 p.p. for the Debt Crisis countries to be compared with a decrease of 1.6 p.p. in the NFC countries and 3 p.p. for the EU as a whole. In fact, the decreasing trend accelerated for both EDP and DC countries during the fiscal consolidation years, while maintaining the previous path in the NFC countries. Therefore, there is no apparent sign of any worsening in early dropout rates that should be related to fiscal consolidation.³

In general terms, the review of the evolution of the European countries shows indeed a distinct pattern for the countries more affected by fiscal consolidation. They do tend to experience falls of their public expenditure on education in real terms, while the countries not affected by fiscal consolidation are able to maintain theirs. At the same time, they also suffer much more sizeable and persistent increases of their youth unemployment rates. Finally, their dropout rates tend to improve more intensively than in the Non-Fiscal Consolidation countries.

² For a recent overview on early leaving from education and its determinants in Europe, see European Commission/EACEA/Eurydice/Cedefop (2014).

³ The evolution of the percentage of people aged 20 to 24 that have completed upper secondary education is coherent with those early dropout trends. Almost all EU countries have achieved rises of that indicator after 2007. Furthermore, those improvements took place after the beginning of the fiscal consolidation period and are more intense precisely in the countries affected by that sort of policies. The share of young people with upper secondary grew more in the EDP countries (5.9 p.p.) and especially in the Debt Crisis countries (7.1 p.p.) than in the EU-28 as a whole (3 p.p.) or the NFC countries (2 p.p.). Some of the biggest increases are those of Portugal, Ireland, Greece and Spain, all of them countries especially affected by fiscal consolidation.

Table 3. Early Dropout rates from education

	2002	2007	2014	Variation 2007-2014	Variation 2009-2014
Belgium	14,1	12,1	9,8	-2,3	-1,3
Bulgaria	20,7	14,9	12,9	-2,0	-1,8
Czech Republic	5,7	5,2	5,5	0,3	0,1
Denmark	9,0	12,9	7,8	-5,1	-3,5
Germany	12,5	12,5	9,5	-3,0	-1,6
Estonia	13,6	14,4	11,4	-3,0	-2,1
Ireland	14,6	11,8	6,9	-4,9	-4,8
Greece	16,2	14,3	9,0	-5,3	-5,2
Spain	30,9	30,8	21,9	-8,9	-9,0
France	13,4	12,8	9,0	-3,8	-3,4
Croatia	8,0	4,5	2,7	-1,8	-2,5
Italy	24,2	19,5	15,0	-4,5	-4,1
Cyprus	15,9	12,5	6,8	-5,7	-4,9
Latvia	16,5	15,6	8,5	-7,1	-5,8
Lithuania	13,4	7,8	5,9	-1,9	-2,8
Luxembourg	17,0	12,5	6,1	-6,4	-1,6
Hungary	12,2	11,4	11,4	0,0	-0,1
Malta	53,2	30,2	20,3	-9,9	-5,4
Netherlands	15,3	11,7	8,7	-3,0	-2,2
Austria	9,5	10,8	7,0	-3,8	-1,8
Poland	7,2	5,0	5,4	0,4	0,1
Portugal	45,0	36,5	17,4	-19,1	-13,5
Romania	23,0	17,3	18,1	0,8	1,5
Slovenia	5,1	4,1	4,4	0,3	-0,9
Slovakia	6,7	6,5	6,7	0,2	1,8
Finland	9,7	9,1	9,5	0,4	-0,4
Sweden	10,0	8,0	6,7	-1,3	-0,3
United Kingdom	17,6	16,6	11,8	-4,8	-3,9
EU-28	17,0	14,9	11,2	-3,7	-3,0
EDP countries	20,9	18,3	11,9	-6,4	-5,6
Debt Crisis countries	26,2	22,6	14,0	-8,5	-7,3
Non-FC countries	11,4	11,0	8,4	-2,6	-1,6

Note: Early school leavers are defined as persons aged 18 to 24 fulfilling the following two conditions: (1) the highest level of education or training attained is ISCED 0, 1, 2 or 3c short, (2) no education or training has been received in the four weeks preceding the survey. The reference group to calculate the early school leaving rate consists of the total population of the same age group (18 to 24). All measurements come from the EU Labour Force Survey (LFS).

Source: Eurostat

4. Dropout rates, public expenditure and youth unemployment: an empirical analysis

The literature on the factors contributing to early leaving from education shows the importance of both individual and family circumstances and more aggregate factors such as the characteristics of the education system or labour market conditions (European Commission/EACEA/Eurydice/Cedefop, 2014).

There is a strong link between dropping-out and socio-economic status. In particular, the levels of parental education have a key role (Eurofound, 2012). A low level of parental education, especially of the mother, is associated with a higher risk of early leaving from education (Beekhoven and Dekkers, 2005; Flouri and Ereky-Stevens, 2008; Nevala et al., 2011; OECD, 2012a; Lavrijsen and Nicaise, 2013; Serrano and Soler, 2013). Gender and migrant background are also relevant. Migrants tend to have higher early leaving rates (Traag and Van der Velden, 2011; Serrano y Soler, 2013) though this may depend on the socio-economic background and having adequate learning support or not (European Commission, 2013). In comparison with girls, boys are more likely to leave school with low or no qualifications (EAEC/Eurydice, 2010; Traag and Van der Velden, 2011; Serrano y Soler, 2013; de Witte et al., 2013). Finally, according to this literature, the previous educational achievement has also an impact on early leaving, those students which are successful being more likely to keep studying (Afsa, 2012; Serrano y Soler 2013).

Aggregate factors, such as those related to the organisation of the educational systems and the amount of resources allocated the education sector, may also matter (European Commission/EACEA/Eurydice/Cedefop, 2014). Grade retention (Jimerson et al. 2002; Allensworth, 2005), socio-economic segregation of schools (Nevalah et al. 2011; Traag and van der Velden, 2011) and early tracking (European Commission, 2013a) seem to be linked to a higher risk of dropping out. High quality early childhood education before compulsory education has the opposite effect, improving educational outcomes and reducing early leaving (European Commission/EACEA/Eurydice/Cedefop, 2014). The lack of attractive and relevant educational pathways from compulsory to upper secondary education also raises drop-out rates (Field et al., 2007; OECD 2012).

Undoubtedly, adequate resources are crucial to provide students with high-quality opportunities in their educational environment, but at the same time these resources may only get to lead to better educational outcomes if they are used efficiently. Empirical evidence for this is still very preliminary, but often shows a rather weak relationship between the amount of invested educational resources and student performance, since much of the variation in performance is explained by the quality of the resources and how they are used (Fuller, 1987; Greenwald, Hedges and Laine, 1996; Buchmann and Hannum, 2001; Rivkin, Hanushek and Kain, 2005; Murillo and Roman, 2011; Hægeland, Raam and Salvanes, 2012; Nicoletti and Rabe, 2012; OECD, 2013).

In fact, the relationship between income per capita, expenditure per student and PISA results is far more complex than it appears at first glance (Baker, Goesling and LeTendre, 2002; OECD, 2012b). Among the low-income countries a higher level of expenditure per student predicts higher PISA scores in mathematics, but this relationship is not observed among high-income countries, including most OECD countries. On the other hand there is some evidence that, within certain contexts, a

lower ratio of public expenditure on education in GDP might increase the rate of NEETs (young people not in education, employment or training) in Europe (Leitner and Stehrer, 2015).

Economic and labour market conditions have also an impact on the choice of staying or leaving school (Nevalah et al., 2011; Tumino and Taylor, 2013). High levels of employment opportunities can foster early leaving in order to improve the economic situation at home or become more independent sooner. High levels of unemployment reduce the opportunity cost of studying, encouraging young people to remain in school, especially if they believe that with more qualifications they will obtain later a better professional career over their working life (Petrolongo and San Segundo, 2002; Clark, 2011; Meschi et al. 2011; De Witte et al. 2013; Serrano y Soler, 2013).

Therefore, our analysis aims to take into account both types of determinants: family and individual characteristics and national and aggregate factors. Looking only to the effect of aggregate factors such as public spending on education or unemployment rates without considering the effect of individual factors could be misleading.

In order to analyse the determinants of the probability of dropping out from education we use a two-step strategy. As a first step, probit models of the individual probability of dropping out from education are estimated such as:

$$drop_{ijt} = \beta_0 + \beta_{jt}F_{jt} + \gamma_x X_{ijt} + \varepsilon_{ijt} \quad (1)$$

where $drop_{ijt}$ is 1 if the individual i is a dropout in period t and 0 otherwise; F_{jt} are fixed effects for economy j and period t capturing any country idiosyncratic aggregate effects over time (capturing any structural or cyclical factor common to country j); X_{ijt} is a vector of personal and family characteristics (gender, nationality, parents' education, compulsory schooling success and number of unemployed people at home) and ε_{ijt} is an error term.

All the necessary data for this first step come from the EU-LFS microdata obtained from Eurostat. The sample consists of people aged 20-24 and includes all EU-28 countries. The period considered is 2004-2013.

The marginal effects associated to the fixed country-time effects (F_{jt}) from the previous models are used as dependent variables in models of the aggregate probability of dropping out of the countries. Notice that the country marginal effects have been obtained after removing the effects of family and individual characteristics. Therefore the second step is based on models such as:

$$ME_{jt} = \beta_0 + \beta_j F_j + \beta_t T_t + \theta_z Z_{jt} + u_{ijt} \quad (2)$$

where ME_{jt} is the aggregate marginal effect for country j in period t (obtained from step 1); F_j are fixed effects for economy j capturing any structural country idiosyncratic aggregate effect; T_t are time effects capturing any cyclical or temporal effect common to all countries in period t ; Z_{jt} is a vector of environmental aggregate variables changing across countries and over time (such as youth unemployment rates and various indicators of public expenditure on education) and u_{ijt} is an error term.

