

INVESTMENT IN EDUCATION IN PORTUGAL: RETURNS AND HETEROGENEITY*

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“If you think education is expensive, try ignorance”

Derek Bok

President of Harvard University, 1971-1991

1. INTRODUCTION

Education plays a key role in the modern economic and social development process. Sustainable economic growth in developed economies requires a population of workers, entrepreneurs and managers with high level of schooling. This is the only possible way to foster the creation and adoption of new ideas. Throughout the 20th century Portuguese economic growth was relatively constant, albeit more consistent after the 1950s. However, developments in education were quite irregular. During more than two thirds of the 20th century the median schooling level of the Portuguese population was just 4 years of schooling. Despite the progress seen in the past few decades, the educational structure in Portugal remains rather fragile compared with the other advanced economies. This acts as a binding constraint to the growth of the Portuguese economy in the present and in the future.

Technological developments were always skill intensive across this period and skills fuel the creation and utilisation of technological innovations. The economies that recorded the most significant progress throughout the 20th century were those that combined a workforce with high levels of schooling with growth-promoting institutions, such as the type of government and those protecting property rights (Katz and Goldin, 2008). Among the several countries, reference should be made to the United States, the 20th century leader of education for the whole population. More recently, some countries made remarkable progress in education, such as Japan and Ireland, both currently with rather high schooling levels. The result of this individual and collective investment was the creation of a competitive advantage in the area of innovation and strong economic growth. By contrast, Portugal began the Human Capital Century, as the 20th century is often referred, with a reduction in the number of compulsory years of schooling, from 5 years in 1919, to 3 years in 1930. This situation lasted for more than 30 years and, at the beginning of the last quarter of the century, the workforce in Portugal had the lowest schooling level of all OECD countries.

Education is at the top of individual decisions and has certainly the strongest impact on labour productivity and hence on the return that workers obtain from the labour market, taking the form of higher wages. Education is also vital for workers to take advantage of the demand for skills that is

* The authors thank the comments and suggestions of António Antunes, Ana Cristina Leal, José Ferreira Machado and José Francisco Maria. The opinions expressed in the article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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associated with technological progress. If the supply of more qualified workers does not move in line with the increase in the demand for skills, the income gap between the most and the least educated increases. This type of inequality results from the operation of market mechanisms and, for a given institutional structure, it can only be changed through a massive rise in schooling. When there is a shortage of skills, a broad-based rise in education is also accompanied by strong economic growth.

Developments in the supply and demand for skills, which characterised the Portuguese economy in the 20th century, conditioned its development pattern at the beginning of the 21st century. In the last three decades, through the increasing openness and world economic integration, technological changes in the Portuguese economy seem to have increased. However, the ensuing benefits were distributed in a very asymmetrical way, giving rise to the most unequal income distribution among OECD countries. In fact, labour market opportunities were only available for a reduced percentage of its participants, *i.e.* those with higher schooling level. Thus, most Portuguese workers were not able to profit from the increased demand for skills.

During the last thirty years there were times when the majority of the Portuguese population improved their income level, although those in the upper tail of the income distribution benefited the most. However, there were also periods when wage gains of workers in the lower quartile of the distribution were almost non-existent (or negligible).

The Portuguese experience shows how periods of economic growth may be associated with higher income distribution inequality. The key to understanding these developments lies in the schooling level of the population. In this context, it is not surprising that inequality increases whenever technological developments are associated with a constant or modestly dynamic qualifications structure. It should be noted that several institutions in the Portuguese labour market tend to favour wage compression (minimum wage, centralised wage negotiation and unemployment benefits). Nonetheless, developments in the supply and demand of skills played a major role in determining inequality developments favouring the more skilled individuals.

At the beginning of the 1980s the workforce had an extremely low schooling level. More than a decade and a half was needed to see a significant improvement in the qualifications structure. Even though, Portugal was never able to keep pace with its European partners, as regards the increase in the qualification levels of its workforce. In fact, individual decisions have been framed by an inefficient incentives system, with particular emphasis on low compulsory schooling and weaknesses at preschool level (preschool was created in 1919, but was persistently kept at a nearly incipient level, despite some recent progress), but the set of labour market institutions also played a role. Education decisions are also conditioned by the underlying social dynamics, namely at the household level. In fact, education has a very strong intergenerational component. In all countries of the world the composition of households is quite homogeneous in educational terms and the schooling path of children is strongly influenced by their parental education experience. Portugal is one of the OECD countries with a particularly marked intergenerational transmission.

These dynamics tend to increase inequality when computed at the household level and to perpetuate it during successive generations. The only way to break these generational cycles is through the introduction of an education system that promotes equal access and high standards and *de facto* eliminates its elitist character.

In this article we measure the economic return to the different schooling levels in Portugal throughout the last thirty years. In the first part, taking as a basis the schooling structure of the Portuguese population, we measure wage returns in the labour market. By doing this, we explore developments in the skill supply and demand, identifying the impact of changes in each of these market forces in

the valuation made in Portugal of educational degrees. Developments in labour demand over this period were dichotomic. Until the mid-1990s there was a strong increase in the demand for skills, and the employment structure moved towards higher skilled jobs. Conversely, between 1995 and 2006, there was a polarisation of the demand for labour, and less qualified jobs increased their share in the employment structure, while more qualified jobs continued to gain weight in total employment. In the most recent period, the supply of skills recorded a remarkable evolution, with a significant increase in the weight of college graduates in the private sector. The second part of this article focuses on household-related issues and extends the concepts to the total income and expenditure variables. Unsurprisingly, the return on education remains high when it is estimated at the household level. Education continues to play an important role in this result, although relatively more marked in the case of the income variables than of the expenditure variables.

The success of the Portuguese economy depends on the schooling level of its population. Institutions must allow the return to this investment to be obtained by those who have made it. This is the only way to guarantee that the required investment level does not remain below what is socially desirable. In this context, a broadly based and universal focus on preschool is vital, in line with the evidence demonstrating that the earlier in the life cycle investment is made in education, the higher the return (Carneiro and Heckman, 2003). In addition, it is crucial to put in place an economic regulation system that promotes equal access to opportunities available on the labour market. It is essential that the tax system does not distort education decisions, which should obtain a return as an investment in skills, and that labour market regulations do not promote the segmentation of the market, which implies more difficult access to new and better employment opportunities and concentrates the market risk on the youths.

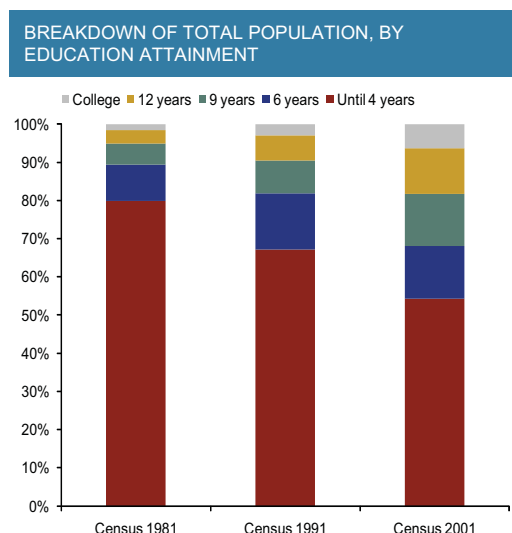
The remaining of this article is organised as follows: Section 2 describes the educational transition seen in Portugal in the past three decades. Section 3 focuses on the estimation of the individual return to education in the labour market in Portugal for the period 1982-2006, in particular on developments in the wage premium in college education. Section 4 extends the analysis to households and to the income and expenditure aggregates. The whole article assesses not only the average return but also its dispersion, according to educational attainment. Section 5 concludes.

2. EDUCATIONAL TRANSITION IN PORTUGAL

In the last three decades there was a profound educational transition in Portugal, which has not been fully materialised yet. Charts 1 and 2 illustrate this fact, taking as a basis the last three population censuses. At the beginning of the 1980s, the Portuguese population was characterised by extremely low schooling levels. Approximately 80 per cent had a maximum of 4 years of schooling, and the number of illiterate persons stood at 20 per cent (see Office of Statistics and Education Planning/Ministry of Education (*GEPE/ME*) and Statistics Portugal (*INE*), 2009). In turn, the share of individuals with complete college education stood at less than 2 per cent. Low schooling was also prevalent in the workforce, with more than 80 per cent of the individuals having a maximum of 6 years of schooling.

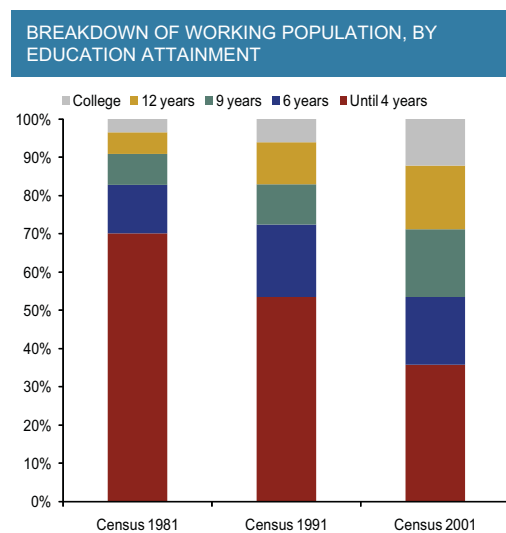
The widespread coverage of the population by the education system – also reflecting the impact of the increase in compulsory schooling from 6 years in 1964 to 9 years in 1986 – implied a significant change in the distribution of schooling in the past few decades. Between the 1981 Census and the 2001 Census, the share of the workforce with a maximum of 6 years of schooling decreased by 30 percentage points (p.p.) and the share of the workforce with 12 years of schooling or more increased by 20 p.p. Thus, average schooling in Portugal rose significantly over these decades. The dispersion of educational distribution also increased in Portugal. While in 1981 the large majority of individuals was concentrated in the lower schooling levels, in 2001 all schooling levels considered had significant weight, in particular as regards the workforce distribution (Chart 2).

