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CONTENTS

CONTENTS

Issue for Discussion

Investment in Education in Portugal: Returns and Heterogeneity 9

Economic Policy and Situation

Outlook for the Portuguese Economy: 2010-2011 39

Box *Financing Conditions and Their Macroeconomic Impact* 45

Articles

Capital Taxation and Globalization 53

Bank Interest Rates and Loan Determinants 65

Volatility and Seasonality of Tourism Demand in Portugal 87

The Margins of Exports: Firms, Products and Destinations 103

Chronology of Major Financial Measures

January to March de 2010 I

ISSUE FOR DISCUSSION

Investment in Education in Portugal: Returns and Heterogeneity

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

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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.

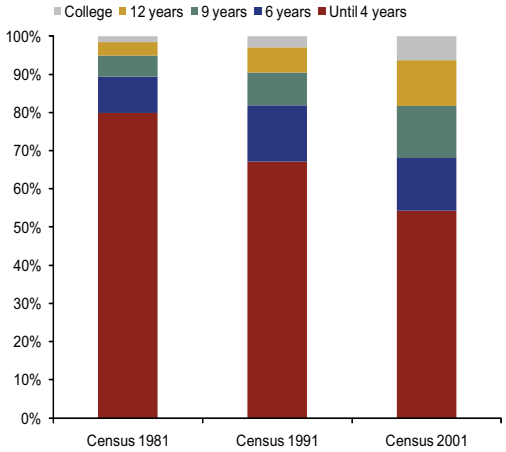
2. EDUCATIONAL TRANSITION IN PORTUGAL

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

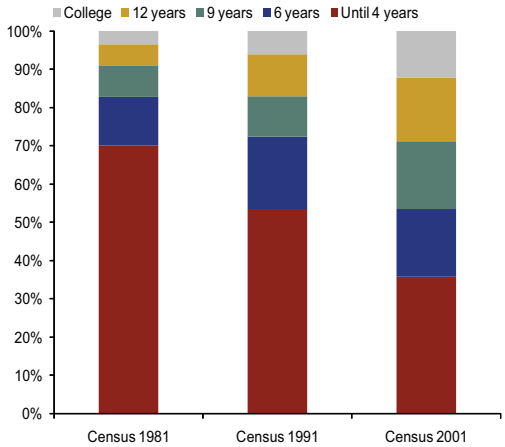
BREAKDOWN OF TOTAL POPULATION, BY EDUCATION ATTAINMENT



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

Chart 2

BREAKDOWN OF WORKING POPULATION, BY EDUCATION ATTAINMENT

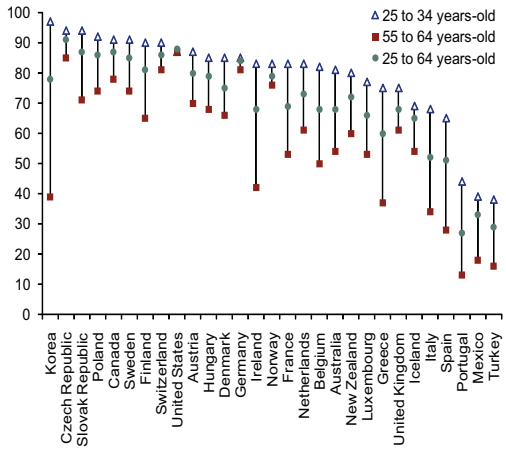


Source: *INE* (Census 1981, Census 1991 and Census 2001)

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

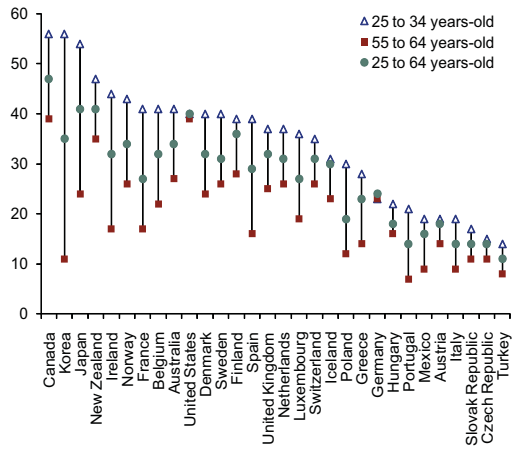
POPULATION THAT HAS ATTAINED AT LEAST UPPER SECONDARY EDUCATION (2007)
By age group, per cent



Source: OECD.

Chart 4

POPULATION THAT HAS ATTAINED AT LEAST TERTIARY EDUCATION (2007)
By age group, per cent



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. [1]The 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 increased 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.

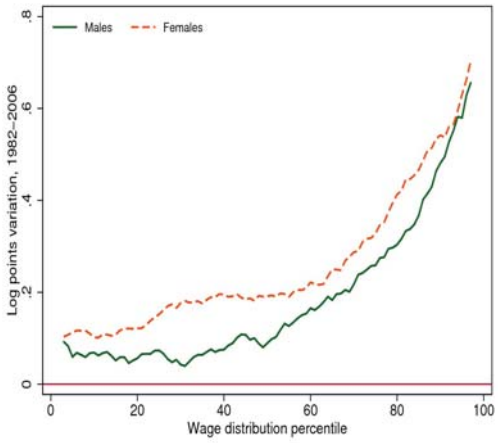
The two panels in Chart 6 break down this pattern into two periods, 1982-1995 and 1995-2006, for each gender. As will be made clear throughout this article, the two periods are a natural way of dividing the sample due to a large inflow of graduates into the labour market in the mid-1990s.

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

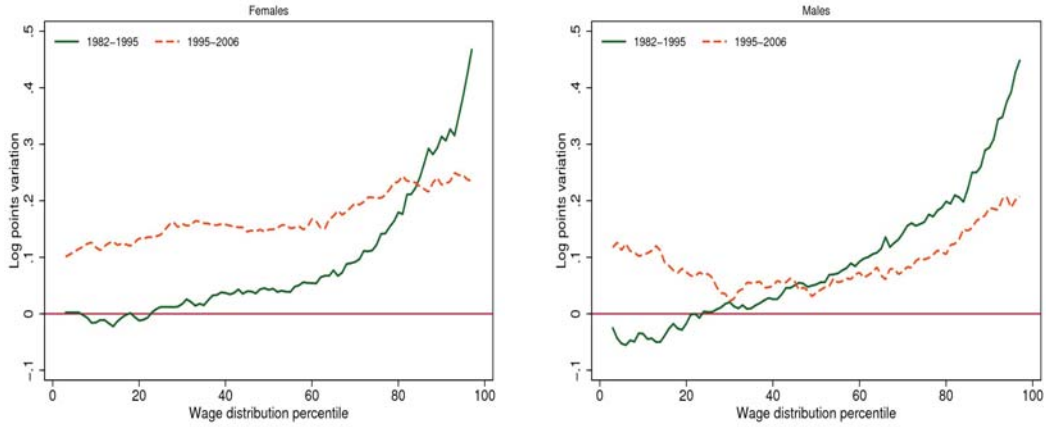
REAL WAGE CHANGES BETWEEN 1982 AND 2006, BY PERCENTILE AND GENDER



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).

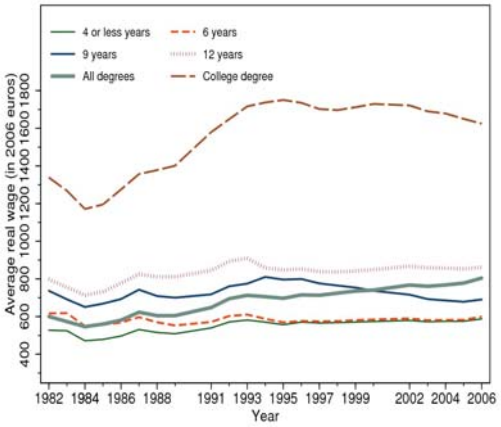
As any other investment, education produces a return. In all markets, the rate of return is a function of developments in market conditions. For a given level of supply, an increase in demand generates a higher rate of return. In a global economy marked by constant technological developments, which raises 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.

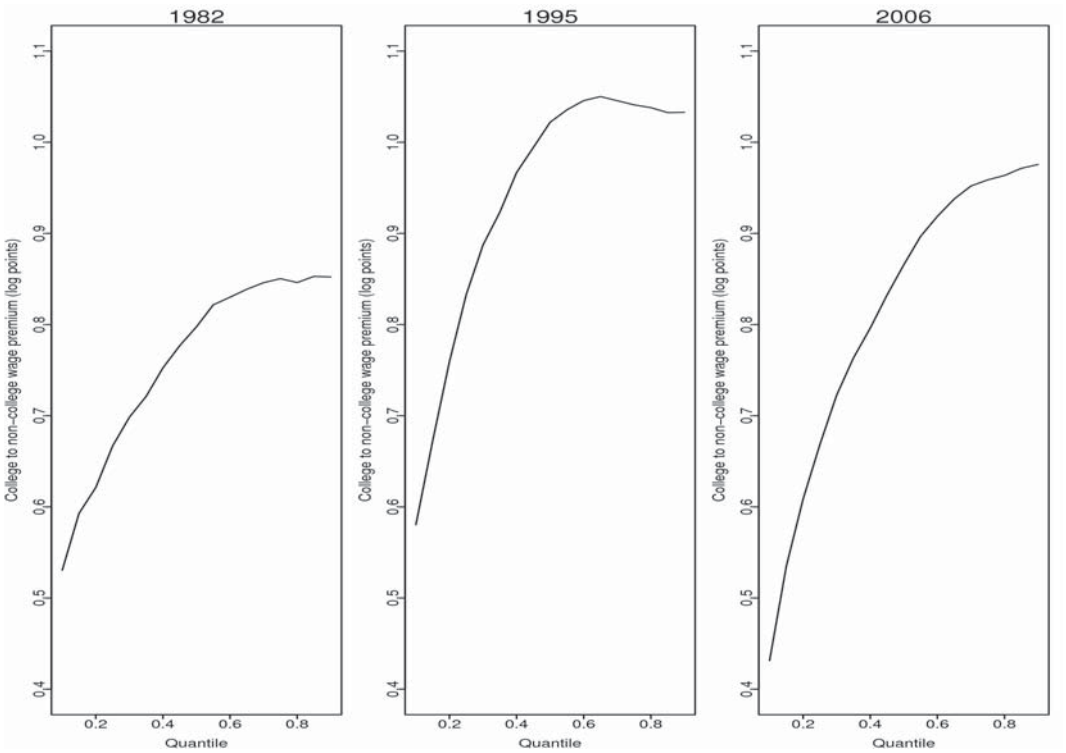
in 1982, respectively, less €20 and €50. The wage premium for individuals with 6 years of schooling, in relation to those with 4 years or less, ceased to exist, while in 1982 it stood at around 17 per cent. This may stem from the extension of compulsory education to 9 years in 1986, which caused the 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:

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

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.

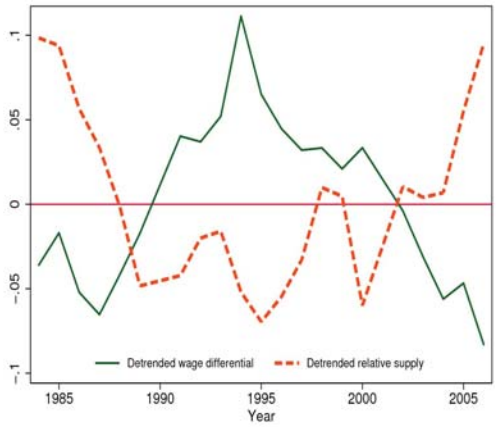
Chart 9 plots the relative supply of graduates and the college wage premium from 1984 to 2006, in deviations from a linear trend. The data show an accelerating relative supply of graduates since 1995; the opposite scenario occurred during the 1980s and in the early 1990s. Chart 9 can be seen as a dynamic 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

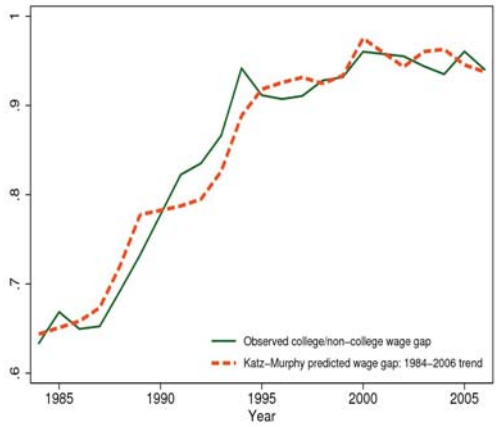
SUPPLY OF SKILLS AND WAGE DIFFERENTIAL IN DEVIATIONS FROM A LINEAR TREND



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: $\log\left(\frac{w_{ct}}{w_{ht}}\right) = -0.27 + 0.03t - 0.72\log\left(\frac{N_{ct}}{N_{ht}}\right)$. For further details on the construction of these measures, see Centeno and Novo (2009).

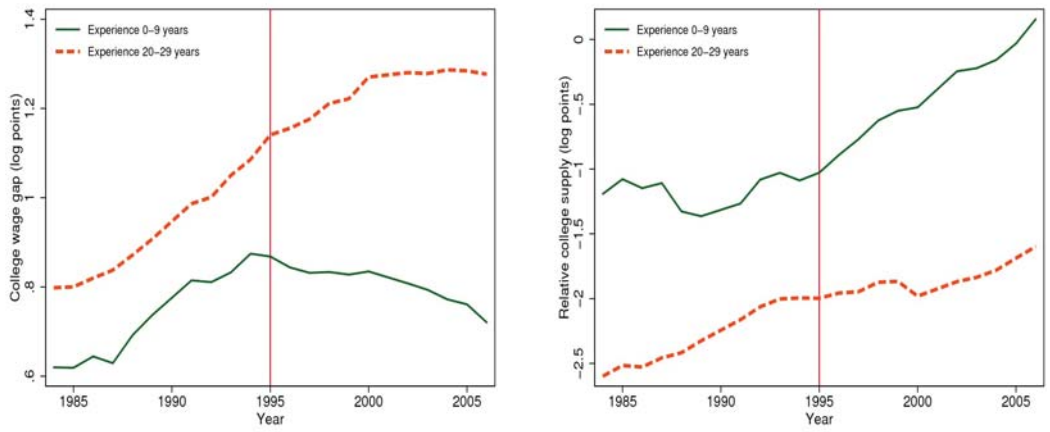
3.6. The college wage gap by experience group

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.

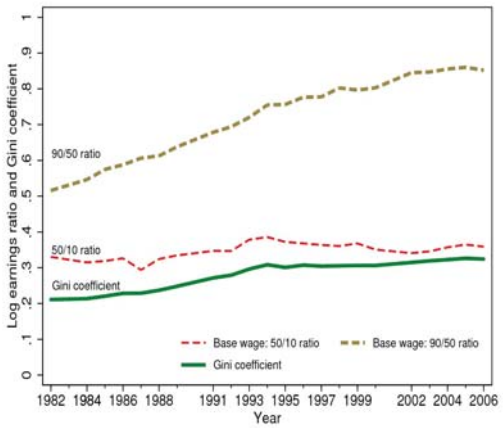
3.7. Wage dispersion

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

WAGE INEQUALITY INDICATORS



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.

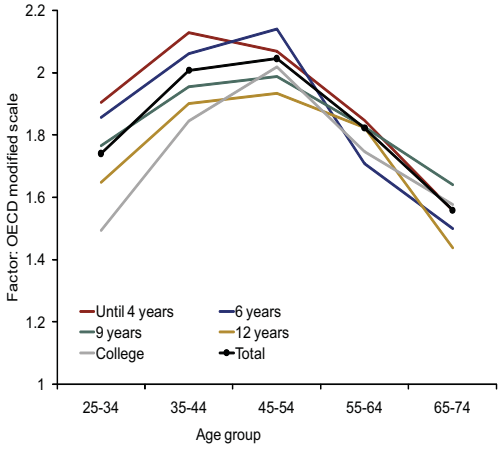
Another relevant dimension in the formation of households lies in the relative level of education of the spouses. According to data from the *IDEF* 2005-2006, and in line with evidence for other countries, there is a significant educational homogeneity in households in Portugal (Chart 14). For example, 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

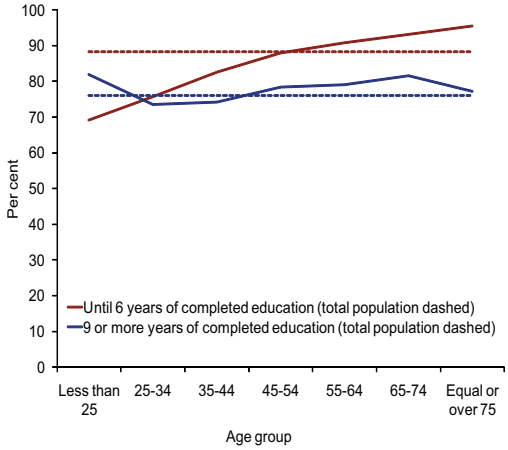
OECD MODIFIED EQUIVALENCE SCALE APPLIED TO *IDEF* 2005/06



Source: *INE* (*IDEF* 2005/06).

Chart 14

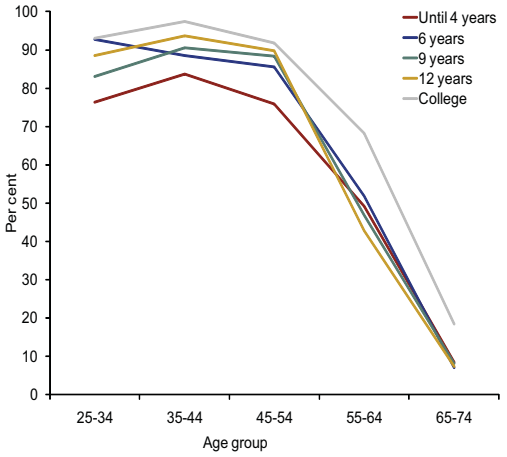
SHARE OF MARRIAGES WITHIN EDUCATION GROUPS (FROM THE PERSPECTIVE OF THE SPOUSE) – 2006



Source: *INE* (*IDEF* 2005/06).

Chart 15

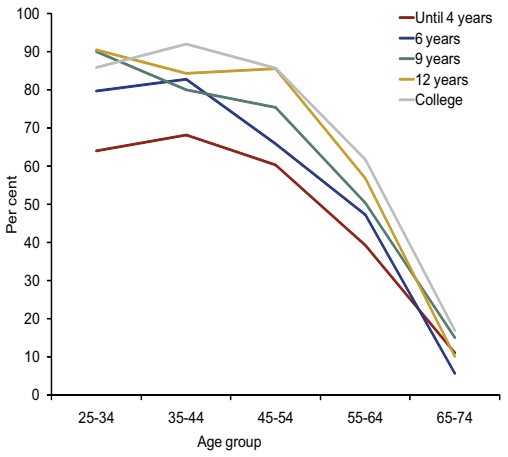
SHARE OF REPRESENTATIVES WORKING



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).