For the explanatory variables in this is second step of the analysis all data come also from Eurostat covering again the period 2004-2013 and all EU-28 countries.

Two different dropout situations are considered at two different moments within a normal educational career. The first one is the usual early dropout possibility after compulsory education. In our case early leavers from education and training are people with at most lower secondary education and not in further education or training (in which case $drop_{ijt}$ would be 1). This indicator refers to both people who failed and dropped out of school and those who did not fail but left education without continuing.⁴

The second dropout situation refers to people who have completed post-compulsory secondary education and classifies them depending on their choice: either keeping on studying (tertiary education) or leaving education. In this case $drop_{ijt}$ is 1 for people with upper secondary education and not in further education or training and 0 for people with either higher education or upper education but still in further education or training.

Table 4 shows the results (marginal effects) for the probit model of the individual probability of dropping out after compulsory education over the period 2004-2013 (column 1). The reference individual is a male, national, having failed at compulsory education, with both parents with lower secondary education as maximum, and without any unemployed person at home.

Table 4. Marginal Effects from probability of dropping-out probits

Dependent variable: $drop_{ijt}$ is 1 if the individual i is a dropout in period t and 0 otherwise

	Early dropping-out (1)	After upper secondary dropping-out (2)
Female	-0,044***	-0,095***
Foreigner	0,043*	0,015
Mother upper secondary	-0,081***	-0,066***
Mother tertiary	-0,133***	-0,242***
Father upper secondary	-0,067***	-0,021
Father tertiary	-0,120***	-0,205***
Compulsory education success	-0,303***	
One person unemployed at home	0,073***	0,164***
Two people unemployed at home	0,120***	0,258***
Three or more people unemployed at home	0,161***	0,368***
Country - time effects	Yes	Yes
Number of observations	2.370.781	1.918.055
Log pseudolikelihood	-10.600.993	-15.034.815
Pseudo R2	0,1910	0,0850

Note: ***, **, * significant at 1%, 5% and 10% respectively. Standard errors are estimated clustered by country. The individual reference corresponds to a young male, national, whose both parents have basic studies as maximum.

⁴ Typically the indicator of 'Early leavers from education and training' is usually defined as the share of the population aged 18 to 24 with at most lower secondary education and not in further education or training. In our case, due to data limitations, the analysis is carried out for people aged 20-24.

All explanatory variables are significant and their signs make sense. *Ceteris paribus*, after controlling for any aggregate structural or cyclical country effect, females have a lower probability of dropping out than males in the EU (4 p.p. less) and foreigners have a higher probability than nationals (4 p.p. more). The probability of dropping-out decreases more intensively the higher the level of education completed by the parents. On the contrary, it increases with the number of people unemployed at home. Finally, the degree of personal success in completing compulsory education is highly significant. *Ceteris paribus*, the difference between failing or not amounts to 30 p.p. Those results are coherent with the previous literature on this topic for the EU countries discussed above. The fixed country-time effects are significant both across countries and over time and their marginal effects are used as the dependent variable of the second step. The results (again marginal effects) for the probit model of the individual probability of dropping out after upper secondary education are shown in column 2 of Table 4.

The estimates are qualitatively similar to the ones obtained previously for dropping out after lower secondary education (compulsory education), but there are some interesting differences. Females do have a lower probability of dropping out than males (the effect is even higher, 9 p.p.), but nationality seems to be no longer significant at this stage of education. The level of education of parents is important, but in this case the key factor is having or not tertiary education. Upper secondary education is less important than for early dropping out (even non-significant for the father), but higher education almost doubles its marginal effects. Finally, the economic circumstances at home seem to be more important now. The probability of dropping out after upper secondary increases with the number of unemployed people at home, and the size of the effect almost doubles the estimates in the early dropping out model. The fixed country-time effects are again significantly different both across countries and over time.

As a second step, after controlling for the influence from personal and family characteristics, those sets of country-time effects are used to estimate the effect of economic crisis and fiscal consolidation on the evolution of European countries in terms of dropping out from education. In this second step the explanatory variables are youth unemployment rates, different indicators of public expenditure on education, PISA 2012 scores in mathematics (as an indicator of the average quality of the education system), country dummies and time dummies. Three different public expenditure indicators are considered: 1) the share of total public expenditure on education in GDP; 2) the log of total public expenditure on education per pupil (based on full-time equivalents) in real terms and 3) the log of total public expenditure on education per capita (people aged 0-24) in real terms.⁵

The results for early dropping out are shown in Table 5. Each column refers to a different indicator of public expenditure on education. Youth unemployment rates are always significant and show a negative effect close to -0.1 (-0.15 in the models without time effects). This implies that early dropout rates would roughly fall by 1 p.p. with a 10 pp. increase of that rate. PISA math scores are not significant for most models, although the estimates show the expected negative sign (more education quality, less early leaving). The public expenditure on education indicators are significant

⁵ Public spending is always expressed in euros at constant prices (deflating by the price index based on the individual consumption expenditure of general government) and converted into PPS to eliminate price differences between countries).

in some cases but not in others. The share of public expenditure in GDP shows a negative and significant effect. Its size implies that increasing public expenditure by 1 pp. of GDP would reduce early drop-out rates by 0.8 pp. However, the log of public expenditure per pupil is not significant and the log of public expenditure per person aged 0-24 only weakly significant (the null hypothesis of no effect could not be rejected at a 5% level of significance, but it could be rejected at a 10% level). The point estimate for public expenditure per capita would imply, for example, that a 10% increase (decrease) in that ratio would reduce (increase) early dropout rates by 0.3 pp. In the models without time dummies, the significance of the public expenditure per capita indicators increases and the estimated size of the effects is also higher (a variation of early drop-out rates by 0.25 pp. for a 10% increase in public expenditure per pupil, a change of 0.5 p.p. for a 10% increase in public expenditure per person aged 0-24).

Table 5. OLS. Dependent variable: Early dropout. Probit marginal effects. All EU

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0009***	-0,0015***	-0,0009***	-0,0015***	-0,0010***	-0,0015***
Mathematics Score	-0,0003*	-0,0029*	-0,0002	-0,0002	-0,0001	-0,0000
Expenditure/GDP	-0,0079**	-00058*				
Expenditure per pupil full time eq.			-0,0007	-0,0259*		
Expenditure per capita 0-24					-0,0311*	-0,0498***
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	266	266	267	267	268	268
R-squared	0,9140	0,8983	0,9118	0,8997	0,9132	0,9038

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

The effects are more substantial in the case of the fiscal consolidation countries. For the Debt Crisis countries (Table 6) youth unemployment rate is significant and its effect is negative, implying that early drop-out rates would fall by between 1.8 p.p. and 2.3 p.p. with a 10 p.p. increase of the unemployment rate. The estimates imply a variation of early drop-out rates by 0.9 p.p. for a 10% increase in public expenditure per pupil and a change of 1.1 p.p. for a 10% increase in public expenditure per person aged 0-24, both effects being significant. The share of public education expenditure in GDP shows also a negative effect although its significance is weaker (being significant at 10%, but not at 5%). Increasing public expenditure by 1 p.p. of GDP would reduce early drop-out rates by 1.8 p.p. PISA math score has a negative and significant effect on early leaving.

Table 6. OLS. Dependent variable: Early dropout. Probit marginal effects. DC countries

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0023***	-0,0017***	-0,0019***	-0,0017***	-0,0018***	-0,0017***
Mathematics Score	-0,0017***	-0,0009**	-0,0012***	-0,0008***	-0,0010**	-0,0007**
Expenditure/GDP	-0,0186*	-0,0016				
Expenditure per pupil full time eq.			-0,0913***	-0,0791***		
Expenditure per capita 0-24					-0,1088***	-0,0612*
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	48	48	50	50	50	50
R-squared	0,9603	0,9506	0,9647	0,9573	0,9654	0,9528

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

For EDP countries (Table 7) PISA math score is again significant and has a negative effect. The youth unemployment rate is significant and its effect is negative, implying that early drop-out rates would fall by between 1.2 p.p. and 1.5 p.p. (depending on the specification) with a 10 p.p. increase of that rate. The effects of public expenditure per pupil and public expenditure per person aged 0-24 are both significant and negative. The estimates imply a variation of early drop-out rates by 1.2 p.p. for a 10% increase in public expenditure per people aged 0-24. Public expenditure per pupil has also a negative effect although its significance is weaker (being significant at 10%, but not at 5%), a change of 0.5 p.p. for a 10% increase in public expenditure. The share of public expenditure on education in GDP is not significant.

Table 7. OLS. Dependent variable: Early dropout. Probit marginal effects. EDP countries

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0012***	-0,0018***	-0,0014***	-0,0017***	-0,0015***	-0,0016***
Mathematics Score	-0,0018***	-0,0016***	-0,0015***	-0,0014***	-0,0011***	-0,0013***
Expenditure/GDP	-0,0162	0,0020				
Expenditure per pupil full time eq.			-0,0545*	-0,0266		
Expenditure per capita 0-24					-0,1163***	-0,0309
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	78	78	80	80	80	80
R-squared	0,9280	0,9183	0,9249	0,9146	0,9315	0,9148

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

The effects of both crisis and fiscal consolidation on early dropping out seem to be more intense in those countries more affected by fiscal consolidation, although the results vary with the public expenditure indicator considered.