Chart 1



Source: INE (Census 1981, Census 1991 and Census 2001)

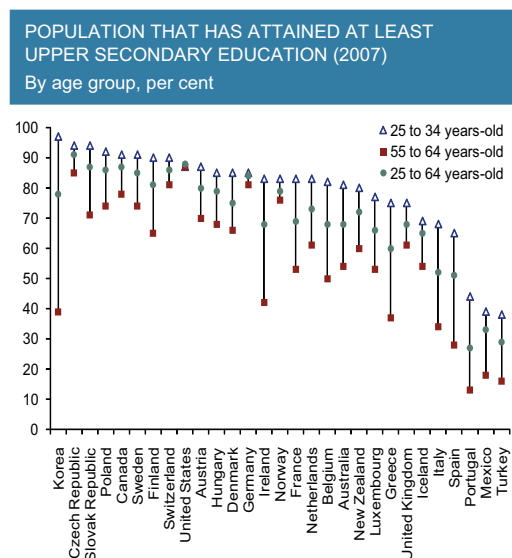
Chart 2



Source: INE (Census 1981, Census 1991 and Census 2001)

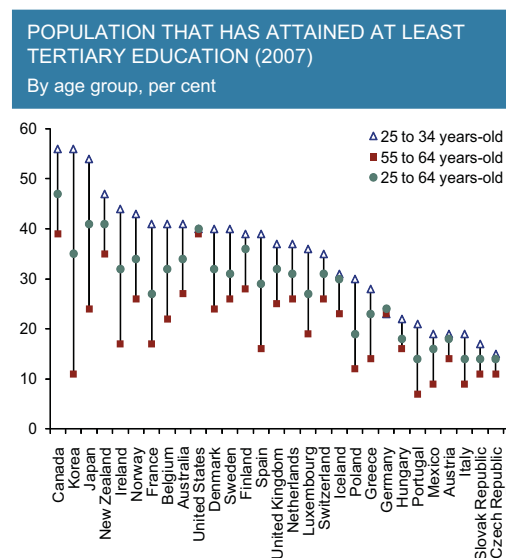
Despite these positive developments, the current average level of schooling of the Portuguese population remains particularly low compared with developed countries as a whole. As illustrated in Charts 3 and 4, in 2007 Portugal recorded the lowest share of 25- to 64 years-old with complete secondary education and one of the lowest shares of individuals with complete college education in OECD countries as a whole. In fact, in 2007 only 27 per cent of the 25- to 64 years-old had completed secondary education in Portugal, compared with an average of 70 per cent in OECD countries. To illustrate the time lag between Portugal and the world schooling leader in the 20th century, it can be noted that the current educational distribution of the workforce is close to the one in the United States in 1930 (Goldin and Katz, 2008).

Chart 3



Source: OECD.

Chart 4



Source: OECD.

The education performance gap is also significant in the younger generations. Although in most recent years the dropout and retention rates during compulsory schooling in Portugal recorded a

decline, there is still a low completion rate of secondary and college education compared with OECD countries (Charts 3 and 4). It should be noted that in 2007, the share of 25- to 34 years-old having completed secondary education was still lower than for the total workforce in most OECD countries.

¹The same applies to college education.

The above evidence has two direct implications. First, a strong boost in the degree of schooling of the younger generations is still needed to achieve convergence with the average in developed countries. Second, the convergence process will only reach maturity after a particularly long period of many decades. In the case of Portugal, the duration of this process will tend to be increased by two factors. On the one hand, the low birth rate currently recorded in Portugal implies a demographic transition towards the ageing of the population and a reduction in the workforce. This is a binding constraint on a rapid educational transition. On the other hand, Portugal is characterised by a high degree of intergenerational transmission of education, *i.e.* the parental educational level strongly conditions the schooling path of children (Carneiro, 2008, and OECD, 2010). The education system is thus not able to eliminate the starting differences associated with the parental background. This prevents *de facto* an equality of opportunities and conditions the pace of progress of the educational attainment of the younger generations, restricting the degree of social mobility.

Therefore, it is possible to foresee that throughout the next decades, the Portuguese economy will continue to be characterised by a relatively low human capital stock. Obviously, this stock must also be assessed in terms of its quality. In this regard, the OECD Programme for International Student Assessment (PISA) is particularly relevant, as it assesses the ability of 15-years old students to use their knowledge to overcome day-to-day challenges, in the areas of reading, mathematics and science. According to the results available – for the years 2000, 2003 and 2006 – Portugal persistently ranks among the last in terms of OECD countries, across all tests. This conclusion does not change even when taking into account differences in the countries' *per capita* GDP.

Three fundamental ideas of the brief characterisation made above should be retained. First, over the past thirty years there was a significant educational transition in Portugal, with a marked rise in the average schooling level and an increase in the dispersion of the educational distribution. Second, current schooling levels in Portugal continue to be particularly low in the context of the developed countries. Finally, the convergence process towards the present educational structure in developed countries still calls for a significant improvement in the education performance of the younger age groups and will tend to be particularly protracted.

3. WAGE STRUCTURE AND THE RETURN TO EDUCATION

The Katz and Murphy (1992) model is used in this section to analyse changes in the Portuguese wage structure that occurred between 1982 and 2006. The Portuguese labour market is a particularly suitable scenario for using this model. In fact, in the past two and a half decades there were important changes in both the demand for and the relative supply of skills, which can be used to identify the wage premium for education. Throughout this period, the institutional framework remained rather stable, which facilitates the economic analysis of supply and demand developments based on this model.

The relative supply of skills (understood as the different degrees of educational achievement) has had distinct developments. From 1982 to 1995 the share of college graduates increased only slightly, remaining at very low levels. After 1995 the number of graduates increased considerably, their weight

(1) According to the latest data available, the share of the population aged between 20 and 24 that had completed secondary education stood at 54.3 per cent in 2008 (see *INE*, 2009).

in private sector total employment increasing by almost 8 p.p. As regards the demand for skills, the recent experience of the Portuguese economy is typical of other developed economies, with growing international economic integration. In the Portuguese case, this occurred initially within the European Union and later at a more global level. These market forces gave rise to an increase in wage inequality. The increase in upper-tail inequality was much sharper over the first half of the period under analysis (until the mid-1990s), but continued into the most recent period. The deceleration after 1995 results, in particular, from an extraordinary increase in the supply of skilled workers. This seems to have even caused a decline in the college wage premium for the younger and more skilled generations. The rise in lower-tail inequality was more contained, which may be associated with the role of labour market institutions, such as the minimum wage. Inequality and the education wage premium in Portugal were previously analysed in Cardoso (1998), Machado and Mata (2001), Martins and Pereira (2004), Portugal (2004) and Machado and Mata (2005).

This section is organised as follows: Subsection 3.1 briefly describes the database used. Afterwards, the most relevant wage structure developments in Portugal during the 1982-2006 period are documented. Subsection 3.3 presents changes in the age and education structure of private sector employment. Subsections 3.4 to 3.6 analyse in detail developments in the wage premium and its immediate causes. Finally, Subsection 3.7 documents wage dispersion stemming from the mentioned wage differentials.

3.1. Data

Quadros de Pessoal is an administrative dataset collected on an annual basis (reported to October of each year) by the Portuguese Ministry of Labour and Social Solidarity (*MTSS*). Coverage is mandatory for firms with at least one salaried worker, except for civil servants, entities that employ non-permanent rural workers, and domestic workers.

The data are available from 1982 to 2006, with the exception of the years of 1990 and 2001. For the purpose of this study, we collect the monthly wage, hours worked, age, education, and occupation of workers. In 2006, the data cover nearly 3 million employees.

Quadros de Pessoal registers different wage components. We use the base wage measure, which corresponds to the monthly wage of regular working hours. Additionally, we consider only full-time workers (defined as those that worked at least 120 hours in the month reported) and earning at least the minimum wage.

3.2. Structure of employment

Wage differences observed across age groups and education levels result from an interaction between supply and demand factors in the labour market, and are therefore equilibrium values. In Portugal there was a rather significant change in the supply of skills in the private sector (Table 1). The share of low-skilled individuals (with 6 years of schooling or less) declined by around two thirds, accounting for 23.5 per cent of employment in 2006. The share of highly skilled workers (college degree) rose from 2.5 per cent in 1982 to 12.9 per cent in 2006. This educational recomposition of the workforce results from legislative changes that have extended compulsory education (to 6 years and 9 years in 1964 and 1986 respectively), but also from a strong investment in college education since the early 1990s. The age composition of employment also changed during this period. The share of young workers declined from 53.6 per cent in 1982 to 45.5 in 2006, and among these, the share of highly skilled workers rose from 2 per cent to close to 18 per cent.

Table 1

WORKER SHARE BY AGE AND SCHOOL LEVEL (PER CENT)			
	1982	1995	2006
6 or less years of schooling			
Age < 36	33.4	15.8	3.7
Age 36-45	16.0	13.2	6.8
Age > 45	19.3	15.3	13.0
All	68.8	44.2	23.5
9-12 years of schooling			
Age < 36	19.0	34.0	33.8
Age 36-45	5.8	10.1	18.3
Age > 45	4.0	6.5	11.5
All	28.7	50.6	63.6
College degree			
Age < 36	1.2	2.8	8.0
Age 36-45	0.7	1.4	3.1
Age > 45	0.5	1.0	1.8
All	2.5	5.1	12.9

Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: Educational and age structure of salaried workers.

3.3. Private sector wage structure in the past 25 years

Chart 5 shows the basic changes in the Portuguese economy's wage structure based on the changes in real wages for men and women between 1982 and 2006. Over this period, the wage distribution shifted to the right, resulting in a real wage increase in all percentiles. In this process, wage gains for women are higher than for men in all percentiles. For example, the median wage increased by 20 per cent and 10 per cent respectively for women and men.² These developments largely reflect the fact that women surpassed men in terms of their level of qualifications. In 1982, 2.6 per cent of men held a college degree and only 1.7 per cent of women had equivalent qualifications. However, in 2006 the share of women who were college graduates had already reached 16.3 per cent, an increase of almost 10 times, while male graduates increased by only four times, to 10.5 per cent.

Chart 5 also shows the non-monotonic widening the wage distribution over the past two and a half decades, with a considerable increase in wage dispersion. For men, gains remained constant below the median, increasing dramatically at the right tail of the distribution, while for women there was a slight increase in the lower tail of the distribution and a considerable increase above the 60th percentile.