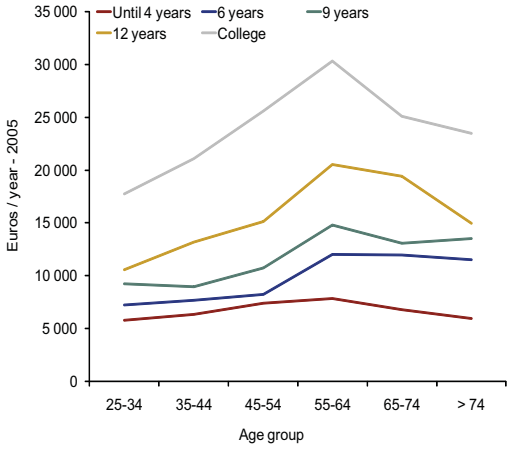
A fifth conclusion to be drawn from the table relates to the percentage changes in income and expenditure from 1994-1995 to 2005-2006, by education group. The lower panel of the table clearly shows that, in this period, the growth of wages, income and expenditure was not homogeneous across education 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

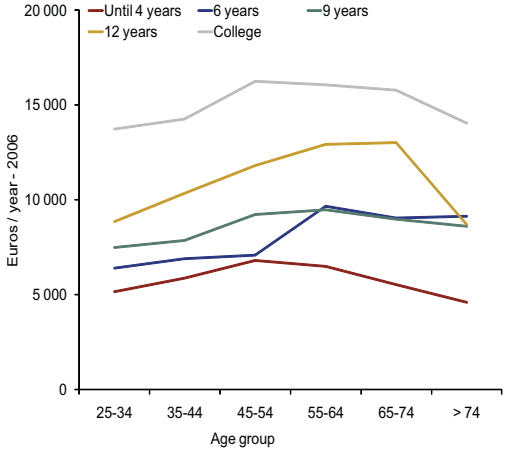
MONETARY INCOME IN 2005, BY AGE AND EDUCATION GROUP



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]

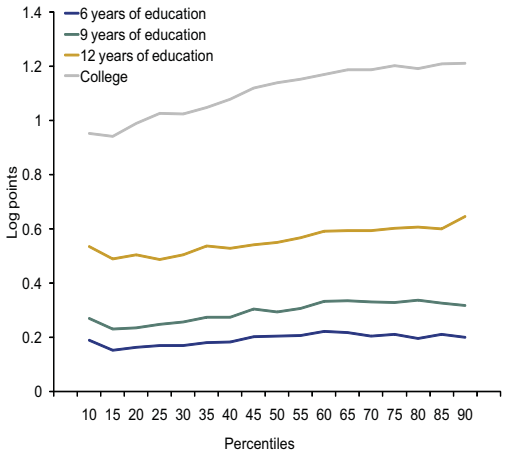
Charts 19 and 20 present the results of these quantile regressions. The estimated coefficients measure the impact of the education levels on the income or expenditure logarithm, for each percentile of conditional distribution (compared to the case where the household has completed a maximum of 4 years 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

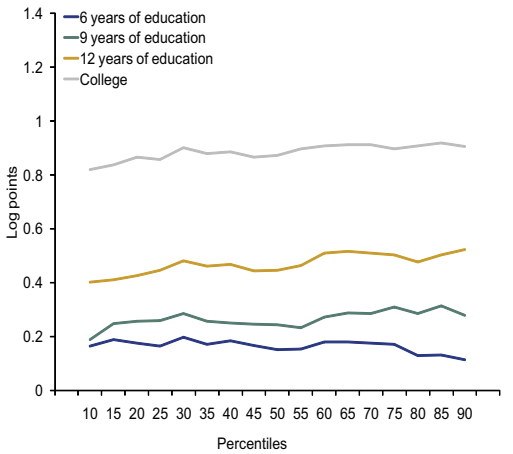
RETURNS TO EDUCATION: MONETARY INCOME, PER PERCENTILE



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

RETURNS TO EDUCATION: EXPENDITURE, PER PERCENTILE



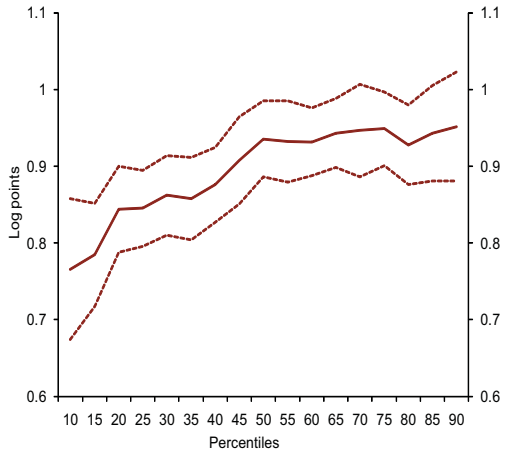
Source: *INE* (*IDEF* 2005/06).
Note: The chart presents, for each conditional percentile, the return to education measured in terms of expenditure, compared with the case in which the household has completed a maximum of 4 years of schooling.

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

COLLEGE TO NON-COLLEGE PREMIUM IN TERMS OF MONETARY INCOME, PER PERCENTIL



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 Pessoal*. 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.

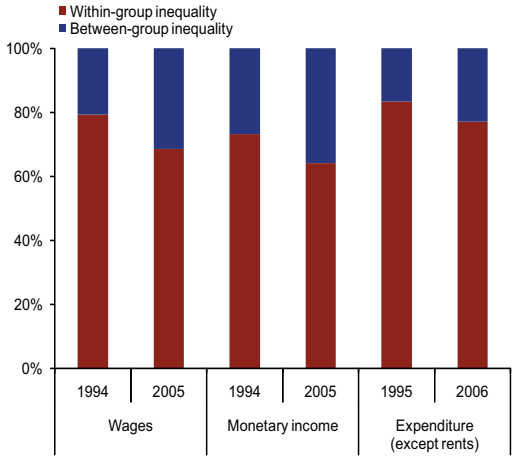
In terms of information per education group, there is a high level of inequality within each educa-

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(•) 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

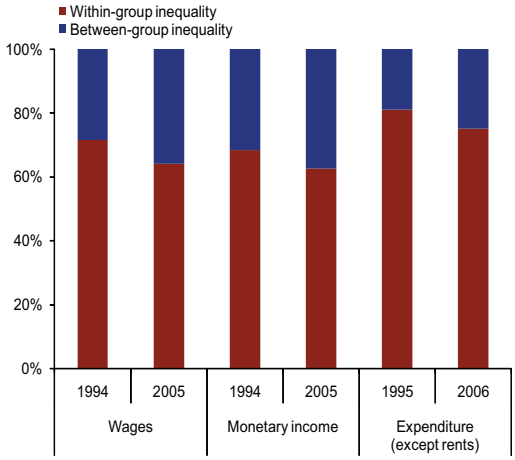
PERCENTAGE OF TOTAL INEQUALITY ATTRIBUTED TO WITHIN AND BETWEEN EDUCATION-GROUP INEQUALITY [G(0)]



Source: *INE* (*IDEF* 2005/06).

Chart 23

PERCENTAGE OF TOTAL INEQUALITY ATTRIBUTED TO WITHIN AND BETWEEN EDUCATION-GROUP INEQUALITY [G(1)]



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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ECONOMIC POLICY AND SITUATION

Outlook for the Portuguese Economy: 2010-2011

OUTLOOK FOR THE PORTUGUESE ECONOMY: 2010-2011

Portuguese economic growth is projected to be low in the 2010-2011 period, following a very marked fall in 2009 (Table 1). Developments in economic activity will likely benefit from the moderate recovery in world demand and the gradual easing of financing conditions. Furthermore, the overall development will be conditioned by the expected slight increase in interest rates and the implementation of the fiscal consolidation measures included in the State Budget for 2010 and in the Stability and Growth Programme for 2010-2013. Over the projection horizon, the dynamics of private consumption will be constrained by the solvency conditions ensuing from the intertemporal household budget constraints. Exports, on the other hand, are expected to follow a relatively favourable profile, against a background of expanding international trade flows. Since growth in demand is expected to be very subdued, corporate investment is projected to fall in 2010, followed by a slight increase in 2011. The assumptions for public finances point to a decline in general government consumption and investment over the projection horizon.

External borrowing requirements for the Portuguese economy will tend to remain high, comprising an increase in the share of the income account deficit. Consumer prices are projected to increase moderately in 2010 and 2011, confirming the temporary nature of the fall observed in 2009. The current projection points to downside risks to overall economic activity, arising mainly from the international economic and financial environment, and balanced risks to inflation. The impact of the necessary fiscal consolidation process in Portugal bears considerable uncertainty for the current projection.

Table 1

PROJECTIONS OF BANCO DE PORTUGAL: 2010-2011
Rate of change, per cent

	Weights 2008	EB Spring 2010			EB Winter 2009		
		2009	2010(p)	2011(p)	2009	2010(p)	2011(p)
Gross domestic product	100.0	-2.7	0.4	0.8	-2.7	0.7	1.4
Private consumption	66.5	-0.8	1.1	0.3	-0.9	1.0	1.6
Public consumption	20.7	3.5	-0.7	-0.2	2.0	0.7	1.1
Gross fixed capital formation	21.7	-11.1	-6.3	0.3	-11.7	-3.4	0.9
Domestic demand	109.6	-2.5	-0.5	0.2	-2.9	0.3	1.4
Exports	33.0	-11.6	3.6	3.7	-12.5	1.7	3.2
Imports	42.5	-9.2	0.2	1.4	-10.8	0.3	2.7
Contribution to GDP growth (in p.p.)							
Net exports		0.1	0.9	0.6	0.5	0.4	-0.1
Domestic demand		-2.8	-0.6	0.2	-3.2	0.3	1.5
of which: change in inventories		-0.6	0.1	0.0	-0.5	0.1	0.0
Current+capital account (% of GDP)		-9.4	-8.8	-9.7	-8.2	-9.8	-11.3
Trade balance (% of GDP)		-6.8	-6.3	-5.8	-6.5	-6.8	-7.0
Harmonised Index of Consumer Prices		-0.9	0.8	1.5	-0.9	0.7	1.6

Source: Banco de Portugal.
Notes: (p) - projected. For each aggregate, this table shows the projection corresponding to be the most likely value, conditional on the set of assumptions considered. The current projections were based on the data available up to mid-March 2010.

Progressive recovery in the world economy and gradual increase in interest rates

Underlying growth prospects for the world economy rely on the European Central Bank staff projections published in the March 2010 issue of the Monthly Bulletin. External demand for Portuguese goods and services will increase in both 2010 and 2011, following the strong contraction witnessed in 2009 (Table 2). However, growth in international trade over this period is expected to be well below that observed, on average, in the run-up before the onset of the international economic and financial crisis.

Along 2009 the international environment surrounding the Portuguese economy was marked by a gradual easing of financing conditions. This development reflects inter alia the adoptions of monetary and fiscal policy measures, as well as measures aimed to support the financial system, which seem to have contributed to dampen the fall in world economic activity and to prevent the collapse of the financial system. However, in late 2009 and early 2010 some turmoil emerged in the sovereign debt market of several euro area countries.

Assumptions underlying the current projection reflect available financial market data in mid-March 2010, which suggest that short-term interbank money market interest rates will remain low throughout 2010, whereas an increase is expected, in average annual terms, in 2011. With regard to long-term interest rates, the current assumptions envisage a partial reversal of the higher risk premium on Portuguese government debt observed in late January and early February 2010.

Technical assumptions on the exchange rates point to a depreciation of the euro, both in effective terms and *vis-à-vis* the US dollar. Oil prices per barrel are projected to increase to approximately USD 85 (around €60), reflecting inter alia a recovery in world demand and economic activity.

The increase in external demand represents a small upward revision *vis-à-vis* the one considered in the winter 2009 Economic Bulletin and reflects a more favourable than expected performance at the end of 2009, which should have positive effects in 2010. However, as a whole, there were no significant changes in the international environment as from the winter 2009 issue of the Economic Bulletin.

Assumptions for the Portuguese public finances, particularly regarding data included in the State

Table 2

ASSUMPTIONS UNDERLYING THE PROJECTION EXERCISE

		EB Spring 2010			EB Winter 2009		
		2009	2010	2011	2009	2010	2011
External demand	yoy	-12.6	3.5	3.7	-13.0	1.9	3.2
Interest rate							
Short term	%	1.2	0.9	1.7	1.2	1.2	2.2
Long term	%	4.2	4.2	4.6	4.2	4.0	4.4
Nominal exchange rate [(a)]							
Euro effective exchange rate	yoy	1.0	-3.3	-0.3	0.8	2.2	0.0
Euro-dollar	aav	1.39	1.37	1.36	1.40	1.49	1.49
Oil price							
in dollars	aav	62.0	79.8	83.8	62.2	80.5	86.3
in euros	aav	44.2	58.4	61.6	44.2	53.9	57.8

Sources: Bloomberg, ECB, Thomson Reuters and Banco de Portugal calculations.
Notes: yoy - year-on-year rate of change, % - per cent, aav - annual average value. (a) An increase in the exchange rate represents an appreciation.

Budget for 2010 and the update of the Stability and Growth Programme have followed the usual rule within the scope of the Eurosystem projection exercise. Hence, these assumptions have only included the fiscal policy measures that have been legally approved or specified in sufficient detail and with high probability of legislative approval.

Interruption of the recovery in economic activity in late 2009 and early 2010

Information regarding the fourth quarter of 2009 showed a 0.2 per cent fall in GDP versus the previous quarter. Underlying this decline was a sharp contraction in gross fixed capital formation (GFCF), which will have persistent effects in 2010, and relatively high private consumption growth. The evolution of export was relatively favourable following the recovering in world economic activity.

Data available for the first quarter of 2010 encompasses a further contraction in GFCF, in sharp contrast with buoyant private consumption. Exports, in turn, will likely continue to benefit from the recovery in external demand.

Weak economic growth, in a context of recovering exports

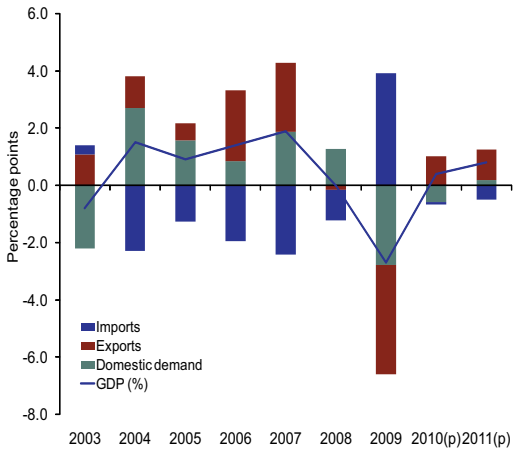
The current projection envisages weak GDP growth in 2010 (0.4 per cent), followed by a slight increase to 0.8 per cent in 2011 (-2.7 per cent in 2009). Underlying these developments is an increase in the contribution of exports to GDP growth, in a context of recovering external demand (Charts 1 and 2). The contribution of domestic demand is expected to be negative in 2010 and marginally positive in 2011.

The role played by exports over the projection horizon suggests that manufacturing activity will play a major role in the economic recovery. The subdued pace of growth of economic activity indicates that net job destruction will continue during 2010 and that some net job creation is expected in 2011.

Private consumption will decelerate sharply along 2010 and limited growth is expected in 2011, reflecting limitations imposed by the solvency conditions ensuing from the intertemporal household

Chart 1

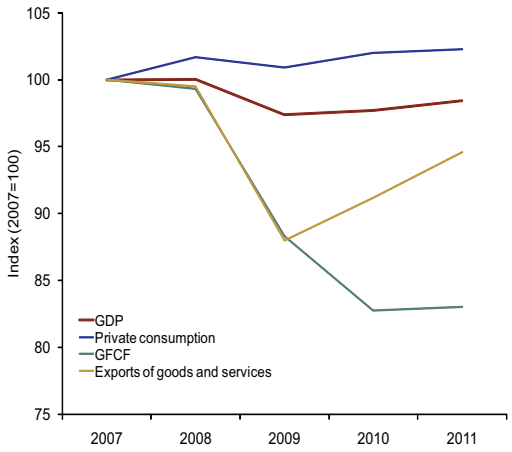
BREAKDOWN OF GDP GROWTH
Contribution to the rate of change



Sources: *INE* and Banco de Portugal.

Chart 2

GDP AND EXPENDITURE COMPONENTS



Sources: *INE* and Banco Portugal.

budget constraints. The current projection envisages a 1.1 per cent growth in private consumption in 2010 (-0.8 per cent in 2009) and only a 0.3 per cent increase in 2011, which delivers a stabilisation of the household savings rate at around 7 per cent of disposable income in 2010 and 2011 (8.6 per cent in 2009). Real disposable income is expected to decrease over the projection horizon, in a context where real wages will likely reflect unfavourable conditions prevailing in the labour market and where developments in the other income should be conditioned by the gradual increase in interest payments and fiscal measures included in the State Budget for 2010 and in the update of the Stability and Growth Programme. As to the fiscal measures, over the projection horizon moderate growth in public transfers and increase in direct taxes paid by households stand out.

The current projection includes a 6.3 per cent contraction in GFCF in 2010 and 0.3 per cent growth in 2011. Public investment is projected to decline in both 2010 and 2011, in line with the assumptions for public finances. With regard to residential investment, the dynamic effects of the contraction observed towards the end of 2009 and that estimated for the beginning of 2010, together with the expected developments in disposable income, will likely lead to a decline in this component in 2010 and 2011. Finally, corporate investment is projected to fall in 2010, mainly due to the dynamic effects of the contraction observed in late 2009 and that projected for early 2010. The prospects of some recovery in overall demand, in particular external demand, should favour a limited increase in this investment component in 2011, amid a slight increase in interest rates.

Exports are projected to evolve in line with the increase in external demand, in a context where no significant external competitiveness changes are expected for the Portuguese economy. Export growth is projected to be 3.6 and 3.7 per cent in 2010 and 2011 respectively (following a fall of around 12 per cent in 2009). This profile reflects the recovery in both international trade flows in goods and in exports of services, in particular tourism exports.

Imports, in turn, are projected to even out somewhat in 2010 and to increase by 1.4 per cent in 2011 (-9.2 per cent in 2009). This implies that import penetration will stabilize around the levels observed in 2009.

External demand for Portuguese goods and services is estimated to be more buoyant than import content-weighted overall demand, leading to a reduction in the goods and services account deficit in 2010 and 2011, notwithstanding the slight deterioration in the terms of trade stemming from higher oil prices. Given the stabilisation of the income account deficit in 2010, external borrowing requirements of the Portuguese economy are expected to reduce over the year to around 8.8 per cent of GDP. However, both the continued increase in the external indebtedness position and the rise in interest rates will likely produce a further deterioration in the income account deficit in 2011 and an increase in external borrowing requirements to 9.7 per cent.

Moderate growth of wages and consumer prices

The growth rates in the Harmonised Index of Consumer Prices (HICP) are expected to be positive in 2010 e 2011 (0.8 and 1.5 per cent respectively), following the contraction in 2009 (-0.9 per cent).

The gradual recovery in world economic activity underpins expectations of an increase in commodity prices, in particular oil prices, which should pass through to the HICP energy component. Therefore, this component is projected to increase in both 2010 and 2011. In contrast, a decline in the import deflator excluding energy goods is expected in 2010, reflecting base effects associated with the strong fall observed in 2009 and that estimated for early 2010. In 2011, together with the increasing normalisation of international trade flows and the expected increase in prices in international transactions, growth rates of the import deflator of non-energy goods and, consequently, the HICP non-energy

component are projected to return to positive levels.

Moreover, moderate recovery in profit margins are expected over the projection horizon, against a background where labour market conditions will likely contribute to moderate unit labour cost growth, in sharp contrast with the strong growth recorded in 2009. In the public sector, nominal wage growth is projected to be low over the next two years, in line with assumptions for public finances included in the current projection.

Downward revision of economic activity growth

The current projection encompasses a downward revision of economic activity growth *vis-à-vis* the figures published in the winter 2009 issue of the Economic Bulletin (Table 1). In 2010, in the light of recent data, domestic demand was subjected to sizeable revision, in particular GFCF, and furthermore in general government consumption and investment, in line with the updated assumptions for public finances.

For 2011 all domestic demand components have been revised downwards, amid deteriorating labour market conditions and less favourable disposable income developments, which reflect, in particular, a larger moderation than previously assumed in public transfer growth and a more marked increase in direct taxes paid by households.

Downside risks to economic activity and balanced risks to inflation

The current projection points to downside risks to economic activity growth. On the international front, such risks arise from the persistence of weaknesses in several international financial market segments, the possible reversal of the economic stimulus measures taken by authorities in various countries and the downward impact of the international financial crisis on trend growth in developed economies. These factors pose downside risks to Portuguese exports, which play a key role in the current projection.

The main domestic risk factor concerns financial market participants' perception regarding the adjustment process of the fiscal imbalance and its possible impact on external financing conditions for the Portuguese economic agents, since the deterioration in public sector financing conditions will tend to pass through on to private agents (see "Box *Financing conditions and their macroeconomic impact*"). In this context, following a credible fiscal consolidation strategy is vital to promote a macroeconomic framework oriented towards stability and sustained growth for the Portuguese economy, notwithstanding any possible short-term recessive effects. Only under this conditions can a sharp adjustment be prevented in the economy, with potentially large negative effects on welfare of economic agents.

Risks to inflation are broadly balanced. Although lower economic growth may exert less pressure on consumer prices, the possibility that nominal wages will grow above the ones included in central projection, as witnessed in previous years, leaves room for higher-than-projected increases in prices.

Finally, the current projections bear great uncertainty, associated with the international financial environment and the current fragile world economy recovery – with implications on the potential GDP growth in Portugal – and the ongoing fiscal consolidation process in Portugal.

This text was based on the data available up to mid-March 2010.

Box Financing conditions and their macroeconomic impact

Developments in the financing conditions of the Portuguese economy and associated risks

The period immediately preceding the international financial crisis was characterised by reduced levels of global risk aversion. However, the outbreak of the crisis in mid-2007 and its intensification at the end of 2008 triggered a very significant increase in risk premia and much tighter access to credit in international wholesale debt markets. Initially, these impacts were more marked in a number of economies particularly affected by the international financial crisis. More recently, the economies of some euro area countries – notably Portugal – with significant fiscal imbalances, high levels of external indebtedness or structural fragilities, recorded considerable increases in the risk premium on the public debt, albeit with different magnitudes.

The current projection for the Portuguese economy is based on an international environment that assumes a gradual normalisation of the financing conditions in international markets. The risk premium on Portuguese public debt was thus assumed to reverse after an increase in late January and early February. Nevertheless, in the event of a reappraisal of global risk price due to an increase in the levels of risk aversion, the tightening of the conditions to access external financing for Portuguese economic agents may be higher than projected, in particular, if uncertainty about the adjustment process of the Portuguese fiscal imbalance increases.

Therefore, it is important to assess the impact of less favourable external financing conditions on the Portuguese economy. This would result in an increase in the risk premium on Portuguese public debt, which would most likely be passed through to financing conditions for private agents, thus affecting the whole economy. In addition, a deterioration in the access conditions of Portuguese banks to international wholesale funding markets would probably make it more difficult for domestic agents to have access to credit, implying an increase in the share of liquidity constrained agents.