The results about dropping out after upper secondary education are shown in Table 8 for the whole EU. Again each column refers to one of the three different indicators of public expenditure on education. In general PISA math scores at the end of compulsory education is no longer significant. The unemployment rate shows the expected sign in the model with the share of public expenditure on education in GDP, but the effect is not significant (although it is significant in a model without time dummies with a size even higher than those obtained for the early dropping-out models). In the other models, youth unemployment rates are always significant. The magnitude of the effect is very similar to the previous estimates for early dropping-out. Drop-out rates after upper secondary education would fall by between 0.8 and 1.2 p.p. with a 10 p.p. increase in youth unemployment rates.

Table 8. OLS. Dependent variable: After upper secondary dropping-out. Probit marginal effects. All EU

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0004	-0,0019***	-0,0008**	-0,0023***	-0,0012***	-0,0023***
Mathematics Score	0,0000	-0,0000	0,0001	0,0002	0,0003	-0,0004
Expenditure/GDP	-0,0167**	-0,0175**				
Expenditure per pupil full time eq.			-0,0140	-0,0969***		
Expenditure per capita 0-24					-0,0947***	-0,1569***
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	266	266	267	267	268	268
R-squared	0,9053	0,8808	0,8959	0,8757	0,9003	0,8900

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

The ratio of public expenditure on education to GDP has a significant and negative effect, with a size implying that increasing public expenditure by 1 p.p. of GDP would reduce early drop-out rates by 1.6 p.p. Therefore, the effect would be stronger than the one estimated for early dropping-out. The log of public expenditure per pupil is not significant, but the log of public expenditure per person aged 0-24 is significant (implying that a 10% increase (decrease) in that ratio would reduce (increase) drop-out rates after upper secondary by almost 1 p.p.). In the models without time dummies, both public expenditure per capita indicators would be significant and their estimated effect would be also higher (a variation of early drop-out rates by 1 p.p. for a 10% increase in public expenditure per pupil, a change of 1.5 p.p. for a 10% increase in public expenditure per person aged 0-24). The effect of unemployment would also increase almost doubling respect to the models with time dummies. Drop-out rates after upper secondary education would fall 2.3 p.p. with a 10 p.p. increase in youth unemployment rates.

All in all, these results suggest that the choice of keeping on studying after having completed upper secondary education or not is affected by both unemployment and public expenditure on education. The latter effect seems to be somewhat stronger than in the case of the early dropping-out choice after compulsory education.

Nevertheless, public expenditure on education does not seem to have any significant effects on dropout rates after upper secondary for Debt Crisis countries (Table 9). On the other hand, youth unemployment has a negative and significant effect. An increase of 10 p.p. of the unemployment rate would decrease those drop-out rates between 2.4 p.p. and 3 p.p.

Table 9. OLS. Dependent variable: After upper secondary dropping-out. Probit marginal effects. DC countries

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0031**	0,0020***	-0,0042**	-0,0021***	-0,0027	-0,0022***
Mathematics Score	-0,0002	0,0006	-0,0011	0,0000	-0,0005	-0,0000
Expenditure/GDP	0,0112	0,0138				
Expenditure per pupil full time eq.			0,1450	0,1009		
Expenditure per capita 0-24					-0,0496	-0,0396
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	48	48	50	50	50	50
R-squared	0,9555	0,9463	0,9083	0,8997	0,8967	0,8929

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

When analyzing dropping out after upper secondary for the EDP countries, significant effects are obtained only for one of the three specifications, the one using the indicator of public expenditure per person aged 0-24 (Table 10). In that case both public expenditure on education and unemployment (although weakly in the case of this variable) are significant. An increase of 10 p.p. of the unemployment rate would decrease dropout rates by 1.5 p.p. A 10% increase in public expenditure per people aged 0-24 would reduce them by 1.8 p.p.

Table 10. OLS. Dependent variable: After upper secondary dropping-out. Probit marginal effects. EDP countries

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (15-24)	-0,0009	-0,0020***	-0,0012	-0,0023***	-0,0015*	-0,0022***
Mathematics Score	0,0002	0,0000	-0,0005	-0,0007	-0,0002	-0,0005
Expenditure/GDP	-0,0063	0,0015				
Expenditure per pupil eq.			0,1152	0,0895		
Expenditure per capita 0-24					-0,1796**	-0,0882
Time effects	Yes	No	Yes	No	Yes	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	78	78	80	80	80	80
R-squared	0,7107	0,6853	0,6839	0,6649	0,6881	0,6631

Note: ***, **, *: significant at 1%, 5% and 10%, respectively.

5. Educational attainment effects: labour market and labour productivity

Labour productivity

The effects of education on labour productivity can be estimated through the wage premiums to education within a standard Mincer wage equation framework (Mincer, 1974). The literature on the returns to education tends to confirm the existence of a positive effect of education. Card (1999) offers a good survey on the casual effect of education on earnings. Harmon et al. (2003) and Heckman et al. (2006) are comprehensive surveys on this topic from a microeconomic point of view while Sianesi and Van Reenen (2003) is a detailed survey of the literature from a macroeconomic perspective.

The wage equation framework makes possible to control for other personal characteristics that can also affect wages apart from education. Therefore, wage equations are estimated:

$$\log w_{ijt} = \beta_0 + \beta_j F_j + \beta_t T_t + \gamma_x X_{ijt} + \varepsilon_{ijt} \quad (3)$$

where w_{ijt} is gross labour income for individual i in country j and period t ; F_j are fixed effects for economy j capturing any structural country idiosyncratic aggregate effect; T_t are time effects capturing any cyclical factor common to all countries considered; X_{ijt} is a vector of personal characteristics (gender, nationality, level of education and labour experience) for individual i in economy j and period t and ε_{ijt} is an error term. Gender (male or female) and nationality (national or foreigner) are included through a single dummy in each case. The effect of experience is included through two variables: years of experience and its quadratic term (in order to take into account the typical inverted-U pattern of this effect over the life-cycle). Years of experience are obtained as age minus age at the moment of completing the maximum attainment level. The level of education is included through two dummies. The first dummy is 1 for workers with upper secondary school (ISCED 3-4) as maximum level of education completed and zero for the rest. The second education dummy is 1 for all workers with tertiary education (ISCED 5-6), zero for the rest.

All the data comes from the EU SILC. Employee income is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the income reference period (12 months). It includes both gross employee cash or near cash income and gross non-cash employee income. In order to get more accurate measurement of the effect of education on wages, we restrict the sample for full-time employees who work more than 30 hours per week on his/her main job. All earnings are measured in euros at 2012 PPS so that they can be compared across countries and over time.

Table 11 shows the results obtained from the wage equations for the period 2004-2013⁶ for different European countries or groups of EU countries. The reference individual is always a male, national and whose maximum level of education is lower secondary education (compulsory education). Robust standard errors are always clustered by country.

⁶ The income reference period in the EU-SILC is a fixed 12-month period (such as the previous calendar or tax year) for all countries except the United Kingdom, for which the income reference period is the current year, and Ireland, for which the survey is continuous and income is collected for the last twelve months.

Table 11. Wage equations. EU and Fiscal and Non-Fiscal consolidation countries

	EU-28 (1)	EDP countries (2)	Debt Crisis countries (3)	Non-Fiscal Consolidation countries (4)
Female	-0.225 *** (0.008)	-0.228 *** (0.007)	-0.229 *** (0.012)	-0.197 *** (0.013)
Foreigner	-0.097 ** (0.044)	-0.100 (0.063)	-0.224 *** (0.022)	-0.021 (0.047)
Experience (years of)	0.046 *** (0.006)	0.038 *** (0.005)	0.042 *** (0.004)	0.063 *** (0.003)
Experience ²	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)
ISCED 3-4	0.328 *** (0.074)	0.226 *** (0.036)	0.299 *** (0.032)	0.522 *** (0.095)
ISCED 5-6	0.812 *** (0.082)	0.676 *** (0.045)	0.711 *** (0.070)	0.957 *** (0.115)
Country dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	1,292,494	365,461	224,250	341,744
R ²	0.432	0.273	0.262	0.334
Adjusted R ²	0.432	0.273	0.262	0.334
RSS	469,367	124,960	72,690	132,332

Note: ***, **, * significant at 1%, 5% and 10 % respectively. Robust standard errors clustered by country in parentheses. The individual reference is a male, national, with lower secondary education (compulsory education, ISCED 2) as maximum.

The results for all EU countries are show in column 1. Gender and nationality are both significant. Ceteris paribus female employees earn 23% less than males and foreigners 10% less than nationals. Wages increase with labour experience but this effect shows decreasing returns (notice the negative effect of the quadratic experience term). Education has a significant positive effect on gross wages, being ceteris paribus 32.8% higher for workers with upper secondary than for those lacking it. The effect is even higher for workers with tertiary education. Their wages, after controlling for other personal characteristics such as experience, gender and nationality, are 81.2% higher than for workers with just compulsory education.

Column 2 shows the results from the estimation of wage equations restricted to the EDP fiscal consolidation countries. The returns to both experience and education are still significant and positive but somewhat lower than for the EU as a whole. The wage premium for upper secondary education is only 22.6%. In the case of tertiary education the return is also lower for these countries, 67.6%.

The results for our alternative definition of fiscal consolidation, the Public Debt Crisis countries, are shown in column 3. Again the effects of education on wages are lower that for the whole sample of EU countries, although not so low as in the EDP countries (29.9% premium for upper secondary, 71.1% for tertiary education).

On the other hand, the effects of education and experience on wages are more important for those countries less affected by the crisis and the need of any fiscal consolidation. Column 4 shows the results for those countries. The estimated effect of upper secondary education rises to 52.2% and that of tertiary education to 95.7%.