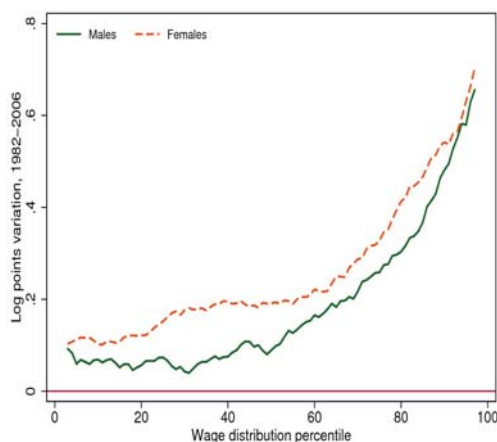
The two panels in Chart 6 break down this pattern into two periods, 1982-1995 and 1995-2006, for each gender. As will be made clear throughout this article, the two periods are a natural way of dividing the sample due to a large inflow of graduates into the labour market in the mid-1990s.

Developments in the wage distribution are quite different, for both men and women, in both sub-

(2) Chart 5 shows changes in log points. The percentage change is given by the exponential of the change in log points minus 1.

Chart 5

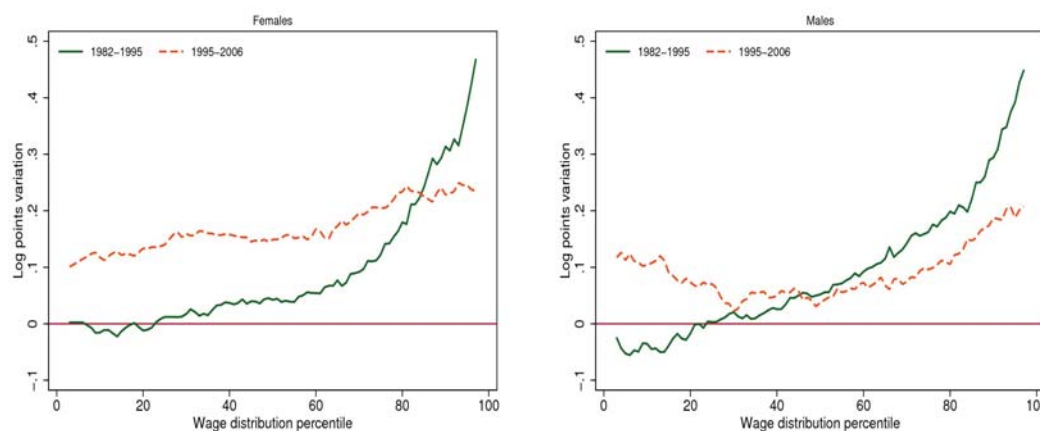
REAL WAGE CHANGES BETWEEN 1982 AND 2006, BY PERCENTILE AND GENDER



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).
Nota: The chart plots, for salaried workers, real wage growth between 1982 and 2006 for each percentile of wage distribution.

Chart 6

REAL WAGE CHANGE FOR MEN AND WOMEN
 For the 1982-1995 and 1995-2006 periods, by percentile



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).
Note: The chart plots, for salaried workers, real wage growth over the two sub-periods, *i.e.* 1982-1995 and 1995-2006. Calculations are made separately for each percentile of the wage distribution for men and women.

periods. For men, in the 1982-1995 period there was a strong increase in the upper-tail wages (the 90th percentile rose by 35 per cent), with modest gains in the central part of the distribution (the median wage rose by only 5 per cent) and even declines in the lower tail (the 10th percentile declined by 4 per cent). For women, real wages at the lower tail remained constant, while rising considerably in the upper tail (above 35 per cent). In the second period, lower-tail wages for women increased clearly above those in the previous period (above 12 per cent). For men, there was a polarisation of wage gains; an increase of more than 11 per cent in lower-tail wages and around 20 per cent in upper-tail wages. In the intermediate percentiles (20th to 80th) real wages increased, on average, only 7 per cent.

3.4. Return to education

In the same way as the success of Robinson Crusoe in the fictitious desert island depended on productive characteristics, such as the availability of natural and physical resources, and the ability to explore them, wages in market economies also reflect the productive characteristics of the economy and of workers. From among these characteristics, human capital and technological knowledge are directly influenced by investment decisions made by individuals over their lives. In fact, the most important factor to determine human capital is the investment in education (experience and training are the other ways of increasing it).

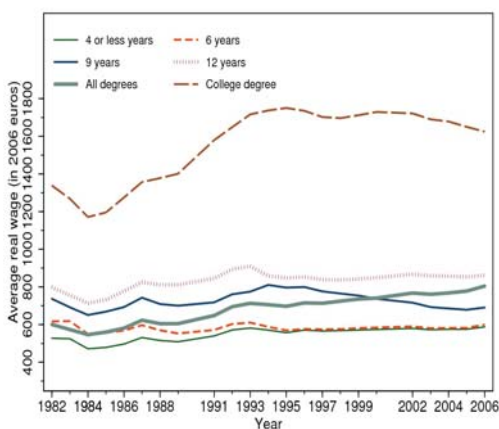
As any other investment, education produces a return. In all markets, the rate of return is a function of developments in market conditions. For a given level of supply, an increase in demand generates a higher rate of return. In a global economy marked by constant technological developments, which raises the demand for goods and services with greater value added, the demand for a more skilled workforce tends to increase, resulting in higher returns for the more educated workers. The tradition of analysing returns to education in a context of supply and demand dates back to Freeman (1975, 1977), although nowadays it still plays a key role in labour economics, as shown by the seminal works by Katz and Murphy (1992) and Card and Lemieux (2001).

Despite the progress achieved as of the mid-1990s, in Portugal the supply of skilled workforce is still scarce, as seen in Subsection 3.2. Under these supply and demand conditions, Chart 7 shows that obtaining a college degree yielded a significant rate of return. In 2006 graduates had, on average, a monthly basic wage of €1625, while the economy's average wage was €805. The marginal benefit of obtaining an educational degree above secondary education was, on average, €763, that is, close to the average wage of a worker with secondary education (€862).

Chart 7 also shows that the highest levels of schooling had large real wage gains between 1982 and 2006: secondary education (from €799 to €861) and college education (from €1339 to €1625). Individuals with the lowest level of schooling (4 years or less) also saw an increase in their average wage, from €527 to €588. This may be accounted for by the 10 per cent rise in the real minimum wage over that period. In 2006, individuals with 6 and 9 years of schooling had lower real wages than

Chart 7

REAL AVERAGE WAGE BY LEVEL OF EDUCATION, AT 2006 PRICES



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: The chart plots, for salaried workers, the average level of the real wage by schooling level in the private sector.

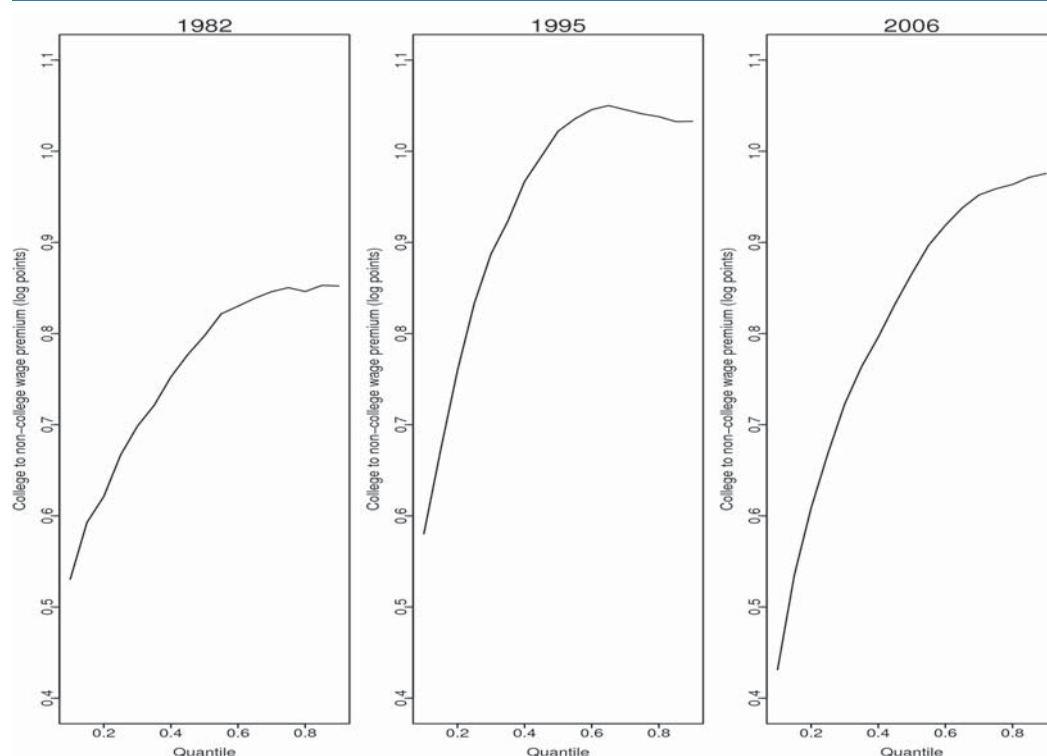
in 1982, respectively, less €20 and €50. The wage premium for individuals with 6 years of schooling, in relation to those with 4 years or less, ceased to exist, while in 1982 it stood at around 17 per cent. This may stem from the extension of compulsory education to 9 years in 1986, which caused the qualifications of workers with only 6 years of schooling to be less valued in the labour market. During the 1980s workers with 9 years of schooling had real wage gains. However, since 1995 they have also been recording losses in the real purchasing power of more than €100 (from €796 to €691).

Chart 7 is based on average wages per level of education. However, the wage distribution is far more heterogeneous than its average value. Hence, the wage premium is not likely to benefit evenly all wages prevailing in the economy. This possibility and especially the manner in which the college premium varies across the wage distribution, can be studied on the basis of a quantile regression (Koenker and Bassett, 1978). The advantage of the quantile regression model is that it allows for the estimation of the effect of explanatory variables – particularly the impact of college graduation – on the wages at each percentile of the distribution. This model will be particularly interesting if the college wage premium is heterogeneous over the conditional wage distribution.

Chart 8 measures the college graduate wage premium in relation to all non-college graduates across the wage distribution for 1982, 1995 and 2006. Each point in the curves is an estimate of the college wage premium at each quantile of the (conditional) wage distribution. The college premium is estimated after controlling for worker experience and gender. It is clear from the 3 curves that college graduation gives rise to a considerable wage premium. The lowest gains, but still above 50 per cent, are associated with the lowest quantiles; in the upper tail of the distribution, gains frequently exceed 100 per cent (approximately 0.69 log points) of non-college wages.