An assessment of deteriorating financing conditions in a general equilibrium model

The impact on the Portuguese economy of the prevalence of less favourable financing conditions than those considered in the current projection is illustrated using a dynamic general equilibrium model which has been calibrated to the Portuguese economy (PESSOA model).[1] A dynamic general equilibrium model has advantages over traditional macroeconometric models, given that it captures, in an integrated fashion, some transmission mechanisms that are not explicitly identified in these models (e.g. the wealth channel and the expectations channels). However, these results should be interpreted bearing in mind that general equilibrium models, like all economic models, are a stylised representation of reality and are based on simplifying assumptions that limit the transmission channels considered.

This model considers that there are two types of households: the asset holders that have access to asset/debt markets and smooth consumption over the life cycle, consuming according to their income prospects over the medium term, and the liquidity constrained that do not have access to asset/debt markets, consuming according to their current income. In addition, in this model, all assets/debt are subject to a single interest rate which is the same for all domestic agents (households with access to asset/debt markets, firms and the Government). The domestic interest rate includes a specific risk premium to Portugal on the reference rate for the euro area, which is determined in accordance with the economic conditions prevailing in the euro area as a whole. For the modelling of the Government, a fiscal policy rule is featured to adjust the tax revenue and/or public expenditure to ensure that public debt remains on a sustainable path. Simulations shown in this box take into account a specification of this rule using the labour income tax rate as the adjustment instrument. This box also briefly discusses the robustness of results when using alternative instruments.

(1) *For a detailed description of the characteristics of the PESSOA model, see Almeida, V., Castro, G. and Félix, R. (2008), "Improving competition in the non-tradable goods and labour markets: the Portuguese case", Banco de Portugal, Working Paper nº 16.*

Simulations were carried out on the assumption of a perfect foresight, i.e. assuming that, when a given shock occurs, economic agents know with certainty whether it is permanent or transitory, as well as its adjustment path. In practice this is not the case. Economic agents learn on the nature of shocks gradually,[2] therefore the simulation results tend to reveal a more front-loaded impact than would be the case if the scenarios considered were to materialise.

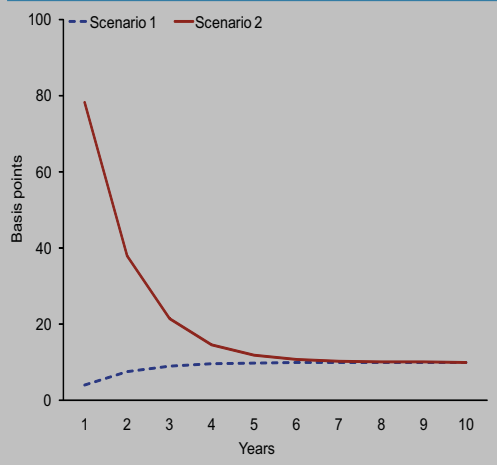
Two alternative scenarios were simulated to illustrate the impact on the Portuguese economy of less favourable developments in financing conditions than those embodied in the current projection. The first scenario represents the impact of a differing perception of risk of the Portuguese economy, considering the significant fiscal imbalance, high external indebtedness and structural fragilities, in the context of a reassessment of global conditions and pricing of risk. The second scenario represents the additional impact of a temporary but larger increase in uncertainty about the fiscal consolidation strategy.

The first scenario has assumed a gradual and permanent increase of 10 basis points (b.p.) in the risk premium specific to the Portuguese economy and of 1 percentage point (p.p.) in the share of liquidity constrained households. The second scenario, in addition to the permanent increase of 1 p.p. in the share of households without access to asset/debt markets, assumed an increase of 100 b.p. in the risk premium specific to the Portuguese economy in the first quarter (corresponding, on average, to an increase around 80 b.p. in the first year). This risk premium decreases gradually and partially, stabilising from year 5 onwards at 10 b.p. (Charts 1 and 2).

Chart 1

RISK PREMIUM

Deviations from the baseline scenario, per cent

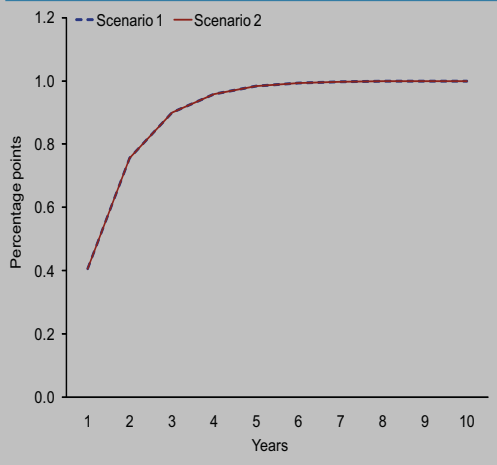


Source: Banco de Portugal.

Chart 2

SHARE OF LIQUIDITY CONSTRAINED HOUSEHOLDS

Deviations from the baseline scenario, per cent



Source: Banco de Portugal.

The impact of deteriorating external financing conditions for the Portuguese economy

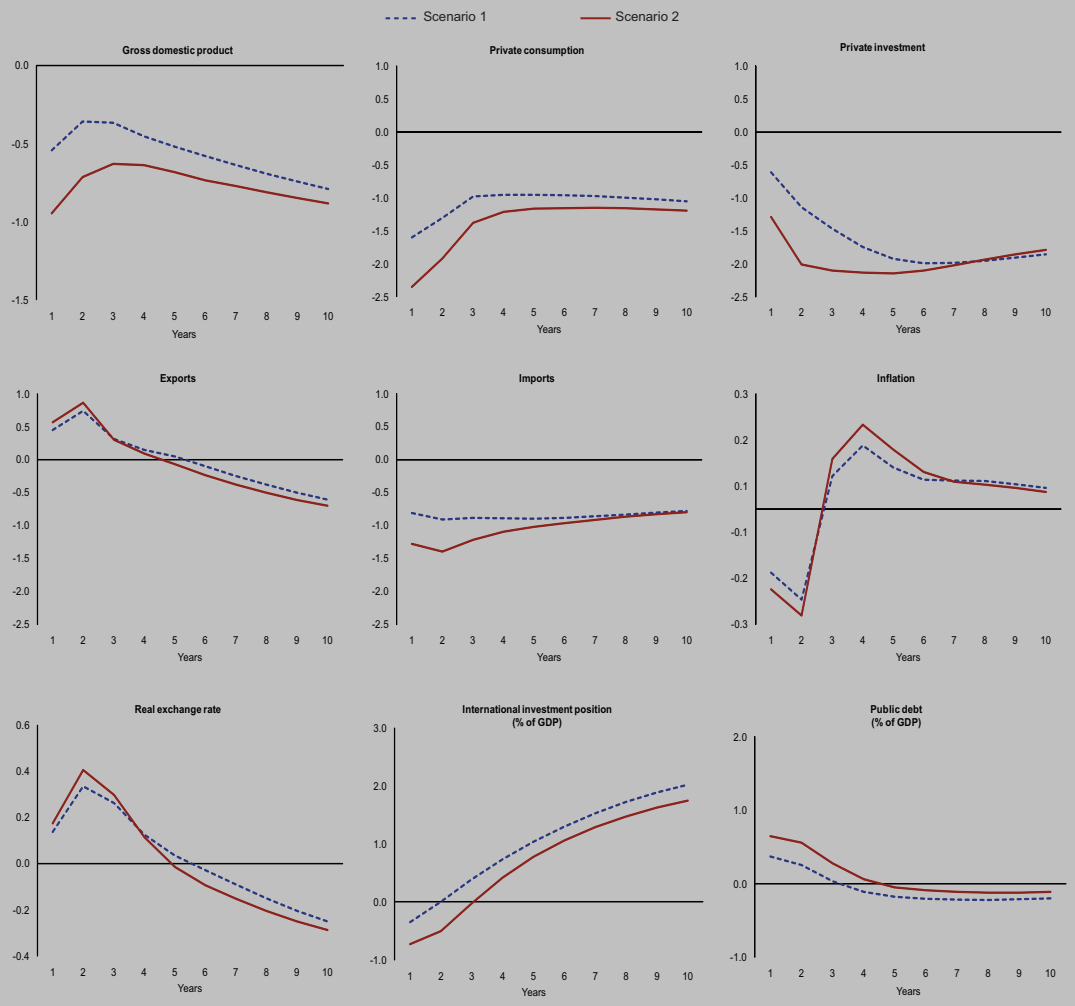
The increase in the risk premium directly affects household and firm decisions, having a negative impact on consumption and private investment decisions, and implying an increase in Government interest outlays (Chart 3). In turn, the increase in the share of liquidity constrained households directly affects their consumption and income levels. In addition, in the second scenario, i.e. in case of an additional temporary increase in the risk premium, the recessive impact on domestic demand would be significantly amplified in the short run, although the long-term effect would be the same for both scenarios.

(2) *The modelling of learning mechanisms by economic agents is one of the main fields of economic research and is subject of fierce debate with a view to its integration in models that are regularly used in economic analysis. For a seminal approach, see Seppo Honkapohja and George W. Evans (2001), Learning and expectations in macroeconomics, Princeton University Press.*

Gráfico 3

SIMULATION RESULTS FROM THE FIRST AND SECOND SCENARIOS

Deviations from the baseline scenario, in percentage; inflation, international investment position and public debt in percentage points



Source: Banco de Portugal.

For households, the increase in the risk premium, per se, implies a significant and permanent reduction in the level of private consumption, resulting, in the early stage, from changes in decisions related to consumption and asset holding by households participating in asset/debt markets. Spending decisions by these households are mainly influenced by: the wealth level, defined not only as assets/debt held in each period, but also by the present value of future earnings and dividends (the wealth effect); the return on assets/debt held (the income effect); and the opportunity cost of present versus future consumption (the substitution effect). An increase in the risk premium therefore implies a higher discount rate on future income, which decreases the level of wealth of these households, adversely affecting their consumption. In addition, in a context of indebted households, an interest rate increase, associated with a rise in the risk premium, has a negative impact on income, which in turn translates into a reduction in household consumption. Finally, the increase in the risk premium induces, ceteris paribus, an increase in the real interest rate, which, in the short run, is reinforced by the recessive and disinflationary impact arising from a sharp contraction in domestic demand. The increase in the real interest rate induces an increase in the return on savings, measured in terms of future consumption, thereby providing a further disincentive to present consumption. The immediate adjustment of private consumption is the result of the impact of shocks on

the level of household wealth, in a context where habits in consumption decisions play a limited role and agents anticipate the permanent component of the shock from the outset.

In addition, the permanent increase in the share of households without access to asset markets also has a negative impact on consumption expenditure, as households that do not participate in asset markets have lower income levels due to the fact that they only benefit from labour income and Government transfers. Moreover, the recessive impact of this change induces a tax revenue decrease which, considering the fiscal policy rule adopted, will be offset by an increase in the labour income tax rate. This, in turn, brings about a reduction in after-tax wages rate, in the number of hours worked and therefore in disposable income, with an additional contractionary impact on consumption expenditure.

As for corporations, the increase in the real interest rate also implies an increase in the opportunity cost of holding capital versus other assets, thereby determining a permanent reduction in the equilibrium capital-output ratio to restore the rate of return on capital. In addition, the immediate contraction in domestic demand, arising from an interest rate increase and from an increase in the share of liquidity constrained households, implies a decline in demand for domestically produced goods, also determining a permanent reduction in the desired capital stock. However, in the short run, the capital stock reduction is mitigated by real adjustment costs, implying a negative output gap and triggering a temporary reduction in the inflation rate, as well as a period of real depreciation. Within this context, the increase in the risk premium and its effects on the real interest rate determine a permanent reduction in the capital stock and in the level of potential output.

The temporary depreciation of the real exchange rate favours an increase in exports, as well as a decrease in imports which goes beyond the one merely implied by contraction in demand. These developments in the external trade of a small open economy favour a reduction in the deficit of the goods and services account, which, in the first stage, contributes to dampen the impact of an increase in interest paid abroad on the current account balance and, subsequently, to improve the international investment position of the Portuguese economy.

However, the process of real depreciation is reversed in the medium term, as a result of both a gradual capital stock adjustment to levels compatible with new demand conditions, as well as of the restrictive impact of the increase in the labour income tax rate on labour supply. This increase implies, ceteris paribus, that the reduction in real wages will be lower than the decline in productivity, thus increasing marginal production costs in the medium to long term. Nevertheless, the simulated scenarios imply a gradual improvement in the international investment position, albeit to a limited extent.

Finally, the interest rate increase arising from an increase in the risk premium implies higher Government interest outlays with an immediate effect on the fiscal deficit. As mentioned above, this increase in interest outlays must be financed in a way that keeps public debt on a sustainable path. Where the Government chooses the labour income tax to make adjustments, the redress of the fiscal imbalances will negatively affect labour supply, favouring leisure to the detriment of private consumption.

The robustness of the results to the choice of the fiscal instrument was assessed through a sensitivity analysis, considering, as alternative fiscal adjustments based on changes in the private consumption tax rate, in government consumption and in transfers to households. Although results do not change significantly in qualitative terms, two interesting aspects should be highlighted. Firstly, assuming the sustainability of the debt path is reached through a reduction in public consumption or in transfers to households, the contraction in demand is less marked, reflecting the non-distortionary nature of the financing. Secondly, assuming the adjustment is based on taxes on household consumption, the impact on inflation is positive when the shock occurs, reflecting the nature of this instrument, which results in lower real wage growth in the short term.

Summing up, a potential rise in the risk premium paid by domestic agents as well as an increase in the share of liquidity constrained households would have contractionary effects on domestic demand and on the level of economic activity in the short, medium and long term, slightly improving the international investment position of the Portuguese economy. Nevertheless, the simulated scenarios assume the maintenance of the public sector indebtedness level over the long term and that there will be no severe credit rationing implying quantitative credit restrictions to agents with access to financial markets. If such a situation were to materialise, it would imply highly recessive effects on demand and activity and an abrupt improvement in the international investment position.

Results shown in this box aim to illustrate the impact on the Portuguese economy of a deterioration in financing conditions, based on the assumption that no other policy changes will occur in addition to those implied by the fiscal rule. However, that may not happen in practice. For instance, in a situation where policy authorities simultaneously implement structural reforms aimed at both fostering an efficient allocation of production factors and increasing the levels of competition in the labour and output markets, the global impact on demand and economic activity level might be mitigated or even reversed.[3]

(3) *See Almeida, V., Castro, G. and Félix, R. (2009), "The Portuguese economy in the European context: structure, shocks and policy", in The Portuguese Economy in the Context of Economic, Financial and Monetary Integration, Banco de Portugal.*

ARTICLES

Capital Taxation and Globalization

Bank Interest Rates and Loan Determinants

Volatility and Seasonality of Tourism Demand in Portugal

The Margins of Exports: Firms, Products and Destinations

CAPITAL TAXATION AND GLOBALIZATION*

*Isabel H. Correia***

1.INTRODUCTION

The increasing integration of capital markets that characterized the last two decades is seen as having implications on the individual governments' ability to tax capital income. Since the tax base is more and more mobile, tax revenues are more sensitive to changes in the tax rate, also. Therefore we have witnessed a growing consensus, namely in regions that share some supranational decision making, and where the intra-area mobility is higher, for the desirability of coordinated fiscal policies, in particular on capital taxation. In practice, however, very few steps have been taken to harmonize capital taxation. This lack of coordination would lead us to expect a "race to the bottom" as a result of fiscal competition, which would imply a negligible tax revenue from capital taxation. Although we can observe as a general trend a small decline of the share of tax revenues from capital over time, that decline is not the one that economic theory would anticipate. This fact is even more puzzling when we take into account that the tax on capital income, when compared either with the tax on labor income or the value-added tax, is much more inefficient. This is a well known and robust result in the literature.[1] Taxing capital imposes a negative incentive on saving (that is, an intertemporal distortion since it taxes more heavily future than current consumption). This characteristic is worsened with the double, or sometimes triple, capital taxation that characterizes most fiscal codes. Social welfare is usually pointed out as the reason for the relatively high taxes on capital income, due to the undesirable effects on equity that a decline of those taxes could deliver, namely when compensated by an increase of labor taxation. Therefore, the existing situation can be seen as an implicit and partial coordination system, since different countries have different levels for capital taxes. This arrangement is supported by the argument that lower taxes would have a positive impact on efficiency, at the cost of penalizing the poorest of each economy. This equity loss is a cost that most countries would not want to pay.

In this article we want to test whether this thesis is supported by the economic theory and by the empirical characterization of different households, in developed economies as well as in emergent countries, which are entering in the international capital markets.

The background work of this article[2] aims at reconciling the apparently conflicting results of two con-

* The opinions expressed in the article are those of the authors and not necessarily those of the Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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(1) Chamley (1986) and Judd (1985) are the seminal works on this subject.

(2) See Correia (2010).

tributions to the literature. The first is the quite well known result of Arnold Harberger (1995),[3] that an increase of capital taxation would lead to a decline in wages, in a general equilibrium model of a small open economy. This article differs from Harberger (1995) since we consider that the change in capital taxes must be compensated by a change in an alternative tax. We assume that it is the tax on labor that is adjusted to guarantee that the total tax revenue is invariant. The second one is that of Garcia-Milá *et al.* (2001). These authors consider a closed economy model with heterogeneous households. Their conclusion is that the elimination of the capital income tax, when compensated by an increase of the tax on labor income, decreases the welfare of the households in the left side of the welfare distribution, that is the poorest of the economy. As the poorest households have labor income as the main source for financing of consumption, if wages would increase, as in Harberger (1995) with the elimination of capital taxation, it may not be the case that they would suffer in terms of welfare. This is the literature dilemma that this article tries to clarify.

2. THE MODEL

The model represents a small open economy with perfect capital mobility, that is an economy integrated in a global capital market. It is a real economy in the sense that we abstract from money as a facilitator of transactions. There is just one good produced in every period, this good is identical to the one produced in the rest of the world and there are no restrictions to the tradability of this good. The available technology uses as inputs capital, K, and labor measured in units of efficiency, EN, where N represents hours of work and E is an index of labor efficiency. We assume that markets are competitive. This assumption and the production function characteristics imply that real wages (in units of consumption), as well as the real cost of capital, depend only on the capital/labor ratio used in equilibrium by each firm. We can also say that the real wage depends positively on that ratio while the cost of capital (as its equilibrium rentability) depends negatively on the same ratio.[4] The produced good can be used in the small open economy for private consumption, for investment or for government consumption or to export to the rest of the world. The government spends a constant flow of per capita expenditures, G and taxes labor and capital income, at the proportional tax rates τ_n and τ_k respectively. The assumption that the system of taxing capital income is the territorial system implies that the income of external assets held by domestic households, B^* is not subject to taxation. The real net return of these assets is the net international real interest rate, r^*. By assuming that this rate is constant we are imposing that the rest of the world is stationary. We also assume that fundamentals in the rest of the world are identical to the ones of the small economy. These assumptions imply that, with no costs of adjustment of capital, the economy will converge immediately to the new stationary state, following the change of policy.

As the objective of this article is to understand the different effects that the change of policy can have on different households that live in the small open economy, it is important to characterize

(3) This paper considers an increase of the tax rate on coorporate taxation. The bulk of the paper contemplates a small open economy environment. I has a section were the results are extended to the US economy, that is to a closed economy.

(4) These properties derive from the production function being neoclassical and markets competitive.

the intrinsic heterogeneity of households, which leads them to suffer differently the effects of the change of policy. Then we will assume that households differ on labor efficiency and in the stock of non-human wealth that they hold at the time of the reform. Each household i has a labor efficiency level measured by E_i and holds wealth in physical capital, K_i domestic bonds, B_i and external assets B_i^*. Agents are identical in every other characteristic. To apply the method described in Correia (1999) we assume that preferences are such that it is possible to define a representative household.[5] Moreover, and given cross section empirical evidence, we propose the type of preferences GHH,[6] which are characterized by labor supply decisions in every period reacting just to the real wage of that period, and not reacting to the current or expect household's wealth. These preferences imply that if rich households work more than poor one it is just because that have a higher labor efficiency index.

Then preferences of household i can be represented by[7]

$$U_i = \sum_{t=0}^{\infty} \beta^t \frac{\left(C_{it} - \chi N_{it}^{\varphi}\right)^{1-\sigma}}{1-\sigma}, \ \chi > 0, \varphi > 1 \tag{1}$$

where C_{it} and N_{it} represent the consumption and hours of work of agent i in period t.

This household is constrained in its choices by the intertemporal budget constraint, which can be written as:

$$\sum_{t=0}^{\infty} \frac{C_{it}}{(1+r_o)(1+r^*)^t} = \sum_{t=0}^{\infty} \frac{w_t E_i N_{it}}{(1+r_o)(1+r^*)^t} + A_{i0} \tag{2}$$

where r_0 is the net rate of return in period zero, w_t is the net wage rate at period t and A_{i0} the initial wealth, is defined as $K_{i0} + B_{i0} + B_{i0}^*$. By solving the household problem it is straightforward to verify that the optimal choice of hours is given by the following expression:

$$N_{it} = \left(\frac{E_i w_t}{\chi \varphi}\right)^{\frac{1}{\varphi - 1}} \tag{3}$$

So it is clear that with GHH preferences the hours of work do not differ across agents when these have the same level of efficiency. Substituting this expression in the utility function (1) and in the budget constraint, (2), we can redefine the optimal choice of consumption as:

$$MAX \ \ U_i = \sum_{t=0}^{\infty} \beta^t \frac{\left(C_{it} - \overline{C_{it}}\right)^{1-\sigma}}{1-\sigma} \tag{4}$$

(5) That is, that preferences are such that conditions for Gorman aggregation are satisfied.