These results indicate that there are significant and substantial effects of education on labour productivity, although their magnitude is lower in the countries affected by fiscal consolidation than in those European countries not affected by it.⁷

The analysis has been carried out also for some individual countries that might be considered as examples of fiscal consolidation. The results, shown in Table 12, are consistent with those already commented. Wages are, *ceteris paribus*, significantly lower for females than for males in all countries (the effect varying between 18.5% in Ireland and between 27% and 28% in Portugal and Bulgaria). Foreigners have lower wages in all the countries considered apart from the UK, Bulgaria and Romania, where the coefficients are positive but not significant. Wages grow initially with the number of years of labour experience although showing diminishing returns in all countries. Finally, wages rise always with education, this positive effect being significant for both upper secondary and tertiary education. The upper secondary estimated wage premium relative to lower secondary varies between 13.6% in the UK and 41.7% in Portugal. The tertiary wage premium relative to lower secondary varies between 57.8% in the UK and 108% in Portugal.

⁷ The possibility of a change in the effect for the fiscal consolidation countries after the implementation of that type of fiscal policies has been tested also (results not shown in Table 9). The hypothesis null of no change after 2009 cannot be rejected.

Table 12. Wage equations by countries

	Greece	Spain	Ireland	Portugal	Italy	France	United Kingdom	Bulgaria	Romania
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female	-0.248 *** (0.010)	-0.241 *** (0.006)	-0.185 *** (0.010)	-0.274 *** (0.008)	-0.207 *** (0.006)	-0.234 *** (0.007)	-0.222 *** (0.006)	-0.279 *** (0.008)	-0.215 *** (0.006)
Foreigner	-0.252 *** (0.016)	-0.239 *** (0.013)	-0.148 *** (0.014)	-0.069 *** (0.018)	-0.256 *** (0.010)	-0.062 *** (0.013)	0.007 (0.012)	0.059 (0.075)	0.247 (0.161)
Experience (years of)	0.050 *** (0.002)	0.037 *** (0.001)	0.052 *** (0.001)	0.036 *** (0.001)	0.049 *** (0.001)	0.051 *** (0.001)	0.035 *** (0.001)	0.032 *** (0.001)	0.029 *** (0.001)
Experience ²	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	0.000 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)
ISCED 3-4	0.295 *** (0.013)	0.255 *** (0.008)	0.195 *** (0.014)	0.417 *** (0.012)	0.317 *** (0.006)	0.203 *** (0.011)	0.136 *** (0.015)	0.303 *** (0.013)	0.257 *** (0.011)
ISCED 5-6	0.751 *** (0.015)	0.616 *** (0.007)	0.741 *** (0.016)	1.085 *** (0.013)	0.754 *** (0.009)	0.679 *** (0.012)	0.578 *** (0.015)	0.729 *** (0.015)	0.862 *** (0.013)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,440	79,582	23,715	27,164	74,349	49,998	42,399	32,585	33,307
R2	0.310	0.226	0.269	0.321	0.206	0.203	0.230	0.191	0.293
Adjusted R2	0.309	0.226	0.269	0.320	0.206	0.203	0.230	0.191	0.293
RSS	5,050.9	25,011.3	7,970.4	8,610.9	24,944.7	19,117.6	12,964.9	10,876.0	6,682.1

Note: ***, **, * significant at 1%, 5% and 10 % respectively. Robust standard errors clustered by country in parentheses. The individual reference is a male, national, with lower secondary education (compulsory education, ISCED 2) as maximum.

Effects on labour market

People with more education should have more human capital and become more capable, more productive and more attractive for firms. Human capital increases their employability, reduces the likelihood of being unemployed if looking for a job, promotes integration into the labour market with better conditions and provides higher wages throughout their working life. Consequently, education should also lead to a greater likelihood of actively participating in the labour market since it increases the benefits associated with being employed. Therefore, participating in the labour market, trying to get a job, would be more attractive.

Therefore, educational attainment should have a significant role on the European labour market, increasing both the probability of participation of working age individuals and the probability of employment of active individuals. In order to get estimates for the total effect on employment rates, we have estimated probit models⁸ for the whole working age population such as:

$$EMP_{ijt} = \beta_0 + \beta_j F_j + \gamma_x X_{ijt} + \varepsilon_{ijt} \quad (4)$$

where EMP_{ijt} is 1 if the individual i is employed in period t and 0 otherwise; F_j are country effects; X_{ijt} is a vector of personal and family characteristics, and ε_{ijt} is an error term. The vector of personal and family characteristics includes gender (male or female), nationality (national or foreign), civil status (married or not), children (having children 6 years old or less), age (being 15-24, 25-34, 35-44, 45-54 or 55+) and maximum level of educational attainment (lower secondary, upper secondary or tertiary education). Interactions between gender and civil status and also between gender and children are included to take into account the potential different effect of those circumstances for men and women. All dependent variables are defined as dummies.

All data come from the EU-LFS microdata obtained from Eurostat. The sample refers to people of working age⁹ and includes all EU-28 countries in 2007.⁹

The marginal effects of each variable on the probability of employment are shown directly in Table 13. They should be interpreted as the differential effects with respect to the reference individual: a male, national, aged between 15 and 24, not married, without children under 6, with lower secondary as maximum level of educational attainment.

All variables are indeed significant in the EU-28 estimates (column 1). Females have 5.2 p.p. less of probability of working than males and foreigners 3.8 p.p. less than nationals while being married increases that probability (9.9 p.p.) for males, but decreases it for females (-7.9 p.p.). Having small

⁸ We have also estimated probit models for the probability of participation and also Heckman models for the probability of employment of active people. The results are available upon request and are similar to those presented in the paper. Most of the overall labour market effect would come from the participation effect.

⁹ Results were obtained also for 2013, to take into account possible differential effects depending on the moment within the economic cycle. The results are similar in qualitative terms. If anything, using 2013 estimates would increase the positive effects of high youth unemployment rates on human capital accumulation because the effect of education on employment seems to have increased with the crisis, especially in the Debt Crisis countries. These results are available upon request.

children increases it by 6.5 p.p. for males, but decreases it by 19 p.p. for females. Age shows again a significant inverted-U. Finally, the country dummies are once more highly significant. The total effect of educational attainment on the probability of working is both significant and positive. The effect is 15.6 p.p. higher for individuals with upper secondary and 25.1 p.p. higher for those with tertiary education. According to the results already commented, most of those effects come through participation, employability playing a smaller role.

Table 13. Probit of the probability of employment. Marginal effects. 2007

	All EU	EDP countries	DC countries	NFC countries
Female	-0,052***	-0,055***	-0,088***	-0,031***
Foreigner	-0,038**	-0,03	0,026*	-0,079***
Married	0,099***	0,096***	0,117***	0,084***
Married*Female	-0,079***	-0,083***	-0,141***	-0,06***
Under 6	0,065***	0,06***	0,076***	0,063***
Under 6* Female	-0,19***	-0,182***	-0,144***	-0,226***
Upper secondary education	0,156***	0,176***	0,128***	0,148***
Tertiary education	0,251***	0,256***	0,207***	0,246***
A25_34	0,251***	0,268***	0,285***	0,181***
A35_44	0,279***	0,283***	0,322***	0,209***
A45_54	0,235***	0,256***	0,282***	0,159***
55 and higher	-0,176***	-0,137***	-0,13***	-0,282***
Country dummies	Yes	Yes	Yes	Yes
Number of observations	3.381.584	841.803	1.145.101	709.951
Log pseudolikelihood	-201.425	-77.384	-52.960	-56.800
Pseudo R ²	0,3012	0,3021	0,3091	0,2963

*Note: ***, **, *: significant at 1%, 5% and 10%, respectively. Standard errors adjusted for country clusters.*

The estimates for the EDP countries (column 2) fit in the general EU pattern. The effect of education on the probability of working is significant and positive both for upper secondary (17.6 p.p.) and tertiary education (25.6 p.p.).

Column 3 shows the results for the Debt Crisis countries. For this group of countries the total effect of education seems to be weaker than the EU average. All the other variables held constant, the estimated effect of upper secondary education is 12.8 pp. while the effect of tertiary education is 20.7 p.p.

For our no-consolidation group (column 4) the estimates are 14.8 p.p. for upper secondary and 24.6 p.p. for tertiary education.

Table 14 summarizes the results obtained in the case of the individual countries considered in the analysis. The effects of educational attainment are always positive and significant. Spain, Portugal and Greece show the lowest effects.

Table 14. Probit of the probability of employment . Marginal effects. 2007

	Spain	Ireland	Portugal	Greece	Italy	France	UK	Bulgaria	Romania
Upper secondary education	0,100***	0,178***	0,033***	0,076***	0,158***	0,130***	0,329***	0,222***	0,062***
Tertiary education	0,198***	0,267***	0,144***	0,190***	0,220***	0,197***	0,420***	0,306***	0,244***
Number of observations	87.248	67.282	148.706	257.228	584.637	92.955	96.983	117.557	219.853
Log pseudolikelihood	-18.643	-1.753	-4.714	-4.436	-22.888	-22.436	-21.758	-2.964	-9.883
Pseudo R ²	0,2946	0,2418	0,2233	0,3195	0,3437	0,342	0,35	0,3565	0,2183

Note: ***, **, *: significant at 1%, 5% and 10%, respectively

6. Long-run effects

The previous results about the effects of crisis and fiscal consolidation on educational choices and of the effects of education on participation, employability and labour productivity are the basis for estimating the effects of crisis and fiscal consolidation on long-run GDP per capita.

The long-run effects of crisis and fiscal consolidation are estimated as the final results of changes in employment rates (due to variations in both participation rates and probabilities of employment) and labour productivity. The estimates are obtained under the assumption of constant demographics, using the following decomposition:

$$GDPpc = \frac{Y}{Emp} \frac{Emp}{Act. Pop.} \frac{Act. Pop.}{Working Age Pop.} \frac{Working Age Pop.}{Pop.} \quad (5)$$

where the last component, the ratio between working age population and total population, is considered as not being affected by neither crisis nor fiscal consolidation.