Chart 8

COLLEGE WAGE PREMIUM BY QUANTILE



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: College wage premium estimates per quantile *vis-à-vis* all other educational levels. The estimation uses private sector salaried workers. In 2006 the 10th percentile of graduate wage distribution was 55 per cent higher than the 10th percentile of non-graduates, while the 90th percentile was about 160 per cent higher.

Over the years curves have moved considerably, which, as shown above, results from changes in market conditions. The strong demand for skilled workers in the late 1980s and early 1990s was met with limited supply, leading to a considerable rise in the college graduate wage premium between 1982 and 1995. The strong increase in the number of college graduate workers in the labour market led to a reduction of the wage premium in 2006. The sharpest decline was observed in the lower tail, which even reached values below those of 1982. In any case, the labour market yields a still attractive return on the investment in college education.

Overall, this evidence reinforces the idea that education is a well-paid investment, which requires, however, a permanent investment at the individual and collective level to reach higher living standards.

3.5. Reasons for the rise (and fall) of the wage premium

Autor, Katz and Kearney (2008) show that the increase in returns to education in the United States is an important component of the rise in inequality. Returns to education are quite high in Portugal, particularly for college graduates. This section attempts to explain changes in this return over time. For this analysis all other levels of education will again be grouped a “non-college” category.

In order to explain the college wage premium, it is necessary to account for supply and demand trends. Katz and Murphy (1992) use a formal model to study the evolution of returns to education. The analytic structure uses a CES (constant elasticity of substitution) production function to explain the educational wage differentials by fluctuations in labour supply and smooth trends in relative demand growth.

In this model, aggregate production depends only on the quantities of skilled and unskilled workers. The college wage premium, as measured by the logarithm of the ratio of college to non-college wages $\log\left(\frac{w_{ct}}{w_{ht}}\right)$ can be expressed as:

$$\log\left(\frac{w_{ct}}{w_{ht}}\right) = \alpha_0 + \alpha_1 t + \alpha_2 \log\left(\frac{N_{ct}}{N_{ht}}\right) + \varepsilon_t \quad (1)$$

where t is a time trend used to capture a gradual rise in relative demand and $\left(\frac{N_{ct}}{N_{ht}}\right)$ is a measurement of the relative supply of college workers. If the rise in demand is directed towards college graduates, α_1 is expected to be positive. The α_2 coefficient reports the sensitivity of the wage premium to the relative supply of college graduates (inverse of the elasticity of substitution); this coefficient is expected to be negative, given that an increase in the relative supply is likely to be associated with declines in the wage premium.

Centeno and Novo (2009) present less parsimonious models that include the unemployment rate to measure labour market conditions and the log real minimum wage and the average unemployment insurance per unemployed to capture labour market institutions that influence the wage premium. The reported results therein do not differ, however, from this simpler specification.

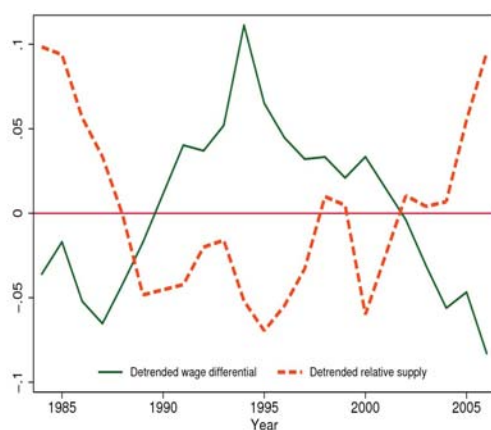
Chart 9 plots the relative supply of graduates and the college wage premium from 1984 to 2006, in deviations from a linear trend. The data show an accelerating relative supply of graduates since 1995; the opposite scenario occurred during the 1980s and in the early 1990s. Chart 9 can be seen as a dynamic demand and supply diagram, insofar as it shows that the wage difference grew over the 1980s and in the early 1990s, while relative supply grew below trend levels. This difference narrowed subsequently, when relative supply grew above trend levels. The symmetric behaviour of prices and

quantities shows that, in fact, market movements have been dominated by supply developments.

Chart 10 uses the estimates of equation (1) to predict the evolution of the college wage premium and compares it to the observed wage differential. The college wage premium grew sharply until 1995, stabilising thereafter. Fluctuations in the relative supply of college graduates, combined with an upward trend of relative demand, largely contribute to explaining developments in relative wages. In fact, the Katz-Murphy model makes an excellent prediction of the wage differential growth. The relative demand favoured the most skilled by making a positive contribution to the rise in the wage premium (3 per cent per year, comparable to the estimates available for other developed countries). The estimated elasticity of substitution is -1.4 (which stands between the higher elasticity of the United States (Autor *et al.* 2008) and the significantly lower elasticity of Germany (Dustmann *et al.* 2009)).

Chart 9

SUPPLY OF SKILLS AND WAGE DIFFERENTIAL IN DEVIATIONS FROM A LINEAR TREND

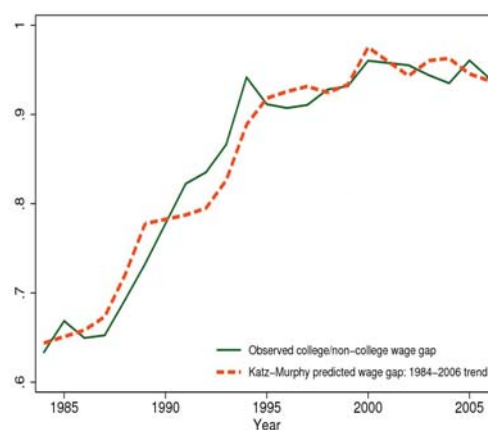


Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: The wage differential and the relative supply are calculated by adjusting the composition of employment by gender, education and experience. The relative supply and the wage differential in deviations from the trend are the residuals of the estimation by ordinary least squares of each variable in a constant and in a linear trend (for further details see Centeno and Novo (2009)).

Chart 10

ACTUAL AND ESTIMATED WAGE DIFFERENTIALS



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: The value predicted for the wage differential corresponds to the result of the estimation by ordinary least squares of the college/non-college wage differential, in a constant and in a measure of relative labour supply:

$$\log \left(\frac{w_c}{w_n} \right) = -0.27 + 0.03t - 0.72 \log \left(\frac{N_c}{N_n} \right)$$

For further details on the construction of these measures, see Centeno and Novo (2009).

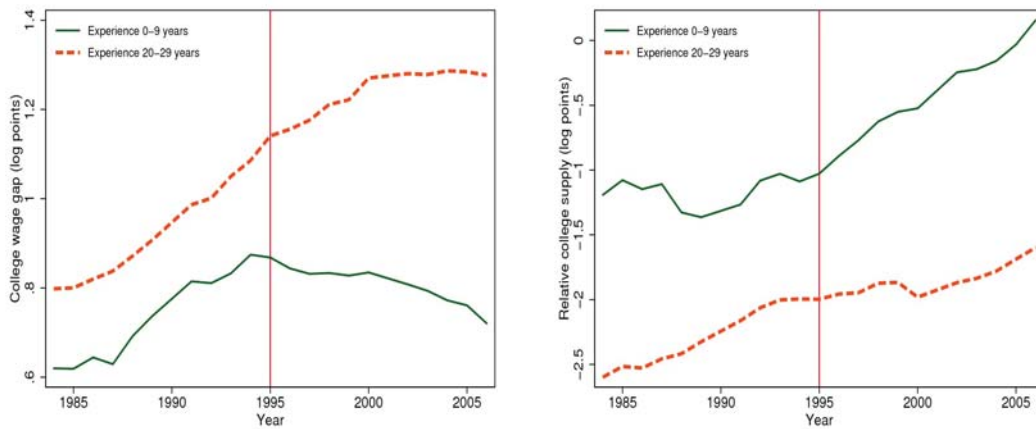
3.6. The college wage gap by experience group

Education and experience may not be perfect substitutes in production. In fact, if workers with the same level of educational attainment but different levels of experience are imperfect substitutes in production, wage developments are expected to be conditioned by the relative supply of skills by experience groups (Card and Lemieux, 2001). This effect will be reinforced if labour market institutions impair the replacement of more experienced workers with others less experienced but with higher skills. In this context, the strong educational increase amongst youth may have led to a narrowing of the college wage premium in this age group since the second half of the 1990s.

Chart 11 compares the trend of the college wage premium with the respective relative supply for different levels of experience (namely 0 to 9 and 20 to 29 years of experience). The left panel of the chart shows that the college wage gap rose similarly for both groups until the first half of the 1990s, but evolved differently from 1995 onwards. The behaviour of the gap after 1995 may reflect a number of factors. On the one hand, there has been a much swifter increase in the supply of graduates amongst less experienced workers since 1995 (see right panel of Chart 11). On the other hand, employment protection legislation makes younger workers weak substitutes for the more experienced

Chart 11

WAGE DIFFERENTIAL AND RELATIVE SUPPLY BY LEVEL OF EXPERIENCE



Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: The left-panel chart plots the college/non-college wage differential for the two experience groups, 0-9 and 20-29 years. The right-panel chart plots the relative supply of college graduates for these groups. For further details on the construction of these measures, see note to Chart 10 and Centeno and Novo (2009).

ones, thereby raising the incidence of fixed-term contracts among these workers, contributing to a segmentation of the labour market and reducing their bargaining power.

It is possible to estimate a model for the college wage gap by experience group by including in the analytic structure of Katz and Murphy the relative supply of skills within each experience group and for economy as a whole (Centeno and Novo, 2009). Hence, each experience group has a different elasticity of wages to shifts in the relative supply of within-group skills, in addition to reacting to supply in the economy as a whole. The previous analysis ignored differences in the experience distribution of educational attainment. However, the introduction of imperfect substitutability between younger (less experienced) and older (more experienced) workers makes it possible to identify different wage premium sensitivities depending on whether they refer to the aggregate relative supply of skills or to a specific experience-group supply. The model estimated in Centeno and Novo (2009) reports a within-group elasticity of substitution of -2.96 (which means that per each log point of increase in the relative supply of skills the wage premium is reduced by 0.34 log points). The elasticity of substitution in relation to the aggregate supply of skills is slightly lower (close to -2).³

From 1995 to 2006, the relative supply of skills in the group of workers with 0 to 9 years of experience increased by 79 log points relative to that of the group of workers with 20 to 29 years of experience. Over the same period the college wage premium declined by 15 log points for the less experienced workers and increased by 14 log points for the most experienced group (*i.e.* a 29 log point differential). By using the estimated elasticity, it is possible to account for 27 of the 29 log points increase in the college wage premium differential. This means that the fall in the wage differential observed since 1995 for the group of younger workers is almost exclusively accounted for by the extraordinary increase in the supply of skills for low levels of experience. These changes in wage premia occur in a context where there is no evidence of a decline in the relative demand for skills.