(6) These preferences are the ones used in Greenwood, Hercowitz and Huffman (1988).

(7) The qualitative result on equity is maintained with different preference representations.

subject to:

$$\sum_{t=0}^{\infty} \frac{C_{it} - \overline{C}_{it}}{(1+r_0)(1+r^*)^t} = \sum_{t=0}^{\infty} \frac{(E_i w_t)^{\frac{\varphi}{\varphi-1}}}{(1+r_0)(1+r^*)^t} \frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}} + A_{i0} \tag{5}$$

where

$$\overline{C_{it}} = \chi \left[\frac{E_i w_t}{\chi\varphi} \right]^{\frac{\varphi}{\varphi-1}} \tag{6}$$

As $\widehat{C}_{it} = \widehat{C}_i$, i.e. transformed consumption is constant over time.[8] In this case the budget constraint for household i, given by equation (5), allows for the determination of the optimal level of $\widehat{C}_i$ for every household i as a function of the net wages path, the international real interest rate, the interest rate at time zero and its level of labor efficiency and of initial wealth.

The value of that variable $\widehat{C}_i$ is given by the expression:

$$\widehat{C}_i = \frac{r^*}{1+r*} \left[\sum_{t=0}^{\infty} \frac{(E_i w_t)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t} \frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}} + (1+r_0)A_{i0} \right] \tag{7}$$

The general equilibrium of this economy depends on the compatibility of the firm's and of the different household's decisions. Firms are very simple entities in this economy that, in each period, hire labor and rent capital goods to, given the technology, produce the unique good. Every firm uses the same technology and are price takers in every market where they operate.

We will define the status quo as the situation where public goods are financed uniquely by taxes on labor and capital income. We will compare this equilibrium with the one that would result from the elimination of capital taxation, increasing the tax on labor income such that the same flow of government consumption can be financed.

As said before we use the method developed in Correia (1999). That is a very simplified method when compared to the ones used in the literature with heterogeneous agents models. One of the hypothesis that allows for that simplification is the choice of preferences which, through households heterogeneity, allows for the existence of the so-called "representative household".[9] The separability between aggregate and individual equilibrium is feasible given the described hypothesis: the type of preferences, households being price takers in the market and being anonymous to the government.

(8) Given the isoelastic preferences described in (4) and since the international real interest rate is at the steady state level, $r^* = \frac{1}{\beta} - 1$, then $\widehat{C}_{it} = \widehat{C}_i$, i.e., the transformed consumption is constant over time.

(9) That is the aggregate equilibrium, namely equilibrium prices, can be computed independently of the distribution of initial wealth A_{io} or the distribution of labor efficiency E_i as well as of the distribution that results from the *equilibrium*.

The effect of policy changes on equity is measured through the effects on welfare distribution. Using the optimum from households' problem the proposed utility function can be written as:

$$U_i^{\frac{1}{1-\sigma}} = \frac{r^*}{1+r*}\left[\sum_{t=0}^{\infty}\frac{(E_i w_t)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}\frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}} + (1+r_0)A_{i0}\right] \tag{8}$$

Note that this utility is an expression linear in $E_i^{\frac{\varphi}{\varphi-1}}$ and in A_{io}. This property is essential for the comparison of the welfare distribution's associated with each fiscal policy.

The interpersonal utility comparison has raised always questions due the cardinality that is necessary to proceed to that comparison. In this work we minimize that problem by using as a measure of the welfare of household i the index $v_i = U_i^{\frac{1}{1-\sigma}}$, which measures the consumption (transformed) of that household. In this case to compare the utility between two households i and j the ratio v_i/v_j. is computed. This ratio has a clear interpretation since it can be read as the consumption ratio across households, transformed by the labor desutility. The value of this ratio is the answer to the question: how much should be the growth of households j consumption, such that household i would be indifferent between their position in the welfare distribution? The reason for defending that we are minimizing the cardinality problem in the interpersonal welfare comparison is that the units chosen allow to interpret this relative position as a consumption equivalent.

To order the different policy regimes by equity it is equivalent to compare vectors of utility across households. We compare those vectors using the concept of relative differentials.[10] Then policy 1 dominates policy 2 if and only if the consumption increase (in percentage) of the poorer household, needed for the richer agent to change positions with him, is lower in policy 1 than in policy 2. In this way the choice of the household utility indicator and the criterion for comparing distributions complement each other.

3. ELIMINATION OF THE CAPITAL INCOME TAX

The objective of this article is to determine in which conditions the elimination of the tax on capital income, when compensated by an increase of the labor tax, improves equity in the small open economy. Then we should compare the welfare distribution of households in policy 1, where the economy is characterized by a constant positive tax rate on capital, with the alternative situation, policy 2, where the economy is characterized by a zero tax rate on capital.[11] In Correia (1996) we prove that policy

(10) Policy 1 is equity improving in relation to policy 2 iff policy 1 dominates policy 2 in relative differential, $v^1 \succ_{rd} v^2$, iff:

$$\frac{v_i^1}{v_j^1} > \frac{v_i^2}{v_i^2},$$

for any household i with a smaller utility than household j

The relative differential dominance is equivalent to the Lorenz dominance for any partition of the distribution support.

(11) In this case we maintain the tax on capital income in period zero, since this is a lump sum tax.

1 is the second best solution. Then, policy 2 is always more efficient than policy 1, i.e. the utility of the representative agent is higher in 2 than in 1. The effect on efficiency, or the effect on utility of the representative agent, $i=i^r$ can be measured by comparing

$$\widehat{C}_{i^r} = \frac{r^*}{1+r*}\left[\sum_{t=0}^{\infty}\frac{(w_t)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}\frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}}+(1+r_0)A_{i^r0}\right] \tag{9}$$

between the two policies. As we said efficiency is higher with policy 2, that is:

$$\sum_{t=0}^{\infty}\frac{(w_t^2)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}\frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}}+(1+r_0^2)A_{i^r0} > \sum_{t=0}^{\infty}\frac{(w_t^1)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}\frac{(1-\frac{1}{\varphi})}{(\chi\varphi)^{\frac{1}{\varphi-1}}}+(1+r_0^1)A_{i^r0} \tag{10}$$

where x^1 and x^2 represent respectively the equilibrium values of variable x associated respectively to policy 1 and to policy 2.

As the tax on capital income is constant in both experiments for $t \geq 1$ the non-arbitrage condition and the neoclassical production function implies that $\frac{K_{i^r}}{N_{i^r}}$, and therefore the marginal productivity of labor, is constant for $t \geq 1$. As the labor tax is also constant over time for every policy, we can guarantee that the net wage is constant over time, for policy 1 and for policy 2, for $t \geq 1$.

For $t=0$ and using the optimum conditions of firms, that equate the wage paid (before taxes) to the marginal productivity of labor, we get that:[12]

$$w_0 = (1-\tau_n)F_2\left(\frac{K_{i^r0}}{N_{i^r0}}\right)$$
$$N_{i^r0} = \left(\frac{w_0}{\chi\varphi}\right)^{\frac{1}{\varphi-1}}$$

If we assume a Cobb-Douglas production function, where α represents the capital share, we can write labor decisions as:

$$\chi\varphi N_{i^r0}^{\varphi-(1-\alpha)} = (1-\tau_n)(1-\alpha)K_{i^r0}^{\alpha}$$

As $\varphi > 1$, then $\varphi-(1-\alpha) > 0$, and since $\tau_n^2 > \tau_n^1$, then $N_{i^r0}^2 < N_{i^r0}^1$ and $w_0^2 < w_0^1$ $\frac{K_{i^r0}}{N_{i^r0}}$ increases with the higher tax on labor. By assumption $\tau_{k0}^1 = \tau_{k0}^2$. Therefore we can state that:[13]

Result 1: The elimination of the tax rate on capital income, accompanied by an increase of the labor tax, implies that the net real interest rate in period 0 declines, i.e. $r_0^2 < r_0^1$.

(12) $F(K,N)$ represents the technology and F_i represents the parcial derivative of F relative to the i argument. Then F_2 represents the marginal productivity of labor.

(13) Note that the net return on capital is given by $(1-\tau_k)\left[(\alpha K_{i^r}/N_{i^r})^{\alpha-1}-\delta\right]$, where δ represents the depreciation rate.

Using (10) result 1 implies:

Result 2: The elimination of the tax rate on capital income implies that:

$$\sum_{t=0}^{\infty} \frac{(w_t^2)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t} > \sum_{t=0}^{\infty} \frac{(w_t^1)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t} \tag{11}$$

These two results explain that, for the representative agent, utility increases not due to the return on capital, which declines, but due to the net present value of human capital, which increases although being taxed at a higher rate.

To understand how different households are affected differently we order households by increasing transformed consumption, or utility. If $i > j$, agent i is richer, that is it has a higher utility than agent j. Then to compare policy 1 with policy 2 in terms of equity we use, as described before, the relative differential concept:[14]

Definition: Policy 2 is equity improving in relation to policy 1 iff policy 2 dominates policy 1 in relative differential, that is :

$$\frac{\widehat{C}_i^2}{\widehat{C}_j^2} < \frac{\widehat{C}_i^1}{\widehat{C}_j^1}, \text{ for } i > j \tag{12}$$

To determine the effect on equity of the elimination of the tax on capital income let us consider two extreme cases: One where households differ just due to labor efficiency, i.e. $A_{io} = A_{i^r o}$, and in the other households have identical efficiency levels $E_i = E_{i^r} = 1$, and heterogeneity comes from different initial levels of non-human wealth.

Note that the definition of $\widehat{C}_i$, given in (7) depends on the sum of two items: one that is homogeneous across households and the other is heterogeneous.

Using (7), we check whether condition (12) is satisfied, after the results 1 and 2. When heterogeneity is in labor efficiency, condition (12) is equivalent to

$$\frac{1+r_0^2}{\sum_{t=0}^{\infty} \frac{(w_t^2)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}} > \frac{1+r_0^1}{\sum_{t=0}^{\infty} \frac{(w_t^1)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}}$$

On the other side when heterogeneity is caused by different initial stocks of financial wealth, condition (12) implies the opposite condition, that is:

(14) This concept was developed by Marshall and Olkin (1979). It is equivalen to a first-order stochastic dominance criteria, for any sub-groups of the population.

$$\frac{\sum_{t=0}^{\infty} \frac{(w_t^2)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}}{1+r_0^2} > \frac{\sum_{t=0}^{\infty} \frac{(w_t^1)^{\frac{\varphi}{\varphi-1}}}{(1+r^*)^t}}{1+r_0^1}$$

Therefore we can state that:

Result 3: The effect on equity of the elimination of the tax on capital depends crucially on the roots of heterogeneity across households: is equity worsening when agents differ on labor efficiency and, on the contrary, is equity improving when agents differ by the initial stock of financial wealth.

We can easily interpret result 3 in the following way. Individual welfare depends on two items: the present value of a function of net wages, which by result 2 increases with the elimination of capital taxation, and the initial wealth of every agent evaluated at $(1+r_0)$, which by result 1 declines with the change of policy. In the extreme cases described in result 3, depending on the characterization of households, either the first or the second parcel is homogeneous across households. So, in the case where agents differ by labor efficiency, the first parcel is heterogeneous across households and the second is homogeneous . The opposite occurs when agents are differentiated exclusively by the initial stock of financial wealth.

Therefore, in this environment, the effect of the elimination of capital taxation on equity depends completely on the roots of households heterogeneity. Then the question proposed is an empirical one: what is the root of the households heterogeneity observed in most industrialized or emerging countries? Cross section data tells us that both wealth and earnings are not equally distributed across households. We can show,[15] using general characteristics of empirical evidence, that the joint distribution of those two household' characteristics, labor efficiency and initial wealth, satisfy the necessary conditions for:

Result 4: The elimination of capital income in a small open economy, inhabited by households characterized by asymmetries compatible with empirical cross section evidence, leads to an improvement in equity. Any household with welfare lower than the one of the representative household of the economy increases welfare due to that policy change.

The last part of this result comes from using together the increase of efficiency and the improvement of equity. As the representative agent is better off and, for $i < r$, $\frac{\widehat{C}_i}{\widehat{C}_j}$ increases, then the utility of household i the poorer, increases necessarily more than the utility of the representative agent.

The question is now to understand how can these results and the opposite one described in Garcia-Mila *et al.* (2001) coexist.

(15) For details see Correia (2010).

4. THE IMPORTANCE OF THE EXOGENOUS REAL INTEREST RATE

The environment in which the exercise of last section was developed was the one of a small open economy with perfect capital mobility, while Garcia-Mila *et al*. calibrate their model for the US, which is described as usual by a closed economy model. How does this change of environment revert the results on equity in a such a strong way? The fundamental difference is that in the environment described until now the real interest rate was exogenous to policy. That is it did not react to the elimination of capital taxation. While in Garcia-Mila *et al.* the real interest rate is a variable that reacts to policy, due to the changes in saving and investment associated to the change in taxation. The same would occur if, even when considering a small open economy, we would assume that the rest of the world, composed by a set of identical small open economies, was changing policy in a similar way and simultaneously to the specific small open economy under study.

In this section we question result 4. How should it change when the economy is represented by a closed economy, that is one economy where the path for the real interest rate would react to the change of policy. The environment is identical to the one developed in section 1.1, except for capital immobility and goods nontradability which implies that, in every period, market clearing imposes that the sum of private consumption, public consumption and investment has to be equal to the production realized in the economy. This change, which is equivalent to the real interest rate being endogenous to policy in this economy, implies that, contrary to the former model which was analyzed analytically, now we have to use a numerical solution method for the computation of the equilibrium. We use the calibration as in Correia (1999). That is, $\tau_k = .5$ [16] and $\tau_n = .23$, which are consistent with $N = .25$ and $G/Y = .19$, Preferences are such the $\varphi = 1.8$, $\chi = 2.34$, $\sigma = 1.001$ and $\beta = .96$. The technology is Cobb Douglas, the share of capital is 0.4 and depreciation is 10%.

The following table summarizes the information that results from the computed equilibria, and which is necessary for the present analysis:

		λ	γ
Policy 1	$\tau_k = .5, \tau_n = .23$	1	3.7
Policy 2	$\tau_k = 0$[17], $\tau_n = .35$	1.02	2.9

λ is the welfare of the representative household relative to its welfare with policy 1. That is the efficiency gain of the elimination of capital taxation is positive and for the chosen calibration it represents an increase of 2% in the utility of the representative household. The effect on equity is still measured by the effect on the value of human wealth and on the value of non-human wealth. The ratio of these two values is given by γ.[18]

(16) Note that this tax is on capital income net of depreciation.

(17) Except for period zero, where is 50%.

(18) The value of γ is given by

$$\sum_{t=0}^{\infty} \frac{(w_t)^{\frac{\varphi}{\varphi-1}}}{\prod_{s=1}^{t}(1+r_s)} / (1+r_o).$$

It is immediate to see that, contrary to what happens in the small open economy, the value of γ declines with the elimination of capital taxation.[19] The transition to the new steady state is now characterized by an increasing capital/ labor ratio, therefore by an increasing path of wages and a decreasing path of interest rates. When compared with the case when there is no transition, the path of wages is now always lower and the path of interest rates always higher. Both contribute to a change of γ of different sign from the change in the small open economy. The incentives to save and invest more are identical to the ones in the small open economy. But now to increase the capital stock it is necessary to sacrifice significativelly consumption. This implies that capital accumulation is now realized at a much more gradual way over time. Therefore wages do not increase so much as before, the incentive to work more is lower and labor taxation has to increase more. On the other hand the slow increase of investment and the immediate elimination of capital taxation implies a higher return on capital than the one observed over time for the small open economy.

This result confirms, partially, the conclusions in Garcia-Milá *et al*. (2001):

Result 5: The elimination of capital taxation in a closed economy, inhabited by heterogeneous households whose distribution of characteristics is consistent with cross-section evidence, implies a more unequal economy.

The effect of the change of policy over the poorest depend now on the specific distribution of the economy under study. Namely we need to know the distance across those poorest and the representative household of the economy. As we know that the representative household increase welfare by 2% and that poorest families increase distance relatively to the representative household we cannot say what happens to welfare of poorest without knowing its distance or its idiosyncratic characteristics.

5. CONCLUDING REMARKS

We show in this article that the effect on equity of the elimination of the tax rate on capital income, when compensated by an increase of labor taxation, depends in a crucial way on the effect that the change of policy has on the path of the real interest rate. When we analyzed a small open economy where that rate is exogenous to policy the result is that the poorest households of the economy increase welfare as a result of the change of policy.

When this change of policy is also implemented by other economies that belong to the international capital market, the real interest rate reacts to the change of policy and the result is the one described for the closed economy. Here the effect on equity is reversed. This may explain why, contrary to what should be expected by fiscal competition, we have observed during the last two decades a slight decline of capital taxation. Maybe policy decision makers are benevolent, or maybe that the hypothesis that, though moved by different incentives, they reach the desirable goals is not so far from reality.

(19) This decline is robust to different preferences, for example the same effect is obtained with preferences isoelactic in consumption and leisure.

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BANK INTEREST RATES AND LOAN DETERMINANTS*

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1. INTRODUCTION

The analysis of changes in bank interest rates and credit aggregates is of great significance both in terms of monetary policy and financial stability. Knowledge of how the monetary authority is able to influence bank interest rates is crucial to a proper assessment of the macroeconomic impact of changes in their official intervention rates, both in terms of final magnitude as in respect of the path leading to this adjustment. In turn, credit contributes to a more efficient allocation of resources in the economy, while assuming particular importance for the activity of banks. This reinforces the need for a conceptual framework permitting an assessment on which of the developments observed are in line with the determinants commonly identified in the literature, in terms of volume of credit granted and interest rates associated with operations. This article aims to make a contribution to this analysis.

Sections 2 and 3 present the methodology and the main results of the econometric modelling of outstanding loans and bank interest rates. These results are then used to illustrate the adjustment dynamics to a change in the money market interest rate and to discuss the importance of the explanatory variables on the evolution of interest rates and bank loans. Taking the results of the most recent period into account and, particularly since the outbreak of financial crisis, we have endeavoured to highlight the impact of variables associated with the conduct of banking institutions as factors determining the evolution of interest rates and bank loans.

2. MODELLING BANK INTEREST RATES

2.1. Theoretical determinants

The evolution of bank interest rates in different credit segments reflects a diversified set of factors. A first factor is the global cost of funding for institutions. Most of the literature which studies the determination of bank interest rates assumes that banks operate under an oligopoly market, which means that a bank does not act as a "price taker", but has some market power in setting prices.[1] Bank interest rates can therefore adjust with a lag and not in full to changes in the cost of funding, which is the main component of the cost of borrowing and which, in the relevant literature, is usually approximated

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(1) See Gambacorta (2004), Gropp, Sorensen and Lichtenberger (2007).

to the short-term interest money market rate.[2] In turn, the determination of this latter rate is generally linked to its reaction to changes (observed or anticipated) in the official interest rates, central to most central banks in their implementation of monetary policy.[3]

The intensity and speed of transmission of money market to bank lending rates may, therefore, vary over time, particularly reflecting issues related to the level of competition in the financial sector, risk of operations and financial innovation. A factor of relevance in the setting of bank interest rates is therefore credit risk, particularly aggregate credit risk, which is associated with the state of the economy. Another important factor is associated with the exposure of banks to interest rate risk. Since financial institutions have to cope with unsynchronized demand for loans and supply of deposits, they often turn to the money market to manage their liquidity position. Volatility of interest rates in the money market is sometimes considered in determining interest rate margins (note that this volatility decreased with the introduction of the euro in January 1999). Another important factor lies not only in increased competition within the banking and financial system as a whole, which made it possible to widen the range of funding opportunities and investment, but also in the increase in financial innovation, that have supported changes in risk management and brought down the costs of doing business. Increased competition and financial innovation are closely linked to the liberalization of financial markets and, more recently, to full participation in the euro area.

2.2. Interest rate estimating

To estimate bank interest rates, three single equation models with an error correcting mechanism were considered, one for each segment: loans to non-financial corporations, residential mortgages and households for consumption and other purposes.[4] The explanatory variables identified are in line with those usually considered in the literature, i.e., the money market interest rate and a variable that proxies credit risk were considered as determinants for each interest rate, in the latter case the default flow in the portfolio of loans to the non-financial sector.[5] A dummy variable intended to capture the effect of the participation of Portugal in the euro area was also considered. The different treatment between the pre and post participation period in the euro area is a common feature in the literature, with several differences in the transmission of interest rates in the two regimes having been identified.[6]

The single equation approach cannot capture second-round effects, which could only be considered in a context of general equilibrium. However, since the intention is to study not only the evolution of

(2) The most important components of the overall funding of the institutions are, in general, deposits and debt securities, a significant part of whose respective interest is at a variable rate. However, as these components remunerations are closely related to the rates prevailing in the money market, in the empirical literature, the cost of funding of institutions is approached by this latter variable. See Kauko (2005). For the Portuguese case, see Boucinha and Ribeiro (2009).

(3) The recent financial crisis has illustrated that risk premiums may occasionally affect this relationship.

(4) The interest rate on outstanding amounts apply to all operations at each moment, within the considered segments. The choice of the interest rates was associated, in particular, with their importance in the context of the models used for economic analysis and projections by Bank of Portugal.