Our strategy considers very long-run effects, assuming that all changes in dropout rates are permanent. We evaluate the final effects after all cohorts in the working age population had been affected by the new education choices. Therefore, the estimates represent in some sense upper band estimates, since neither crisis nor fiscal consolidation, in spite of their longer than expected duration, can be considered a fix and permanent feature for the EU.¹⁰

Crisis and fiscal consolidation have opposite effects on people's choices about education, modifying dropout rates and, therefore, also the educational attainment composition of working age population. Participation in the labour market, employability and unemployment, and labour productivity all depend on educational attainment. A new long-run educational composition of population would imply different employment rates and different levels of labour productivity and, therefore, GDP per capita would be affected in the long-run.

Our aim is to estimate the impact of crisis and fiscal consolidation by comparing this new long-run GDP per capita with the hypothetic contrafactual GDP per capita under a no-change in education assumption. Notice the very long run character of the exercise. The new estimated equilibrium would

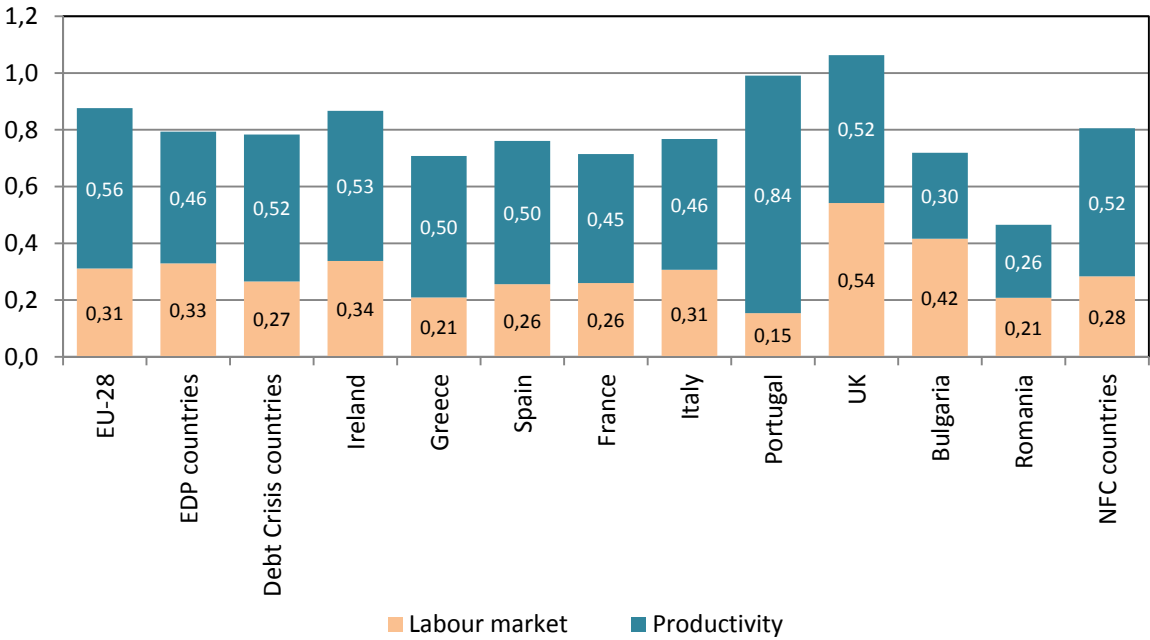
¹⁰ In fact, the last budget data (European Commission/EACEA/Eurydice, 2015) shows for Spain (one of the fiscal consolidation counties with a bigger decrease of public spending on education until 2014) an increase between 2014 and 2015 of 5.3% at constant prices.

be achieved after all working age population had been affected by the new dropout rates (approximately 50 years). The impact would be initially almost negligible and would grow progressively until finally reaching the long-run total effect.

Within that framework different scenarios have been estimated in order to illustrate different aspects of the problem.

The first scenario assumes a permanent and common decrease of 1 p.p. of the early dropout rates for all countries considered¹¹. Figure 1 shows the results. A permanent improvement of early leaving from education of that magnitude would increase long-run GDP per capita in all countries. The effect would vary substantially across countries, from 0.47% in Romania to 1.06% in the UK. It would be slightly lower in the fiscal consolidation countries than in the others. The global effect for the EU as a whole would be around 0.9%. Most of the effect would come from a higher labour productivity (two thirds for the EU-28 as a whole) and the rest would be due to higher participation rates and better employability, the first factor being more important. The labour market effect is especially high in the UK, while the labour productivity effect is most relevant in Portugal.

Figure 1. Long-rung GDP per capita. Percentage of increase due to a 1 p.p decrease on early dropout rates (Scenario 1).



Source: Own elaboration

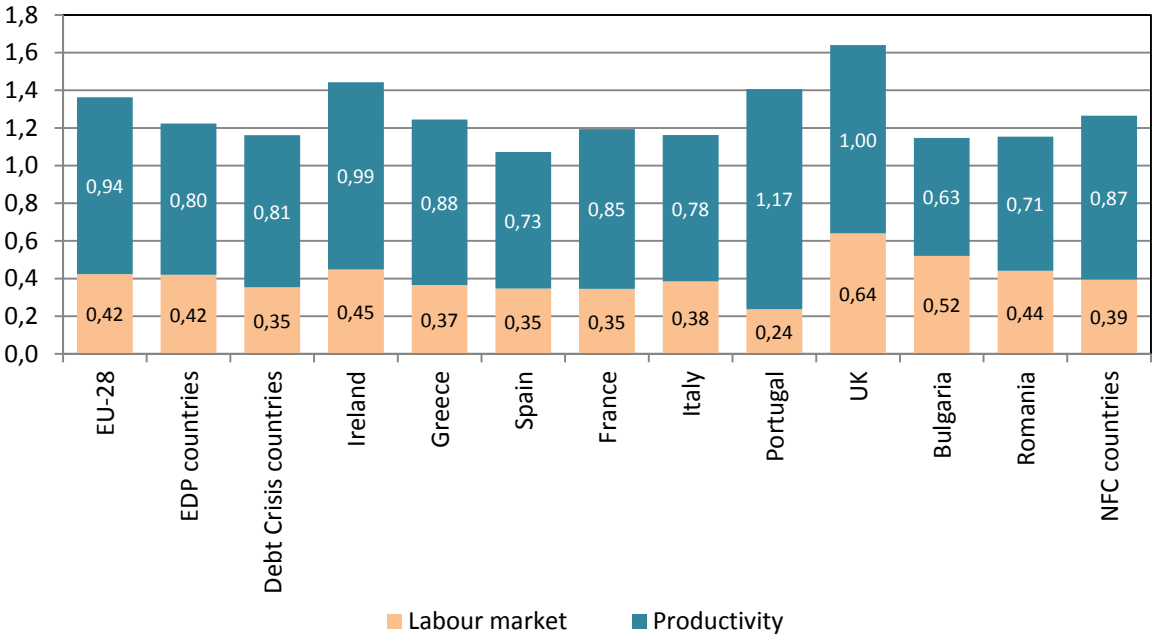
These estimates show that output is sensitive to educational changes in the countries affected by decreases of public expenditure on education but not more than in the average EU country.

¹¹ All scenarios discussed are based on the labour market effects pre-crisis 2007 estimates. The results using 2013 estimates would be very similar.

The scenario 2 assumes the previous 1 p.p. decrease of early dropout rates and besides a 1 p.p. decrease of the dropout rates of those completing upper secondary education (i.e. an additional 1% of those graduates would enter tertiary education). Again it is assumed that those changes are both permanent and common to all countries.

The estimated effects are higher than in the previous scenario since now the educational improvement is more intense. The effects vary substantially across countries, from 1.1% in Spain to 1.6% in the UK. The fiscal consolidation countries show again somewhat lower effects than the rest of the EU. The global effect for the EU would be around 1.4%. The share of the total effect due to labour productivity is even higher than in the previous scenario (69% for the EU-28 as a whole).

Figure 2. Long-run GDP per capita. Percentage of increase due to a 1 p.p decrease on both early dropout rates and post upper secondary dropout rates (Scenario2).



Source: Own elaboration

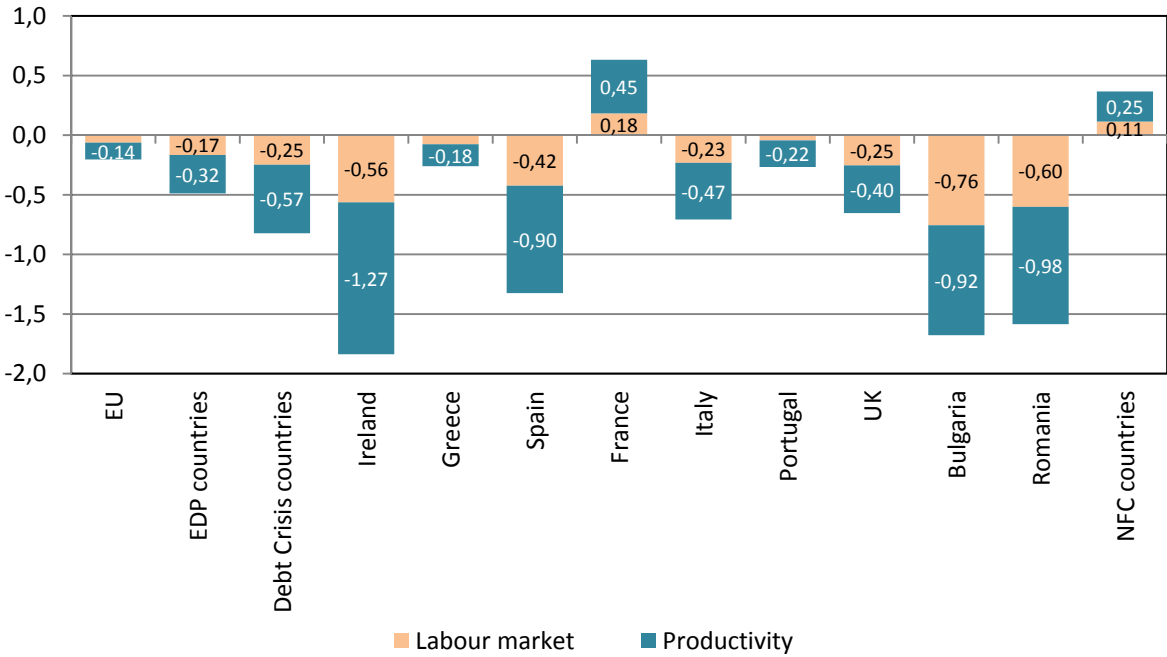
According to those results a few countries affected by decreases of public expenditure on education would be more responsive to educational changes than the average (Ireland, Portugal and UK). However, most of them seem to be slightly less sensitive compared to the EU standard. This means that labour productivity, participation and employability react less to (benefit less from) a higher level of educational attainment. This suggests that returns to education are lower in those countries and points to the existence of more intense problems to take full advantage of their investments in human capital.