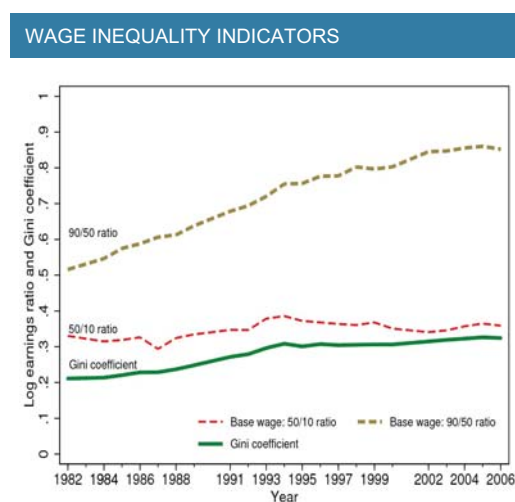
(3) The results of the separate estimation of the model for each of the four experience groups (0 to 9 years, 10 to 19 years, 20 to 29 years and over 30 years) lead to conclude that the sensitivity of wages to within-group supply declines with experience, *i.e.* the wages of younger workers react more to an increase in the within-group supply of skills.

3.7. Wage dispersion

The difference in productivity among workers with different levels of schooling, which is reflected in the already documented wage premium, and the age composition of the workforce inevitably give rise to heterogeneity in wage distribution. The Gini index is often used to describe this heterogeneity. It assumes zero in case of perfect equality (all wages are equal) and one if there is perfect inequality (a single individual receives all wages). Complementarily, the wage ratios between the 90th and 50th percentiles can be used to describe the dispersion in the upper tail of the wage distribution, and the ratio between the 50th and 10th percentiles to characterize lower-tail dispersion.

Chart 12 shows that inequality increased over the period under analysis, although decelerating from 1995 onwards. In 1982, the Gini index was 0.21 points, while 13 years later it stood at 0.31 points. However, from 1995 to 2006 this index increased only slightly, to 0.32 points. Chart 12 plots the two additional inequality measures: the 90/50 and 50/10 percentile wage ratios. These measures behaved differently in the two periods. From 1982 to 1995 inequality in the lower tail grew somewhat, while from 1995 to 2006 it declined by around 3 per cent. At the other end, upper-tail inequality grew throughout the whole period, but more significantly between 1982 and 1995, above 25 per cent, while in the 1995-2006 period more than halved, increasing only 10 per cent.

Chart 12



Source: MTSS (*Quadros de Pessoal*).

Note: The chart plots, for salaried workers, three wage inequality indicators for the 1982-2006 period.

Table 2 expands the analysis by considering changes in inequality by groups of education and age levels. There are three noteworthy facts. First, indicators show that inequality widens with education. Second, it also increases with age. Third, and in line with the above analysis, inequality evolved differently in the two periods considered.

Holding age constant, higher levels of education are associated with higher levels of inequality. For example, in 2006, the Gini index was 0.16 points for middle-aged individuals (36-45 years) with 4 years of schooling or less, increasing in a monotonic way to 0.35 points for college graduates. A similar exercise, but this time holding constant the level of education, shows that older individuals have a less homogeneous wage distribution. For example, in 2006 the Gini index for secondary education, for those aged 35 or less, was 0.23 points, for middle-aged individuals it was 0.31 points and it increased to 0.34 points for the older group (46 years or over). Both results are expected and may be due to better productive characteristics (higher level of education and experience), but also to the

Table 2

GINI INDEX BY AGE AND EDUCATION			
	1982	1995	2006
4 or less years of schooling			
Age < 36	0.133	0.154	0.140
Age 36-45	0.157	0.193	0.160
Age > 45	0.163	0.215	0.204
All	0.153	0.199	0.187
4-6 years of schooling			
Age < 36	0.163	0.172	0.151
Age 36-45	0.178	0.231	0.190
Age > 45	0.209	0.264	0.251
All	0.199	0.225	0.197
6-9 years of schooling			
Age < 36	0.191	0.221	0.176
Age 36-45	0.198	0.247	0.246
Age > 45	0.244	0.259	0.312
All	0.231	0.291	0.255
9-12 years of schooling			
Age < 36	0.184	0.264	0.230
Age 36-45	0.213	0.272	0.307
Age > 45	0.242	0.307	0.341
All	0.230	0.303	0.304
College degree			
Age < 36	0.214	0.300	0.277
Age 36-45	0.231	0.303	0.345
Age > 45	0.251	0.322	0.376
All	0.255	0.332	0.359

Source: MTSS (*Quadros de Pessoal* in 1982, 1995 and 2006).

Note: The table shows, for salaried workers, the Gini index calculated for each group defined by the schooling level and age group.

role played by internal labour markets (accessible to tenured workers) and other institutional labour market characteristics (unionisation).

Finally, there is a clear difference between periods. From 1982 to 1995 inequality increased in all levels of education and in age groups within schooling levels, while from 1995 to 2006 it typically declined. More precisely, wage inequality declined for individuals with 9 years of schooling or less, remaining equal for those with secondary education and continuing to increase for college graduates, although at a slower pace. This occurred despite the enormous rise in the supply of higher qualifications, which suggests that the rise in demand more than offset the rise in supply.

In this intertemporal evolution it is interesting to condition simultaneously on age and education. For example, inequality among young workers (aged 35 or less) declined for all levels of education in the most recent period. By contrast, workers aged 45 and over with at least 9 years of schooling had higher degrees of inequality in 2006 than in 1982 or 1995. As stated previously, differences amongst younger and older workers suggest that the latter are more protected against fluctuations

in the economy and are more capable of capturing the rents that exist in the economy. Fixed-term contracts, which are more ubiquitous among younger workers, may play a significant role in explaining the different inequality patterns.

4. FROM INDIVIDUAL WAGES TO HOUSEHOLDS' INCOME AND EXPENDITURE

The previous section has sought to evaluate the role of education in explaining individual wage returns and dispersion in the labour market. In this section, the analysis will be extended in three dimensions. First, the object of the analysis will be Portuguese households as a whole. At a more immediate level, this implies a substantial widening of the scope of the analysis, not only in terms of working-age individuals – including information on the self-employed and civil servants – but also as regards the total life cycle of the individuals. This new level of the analysis is relevant given that many decisions with an economic impact are taken at the household level, namely regarding labour supply, family planning, savings, sharing of monetary resources, or investment in financial and non-financial assets (for a comparative analysis of these issues across a group of nine countries, see Krueger *et al.* (2010), and the respective references). It should also be noted that most transfers to/from the State are made at the household level.

Second, this analysis will evaluate not only labour market income, but total monetary income generated at household level. Therefore, account will be taken of the role of financial markets, the social security system and private redistribution mechanisms in the generation of disposable income.

Finally, this article will seek to evaluate the extent to which the role of education in the generation of returns and income distribution inequality also applies to households' expenditure decisions. This is particularly interesting given that expenditure represents an important dimension in the evaluation of the economic welfare and long-term living standards (Meyer and Sullivan, 2008).

This section is organised as follows: Subsection 4.1 presents a summarised description of the databases used. The subsequent subsection illustrates some characteristics of households in Portugal, in terms of their decisions over the life cycle and with a breakdown by the respective educational attainment. Subsection 4.3 presents an analysis of returns to education at the household level over the 1994-1995/2005-2006 period, with a focus on the most recent period. Finally, Subsection 4.4 evaluates the role of education in income and expenditure dispersion in Portugal. In particular, it will quantify the share of income and expenditure inequality which may be directly due to differences across education groups.

4.1. Data description

In this section, the analysis is based on information taken from the Household Budget Survey (*IOF*) 1994-1995 and the Household Expenditure Survey (*IDEF*) 2005-2006, both carried out by *INE*.⁴ More than 10,000 (non-overlapping) households have participated in each survey. Surveys provide information on the income and expenditure patterns of each household – including monetary and non-monetary components – and on a number of socio-demographic characteristics of the households and their members. Household expenditure relates to the main year of each survey (1995 and 2006), while income aggregates refer to the year before (1994 and 2005 respectively). Surveys also provide weights for each household making it possible to extrapolate the results of the surveys for the population as a whole (*INE*, 2008). These weights were used in all calculations below.

(4) For a detailed presentation of the survey and the sample design of the *IDEF* of 2005-2006, see *INE* (2008).

Given that the income and expenditure aggregates are measured at the household level, we assume that the resources are equally shared in each household. Moreover, households' income and expenditure have been re-scaled to capture the fact that different households – in terms of their size and composition – present different needs. The OECD-modified equivalence scale is used in this article. It assigns a value of 1.0 to the first household member, 0.5 to each additional adult member and 0.3 to each child (aged under 15). For illustration purposes, in the case of a household formed by 2 adults and 2 children, the income (expenditure) level per equivalent adult corresponds to the division of the household's income (expenditure) by a factor of 2.1, wherefore this value is assigned to each household member. All results below refer to measures per equivalent adult.

4.2. Characteristics of the households, level of education and life cycle

The transmission of returns to education generated in the labour market to the level of households' income and expenditure is necessarily conditional on the characteristics of the household members and their joint decisions. This subsection seeks to establish some facts on the interaction between the educational gradient and different structural characteristics of households, also taking into account the dynamics inherent in the agents' life cycle. The analysis is based on data of the *IDEF* 2005-2006.

A first dimension to be assessed refers to the composition of households depending on the level of education. Chart 13 presents the OECD-modified equivalence scale applied to households in the *IDEF* 2005-2006. As expected, this "equivalence factor" shows a hump-shaped behaviour over the life cycle, reflecting, on the one hand, marital and family planning decisions and, on the other, the average life expectancy of the agents. The chart suggests that the equivalence factor is relatively lower for households with higher qualifications, particularly until the mid-life cycle. This conclusion is chiefly due to the fact that more qualified heads of household are, on average, more prone to live alone.⁵ It may therefore be concluded that the composition of households will tend to raise the relative return to higher qualifications, as well as the respective dispersion.