(5) Other variables were also tested, in the light of economic theory, such as the volatility of interest rates, although these variables have not proved significant in determining changes in bank interest rates.

(6) For instance, De Bondt (2005) concludes that the transmission of money market rates to the rates charged by banks on lending to customers has changed since the introduction of the euro, becoming faster.

interest rates in different segments but also the evolution of bank lending in light of its specific determinants, an "integrated" approach would become too complex because of the number of endogenous variables. The use of single equation models, in the case of several variables, therefore has the advantage of being simple in terms of econometric estimating, while the economic interpretation of the parameters tends to be very appealing.[7]

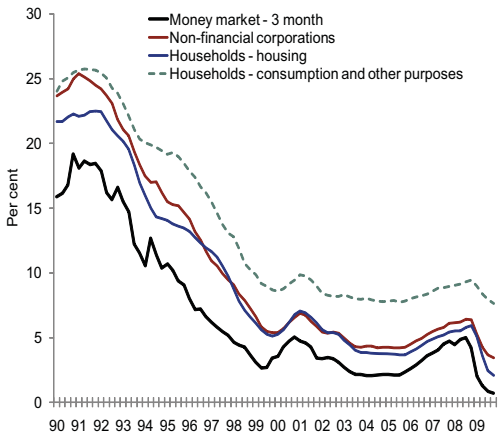
The data used correspond to quarterly series for the period beginning in the first quarter of 1990 and extending up to the last quarter of 2009 (Chart 1).[8] The interest rates series is based on the Monetary and Financial Statistics. The default flow in the portfolio of loans to the non-financial private sector is based on an estimate of the flow of new overdue loans and other non-performing loans as a percentage of loans.[9] The choice of the rate of money market interest rate fell to the three-month Euribor rate, given that in Portugal interest rates on the major proportion of loans to bank customers are strongly associated with short-term money market rates.

The existence of a well-defined, long-term relationship between endogenous variables and regressors firstly requires the variables in question to have the same order of integration. It was therefore ascertained, using the augmented Dickey-Fuller (ADF) test, if the variables were stationary around a linear trend or stochastic trend. The results indicate that the null hypothesis of the existence of a unit root in the series under analysis cannot be rejected. For the series in first differences, this hypothesis is clearly rejected, suggesting that the series can be treated as integrated of order 1, I(1).

In order to study the cointegration properties of the series, two types of tests were performed: the

Chart 1

MONEY MARKET AND BANKS' INTEREST RATES



Source: Banco de Portugal.
Note: Quarterly averages.

(7) The single equation approach is also reflected in the literature, for example, in De Bondt (2005), Kauko (2005), Nieto (2007) and ECB (2007).
(8) The choice of sampling period was dependant on the availability of time series.
(9) This variable is defined in the manner set out in the Banco de Portugal's Financial Stability Report.

Shin test, which assumes the existence of cointegration as a null hypothesis and the augmented Dickey-Fuller (ADF) test, which posits the absence of cointegration as a null hypothesis.[10] The existence of a cointegration relationship between bank and money market interest rates and the default flow in the portfolio of loans to the non-financial private sector was tested. The Shin test is indicative of the non rejection of the null hypothesis, the existence of cointegration, for most of the leads and lags considered. It may therefore be considered that there is a long-term relationship on which the interest rates charged by banks in transactions with their customers depend positively on the money market interest rate and default flow.

The empirical model is based on the following long-term relationship,

$$stn_i_t = \alpha_0 + \alpha_1 stn_mm_t + \alpha_2 pbd_t + d_euro_t + \varepsilon_t \qquad (1)$$

in which *stn_it* is the interest rate for the three segments mentioned above, *stn_mm* is the three-month Euribor rate, *pdb* is the default flow on the loans portfolio to the non-financial private sector,[11] and *d_euro* is the variable that captures the effect of Portugal's participation in the euro area.[12]

Table 1 presents the results obtained for the estimating of equation (1). The evidence obtained indicates that the long-term transmission from money market interest rates to interest rates on loans to non-financial corporations and for residential mortgages is complete, but slightly lower in the case of the interest rates on loans to households for consumption and other purposes. The variable *d_euro* appears significant, indicating that participation in the euro area has had a negative impact on the level of interest rates on bank loans (which is consistent, inter alia, with the reduction in spreads between these rates and the money market interest rate).

The dynamic relationship includes lags of the endogenous variable, exogenous variables and the error-correction term. The results of the estimating of the dynamic equations on interest rates in the various segments are also presented in Table 1. The estimated coefficients suggest that the interest rates charged by banks respond positively to changes in money market interest rates and changes in default rates.[13]

(10) Ogaki and Park (1997) argue that the tests assuming as null hypothesis the absence of cointegration are known to be underpowered to identify a false null hypothesis, so that, with a high level of probability, fail to reject the null hypothesis although the variables are cointegrated. Ogaki and Park argue that when the economic model postulates the existence of a long-term relationship between variables, as is the case, it is more appropriate to test the null hypothesis that there is cointegration test instead of testing the absence thereof.

(11) Although not presented in this article, the default flow has also been modelled, as a positive function of the level of bank lending rates and negative on the growth in economic activity.

(12) This variable takes the value 0 in the period before 1999 and 1 thereafter. Differences in coefficients associated with the long-term determinants between the two periods have proved significant.

(13) We tested for the existence of asymmetries in the adjustment of bank interest rates to money market interest rates, whether they increase or decrease. However, in the context of the adopted specification, the data did not support the existence of significant asymmetries in the transmission of interest rates in Portugal.

Table 1

INTEREST RATE ESTIMATE RESULTS

Segment	Non-financial corporations	Households - housing	Households - consumption and other purposes
Cointegration relations for bank interest rates		**Levels**	
constant	0.014	0.015	0.052
money market interest rate - 3 month	1.000	1.000	0.849
default flow	1.000	0.426	0.914
d_euro	-0.020	-0.022	-0.030
Short-term dynamics		**First difference**	
Δendogenous_1	0.298	0.524	0.535
	(5.07)	(9.31)	(8.59)
Δmoney market interest rate - 3 month	0.364	0.253	0.146
	(10)	(8.78)	(4.89)
Δmoney market interest rate - 3 month_1	0.279	0.066	0.133
	(7.54)	(2.21)	(3.79)
Δunemployment rate_1	0.197	-	0.224
	(2.57)		(2.65)
ECM_1	-0.097	-0.122	-0.076
	(-2.11)	(-4.42)	(-2.52)
Standard deviation	0.0014	0.0015	0.0017
R^2	0.893	0.877	0.807
AR 1-5 test:	0.472	2.499	1.314
	(0.7561)	(0.0401)	(0.2699)

Source: Authors' calculations.

3. MODELLING OF BANK LOANS TO NON-FINANCIAL CORPORATIONS AND HOUSEHOLDS

3.1. Theoretical determinants

The evolution of bank lending theoretically results from the interaction between demand and supply factors. However, the variables that help to explain the dynamics of the loans sometimes affect both demand for and supply of credit, and it is not always, accordingly, possible to empirically identify the two channels. There are usually variables of scale, variables related to financing conditions, variables related to the position of households and corporations and factors related to structural changes in the banking sector and other variables.[14]

In the case of scale, an expense aggregate, an income aggregate or a variable that proxies economic activity is usually considered. In the case of households, bank loans are usually taken out to finance

(14) For more details, see ECB (2007).

consumer spending or investment, which agents are unable or unwilling to fund with current income and/or savings. Lifecycle hypothesis [Modigliani and Brumberg (1954)] establishes that households rely on loans in order to smooth their consumption expenditure over the life cycle, according to the present value of its future expected return. Variables of scale, such as economic activity or disposable income, accordingly reflect the ability of households to contract debt, since the expectation of higher levels of income, permitting a higher debt burden to be serviced, leads to higher indebtedness. Corporations, usually take out loans out to finance investment. Moreover, robust economic growth, translated into higher current results, make it possible to support higher debt levels, therefore financing investment through bank loans. Additionally, expectations of increased activity and productivity may lead to an increase in capacity and/or to a higher volume of projects that become profitable, therefore creating more demand for loans.

A second set of relevant factors relates to financing conditions, which include not only the cost of credit but also other contractual features, such as loan maturities. Higher costs reduce the availability and capacity of economic agents to incur and support debt and have a negative effect on demand for bank loans.

A third factor relates to the financial position of the borrower, which influences the assessment of its solvency and respective ability to raise new loans. For example, an increase in wealth (particularly in housing wealth) can increase its borrowing capacity, facilitating the acquisition of loans, since it reduces the problems of asymmetric information. This mechanism is similar to the one usually reported for corporations, as documented, for example, in Bernanke and Blinder (1988) and Bernanke and Gertler (1989). In this context, the level of existing debt will be a factor that is also likely to influence the demand for loans. More specifically, the higher the level of debt, the higher the sensitiveness to shocks that may affect debt servicing capacity.

Another set of factors that play a predominant role, especially in the supply of loans, is related to factors, mainly structural in nature, that affect the banking sector. An important example is the financial liberalization that took place in Portugal in the second half of the 80s and early 90s. Increased competition in the banking sector, which was accentuated by financial integration in Europe, undoubtedly played a role in the financing conditions for households and corporations. Increased competition led to a wave of innovation and a significant increase in the supply of new products in the financial sector (by increasing loan maturities, securitization, inter alia), which has had serious consequences not only in terms of amounts and conditions of credit supply but also in terms of raising funds and risk management by financial institutions.

Other factors that may also be important in the determination of the loans to households are related, for example, to demographic issues. The increase in households' debt may be related to the effects of demographic composition, owing to an increase in the number of agents with greater propensity to take on debt.

Empirical literature on the identification of determinants of bank loans usually focuses on variables more closely associated with demand. The fact that the non consideration of factors typically associ-

ated with supply may be acceptable in most situations, adds to their general measuring difficulties. However, in episodes such as the recent financial crisis, this may limit the explanatory power of adopted specifications, since there is evidence that credit institutions' supply has been affected in a number of dimensions, including inter alia, fees, amounts, maturities and collateral requirements, which factors are also relevant in determining the equilibrium quantities.

3.2. Bank loans estimating

The methodology used is roughly in line with the approach adopted by Calza, Gartner and Sousa (2003), when presenting an analysis for the private sector in the euro area and by Fritz and Reiss (2008), who study the evolution of credit to households in Austria. In line with other studies, these authors demonstrate that the development of loans can be roughly explained by aggregate macroeconomic variables and find evidence of a long term relationship between lending, GDP and interest rates.[15]

In the study now presented for Portugal, several loan series to the non-financial private sector were considered, broken down into three segments, as presented for estimating interest rates (loans to non-financial corporations, residential mortgage loans and loans to households for consumption and other purposes). These segments comprise the most relevant credit activities of resident banks, and therefore play a relevant role in the model for the Portuguese economy used by the Banco de Portugal for analysis and forecasting purposes. Three single equation econometric models with an error-correction mechanism (ECM) were estimated separately in two steps, using OLS, with each model corresponding to a credit segment. For each segment, a relatively limited set of explanatory variables was considered as long-term determinants, similarly to what is usually found in the literature, i.e., a cost of credit variable and a variable of scale. A dummy variable transversal to the three segments was also included, aiming to capture the change of economic regime occurring with Portugal's participation in the euro area.[16]

Quarterly series are used in Portugal for the period between the first quarter of 1990 and the last quarter of 2009 (Chart 2). All series except interest rates are expressed in logarithms. As mentioned above, for each segment the corresponding expense aggregate was chosen.[17] In the case of loans to non-financial corporations, corporate investment was chosen, in the case of residential mortgage loans, investment in housing was considered and, finally, in the case of loans to households for consumption and other purposes, private consumption of durable goods was used.

The series on outstanding loans for the different segments considers bank loans from resident and non-resident banks. The series on interest rates is obtained from the Monetary and Financial Statistics. The housing prices are based on data from the Confidencial Imobiliário real estate Index.

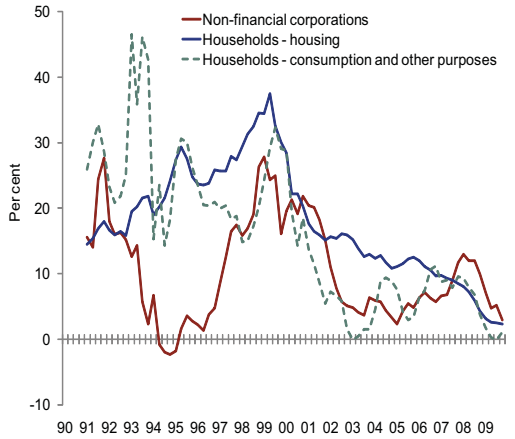
(15) In Fritz and Reiss (2008), the inflation rate is also considered in the long-term relationship as a factor explaining the evolution of loans to the private sector.

(16) This dummy has the value 0 in the period before 1999, reaching a value of 1 in mid-2007, when the international financial crisis changed the context of financial integration that had been deepening since the beginning of participation in the euro area.

(17) In the literature of bank loans is is usually considered as a scale variable the GDP instead of its components. This should be linked to the fact that tipically it is also considered the aggregate lending, due to difficulties in obtaining disaggregated series.

Chart 2

BANK LOANS
Year-on-year growth rate



Source: Banco de Portugal.

Finally, the series on expenditure corresponds to an update of the quarterly series for the Portuguese economy published in the Banco de Portugal, Economic Bulletin, June 2009.

The results of the unit root tests indicate that the null hypothesis of the existence of a unit root cannot be rejected. For the series in first differences, this hypothesis is clearly rejected, suggesting that the series in question can be treated as integrated of order 1, I (1). The series on residential mortgage loans is an exception, as the hypothesis of a unit root in the series in differences cannot be rejected for the sample considered. However, for residential mortgage loans in real terms, the ADF test indicates that we are very close to accepting the stationarity of the series in first differences. In this context, and given also the reasonableness of such a theoretical option, it is assumed that the real stock of these loans is I (1).[18]

As beforehand, we implemented two types of tests to study the cointegration of the series (the Shin test and the Dickey-Fuller test). The existence of a cointegrating relationship between each credit aggregate, the corresponding expenditure variable and the cost of credit variable were therefore tested. For the ADF test, we can conclude that for a test with a 5 per cent significance level, the absence of cointegration is rejected only in the specification for residential mortgage loans. However, in the case of the Shin test, the null hypothesis of the existence of cointegration is not rejected in any case, regardless of the number of leads and lags considered. The existence of a long-term relationship in which credit depends positively on aggregate spending and the dummy variable and negatively on the cost of raising funds is not, accordingly, rejected.

The empirical model is based on the following long-term relationship, specified in a semi log-linear:

(18) As will be discussed below, from the viewpoint of the estimate it is irrelevant to estimate the long-term relation in nominal or real terms, since the existence of a unit coefficient on the variable expense is not rejected.

$$cdn_i_t = \alpha_0 + \alpha_1 desp_i_t + \alpha_2 stn_i_t + d_euro_t + \varepsilon_t \quad (2)$$

in which *cdn_i* is the logarithm of the nominal stock of credit (end of period) in the three segments mentioned above, *stn_i* and *desp_i* represent, respectively, the interest rate and the logarithm of the nominal expenditure variable associated with each segment and *d_euro* is the variable that captures the effect of Portugal's participation in the euro area.

In estimating the parameters associated with long-term relationships (Table 2), static homogeneity in the expenditure variables was imposed, i.e. a unit coefficient.[19] This restriction is verified by the data, since the estimate for the free coefficient associated with these variables is not statistically different from 1. As regards the coefficient on the interest rate, the sign obtained in the long-term relationship is negative, i.e. an increase in the interest rate implies a reduction in credit. For the sample considered, this effect appeared to be clearly more significant for the stocks of loans to households than for the loans to non-financial corporations.

The dynamic relationship for the credit aggregates is given by lags of the endogenous variable and of exogenous variables and by the error-correction term. In the case of residential mortgage loans, changes in house prices are also considered. Table 2 presents the results of the estimating of the dynamic equations for the various loan segments. The coefficients obtained are statistically significant and have the expected sign.

(19) This restriction aims to ensure the necessary long-term properties, noting that these relations are used for the medium to long term projection exercises carried out in the context of the Bank of Portugal's quarterly model. In particular, this ensures that real equilibrium is not affected by changes in the level of nominal variables.

Table 2

BANK LOANS ESTIMATING RESULTS

Segment	Non-financial corporations	Households - housing	Households - consumption and other purposes
Cointegration relations for bank loans		**Levels**	
constant	2.661	3.715	2.695
expense aggregate for the segment	1.000	1.000	1.000
bank interest rate for the segment	-1.154	-8.219	-7.065
d_euro	0.431	1.061	0.372
Short-term dynamics		**First difference**	
Δendogenous_1	0.163	0.452	-
	(1.78)	(4.94)	
Δendogenous_2	0.423	-	0.195
	(5.18)		(2.45)
Δendogenous_4	-	0.281	-
		(3.61)	
Δexpense aggregate for the segment	0.146	-	-
	(2.04)		
Δexpense aggregate for the segment_3	-	-	0.264
			(3.5)
Δhousing prices_2	-	0.187	-
		(2.51)	
Δbank interest rate for the segment	-	-0.799	-2.886
		(-2.99)	(-3.62)
Δbank interest rate for the segment_3	-	-0.768	-
		(-2.25)	
ECM_1	-0.046	-0.017	-0.053
	(-1.88)	(-1.68)	(-2.03)
Standard deviation	0.017	0.008	0.021
R^2	0.631	0.853	0.688
AR 1-5 test:	1.445	0.579	1.679
	(0.22)	(0.72)	(0.15)

Source: Authors' calculations.

4. PASS-THROUGH OF MONEY MARKET INTEREST RATES TO BANK INTEREST RATES AND BANK LOANS

This section examines the pass-through of money market interest rates to bank lending rates and bank loans, based not only on the equations presented above, but also on the above-mentioned equation for the default flow. Thus, a shock on the money market interest rate is implemented. This variable can be considered more conclusive since the beginning of participation in the euro area, as exogenous to the Portuguese economy, at least in economic terms[20].

With regard to bank interest rates, the results suggest that banks adjust their lending rates in line with developments in money market rates, although the pass-through process is not immediate. In the short-term several lags in the pass-through are observed, in line with other studies. It is also conclud-

(20) In econometric terms this may not be the case, to the extent that, on the whole, a synchronicity between the developments in the Portuguese economy and throughout the euro area could be revealed.

Table 3

BANK INTEREST RATES ADJUSTMENT TO A 1 P.P. CHANGE IN THE MONEY-MARKET INTEREST RATE

	Long-term impact (p.p.)	Adjustment (per cent)		
		After 3 months	After 6 months	After 1 year
Non-financial corporations	1.09	74	88	94
Households - housing	1.04	52	72	94
Households - consumption and other purposes	0.93	44	63	83

Source: Authors' calculations.

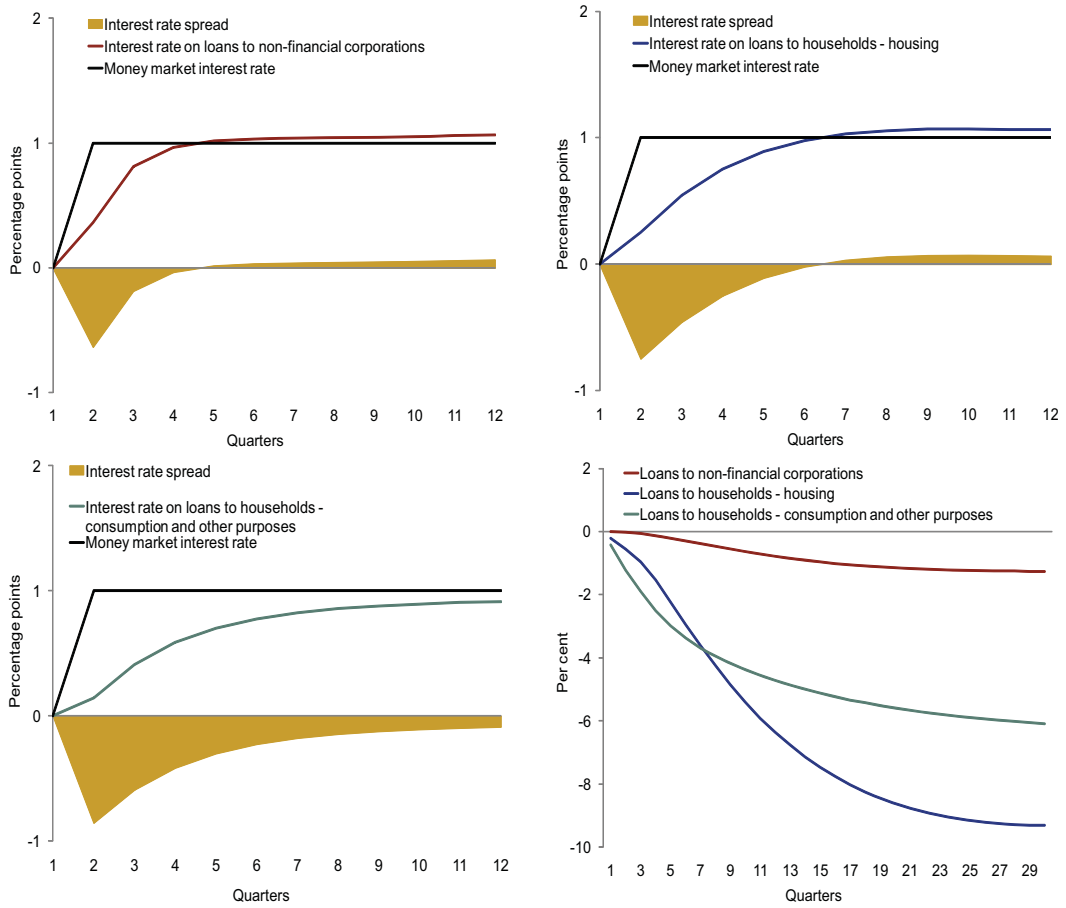
ed that the speed of adjustment is different depending on the segment considered. Table 3 shows the long-term cumulative impact after a unit percentage change in the money market rate and the proportional adjustment of bank interest rates of up to one year. It is estimated that the pass-through is not complete in the case of interest rates on loans to households for consumption and other purposes, but is still higher than 90 percent. It should be noted that the long-term impact on bank interest rates is affected by developments in the default flow, thus justifying the fact that long-term impacts on different segments are higher than the long-term coefficients presented in Table 1. It is also estimated that the interest rates on loans to non-financial corporations were those that adjusted quickly to changes in money market interest rates, in the period under analysis. These were followed by the interest rates on residential mortgage loans and finally by the interest rates on loans to households for consumption and other purposes. This difference in the speed of adjustment may reflect a higher level of competition in the market for loans to non-financial corporations.