Our scenario 3 explores directly the potential negative effect of fiscal consolidation on long-run GDP due to the reductions of public expenditure on education. The results are based on the actual evolution of that expenditure in real terms after 2009. It is assumed that the accumulated variation since 2009 until 2013/4 is permanent. Diverse estimates were previously obtained for the effect of public expenditure on both early and after upper secondary dropout rates (section 4, Tables 5-10).

Taking all those results into account, a 0.1 p.p. increase of both rates for every 1% decrease of public expenditure on education in real terms does not seem out of reason. The results under all those assumptions are shown in Figure 12.

These estimates show that fiscal consolidation would have, ceteris paribus, negative effects on long-run output. The effect is more intense in those countries which have experience bigger reductions of that type of public expenditure and/or those where productivity and labour market performance are more sensitive to educational attainment. Therefore the most negative effects would correspond to Ireland, Bulgaria, Romania and Spain (between 1% and 2%). The global effect for the EU would be negative but very moderate, 0.2%. The average effect for the EDP countries would be 0.5%. It would be bigger in the case of the Debt Crisis countries, around 0.8%. On the contrary, the Non-Fiscal Consolidation countries present a moderate positive effect (+0.37%) since public expenditure on education has risen in those countries. France, in spite of its long EDP, presents also a positive effect for similar reasons.

Figure 3. Long-rung GDP per capita. Percentage of increase associated to the real variation of public expenditure on education after 2009 (Scenario 3).



Source: Own elaboration

Nevertheless, those negative effects are estimated under the ceteris paribus condition. It means, in particular, assuming no change in the youth unemployment rates. Scenarios 4 and 5 analyze the long-run effects of the substantial increases of those rates in the EU countries. Two scenarios are postulated due to the various estimates about the effect of youth unemployment on dropout rates obtained above (section 4, Tables 5-10). For the All-EU models those previously estimated impacts implied a decrease of about 1 p.p. on dropout rates for every 10 p.p. increase in the youth unemployment rate. In the case of the fiscal consolidation countries that effect would be around 2 p.p. Scenario 4 assumes a low sensitivity of dropout rates to unemployment, such as the average

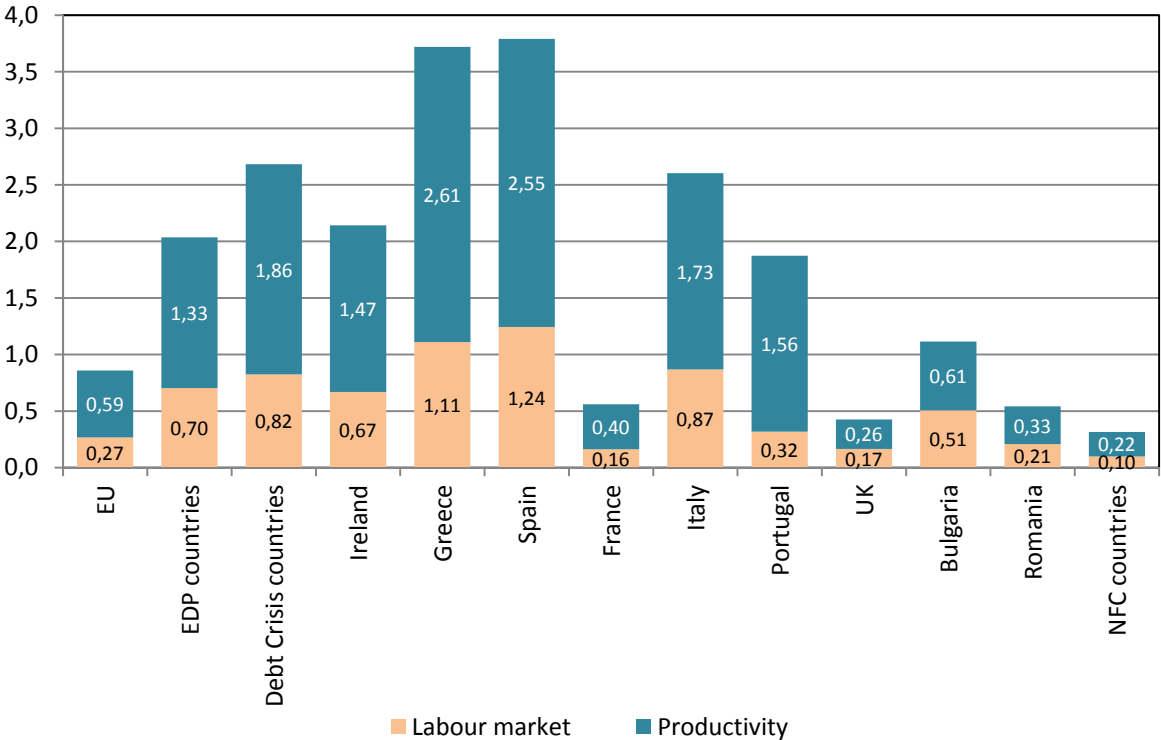
response in the EU. Scenario 5 assumes a high sensitivity to unemployment as the one estimated for the fiscal consolidation countries.

According to our estimates for scenario 4, the long-run effect would be positive for both the EU and all the countries considered (Figure 13). The reason is that all of them have experienced more youth unemployment due to the crisis. This high unemployment reduces the opportunity cost of studying and fosters a decrease in the dropout rates and better educational attainment levels for the working age population. A more qualified population participates more in the labour market, has more employability and is more productive. As a result, long-run income per capita would be higher than otherwise.

The positive effect is paradoxically more pronounced in those countries whose labour markets have suffered a deeper crisis, such as Spain and Greece (close to 3.5% in both countries) and/or those where participation, employability and labour productivity rise more sharply for a given increase of the educational levels of their population.

As we can see, the average effect in the fiscal consolidation countries is clearly more intense than in the EU as a whole (0.86%), doubling it in the case of the EDP countries (2%) and tripling it in the case of the Debt Crisis countries (2.7%). The effect is negligible for the NFC countries (0.32%) since they have experienced a much better performance in terms of employment opportunities for young people. Most of the positive effect comes from labour productivity, although labour market effects are also significant in some fiscal consolidation countries.

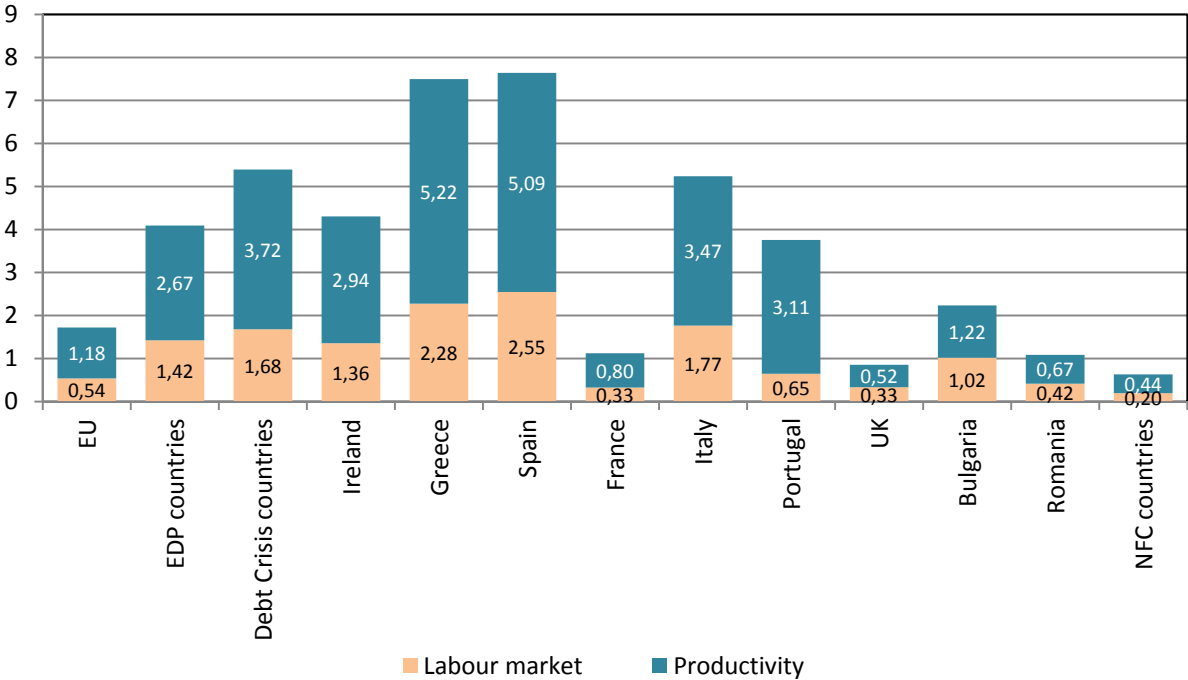
Figure 4. Long-rung GDP per capita. Percentage of increase associated to the real variation of the youth unemployment rate after 2007 (low sensitivity scenario 4).