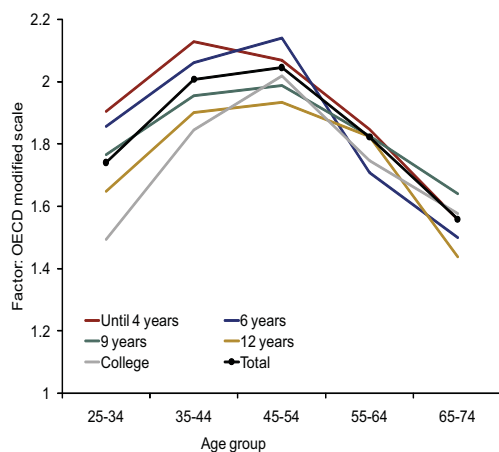
Another relevant dimension in the formation of households lies in the relative level of education of the spouses. According to data from the *IDEF* 2005-2006, and in line with evidence for other countries, there is a significant educational homogeneity in households in Portugal (Chart 14). For example, the share of marriages in which the educational attainment level of both spouses does not reach the 9 compulsory years of school attendance stands at approximately 80 per cent. Similar ratios are observed in higher levels of education. This trend has not changed significantly over recent decades, which can be observed when comparing the results for the different age groups. Naturally, the fact that spouses have similar levels of educational attainment implies that the high returns to education illustrated in Section 3 will tend to be transferred, to a large extent, to households. It should also be mentioned that a number of economic shocks are related to the level of education, such as situations in which technological progress is biased towards better skills or the case of recessive periods, where less qualified workers are typically the most affected. Therefore, educational homogeneity among spouses will tend to mitigate the potential role of the household in terms of risk sharing, as it raises the correlation among the events that affect – either positively or negatively – each of the spouses.

Finally, the level of education directly influences the generation and dispersion of household income through decisions related to participation in the labour market. In order to evaluate this issue, Charts 15 and 16 present the employment rates of household heads and their spouses (if applicable), depending on educational attainment. The observation of the charts leads to two main conclusions.

(5) According to data of the *IDEF* 2005-2006, there seems to be no significant difference in the average number of children in households for different levels of educational attainment of the respective head, although more qualified households tend to have a relatively lower number of children at the start of working age and a relatively higher number in the rest of the life cycle.

Chart 13

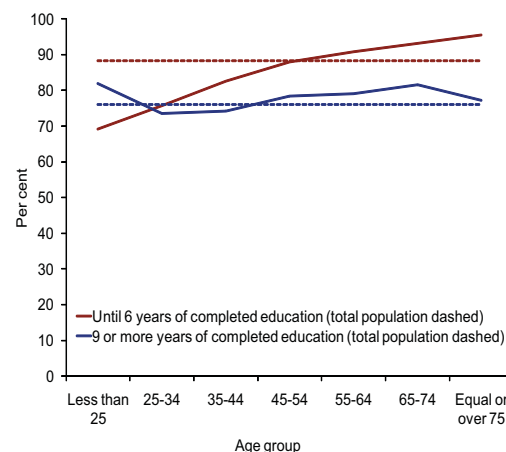
OECD MODIFIED EQUIVALENCE SCALE APPLIED TO IDEF 2005/06



Source: INE (IDEF 2005/06).

Chart 14

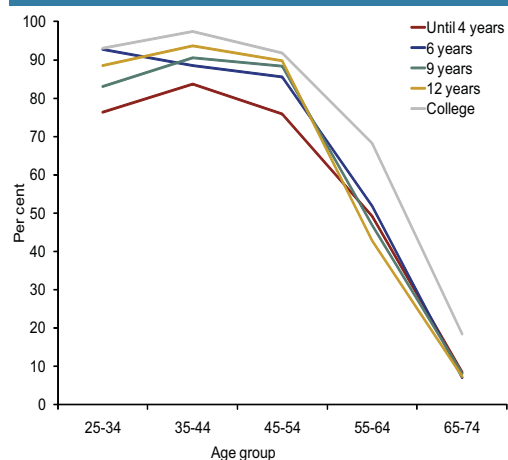
SHARE OF MARRIAGES WITHIN EDUCATION GROUPS (FROM THE PERSPECTIVE OF THE SPOUSE) – 2006



Source: INE (IDEF 2005/06).

Chart 15

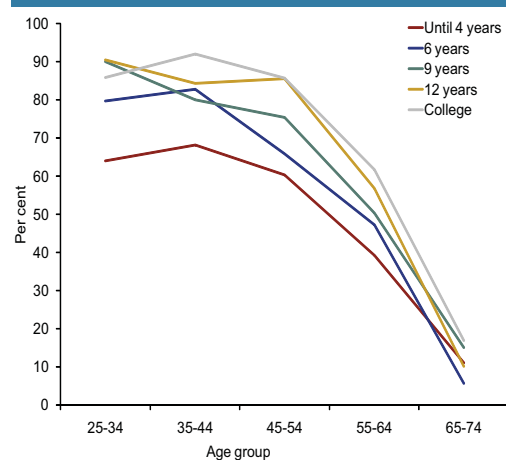
SHARE OF REPRESENTATIVES WORKING



Source: INE (IDEF 2005/06).

Chart 16

SHARE OF SPOUSES WORKING



Source: INE (IDEF 2005/06).

First, the employment rate shows a clear positive relationship with the level of education of the individuals, as regards both the heads of household and their spouses. This further supports the idea that education is an investment, wherefore non-participation in the labour market implies an opportunity cost that increases in parallel with educational attainment. Greater participation in the labour market of individuals with higher skills is another dimension in which income aggregation within households will tend to strengthen education-related returns and their distribution. Second, participation in the labour market is high, not only of household heads, but also of their spouses. In the case of household heads, the employment rates average around 90 per cent in the 25-54 age group, quickly declining in higher age groups. The employment rates of the spouses, in turn, are consistently below those registered by the household heads – albeit by less than 10 p.p., on average –, with a similar profile in terms of the life cycle.

Evidence suggests that the household characteristics – in terms of composition and birth rates, the relationship between the marital bond and the level of education, and decisions related to participation in the labour market – seem to imply the maintenance of high returns to education, when estimated at the household level, as well as an increasing dispersion of income. The subsections below present evidence on these issues based on the Household Budget Survey (*IOF*) 1994-1995 and the *IDEF* 2005-2006.

4.3. Returns to education at household level: wages, income and expenditure

This section seeks to evaluate the returns to education at the household level. The analysis will cover not only income aggregates, but also expenditure aggregates, which are potentially more relevant for the evaluation of expectations in terms of income generation on a permanent basis. Again, it should be noted that all monetary aggregates will be measured per equivalent adult, according to the OECD-modified equivalence scale.

Table 3 presents some descriptive statistics that make it possible to establish the main features of the returns to education in terms of income and expenditure, and their recent developments. The upper panel of the table presents – for the different education groups – the average wage levels of employees, total monetary income levels (for the subgroup of households with wage earners), total monetary income levels (for all households) and total expenditure excluding owner-occupied housing (again for all households). All the variables were re-based for a 100-base scale, corresponding to the average wage level of wage earners in 2005. The lower panel of the table presents the changes in the different income and expenditure aggregates from 1994-1995 to 2005-2006. The breakdown by education group is different from that presented in the upper panel of the table, because the breakdown by education groups in the *IOF* 1994-1995 is less detailed than in the *IDEF* 2005-2006.

Table 3

WAGE, INCOME AND EXPENDITURE LEVELS					
Breakdown by the education attained by the household representative					
	Wages	Monetary income	Monetary income	Expenditure	Memo item: education shares
	Households with wages	Households with wages	All households	All households	All households
Mean (Wages 2005/06=100)	100.0	127.6	118.4	93.0	100.0
Until 4 years	65.6	90.9	82.9	71.0	50.5
6 years	77.0	97.5	96.9	84.3	16.9
9 years	100.4	126.8	125.4	99.9	12.8
12 years	137.9	165.0	168.1	127.1	10.4
College	234.0	285.9	281.2	179.0	9.5
			Per cent		Percentage points
Change (2005/06 - 1994/95)	35.6	23.9	27.9	13.7	0.0
None	-9.9	-5.3	1.7	2.0	-6.3
4 to 9 years	23.9	14.8	16.8	6.7	-1.9
12 years	33.1	16.4	17.3	1.5	4.0
College	24.4	14.6	14.2	-2.7	4.2

Source: *INE* (*IOF* and *IDEF*).

Notes: Average levels defined per equivalent adult. Observations were weighted with sample weights. Total wages and income are liquid of taxes and contributions to social security regimes. Monetary income includes all social transfers. Expenditure includes all non-monetary components, except owner-occupied housing.

The main ideas arising from the table are the following: first, income and expenditure levels are strongly related to the level of education of the head of household. There is a sustained increase from one education group to the next, which is more marked in the households whose head has completed college. For instance, in the case of households whose head has completed, at most, primary education, wages stand at around two thirds of the average, whereas in households whose head has completed college wages are more than twice as high as the average. These results are in line with evidence in Section 3.⁶

Second, total monetary income, taken as a whole, is almost 30 per cent higher than the level of labour income. This is first due to income of the self-employed, which account for a significant share of the total number of workers in Portugal. To a lesser extent, social transfers also have a considerable impact, even for the sub-group of households with labour income. It is worth noting that the percentage increase in income is relatively uniform for the different education groups.

Third, when assessing all households (and not only those participating in the labour market) the average income level decreases, in particular for households with a maximum of 6 years of school attendance. This is the result of including in the sample households comprising only inactive members, typically in higher age groups, who have much lower levels of education (see Section 2). Such observation suggests the importance of taking into account the life cycle of the agents when evaluating returns to education. In this vein, Chart 17 illustrates the generation of monetary income over the life cycle.⁷ As expected, monetary income shows an upward profile up to the end of working age and a slightly downward trend in higher age groups, for all levels of education. The first conclusion to be drawn from the chart is that significant returns to education can be observed over the whole life cycle of the agents, including the retirement age. Indeed, in these higher age groups, the sharp drop observed in wages is only partly reflected in total monetary income, which, on average, stands close to the income levels earned during the mid-life cycle.

Fourth, the evidence regarding expenditure aggregates shows that the returns to education in terms of income pass through – albeit in a mitigated manner – to the returns to education in terms of expenditure. For instance, the expenditure of households whose head has completed a maximum of 4 years of school attendance stood 25 per cent below the average, whereas the expenditure of households whose members have completed college was 40 per cent above the average. These levels confirm the existence of a relative compression in expenditure decisions, in terms of the educational gradient, *vis-à-vis* the corresponding generation of income. Chart 18 also indicates that the profile in terms of expenditure decisions over the life cycle is less marked than the income profile. Such result is largely associated with the fact that the analysis focuses on expenditure measures per equivalent adult, which consider the household composition. In effect, had the focus been on measures per household, a hump-shaped profile would be obtained, quite similar to the income profile. This is line with the evidence reported by Attanasio and Weber (2010).