In terms of interest rate spreads, the results indicate that an increase in the money market interest rate, is followed by an immediate compression of spreads in all segments. It is estimated that the largest reduction occurs in the segment of interest rates on loans to households for consumption and other purposes and the lowest in the non-financial corporations segment (Chart 3). However, twelve months after the change in the money market interest rate the transmission is almost complete, and it is estimated that the spreads are close to their initial values (with the above-mentioned exception of the consumption and other purposes segment).

With regard to bank loans, it can be concluded that the segment with the highest sensitivity in the long term to changes in the money market interest rate is in residential mortgage loans with the least sensitive segment being lending to non-financial corporations. It should be noted however, that this result was largely conditioned by the sample period considered. This was characterized by a considerable expansion of credit to households, particularly in the 90s, in a context of strong decline in interest rates, with loans to non-financial corporations, despite this context, exhibiting a more definite cyclical pattern.

Chart 3

IMPACT ON BANK INTEREST RATES AND BANK LOANS OF 1 P.P. NCREASE IN THE MONEY MARKET INTEREST RATE



Source: Authors' calculations.

5. CONTRIBUTIONS ANALYSIS

The estimating of the econometric models presented in the previous section enables the impact of key determinants in the dynamics of loans and of the corresponding interest rates over the last decade to be quantified. For the above purpose, we calculated contributions to the growth of loans and the change in interest rates of the adopted explanatory variables. Reference should be made to the limitations inherent in the approach taken in the analysis, namely the fact that it is based on partial equilibrium models. In this context, it should be noted that one of the main limitations of this type of analysis is the inability to properly assess the importance of a structural shock, since several of the variables considered are endogenous and the possible feedback effects are not considered.

In dynamic specifications such as those used, the lagged endogenous variable is also a function of the explanatory variables. The lagged endogenous variables are therefore replaced recursively, with the result that the contribution of the change of variable *X* to the change in endogenous variable C_t^X in period *t* is calculated as:

$$C_t^X = \sum_{j=0}^{J} \theta_j^X X_{t-j} \tag{3}$$

in which X_{t-j} is the change in the explanatory variable in period *t-j* and θ_j^X is the impact on the change in endogenous variable j periods after a shock of 1 per cent/percentage point in the variable *X* in period *t*, calculated from regressions (1) and (2). Thus, the rate of change of each credit aggregate (change in interest rate) results from a weighted average of past rates of change (changes) in determinants. [21]

Based on the methodology presented, it can be seen that the trajectory of money market interest rates has been the major determinant of changes in bank interest rates over the last decade (Charts 4, 5 and 6). It should also be noted that that there are several lags in transmission, justifying increases/decreases in spreads on lending rates, in periods of significant decreases (increases) of the money market rate. It should be noted that in Portugal, the prices of a major proportion of bank loans to customers are very closely related to money market interest rates, primarily for two reasons: firstly, there are segments in which contracts are primarily arranged on the basis of variable rates or in which the term for interest rate refixing is up to one year (with residential mortgages being a prime example). On the other hand, there is a significant share of transactions with a maturity not exceeding one year, namely transactions with non-financial corporations. Developments in money market interest rates therefore had an obvious effect on the interest rates of banks' operations with customers.

Additionally, risk (proxied by the unemployment rate and/or the flow of new defaults) has also contrib-

Chart 4

INTEREST RATE ON OUTSTANDING LOANS - NON-FINANCIAL CORPORATIONS
Quarterly change rate and contributions of some determinants

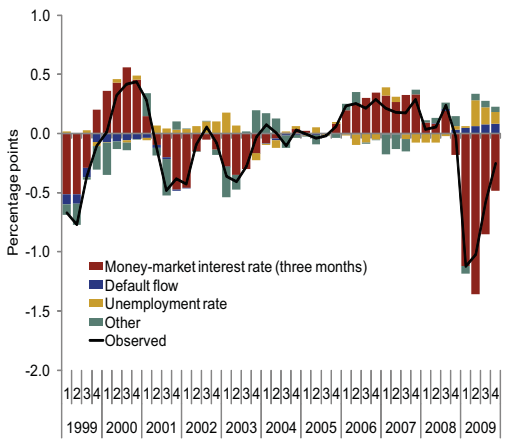
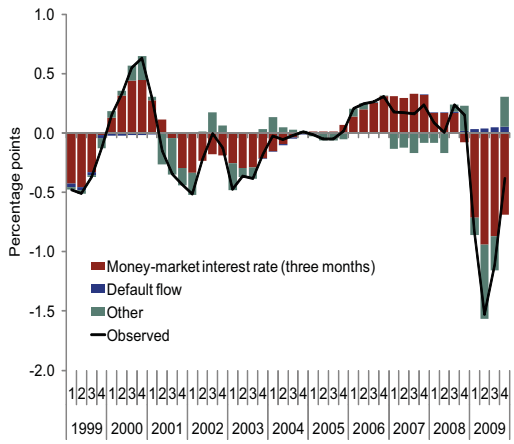


Chart 5

INTEREST RATE ON OUTSTANDING LOANS - HOUSEHOLDS FOR HOUSE PURCHASE
Quarterly change rate and contributions of some determinants



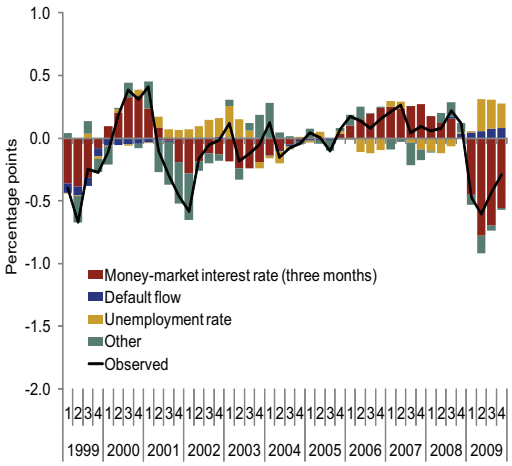
Source: Banco de Portugal.

(21) The weighting factors associated with each 'dependent variable – determining factor' combination vary in line with the segment considered, so that although the long-term impact may be similar, the adjustment path can differ markedly.

Chart 6

INTEREST RATE ON OUTSTANDING LOANS - HOUSEHOLDS FOR CONSUMPTION AND OTHER PURPOSES

Quarterly change rate and contributions of some determinants



Source: Banco de Portugal.

uted to the determination of bank interest rates, and is particularly visible during periods of recession. In particular for the most recent period, this has assumed some importance in the segments of loans to non financial corporations and to individual borrowers for consumption and other purposes. The

change in this factor contributed towards the mitigation of the reduction of interest rates on loans since the beginning of the year, given the underlying demand for a higher return on credit risk. The non-repercussion of credit risk in the change of interest rates on outstanding amounts in the residential mortgage loans segment during the period considered is related to the fact that operations for extended periods are predominant in this segment and that the terms are defined for the life of the operation, with banks therefore not being able (in general) to change the previously agreed contractual conditions. Moreover, this effect was also conditioned, in the most recent period, by the historically low growth rates recorded by the credit aggregate, with only a tiny fraction of outstanding loans being negotiated in the context of the difficult conditions imposed by banks after the outbreak of the crisis in international financial markets. It should also be noted that the increase in the default flow in this segment was much less pronounced than that observed in the loans to households for consumption and other purposes and non-financial corporations segments, in which the values of such flows were clearly higher than in the previous recession.[22]

Charts 7, 8 and 9 illustrate the evolution of bank interest rates since 1999, and the levels derived from the estimated long-term relationships. It can be seen that between 2005 and 2008, actual interest rates were consistently lower than those implied in the identified determinants (resulting in a gap

(22) For an analysis of credit risk, see section 4.4 Credit Risk of the text "The Portuguese banking system during 2009", Banco de Portugal, *Economic Bulletin*, Autumn-2009.

Chart 7

INTEREST RATE ON OUTSTANDING LOANS TO NON-FINANCIAL CORPORATIONS

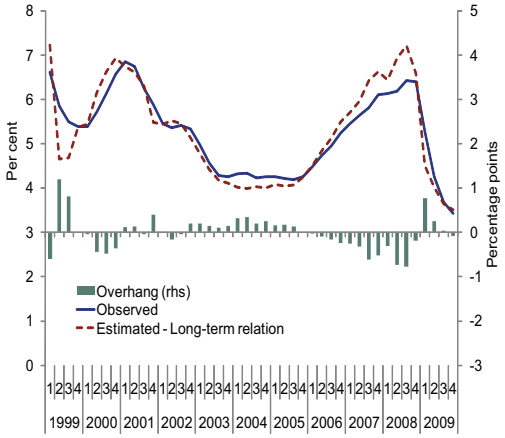
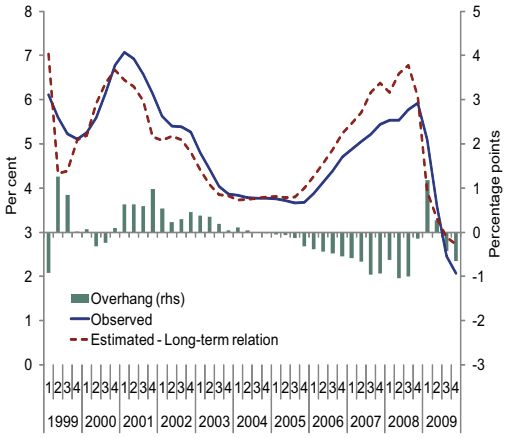


Chart 8

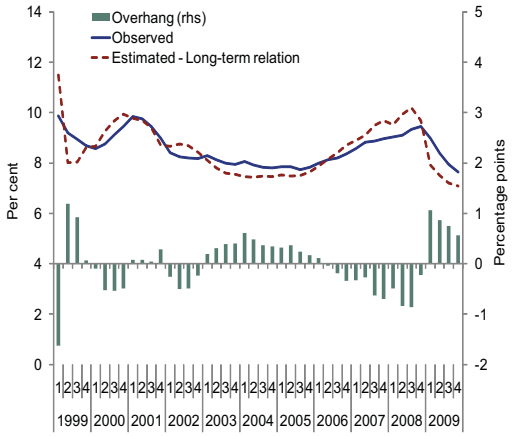
INTEREST RATE ON OUTSTANDING LOANS TO HOUSEHOLDS FOR HOUSE PURCHASE



Source: Banco de Portugal.

Chart 9

INTEREST RATE ON OUTSTANDING LOANS TO HOUSEHOLDS FOR CONSUMPTION AND OTHER PURPOSES



Source: Banco de Portugal.

in the graph, the so-called overhang[23]). This reflected, to a certain extent, the already-mentioned gradual nature of the process of adjustment of bank interest rates to changes in money market interest rates. It also reflected competition in the considered markets, a factor which, according to the results of the Bank Lending Survey, realised during this period a progressive narrowing of bank interest rate margins on lending to customers. Note that there is some evidence that this trend had already begun, to the extent that the process of financial liberalization and privatization of the Portuguese banking system has induced a competitive environment, powered by technological innovation, in

(23) Expression commonly used in economics to describe an excess/difference between observed trends and estimates of value of long-term equilibrium.

terms of products and channels. Interest rates on credit translated into a compression of intermediation margins, which were also influenced by the progressive decrease in cross-subsidization in retail banking. In early 1990 most services were provided without making an explicit related costs charge, which tended to be offset by higher net interest income. This has been changing, with fees assuming increasing importance in terms of income generation for Portuguese banks. These characteristics tend to affect not only the level of bank interest rates but their adjustment dynamics to shocks.

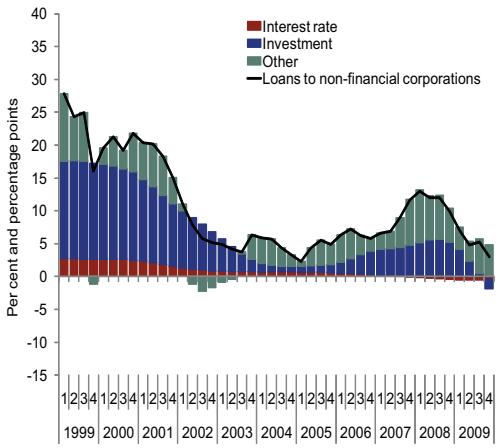
The evolution of bank interest rates has been one of the most visible expressions of the significant change in the framework of the Portuguese economy over the last two decades. This change had major implications on the behaviour of economic agents and on their financial situation. The elimination of the exchange risk premium, has significantly relieved the restriction on shortage of capital, simultaneously increasing economic agents' portfolio diversification possibilities. Therefore, there was an adjustment process to a higher equilibrium level of debt for the non-financial private sector and, in parallel, a portfolio diversification of financial instruments by residents (both in terms of instrument and originating sector).

Over the last two decades, liquidity constraints have been alleviated for a large number of households and corporations, enabling them to access the credit market, together with a broadening of the purposes covered. Increased competition in the banking sector, the adoption of new methods for the assessment of credit risk by banks or the sophistication of corporations regarding the use of credit instruments have also facilitated the expansion of credit.

Chart 10 shows the year-on-year growth rate of loans to non-financial corporations and the contribution of the main determinants identified. In the early participation in the euro area, loans to the sector registered an extremely high growth rate, reflecting strength of corporate investment and, to a lesser

Chart 10

LOANS TO NON-FINANCIAL CORPORATIONS
Year-on-year growth rate and contributions of some determinants



Source: Banco de Portugal.

extent, the significant reduction observed in bank interest rates on loans to the sector. However, the dissipation of the impact of these changes and the reduction of investment during the 2003 recession led to a slowdown in loans to the sector. The subsequent recovery of investment (which resulted in growth rates still well below those observed in 1997-1998) coexisted with a cycle of rising interest rates, which have mitigated the positive impact on the evolution of the loans.

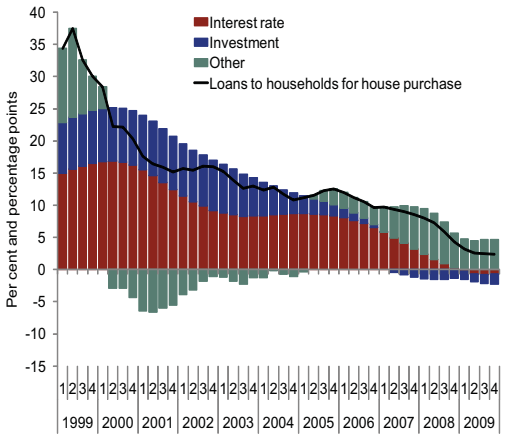
In recent years, developments in respect of loans to non-financial corporations exceeded (incrementally until early 2008) that underpinning the behaviour of the determinants considered. This occurred in the context of a significant increase in the sector's borrowing requirements, reflecting a decrease in their savings, in line with the higher income paid by the sector as return on invested capital, and relatively stable investment (as a percentage of GDP). In global terms, and despite the slight increase in investment, the development of loans was primarily associated with inventory finance and working capital requirements and with situations of debt restructuring. In this context, it should be noted that following the outbreak of the crisis in international financial markets in the summer of 2007, the growth rate of bank loans to non-financial corporations remained relatively sustained in 2008. In a context of adverse conditions in international financial markets, this suggests that Portuguese banks have continued to demonstrate an ability/willingness to accommodate to some extent corporate borrowing requirements, given the strong and unexpected fall in demand, allowing for additional credit support in comparison to that historically observed at low stages of the cycle. However, during 2009, loans to non-financial corporations slowed markedly, owing to the significant contraction of investment. Overall, this pattern of change in loans to non-financial corporations is in line with the historical regularities existing in Portugal and the euro area, i.e., the growth of loans to non-financial corporations tends to have a gap (of about a year) in comparison to the evolution of economic activity.[24]

There was a gradual acceleration in bank loans for residential mortgages throughout the 90s, to growth rates of more than 30 percent (Chart 11) in 1999. Together with a number of factors already mentioned, with a relatively transversal impact on the operational segments considered, several other factors have affected this sector more specifically, such as the existence of the system of subsidized loans, which have accentuated the combined effect of reduced liquidity restrictions and lower interest rates, demographic trends over the 90s, leading to an increase in demand in the housing market and the malfunctioning of the rental market. Over the next decade, residential mortgage loans slowed, evolving more in line with the determinants considered and therefore reflecting lower contributions by changes in interest rates since the mid 90s and the trend decline in housing investment. Growth observed between 2005 and 2008, however, systematically exceeded the growth associated with the evolution of the determinants considered. A part of the explanation of this trend appears to be associated with the fact that, in the context of the rising trend in ECB interest rates (in late 2005 and the third quarter of 2008), banks offered their customers credit agreements tailored to their debt servicing capacity. This translated into longer maturities, an increase in loan-to-value and the introduction of payment plans to alleviate the burden on families over the short term. These trends

(24) In this regard, see BOX 1 - Loans to the non-financial private sector over the business cycle in the euro area, European Central Bank, Monthly Bulletin, October 2009.

Chart 11

LOANS TO NON-FINANCIAL CORPORATIONS
Year-on-year growth rate and contributions of some determinants



Source: Banco de Portugal.

reflected the competitive environment existing in credit operations and the particularly favourable context prevailing in international financial markets. Later, in the context of an intensifying financial crisis, this situation gradually changed.

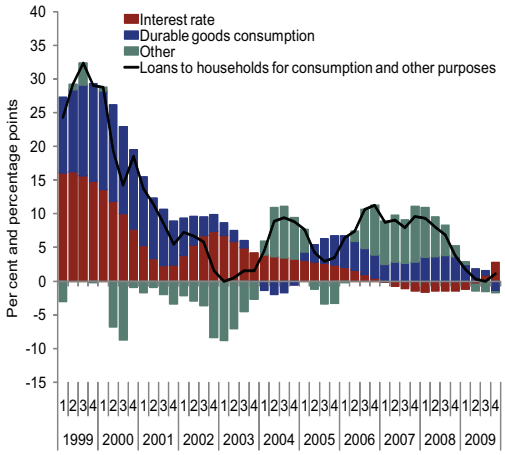
Bank loans for consumption and other purposes, especially those for consumption, have grown rapidly over the last 20 years, but were based on a very low level (Chart 12). Households have increasingly resorted to this type of credit to meet the demand for consumer goods, particularly durable goods. According to the results of the 2006 edition of IPEF (a household survey on assets and debt), car purchases are the main factor associated with these operations. However, as noted above, the set of purposes acceptable was expanded over the years. In the segment under analysis, loans displayed greater sensitivity to changes in interest rates, in comparison to loans to non-financial corporations. This sensitivity was reflected in a significant contribution to the fluctuations in the growth rate of loans for consumption and other purposes. Similarly, the downward trend in the growth of consumption of durable goods and its cyclical sensitivity contributed decisively to the growth of loans to this sector/purpose. As in the case of the non-financial corporations segment, the trends observed between 2006 and 2008 also exceeded that underpinning the behaviour of the determinants considered in the case of loans to households for consumption and other purposes. This may have reflected the particularly favourable conditions of credit supply in force at the time, allowing a greater participation of families in this segment of the credit market, as documented in the IPEF's conclusions and in line with banks' increased supply of personal credit products for multiple purposes. This situation was later reverted.