Source: Own elaboration

As was to be expected, the estimated long-run effects are even more intense in the scenario 5 (Figure 14), which assumes a higher sensitivity of dropout rates to youth unemployment in line with the specific results obtained for fiscal consolidation countries in section 4. The size of all the effects double those commented in scenario 4. These high estimates should be preferable in the case of the fiscal consolidation countries, especially those within the Debt Crisis group. For the latter the average effect is over 5%, but it exceeds 7% in the case of both Greece and Spain.

Figure 5. Long-rung GDP per capita. Percentage of increase associated to the real variation of the youth unemployment rate after 2007 (high sensitivity scenario 5).



Source: Own elaboration

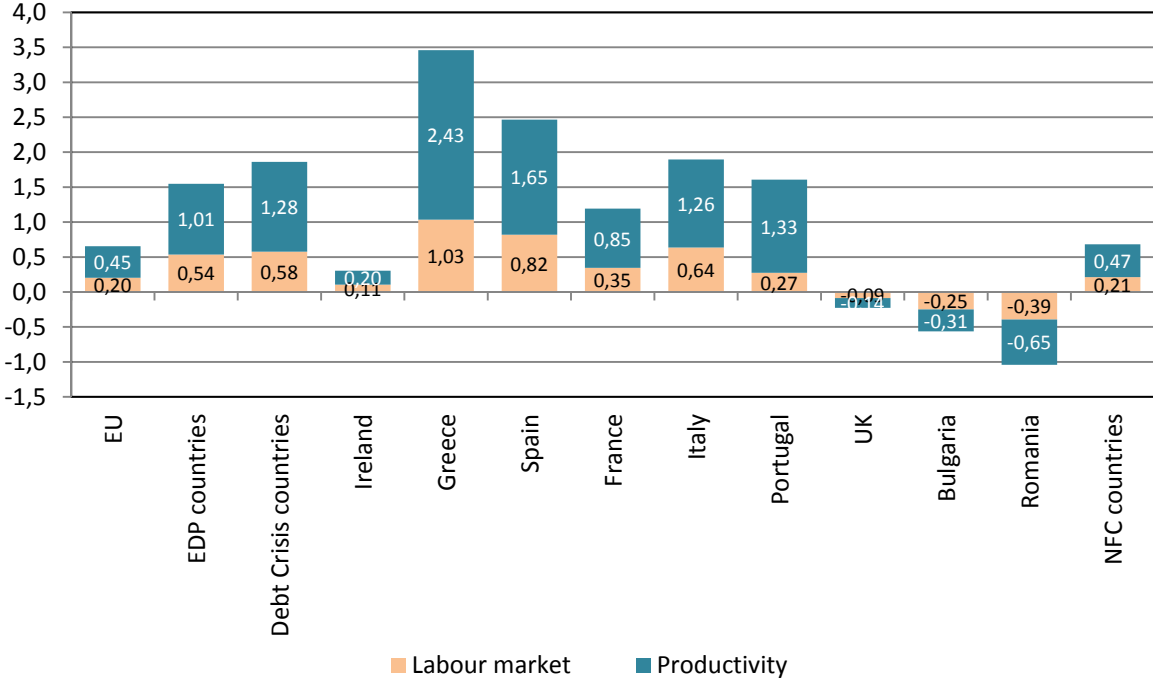
On the one hand, our estimates show that fiscal consolidation might have negative long-run effects on the GDP per capita (scenario 3). The effects would work through less human capital accumulation. They depend on the degree in which fiscal consolidation reduces public expenditure on education or no. On the other hand, our estimates also show that economic crisis could have positive long-run effects if youth unemployment rates rise sharply, cutting the opportunity cost of education for individuals (scenarios 4 and 5).

All those estimates are ceteris paribus estimates, holding the other factors constant. Nevertheless, this assumption would not be too realistic since fiscal consolidation would not have existed, at least not in the same way, without the crisis. Both phenomena go hand in hand. Therefore, we should consider both factors jointly in order to estimate properly the effect of fiscal consolidation.

Scenario 6 is based on the scenario 3 estimates for the effect of the reduction in public expenditure on education and the scenario 4 results of the effect of youth unemployment. It assumes a low sensitivity of dropout rates to unemployment, being the more favorable case for a negative overall effect. The results of this scenario are shown in Figure 15. A total negative effect is indeed obtained

for a number of countries: UK, Bulgaria and Romania. Nevertheless, the predominant pattern is the opposite. The average effect for the EU is moderate but positive (about 0.6%). The size of the positive effect is higher for the EDP countries (1.5%) and especially for the Debt Crisis countries (1.9%). High youth unemployment more than compensates the effect of a more intense consolidation of the public expenditure on education. The effect is also positive for the NFC countries (0.7%), where there are neither high unemployment rates nor any significant fiscal consolidation measures. Actually, public expenditure on education grew moderately in those countries, fostering human capital accumulation and long-run output.

Figure 6. Long-rung GDP per capita. Percentage of increase associated to the real variation of both public expenditure and the youth unemployment rate (low sensitivity scenario 6).



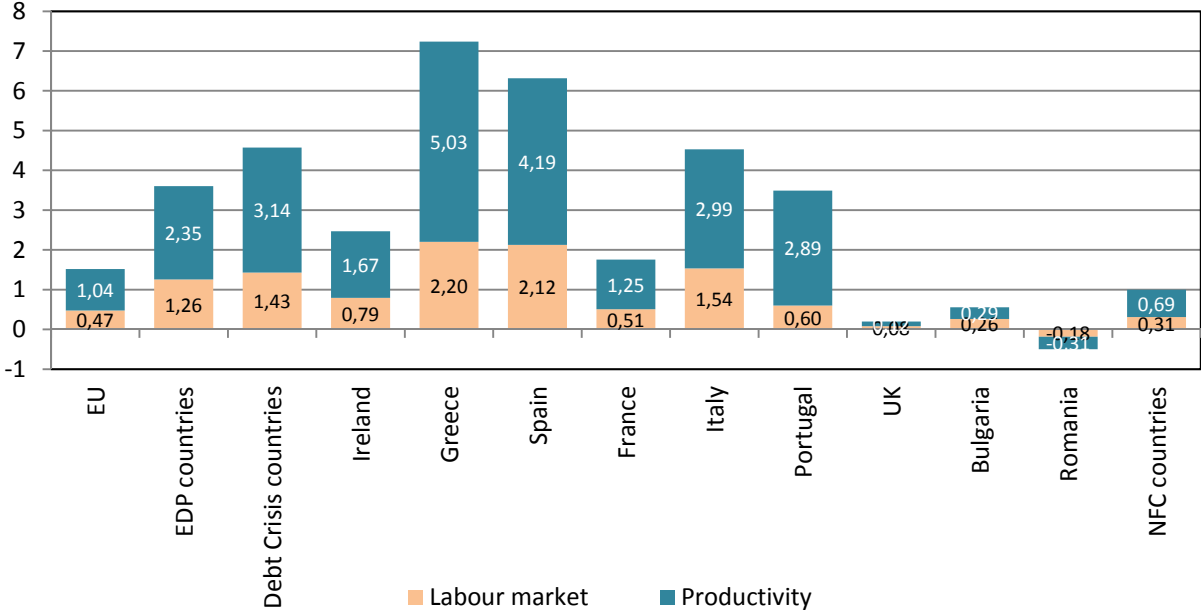
Source: Own elaboration

Scenario 7 is based on the high sensitivity to unemployment assumption, being the more favorable for an overall positive effect. The results of this scenario are shown in Figure 16. Now the estimated effects are positive for all the countries considered except Romania, although the size of those effects shows a great degree of heterogeneity. The average effect for the EU is again positive but higher than before (about 1.5%). The size of the positive effect also grows for both the EDP countries (3.6% now) and especially for the Debt Crisis countries (4.6% now). This is especially noteworthy since the high sensitivity assumption seems to be particularly appropriate for these countries according to the econometric results obtained in a previous section. The effect also grows for the NFC countries but more moderately (up to 1%) due to the very small increases experienced by their youth unemployment rates after 2007.