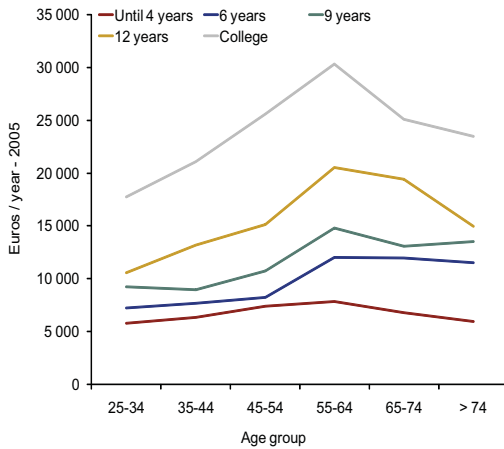
A fifth conclusion to be drawn from the table relates to the percentage changes in income and expenditure from 1994-1995 to 2005-2006, by education group. The lower panel of the table clearly shows that, in this period, the growth of wages, income and expenditure was not homogeneous across education groups. Indeed, while there was a higher growth of income in higher education groups (thus contributing to an increase in income inequality), expenditure recorded higher rates of growth in lower education groups (thus contributing to a decline in expenditure inequality). Given the

(6) Note that in Section 3, the analysis of the *Quadros de Pessoal* covers employees working full-time in the private sector in October every year. Table 3 includes all households whose members are wage earners (including civil servants) in 2005 as a whole.

(7) The precariousness of the exercise results from the fact that this is a cross-sectional sample. It implies that we do not examine income generation in each household over the life cycle, but instead income generated by households in different age groups, at a given moment in time (and therefore subject to different backgrounds in terms of incentive structures).

Chart 17

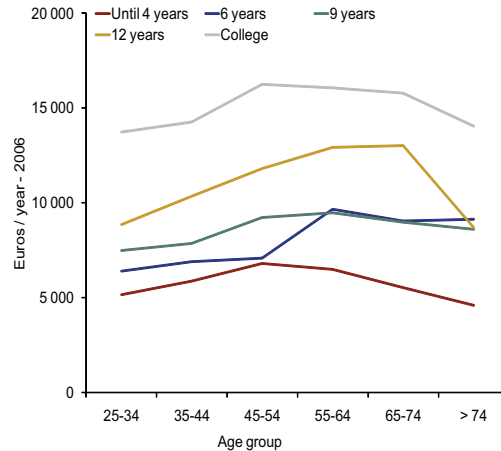
MONETARY INCOME IN 2005, BY AGE AND EDUCATION GROUP



Source: INE (IDEF 2005/06).

Chart 18

EXPENDITURE IN 2006, BY AGE AND EDUCATION GROUP



Source: INE (IDEF 2005/06).

significant changes in education groups in this period – with an increase in the share of households with higher educational attainment – the composition effects play an important role in the aggregate dynamics of income and expenditure. For instance, none of the four education groups shows growth rates above the population average in any of the monetary aggregates considered.

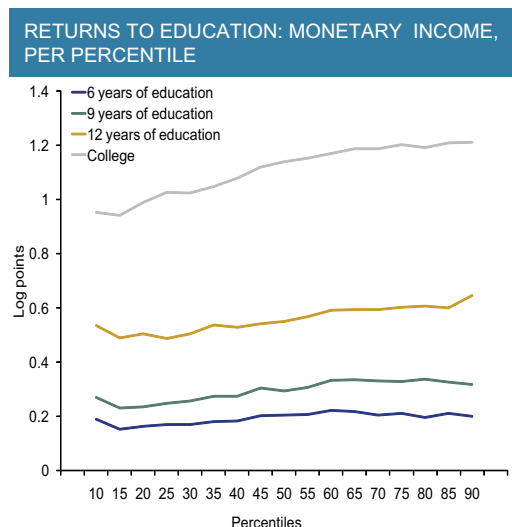
As seen in Section 3, it is possible to obtain a more accurate quantification of the returns in the different education groups in Portugal by estimating quantile regressions of the income (and expenditure) logarithms in a set of explanatory variables representing (i) the geographic characteristics of the place of residence (region where the household resides and the degree of urbanisation of the place of residence); (ii) the characteristics of the household (size of the household, number of members working other than the head of household, existence of a spouse in the household); (iii) the age of the head of household; and (iv) the maximum educational attainment between the household head and the respective spouse (if any).⁸

Charts 19 and 20 present the results of these quantile regressions. The estimated coefficients measure the impact of the education levels on the income or expenditure logarithm, for each percentile of conditional distribution (compared to the case where the household has completed a maximum of 4 years of schooling). The charts point to the existence of high returns to education in Portugal for all schooling levels, in both income and expenditure. These returns increase as the individual moves up along the education path. In addition, in the case of income, returns to education rise significantly as the percentiles of conditional distribution are higher, particularly in college. This contributes to raising income inequality in Portugal (see also Machado and Mata, 2001). In contrast, in the case of expenditure, returns are relatively stable over the whole conditional distribution.

In quantitative terms, it is possible to calculate that the college graduation wage premium per equivalent adult – *vis-à-vis* a maximum of 4 years of school attendance – stands at approximately 170 per cent (100 log points) in lower income percentiles, and rises to 230 per cent (120 log points) in higher percentiles. Compared with the cases where households have completed upper secondary education, the college graduation wage premium per equivalent adult stands at approximately 50 per cent in lower income percentiles and rises to around 80 per cent in higher percentiles. In terms

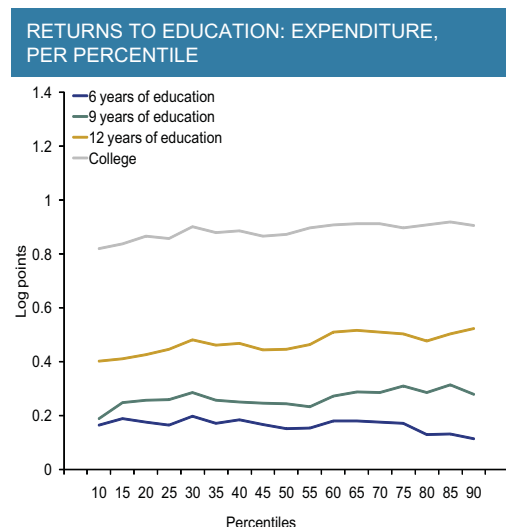
(8) The results would nevertheless be robust if instead we included only the educational attainment level of the head of household.

Chart 19



Source: INE (IDEF 2005/06).
Note: The chart presents, for each conditional percentile, the return to education measured as monetary income, compared with the case in which the household has completed a maximum of 4 years of schooling.

Chart 20

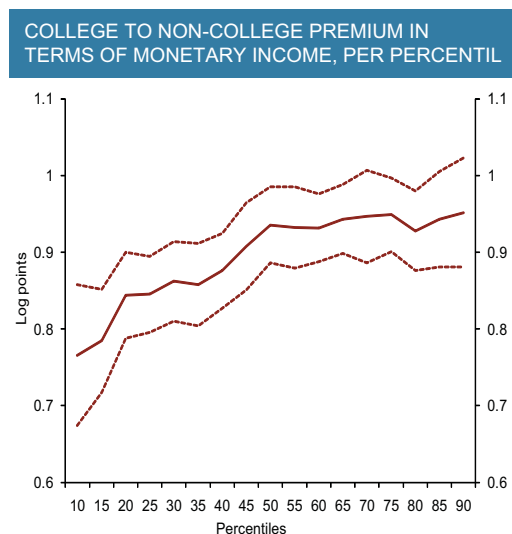


Source: INE (IDEF 2005/06).
Note: The chart presents, for each conditional percentile, the return to education measured in terms of expenditure, compared with the case in which the household has completed a maximum of 4 years of schooling.

of expenditure per equivalent adult, the college graduation premia, when compared with the cases where the households have completed 4 to 12 years of school attendance, stand at 145 and 50 per cent respectively and remain relatively stable over the respective conditional distributions.⁹

For the purpose of comparison with Chart 8 of Section 3, it is interesting to calculate the college premium *vis-à-vis* the other schooling levels for the different percentiles of the respective conditional distribution. The results are presented in Chart 21 and point to a premium of approximately 100 per cent in lower income percentiles and of around 170 per cent in the right tail of income distribution. These results confirm the main features already identified in Chart 8 and suggest that returns to education, in terms of income, are estimated to be higher than those for income at the individual wage level.

Chart 21



Source: INE (IDEF 2005/06).

(9) It is also possible to calculate the return of one additional year of schooling, which on average reaches 8.7 per cent in the case of monetary income and 6.9 per cent in the case of expenditure.

4.4. The role of education in income and expenditure dispersion

As mentioned in Section 3, the high inequality in the distribution of education contributes to the high wage inequality in Portugal. This subsection extends such conclusion to household income and expenditure.

Table 4 presents the Gini coefficient for the different income and expenditure aggregates examined in this section, mimicking the structure used in Table 3. In terms of levels, the table shows the high income and expenditure inequality in Portugal, among the highest across developed countries (OECD, 2008). By way of example, the Gini index for monetary income in the EU-27 as a whole reached 0.31, which compares with 0.37 for Portugal. In terms of changes over time, the evidence points to an increase in income the inequality from 1994 to 2005 and to a decline in expenditure inequality from 1995 to 2006.

Table 4

WAGE, INCOME AND EXPENDITURE: GINI COEFFICIENT				
Breakdown by the education attained by the household representative				
	Wages	Monetary income	Monetary income	Expenditure
	Households with wages	Households with wages	All households	All households
Gini coefficient	0.407	0.354	0.373	0.357
Until 4 years	0.325	0.256	0.284	0.318
6 years	0.293	0.244	0.260	0.294
9 years	0.327	0.286	0.299	0.314
12 years	0.342	0.308	0.323	0.322
College	0.339	0.315	0.324	0.303
Change (2005/06 - 1994/95)	0.018	0.024	0.019	-0.039
None	-0.049	-0.082	-0.094	-0.099
4 to 9 years	-0.098	0.003	0.004	-0.040
12 years	0.014	0.020	0.017	-0.026
College	-0.003	0.044	0.044	-0.033

Source: INE (IOF and IDEF).