As already mentioned, the specifications used in this article regarding loans mainly tend to reflect demand factors. However, conditions in the credit market have also changed in terms of supply (quantities and prices). In particular since participation in the euro area, Portuguese banks were able

Chart 12

LOANS TO HOUSEHODLS FOR CONSUMPTION AND OTHER PURPOSES

Year-on-year growth rate and contributions of some determinants



Source: Banco de Portugal.

to access a much broader financing market, with no exchange rate risk. At the first stage, through the euro interbank market, and latterly through bond issues (in the market for European Medium Term Notes) and loan securitisation operations, which have grown at a significant rate since 2000. Available evidence suggests that developments associated with technological and organizational changes have contributed to increased competition in the credit market, through the modernization of distribution channels and the introduction of new financial products. This has given credit institutions increased flexibility to respond quickly to fluctuations in demand. In periods of rising interest rates, banks were therefore able to adjust their practices in order to limit the pressure on the ability of households to continue to service their debt and sustain the demand for loans. Such adjustments translated, for instance, into the willingness to change contractual maturities (particularly through the adoption of grace periods on capital) and/or spreads associated with the transactions.[25] The change in the terms of the supply contributed to maintaining the growth rates of loans to the non-financial sector increasingly away from their equilibrium levels in relation to identified factors, a situation leading up to the early stages of the crisis in international financial markets. There was also a growing disparity in interest rates in relation to long-term determinants, which, in addition to the already documented existence of lags in the transmission of interest rates, reflected changes in supply conditions.

With the outbreak of crisis in international financial markets, and its intensification at the end of 2008, there was an across-the-board interruption to these trends as regards variables and segments, albeit somewhat heterogeneously. Accordingly, at the end of 2009, both bank interest rates and the change in lending aggregates stood at levels more consistent with their determinants. For interest rates, this interruption was particularly visible in the loans for consumption and other purposes segment, with

(25) In this regard, see "Box 4.2 *The main characteristics of residential mortgage loans in Portugal*", Banco de Portugal, Financial Stability Report-2008.

interest rates in this segment being higher than those associated with the evolution of determinants, which were associated with significantly increased delinquency in the segment.[26] On the other hand, it was less pronounced in the housing segment, where delinquency, although rising, has not been of a similar magnitude, and where, due to the characteristics of the contracts, it is not (usually) feasible to aggravate contractual conditions, i.e. spreads on previously existing contracts. It should also be noted that the effect on the rates associated with outstanding amounts of the less favourable conditions in the new contracts is constrained by the (historically) low rates of change on loan rates.

In addition, residential mortgage loans and lending to non-financial corporations were significantly down, although growth rates have remained higher than those associated with the evolution of the determinants. It should, however, be noted that residuals in the corresponding equations, although positive, were lower in late 2009 than at the end of 2008. In the case of loans to households for consumption and other purposes, the slowdown was even more significant in light of the determinants, so that residuals in this segment changed sign, becoming negative.

The results obtained accordingly suggest that other factors may have assumed greater importance in determining the dynamics of lending and bank interest rates over recent quarters. Data from the Bank Lending Survey point to the importance of factors related to credit supply conditions.

The economic and financial crisis has created a change in the conditions of credit supply, in the segments considered. This process started in 2007, initially driven by constraints in the international wholesale funding markets, persisting and deepening further in the second half of 2008, when the risk assessment was particularly negative. In light of the results of the Survey, this change translated into a tightening of conditions for the banks' approval of credit to the non-financial sector. There were increases in spreads on bank interest rates and other restrictions (both in prices and quantities), mitigating the reductions in bank interest rates and contributing to a more significant slowdown of bank loans to households and non-financial corporations. It should be noted that this change in conditions is applicable to new business and/or renewals, and the full impact thereof on loan balances and corresponding interest rates will, accordingly, tend to emerge only gradually.

6. CONCLUSION

This article emphasises the importance of the existence of an analytical framework that permits, at any time, an assessment of the extent to which changes in interest rates and bank lending conform or not with a coherent set of factors with empirical and theoretical support. It also makes it possible to highlight the importance of the banking system as a factor that significantly conditions the pass-through of monetary policy impulses.

Over the past few years, interest rates and bank lending have remained closely associated with a relatively limited set of variables with theoretical support. After controlling these relationships for the impact of participation in the euro area, money market interest rate and several risk indicators

(26) Note that the variable that controls the default flow in the loan portfolio considers the aggregate total portfolio, not distinguishing between the different segments.

were identified as key factors in interest rates on bank loans; in the case of bank loans, expenditure aggregates and cost variables turned out to be determinants. Based on the identified empirical models, there was an across-the-board decrease in the residuals of the estimated equations for the outstanding amounts of loans in 2009 in all segments, even turning negative in the case of loans to households for consumption and other purposes. Also in the case of interest rates, residuals exchanged sign in the latter segment (becoming positive). These developments may have been partly associated with the impact on Portuguese banks of the significant deterioration of the economic and financial framework. Recent studies also suggest that the slowdown in lending noted in the euro area reflected not only a reduction in demand but also, to a certain extent, supply factors.

The possibility (not yet verified) that the turbulence in financial markets resulted in structural changes on how the banks operate as financial intermediaries in the economy recommends the need to monitor the stability of the interest rates and bank loans models used for analysis and forecasting.

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VOLATILITY AND SEASONALITY OF TOURISM DEMAND IN PORTUGAL*

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1. INTRODUCTION

Tourism is an important economic activity of Portugal. According to preliminary data from the Portuguese Office for National Statistics (INE, 2009), tourism generated in 2008 about 5% of the Economy's Gross Value Added, corresponding to approximately 7.3 billion euros. The 2008 Report on Competitiveness of Travel and Tourism, ranked Portugal 15th from a list of 130 countries in terms of tourism industry competitiveness. Overall, Portugal climbed seven positions in relation to 2007 and four positions among all 27 EU countries (Portugal Digital, 2008). Amador and Cabral (2009) present a detailed analysis of the services industry in Portugal and show that this positive evolution has occurred in this sector in general and reveals a comparative advantage in the travel and tourism industry.

The main source countries of tourists to Portugal include Germany, Spain, France, the Netherlands and the United Kingdom, with these countries accounting for more than four-fifths of total inbound tourists. Spain is responsible for almost half of foreign tourism. In 2008, these countries represented over 65% of total tourism revenue, in 1990, 58% and in 1970, 44%. The United Kingdom was the main generator of revenue in 2008 having reached 1 640 375 thousand euros, followed by France with 1 200 581 thousand euros. Domestic tourism demand is of growing interest and an important focus of the 2006-2015 National Strategic Plan for tourism is precisely to "accelerate the growth of domestic tourism".

Seasonality is an important feature of tourism and in particular of Portuguese tourism (Baum e Lundtorp, 2001). It is in the warmer months that the country is most sought by tourists and the number of nights spent in hotel establishments increases. However, although the tourism industry looks to diversification in terms of supply, seasonality is an important feature of tourism and should be taken into account when developing this area of research.

In addition, nonstationarity and conditional heteroscedasticity (high and low volatility movements) are other important characteristics of tourism series. Volatility is considered by many researchers as an unpredictable measure of variation intensity. These variations are normally associated to unexpected

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events typically known as "news shocks" (Shareef and McAleer, 2005 and Kim and Wong, 2006). For instance, among several factors responsible for changes in tourism patterns, are global terrorism, economic changes in the tourism source countries, exchange rate volatility, tourist health and safety in the destination and unexpected national and international political changes.

The main objective of this paper is to analyse and model tourism demand series. Based on a range of existing models, we apply a symmetric model – the GARCH model (Engle, 1982 and Bollerslev, 1986) - and two asymmetric models – the GJR model (Glosten, Jagannathan and Rukle, 1993) and the EGARCH model (Nelson, 1991). The inclusion of the latter two is due to the fact that volatility may exhibit asymmetric behavior, *i.e.*, may display different responses to positive and negative shocks. The information that can be drawn from the application of these methodologies, especially in the current context of economic and financial instability we are experiencing, may be useful for macroeconomic analysis and forecasting.

This paper is structured as follows. Section 2 provides a brief overview of the volatility models used in the paper. Section 3 presents a description of the data and Section 4 estimation results for the volatility models. Section 5 summarizes the main conclusions.

2. DESCRIPTION OF VOLATILITY MODELS

An important characteristic of the behaviour of volatility in tourism demand series (similar to what happens in financial series) is that periods of high volatility may be followed by periods of low volatility and vice-versa. This type of behaviour is known in the literature as "Volatility Clustering". This characteristic is directly related to leverage and asymmetry effects, *i.e.*, the response of volatility to shocks. The asymmetry effect indicates that volatility of a series is affected differently whether the news are positive or negative and the leverage effect indicates that volatility gets higher and more persistent as a response to negative shocks than to positive shocks. According to McAleer (2005): "A favourable comment can increase happiness momentarily, but a negative comment can last forever" (p. 237).

As will be seen below, there are models that are appropriate for situations where volatility presents symmetric behaviour, and models that fit situations in which volatility displays asymmetric behaviour. Consider the first group of models.

The Autoregressive Conditionally Heteroskedasticity (ARCH) model introduced by Engle (1982) looks to model the autoregressive structure of the linear time dependence that exists in the error variance of a time series of interest. An ARCH model of order q can be specified as,

$$\sigma_t^2 = \omega + \alpha_1 \varepsilon_{t-1}^2 + \ldots + \alpha_q \varepsilon_{t-q}^2 \tag{1}$$

where $\omega > 0$ and $\alpha_i \geq 0$, $i=1,\ldots,q$, σ_t^2 is the conditional variance, $\varepsilon_t = u_t \sigma_t$ and u_t is an independent and identically distributed (iid) random variable.

This equation considers that the volatility of a series is a random variable influenced by past vari-

ability. It is a model that presents however limitations, such as imposition of the non-negativity of its parameters and the need to include a large number of lags to capture the volatility of the process.

Given these limitations, Bollerslev (1986) proposed a new structure known as generalized ARCH (GARCH). The general GARCH (*p, q*) model can be presented as,

$$\sigma_t^2 = \omega + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 \tag{2}$$

where $\omega > 0$, $\alpha_i \geq 0$ and $\beta_j \geq 0$ are sufficient conditions to ensure that the conditional variance, σ_t^2, is positive. The first sum corresponds to the GARCH component of order q and the second to the ARCH component of order *p*. The GARCH (1,1) model has proven to be sufficient to model the variance and has been widely used in the literature. In this case, equation 2 reduces to,

$$\sigma_t^2 = \omega + \beta \sigma_{t-1}^2 + \alpha \varepsilon_{t-1}^2 \tag{3}$$

where α measure the persistence of shocks in the short-run, and $(\alpha+\beta)$ reveals the degree of persistence of volatility in the long-run. To ensure that σ_t^2 is positive, $\omega > 0$, and α and β must be non-negative (*i.e.* $\alpha \geq 0$, and $\beta \geq 0$). The sum of α and β has to be below one to ensure the stationarity condition (*i.e.*, $\alpha + \beta < 1$).

The ARCH and GARCH models assume that volatility has symmetric behaviour *i.e.*, that it has the same behaviour for positive or negative shocks (good or bad news). However, in practice this is not always the case. This led Nelson (1991) to introduce the exponential GARCH model known in the literature as EGARCH model. The EGARCH (1,1) model, frequently found in the literature, has the following specification:

$$\log \sigma_t^2 = \omega + \beta \log \sigma_{t-1}^2 + \alpha \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \tag{4}$$

In this case, given that the left-hand side of the equation is the logarithm of the conditional variance it is not necessary to impose non-negativity constraints on α and β. This model considers a multiplier effect (leverage effect) through the term $\varepsilon_{t-1}/\sigma_{t-1}$, that seeks to capture different impacts of positive and negative shocks on volatility. The leverage effect occurs if $\gamma<0$. The asymmetric effect, which is also considered by this term, is used to determine whether the market differentiates positive and negative effects. The asymmetric effect occurs if $\gamma\neq 0$ and is symmetric if $\gamma=0$. The persistence of the shock in this model is measured through β.

Glosten, Jagannathan e Runkle (1993) and Zakoian (1994) introduced the Threshold ARCH model or TARCH[1] model, which also considers the asymmetric effect of volatility. The most common model is the TARCH(1,1) that has the following specification:

(1) This model is also commonly known in the literature as GJR model.

$$\sigma_t^2 = \omega + \beta\sigma_{t-1}^2 + \alpha\varepsilon_{t-1}^2 + \gamma\varepsilon_{t-1}^2 d_{t-1} \tag{5}$$

In this model $d_t=1$ if ε_t is negative and zero otherwise. Again it is necessary that $\omega > 0$, $\alpha\geq 0$, $\beta\geq 0$, and $\alpha+\gamma\geq 0$ to ensure that σ_t^2 is positive. Regarding the impact of news on volatility, it tends to increase with negative shocks (when $\varepsilon_{t-1}<0$) and decrease with positive shocks (when $\varepsilon_{t-1}>0$). As in the previous model the shock is asymmetric if $\gamma\neq 0$ and is symmetric if $\gamma=0$, but unlike the previous model the leverage effect occurs if $\gamma>0$. The short-run effect of positive shocks (good news) is measured through α, and that of negative shocks (bad news) through $\alpha+\gamma$. The persistence of shocks in the short-run is measured as $\alpha+\gamma/2$ and in the long-run as $\alpha+\beta+\gamma/2$.

For a more detailed review of these models and others associated to the same topic see for example, Bollerslev, Engle and Nelson (1994), Li *et al*. (2002) and McAleer (2005) and for applications to tourism, Chan, Lim and McAleer (2005), Shareef and McAleer (2007) and Divino and McAleer (2008), among others.

3. DATA

The data used in this paper is monthly and covers the period from January 1976 to December 2006, constituting a sample of 372 observations for each of the source countries of tourists to Portugal, *i.e.* Germany, Spain, France, the Netherlands and the United Kingdom. We also consider domestic demand in our analysis. To measure tourism demand we have chosen the "Number of nights spent in hotel establishments". The time series were obtained from one of the main publications of the ex-*Direcção Geral do Turismo* – "O Turismo em …." (several years) and from *INE* (the Portuguese Office for National Statistics) – "Estatísticas do Turismo" (several years). Graphical representation of the series in levels and natural logarithms are presented in Charts 1 and 2.

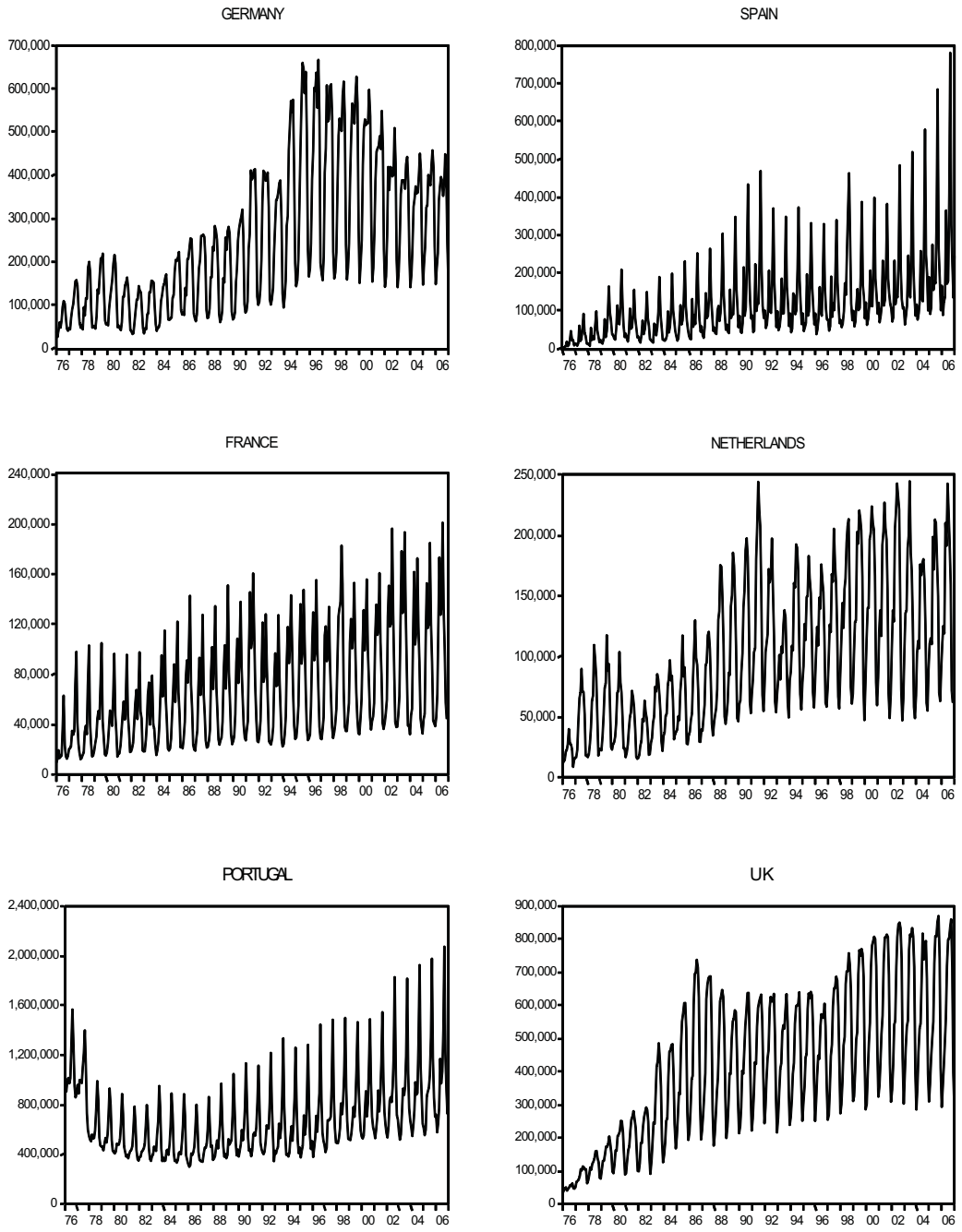
Despite the existence of stages of growth and decline, all series exhibit a strong seasonal pattern. In the case of Portugal, the values of the first two years are slightly overstated. This is due to the fact that many individuals returning from the ex-Portuguese colonies during the decolonization process had been temporarily housed in hotels. Table 1 presents some descriptive statistics of the series under study.

From Table 1, it can be observed that the standard deviation is high when compared to the mean (coefficient of variation). Of all countries considered, Portugal has the lowest coefficient of variation, meaning that data are less dispersed, thus suggesting a more stable demand. The asymmetry and kurtosis are typically analyzed with reference to the normal distribution. The normal distribution is symmetric (the measure of asymmetry is zero) and mesocurtic (*i.e*. the value of the measure of kurtosis is 3). Hence, taking these values as reference and considering the results in Table 1 obtained for the various countries under analysis, we observe that asymmetry is always positive and from the value for kurtosis we conclude for a platicurtic distribution (a flatter distribution than the normal, *i.e*. the values are more dispersed from the mean) for Germany, France, the Netherlands and the United

Chart 1

TOURISM DEMAND OF THE MAIN SOURCE COUNTRIESTURISTAS

Tourists

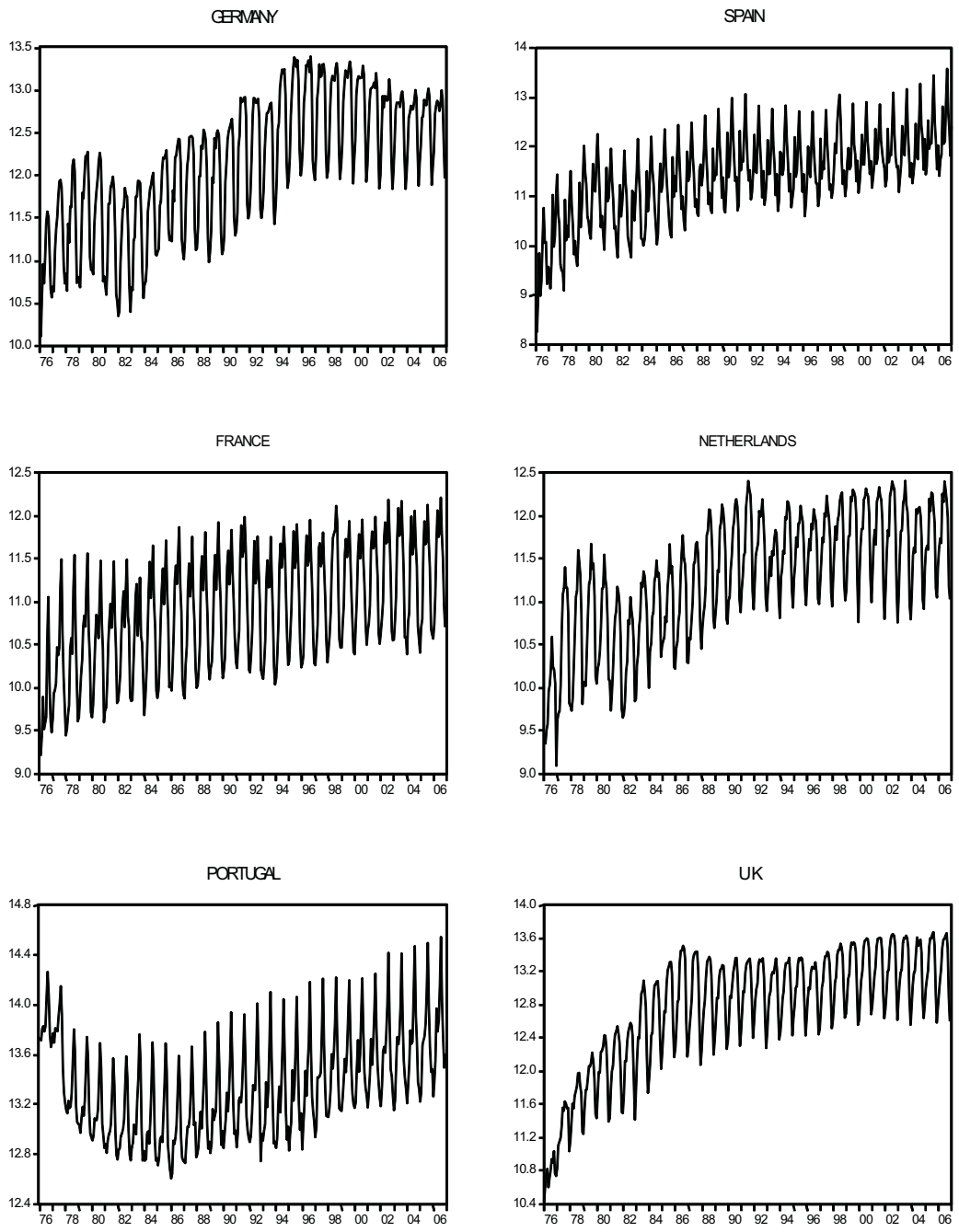


Sources: *Direcção Geral do Turismo* and *INE*.