The last scenario (scenario 8) is based on the real change of dropout rates after 2009. The estimates show positive effects for all countries apart from Romania, the only country experiencing falling dropout rates among those considered in our analysis (Figure 17). The effects are higher for fiscal

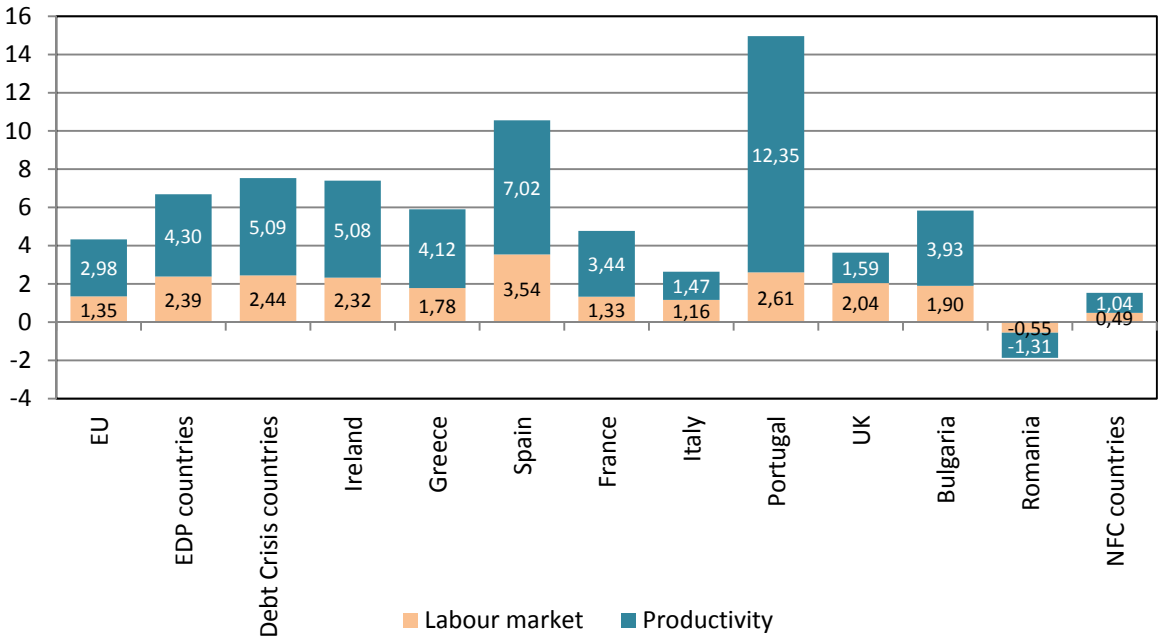
consolidation countries than for the others, especially for the Debt Crisis countries (7.5%) but also for EDP countries (6.7%). The average effect for the EU would be 4.3%, while it would be lower, although still positive, for the NFC countries (1.5%). Portugal and Spain show the biggest effect (over 10%), while in Italy it would be smaller (2.6%). As in previous scenarios, most of the effect comes from labour productivity although labour market effects are also substantial.

Figure 7. Long-rung GDP per capita. Percentage of increase associated to the real variation of both public expenditure and the youth unemployment rate (high sensitivity scenario 7).



Source: Own elaboration

Figure 8. Long-rung GDP per capita. Percentage of increase associated to the real variation of dropout rates after 2009 (Scenario 8).



Source: Own elaboration

The difference between these results and those of scenarios 7 and 8 are driven by the variation of dropout rates not explained by the factors taken into account in those previous scenarios (public expenditure on education and youth unemployment). Other variables, such as family, personal, economic and institutional factors, also play a role.¹² The fall of dropout rates in Portugal and Spain, among other countries, is faster than expected according to their performance in terms of public expenditure on education and youth unemployment. The opposite happens in Romania.

Our results show that fiscal consolidation by itself, apart from any effect in the short-run, might have some moderate negative effects on the long-run income per capita perspectives for those countries more affected by it. Nevertheless, this result is true only in the sense that without reductions on public expenditure *and holding all the rest constant* the perspectives would be somewhat better in the long-term. Fiscal consolidation has been however intrinsically linked to the economic crisis in the EU. Therefore, it makes little sense to estimate any effect of fiscal consolidation without taking into account other impacts on educational choices due to the 2007 crisis, such as those operating through youth unemployment. From that point of view, our estimates do not show any negative impact on the long-term perspectives for GDP in the EU as a whole or, especially, those countries more affected by fiscal consolidation.

All the previous long-run estimates assume that both fiscal consolidation and higher youth unemployment rates are permanent. In that sense, they are upper bound estimates.¹³ It does not seem realistic that those very high unemployment rates may be permanent. Therefore, the long-run positive effects would be much lower or would vanish completely, being much more temporary. However, the same argument applies to fiscal consolidation. It does not seem realistic to assume that the reductions on real public expenditure on education will be permanent either. Therefore, any long-run negative effect due to them would be much more temporary also. The most sensible assumption is that both phenomena would fade away progressively and simultaneously.

The size of these more moderate effects would depend on the duration of the treatment (fiscal consolidation plus youth unemployment). A few back-of-the-envelope calculations may be useful. For example, a 10-years treatment would imply that roughly one fifth of the working age population at most would be affected, modifying their dropout choices accordingly. In that case we would not be too far away from the mark by considering that the size of the effect would be roughly a fifth of our long-run estimates and that the effect would vanish completely after approximately 50 years.¹⁴

Finally, in order to assess the relevance of our long-run estimates, it is convenient to compare them with the potential long-run effects coming from other sources such as technical change. Again, some back-of-the-envelope calculations might prove useful. For example, raising annual TFP growth from 1% to 1.1% during 50 years would amount to an accumulated effect of 6% on long-run GDP per

¹² Notice the significance of family and personal variables in the dropout probit models with individual microdata (step 1, section 4, Table 5). Notice also the significance of both country and time effects in the OLS dropout models (step2, section 4, Tables 6-11).

¹³ They assume also that all new entrants in each educational level will complete it successfully. This is another upper-bound hypothesis. Considering that a part of the students do fail and leave upper secondary education and tertiary education without graduating would imply reducing proportionately all our long-run estimates.

¹⁴ We consider 50 years a sensible approximation to the maximum working life-cycle of the average individual.

capita ceteris paribus. Actually, a 1.1% TFP growth rate would have an accumulated effect of 73% after 50 years. Raising annual TFP growth from 1% to 1.016% during 50 years would amount to an accumulated effect of 0.82%, the average long-run effect estimated for EDP countries assuming that the post-2009 reduction in real public expenditure on education is permanent (scenario 3).

7. Conclusions

Education is essential for the European Union countries if they want to be able to consolidate a new era of sustainable growth after recovering from the last economic and financial crisis. Human capital will be a key factor within a global economic scenario characterized by the importance of innovation and the need to preserve competitiveness.

Precisely as a result of the crisis public, public budgets have been under great pressure. The combination of falling tax revenues and increasing public spending (related to rising unemployment benefit payments, banking sector rescue packages, etc.) produced huge and persistent public deficits in some countries. Among serious doubts about the sustainability of public finances and even the existence of the euro, some Governments had (almost) insurmountable problems to manage their public debt, experiencing dramatic increases in the risk premia. The European Commission opened Excessive Deficit Procedures to most EU countries in order to ensure that Member States adopted appropriate policy responses to correct excessive deficits. Many of them are still ongoing. Although the education sector is indeed considered one of the foundations of sustainable growth, some EU Governments have reduced their public spending on that area. The need of short-term fiscal consolidation has forced them to take those undesired measures.

The aim of this research has been to analyze the impact of fiscal consolidation on economic growth through its effect on the education sector and human capital accumulation. European countries allocate a significant amount of public resources to the educational system. This effort makes more sense inasmuch as it is expected that the sacrifice made in the present will allow to reap a number of benefits for society in general in the future. So, from the point of view of economics, education can be considered as an investment whose profitability will depend heavily on the economic effects of education in terms of a better and more intense employment career for graduates.

The paper has focused on analyzing: i) the impact of fiscal consolidation on public expenditure on education; ii) the effects of crisis (youth unemployment) and fiscal consolidation (real public spending on education) on human capital accumulation (dropout rates) and iii) the effects of educational attainment on participation, employability and labour productivity.

The results show that fiscal consolidation has been negative for the levels of public spending on education in real terms, especially for the EU countries more affected by it. Nevertheless, it is relevant that the decreases come in most countries after significant increments during the first years of crisis (the final levels of real public expenditure on education being similar to the 2007 levels for the EDP countries and higher than the 2000 levels in almost all the countries considered). The fiscal consolidation countries have also experienced a higher increase of their youth unemployment rates and, furthermore, have improved more their dropout rates.

The estimates from econometric models on the determinants of dropout rates indicate that public expenditure, *ceteris paribus*, might reduce dropping-out. However, they also show that dropout rates are rather sensitive to youth unemployment, especially in those countries more affected by fiscal consolidation and economic crisis. The empirical analysis has also shown that educational attainment has significant positive effects on labour market participation, employability and labour productivity.

Some estimates of the impact on long-run output per capita under different assumptions have been obtained based on those results. All in all, those estimates show that a *permanent* fiscal consolidation might have some moderate negative supply-side effects on the long-run perspectives for those countries more affected by it compared with a scenario of similar effects of crisis on youth unemployment rates. For the average fiscal consolidation country the estimated effect would be equivalent to a 0.02 p.p. increase of TFP growth.

However, since fiscal consolidation in the EU has been due to the economic crisis, any effect of fiscal consolidation should consider also the impact of youth unemployment. From that point of view our estimates do not show any negative impact on the long-term perspectives for GDP in the EU as a whole or, especially, those countries more affected by the need of fiscal consolidation. On the contrary, the estimated effect is positive especially in the fiscal consolidation countries. These results are coherent also with the estimated long-run positive effect obtained using the actual evolution of dropout rates from 2009 onwards.

Fiscal consolidation might, *ceteris paribus*, affect negatively educational attainment when public expenditure on education is reduced due to the need of austerity as a result of the impact of economic crisis on public finances. However, also as a result of the economic crisis, job opportunities for young people have drastically decreased on the fiscal consolidation countries. The substantial fall in the opportunity cost of studying seem to dominate any negative effect from a lower level of public spending on education in the case of the EU.

Interestingly, this is an area in which the last crisis could have some long-run positive supply-side effects, fostering accumulation of human capital by reducing dropping out and extending schooling precisely in those countries more affected by the crisis and for that reason also by fiscal consolidation policies. In the EU the net effect on education would be even positive due to the combined effects of fiscal consolidation and crisis, human capital accumulation being more intense than in non-crisis-and-non-fiscal consolidation periods.

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