Notes: Average levels defined per equivalent adult. Observations were weighted with sample weights. Total wages and income are liquid of taxes and contributions to social security regimes. Monetary income includes all social transfers. Expenditure includes all non-monetary components, except owner-occupied housing.

The Gini coefficient value for households whose members are wage earners is substantially higher than that calculated in Section 3, based on *Quadros de Pessoa*. Several reasons may be behind this. On the one hand, as mentioned in Subsection 4.1, the characteristics of the marital bonds and the decisions related to participation in the labour market tend to contribute to raising income dispersion among households. On the other hand, the present analysis is not limited to households whose members are full-time employees, which raises the potential heterogeneity of the situations under study.

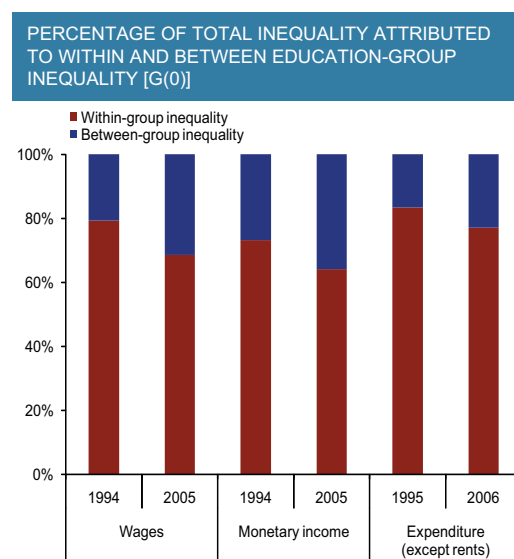
As regards the relative dispersion across the different income and expenditure aggregates, total income presents a significantly lower Gini coefficient value than income generated in the labour market. This reflects the equalising effect of social and private transfers in income distribution. In turn, total expenditure dispersion is slightly lower than income dispersion, which may reflect the usual smoothing of consumption expenditure relative to changes in income.

In terms of information per education group, there is a high level of inequality within each educa-

tion group, which is higher than inter-group inequality. Also, in the case of income aggregates, this inequality grows in tandem with the educational attainment of the head of household. This result replicates the conclusion reported in Section 3.

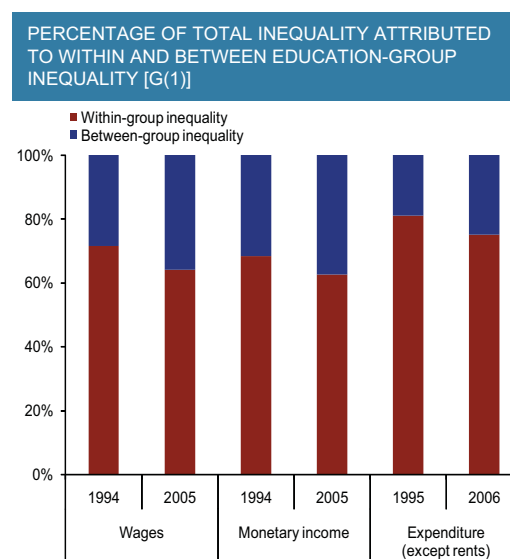
In spite of being suggestive, Table 4 does answer the question of which share of inequality in income and expenditure is accounted for by differences in education. Charts 22 and 23 help to tackle this issue. The charts provide a breakdown of inequality by education group, following the methodology presented in Cowell and Jenkins (1995). According to this methodology, for a given share of the population – in the present case education groups – some inequality indices may be broken down into the shares attributable to intra-group inequality and to inter-group inequality (where the latter defines the inequality explained by the characteristic partitioning the population). Naturally, the implementation of this methodology requires inequality measures to be decomposable (which is not the case, for instance, of the Gini coefficient). Thus, and in line with Rodrigues (2007), we analysed generalised entropy indices $GE(\bullet)$ for two usual parameter calibrations defining the sensitivity to different parts of distribution, $GE(0)$ and $GE(1)$. The results suggest that approximately one third of income inequality in Portugal is associated with differences among education groups. This share is lower in the case of expenditure inequality, standing at around 20 per cent. Finally, the share of inequality attributable to inter-education group inequality increased from 1994-1995 to 2005-2006 for both income and expenditure.

Chart 22



Source: INE (IDEF 2005/06).

Chart 23



Source: INE (IDEF 2005/06).

The role of education in explaining inequality in Portugal, however, is not confined to inter-group inequality. In effect, as can be seen in Chart 19, returns to education in terms of income are higher for individuals in the higher percentiles of the respective conditional distribution. This implies that education also contributes to increase inequality within each education group, particularly in the case of college education. This conclusion replicates – for household income – the results presented in Martins and Pereira (2004) for individual wages in the labour market. This conclusion, however, does not apply to expenditure distribution, as can be seen in Chart 20.

In short, education plays an important role in explaining income and, to a lesser extent, expenditure inequality in Portugal. In the case of income distribution, this role arises not only from different returns across the various education groups, but also from different returns within the conditional distribution of income, particularly in the case of college education.

5. CONCLUSIONS

In all advanced economies, education provides a significant wage premium, which should be interpreted as a return to investment in higher schooling levels. Human capital accumulation fosters higher productivity of workers which is rewarded in the labour market in the form of higher wages. These individual returns have a direct counterpart in total income of the countries. In Portugal, relatively low skills in the workforce are a binding constraint on the real convergence process to European Union income levels. In fact, the current relative level of income per capita in Portugal compared with its European partners is broadly in line with would be expected, in view of the relative educational endowments of human capital of their populations.¹⁰

The debate on the wage structure (level, premium and wage inequality) in developed economies has evolved around a “continental divide”. On the one hand, Anglo-Saxon countries show higher and growing inequality in the 1980s and 1990s (Card and Lemieux, 2001 and Autor, Katz and Kearney, 2008), whereas in continental Europe, wage distribution has remained more contained. In the latter case, the continued increasing supply of highly-qualified individuals and the existence of labour market institutions, such as minimum wages, collective bargaining and unions, are frequently held responsible for the low level and lower growth of inequality. This view has recently been questioned by the revaluation of inequality developments in some European countries, namely in Dustmann, Ludsteck and Schoenberg (2009), who identify a significant increase in inequality in Germany over the past two decades.

The developments of returns to education and inequality in Portugal do not seem to fall within the scope of an institutional explanation. In fact, Portugal shares the institutional characteristics of continental Europe, but its wage distribution is closer to that of Anglo-Saxon countries. This article provides evidence that the Portuguese experience may be weighed against developments in Europe, in a context of supply and demand shocks for education. This has been facilitated by the relative stability of the institutional framework of the Portuguese labour market over the last 30 years. Indeed, the basic rules of collective bargaining, minimum wages and fixed-term contracts had already been in force before 1982. Therefore, a key characteristic to understand these developments is the high inequality in the level of education in Portugal. Against a background of increased valuation of skills in world economy, the relative shortage of qualifications results in high returns to education in the Portuguese labour market. These individual returns pass through to household income and expenditure levels throughout the whole life cycle.

In the medium term, Portugal faces serious challenges to match its labour supply skills with the pattern of labour demand. The growing globalisation process has been characterised by a polarisation of demand for labour in developed countries. This is characterised by the continued increase in demand for very qualified labour, but also by a significant deceleration in demand for intermediate skills, which is met abroad through outsourcing processes.

In view of the current characteristics of the schooling level and the demographic transition in Portugal, some persistence of inequalities in the levels of education is to be expected in the medium term, as well as some persistence of high returns to education and, as a result, some persistence of the high dispersion of wages at the individual level, and the income at the household level.

In this context, the evidence presented in this article points to the crucial importance of establishing an institutional environment that favours individual investment in education. From a dynamic perspective, it is necessary to promote a coherent range of policies preserving returns to education,

⁽¹⁰⁾ See Acemoglu, (2009), Chapter 3, for some illustrative examples in this scope.

and bringing individuals' incentives into line with society's incentives as a whole. Portugal is faced with the need not only to maintain its best workers, but also to attract highly-qualified individuals. The policies reducing the full achievement of the benefits arising from educational investment will result in persistently low schooling levels. It must be borne in mind that younger generations must still fill a large gap, since their average school attainment level continues to be lower than that of younger generations in most other developed countries and, in some cases, even lower than that of older generations in those countries.

The need to promote and reward investment in education should involve a range of integrated policies, not restricted to the education policy, but rather covering, *inter alia*, labour market, immigration and tax policies. A consistent policy should therefore appropriately cover these areas.

The first instrument in the pursuit of this objective should be devoted to the regulation of the labour market. The Portuguese labour market is rather segmented. Younger and more qualified generations do not have access to better and more stable jobs. Approximately 90 per cent of new jobs are subject to fixed-term contracts and their vast majority is not followed by permanent contracts. A large share of these is occupied by young workers. From a microeconomic perspective, this segmentation, which induces lower returns to investment in education, is naturally the result of levels of investment in education that are not optimum. The smooth operation of the labour market also requires the product market to be characterised by competition and mobility levels that foster an efficient allocation of resources.

A second range of instruments should cover the problem associated with the slow educational transition imposed by the demographic structure and arising from low fertility rates. Portugal should endeavour to retain more qualified workers and create incentives to those studying abroad to return to the country, avoiding phenomena similar to "brain drain", which normally occur due to the lack of opportunities in the home country. However, a fast transition in the short and medium term is only possible through immigration policies attracting more qualified workers. This has been done with great success in other countries, namely in Ireland in the 1980s and more recently in Australia and Canada.

Finally, the education policies should aim at obtaining high educational attainment levels, ensuring their quality. Therefore, it seems appropriate to foster the generalization of preschool education, high standards across all education levels, and continued support to individuals with learning difficulties. Simultaneously, the tax system should positively differentiate those investing in higher levels of education. A consensus in economy is that education should be subsidized, since its benefits to society exceed individual benefits. Indeed, the authors of this article are not aware of any country that does not subsidize education. Under such circumstances, it comes as a surprise that this argument has been omitted from the economic debate on the direct and indirect taxation of investment in education, in terms of either quantity or quality. Policies raising the education cost via taxes may lead to higher tax revenue in the short run, but at the cost of lower levels of education in the medium to long term and, as a result, lower economic growth. In this vein, education is not different from any other economic investment, except for the fact that it is the most important.

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