Kingdom, and a *leptokurtic* distribution (distribution presents a greater concentration of observations around the mean than the normal) in the case of Spain and Portugal. The Jarque-Bera statistic (a measure of deviations from normality which is calculated considering the skewness and kurtosis of the series) suggests rejection of the null hypothesis that the series are normally distributed.

Chart 2

LOGARITHMS OF TOURISM DEMAND OF THE MAIN SOURCE COUNTRIES
Logarithms



Sources: *Direcção Geral do Turismo* and *INE*.

To highlight the importance of seasonality, in Table 2 seasonal indices are presented according to the country of origin. These indices measure the degree of seasonal variation in the series.

Table 1

DESCRIPTIVE STATISTICS OF THE REPRESENTATIVE SERIES OF TOURISM DEMAND IN PORTUGAL
Units: number of overnight stays

Statistic/Country	Germany	Spain	France	Netherland	Portugal	UK
Mean	233047	106282	62340	94005	639348	390246
Median	173912	87492	49050	78663	554839	376851
Maximum	664129	483759	196305	243869	1824096	851087
Minimum	24715	3876	9998	8980	298841	34218
Standard deviation	172031	86365	39025	58138	268700	215659
Asymmetry	0.8569	1.8481	0.8279	0.6446	1.4047	0.1890
Flattening	2.5344	7.0391	2.8867	2.4320	5.0437	1.9442
Jarque-Bera	42.5813	404.6841	37.1872	26.7939	162.9393	16.9765
Prob (J-B)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0002)

Source: Authors' calculations.

As shown in Table 2 it is in the summer months (particularly July and August) that the indices are higher. It should be noted that some countries also report high values in other months of the year (see for instance the months that coincide with the Easter holidays, *i.e.*, March and April, for Spain). The winter months (particularly December and January) are those that, in general, have lower indices (again Spain is an exception showing lower values in January and February).

In addition to seasonality, the series under analysis have volatility patterns as shown in Chart 3. To analyse volatility we used the squared residuals, $\hat{\varepsilon}_t^2$, of the following regression,

$$\Delta \log T_t = ARMA(1,1) + \sum_{i=1}^{12} \varphi_i D_{it} + \varepsilon_t \tag{6}$$

where T_t is tourism demand from the countries under analysis, D_{it}, i=1,…,12, corresponds to a sea-

Table 2

SEASONAL INDICES OF THE REPRESENTATIVE SERIES OF TOURISM DEMAND IN PORTUGAL

Month/Country	Germany	Spain	France	Netherland	Portugal	UK
January	0.483	0.445	0.479	0.595	0.723	0.594
February	0.558	0.450	0.596	0.707	0.759	0.747
March	0.942	**1.020**	0.811	0.898	0.906	0.932
April	**1.144**	**1.422**	**1.430**	0.957	**1.014**	0.955
May	**1.435**	0.888	**1.759**	**1.413**	0.937	**1.228**
June	**1.507**	0.972	**1.298**	**1.463**	**1.071**	**1.368**
July	**1.663**	**1.752**	**1.668**	**1.842**	**1.377**	**1.371**
August	**1.706**	**3.189**	**2.479**	**1.651**	**1.926**	**1.441**
September	**1.709**	**1.587**	**1.391**	**1.524**	**1.382**	**1.426**
October	**1.256**	**1.068**	0.955	**1.124**	0.923	**1.226**
November	0.579	0.603	0.536	0.537	0.769	0.813
December	0.452	0.697	0.448	0.478	0.758	0.537

Source: Authors' calculations.
Note: To obtain these indices, moving averages for each month were first calculated – using the multiplicative method. These figures isolate the cyclical and seasonal components of the series. The seasonal indices result from the division of the original series by the moving averages, resulting in 12 indices. When this index exceeds the value of one this indicates that tourism demand exceeds the monthly components of trend and cycle which is an indication of the presence of seasonality.

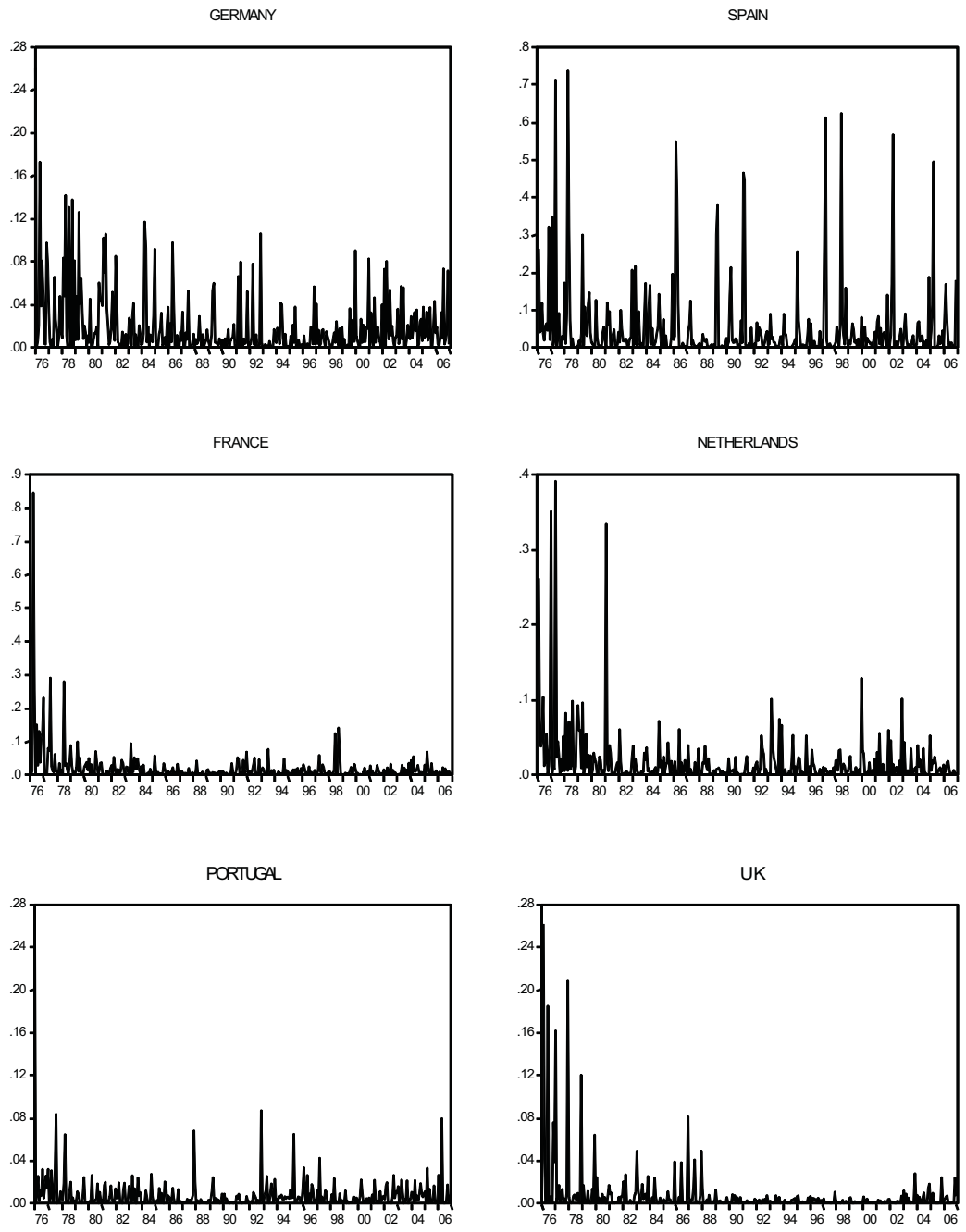
sonal dummy that is equal to 1 in month *i* and 0 otherwise, and ARMA (1,1) refers to a component of this type that was estimated for each series.

As shown in Chart 3, Portugal and the UK have the lowest levels of volatility and Germany and Spain, the highest levels. The Netherlands, France and the United Kingdom, in the early years display high

Chart 3

VOLATILITY OF TOURISM DEMAND OF THE MAIN SOURCE COUNTRIES

Volatility



Source: Authors' calculations.

volatility, however it declines from 1980 onwards. These results were confirmed using the test for ARCH effects proposed by Engle (1982), based on which we found significant results for Germany, Spain and France and weak evidence for the Netherlands, Portugal and the United Kingdom. These results suggest that tourism demand from these latter countries appears to be more resistant to unanticipated shocks. A possible explanation for this phenomenon is related to the fact that the 80's correspond to the affirmation of this sector. Although tourism started to gain importance in the 60's, it is in fact only in the 80's that this industry consolidates its activity, particularly in these markets.

4. MODELLING SEASONALITY AND VOLATILITY OF TOURISM DEMAND IN PORTUGAL

For modelling purposes, the first differences of the logarithms of the series were considered. The graphs of the series are presented in Chart 4 and all appear to be stationary. Stationarity of these series was also confirmed using formal unit root tests (see Appendix).

4.1. Results

Given the importance of achieving an appropriate model for the conditional mean, several ARMA models have been tested to determine the most appropriate one to obtain estimates of the parameters of the mean equation. Table 3 presents the results for the mean equation for each country considering a GARCH(1,1)[2] as the model for volatility and Table 6 the results for the variance equations for the countries under analysis.

Table 4 presents the results for the conditional mean of the first differences of logarithms of tourism demand in Portugal. All estimates of the ARMA(1,1) parameters are significant for all countries. The results for the AR(1) model, are higher for the Netherlands and the United Kingdom, although for the latter they show an opposing sign compared to all other countries. The MA(1) estimates are also high for all countries, particularly in the case of France, the Netherlands and the United Kingdom, although once again for the latter they present a different sign. From the mean equations we also conclude that seasonality is indeed one of the main characteristics of tourism.

With regard to volatility, with the exception of Spain and the Netherlands, the GARCH (1,1) model seems to be the most appropriate. Estimates of conditional volatility suggest generally that there is no asymmetry, so that positive and negative shocks have similar effects on the volatility of the series of tourism under analysis.

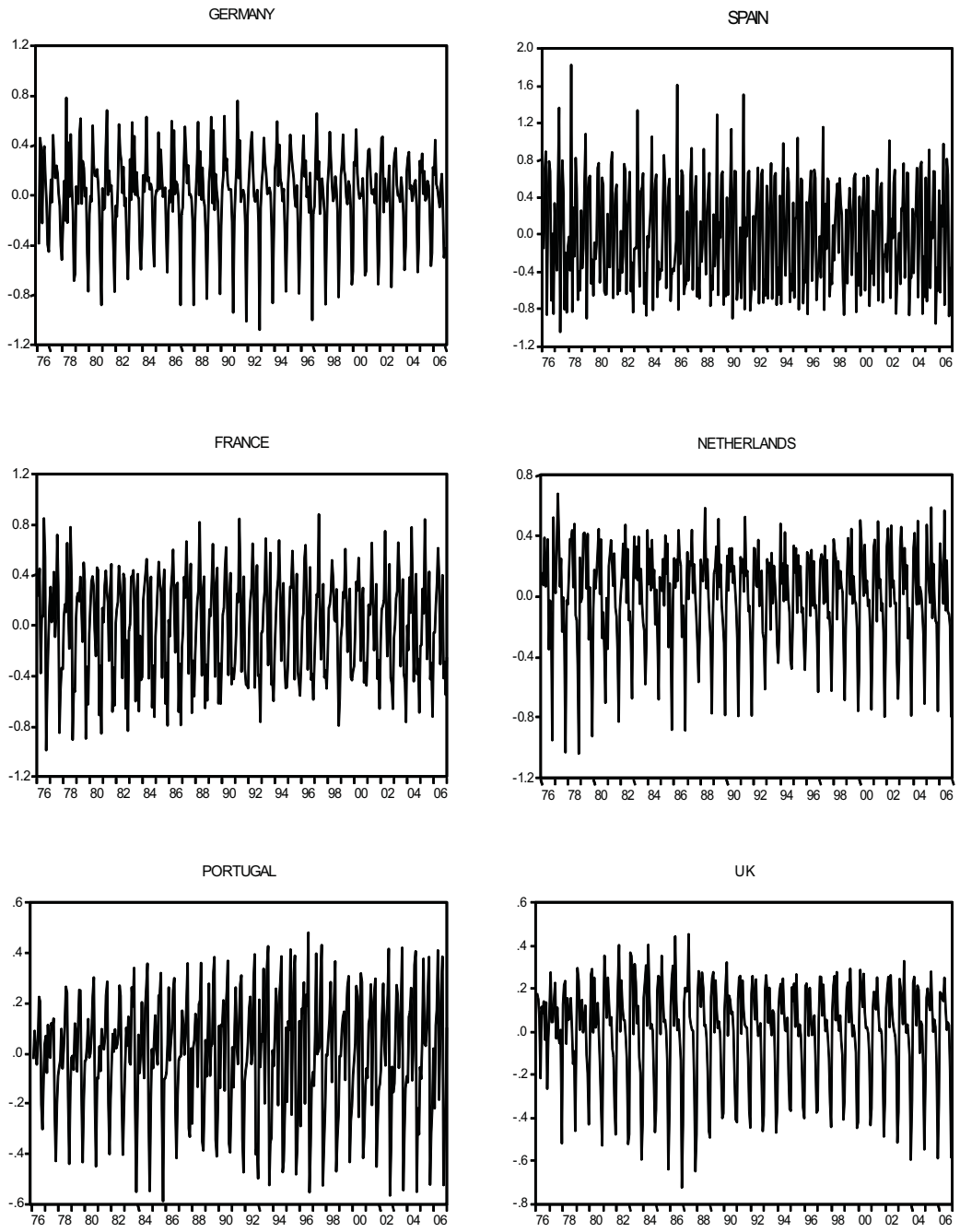
With respect to the GARCH(1,1) model, in the case of Germany, all parameters are significant and positive and the sum of α and β is less than one, satisfying in this way the conditions required to ensure that σ^2_t is positive and the stationarity of the model (*i.e.* existence of finite unconditional variance). The persistence of the shock in the long run is 0.983, very close to one, meaning that an unanticipated shock will have a strong impact on tourism demand of these tourists to Portugal and will

(2) The parameter estimates using an EGARCH or a TGARCH are qualitatively similar to those presented in Table 3 and are therefore omitted.

Chart 4

FIRST DIFFERENCES OF THE LOGARITHMS OF TOURISM DEMAND OF THE MAIN SOURCE COUNTRIES

First Differences of the Logarithms



Source: Authors' calculations.

persist for a considerable period of time. The same conclusion can be reached in the case of France and the United Kingdom. For Germany and for the United Kingdom, α is not significant (*i.e.* shocks have little impact in the short-run).

The EGARCH(1,1) model, when compared to the GARCH and TARCH models, is the one that best

Table 3

CONDITIONAL MEAN OF FIRST DIFFERENCES OF LOGARITHMS OF TOURISM DEMAND IN PORTUGAL - GARCH(1,1) MODEL

			Dependent	Variable	Δ LogT	
Country	**Germany**	**Spain**	**France**	**Netherland**	**Portugal**	**UK**
Parameters						
AR[(a)]	0.5490***		0.3909***	0.6454***		-0.9592***
	(0.0803)		(0.0823)	(0.0483)		(0.0511)
MA[(a)]	-0.8637***	-0.7586***	-0.8980***	-0.8917***	-0.5444***	0.9340***
	(0.0436)	(0.0391)	(0.0333)	(0.0337)	(0.0641)	(0.0607)
January	0.1019***	-0.4383***	-	0.2808***	-0.0430**	0.1392***
	(0.0289)	(0.0566)		(0.0197)	(0.0168)	(0.0092)
February	0.2099***		0.2225***	0.2199***		0.2235***
	(0.0279)	-	(0.0287)	(0.0173)	-	(0.0149)
March	0.5190***	0.7405***	0.3101***	0.2285***	0.2139***	0.2152***
	(0.0278)	(0.0426)	(0.0225)	(0.0249)	(0.0172)	(0.0111)
April	0.1841***	0.5113***	0.6489***	-	0.1217***	0.0472***
	(0.0215)	(0.0386)	(0.0265)		(0.0144)	(0.0136)
May	0.2378***	-0.5043***	0.2489***	0.4205***	-0.0757***	0.2635***
	(0.0195)	(0.0612)	(0.0278)	(0.0192)	(0.0292)	(0.0112)
June	-	-	-0.3132***	-	0.1244***	0.0997***
			(0.0228)	0.2038***	(0.0328)	(0.0149)
July	0.0709***	0.6565***	0.1531***	(0.0236)	0.2599***	-
	(0.0236)	(0.0932)	(0.0232)	-0.0755***	(0.0324)	-
August	-	0.6177***	0.3869***	(0.0212)	0.3426***	-
		(0.1184)	(0.0322)	-0.0802**	(0.0211)	
September	-	-0.7256***	-0.4771***	(0.0323)	-0.3662***	
		(0.1109)	(0.048)	-0.2887***	(0.0170)	
October	-0.2260***	-0.3837***	-0.3560***	(0.0332)	-0.3883***	-0.1551***
	(0.0286)	(0.0853)	(0.0343)	-0.7179***	(0.0290)	(0.0152)
November	-0.7736***	-0.5547***	-0.6026***	(0.0204)	-0.1941***	-0.4601***
	(0.0214)	(0.0824)	(0.0234)	-0.1475***	(0.0201)	(0.0071)
December	-0.2796***	0.1941***	-0.1841***	(0.0202)		-0.3839***
	(0.0247)	(0.0632)	(0.0253)			(0.0113)

Source: Authors' calculations.
Notes: (a) The results in brackets correspond to Bollerslev and Wooldridge(1992) type robust standard errors.** and *** indicates statistical significance at 5% and 1%, respectively. – indicates that the variable is not statistically significant.

fits the volatility of Spain and the Netherlands. However, also for these countries there is no evidence of asymmetric effects (*i.e.* the hypothesis that $\gamma = 0$ is not rejected). The persistence of shocks measured through β, is significant for both countries and is strong in the case of the Netherlands and small in the case of Spain (0.9911 and 0.2193, respectively).

Table 4

CONDITIONAL VARIANCE OF FIRST DIFFERENCES OF LOGARITHMS OF TOURISM DEMAND IN PORTUGAL

			Dependent	Variable	Δ LogT	
Country	Germany	Spain	France	Netherland	Portugal	UK
Model	GARCH (1,1)	EGARCH (1,1)	GARCH (1,1)	EGARCH (1,1)	GARCH (1,1)	GARCH (1,1)
Parameters						
ω	0.0002*	3.2269***	0.0006***	-0.0338	0.0044	0.00005***
	(0.0001)	(0.3148)	(0.0002)	(0.0455)	(0.0037)	(0.00001)
GARCH α	0.0195	-	0.0471**	-	0.1078	0.0104
	(0.0162)		(0.0203)		(0.0673)	(0.0099)
GARCH β	0.9635***		0.8974***		0.3844	0.9668***
	(0.0190)		(0.0210)		(0.4487)	(0.0096)
EGARCH α		0.9813***		-0.0136		
		(0.1139)		(0.0324)		
EGARCH β	-	0.2193**		0.9911***	-	-
	-	(0.0985)		(0.0051)	-	-
EGARCH γ	-	0.1309		-0.0071	-	-
		(0.0836)		(0.0189)		
Log-Likelihood	229.3550	69.3288	271.2198	235.3283	389.2318	475.2967
AIC	-1.1641	-0.2928	-1.3796	-1.3623	-2.0228	-2.4935
BIC	-1.0160	-0.1345	-1.2103	-1.1747	-1.8750	-2.3454

Source: Authors' calculations.
Notes: The results in brackets correspond to Bollerslev and Wooldridge(1992) type robust standard errors. ** and *** indicates statistical significance at 5% and 1%, respectively.

6. CONCLUSION

From the analysis of this study, it is possible to observe that seasonality is indeed one of the main characteristics of tourism. The parameter estimates for the winter months are negative and positive for the warmer months. Furthermore, the results for the conditional mean of the first differences of logarithms of tourism demand in Portugal show that all estimates of the ARMA(1,1) parameters are significant for the three models and for all countries.

The results suggest that in general the GARCH (1,1) model provides an appropriate measure of conditional volatility of most of the series considered. Based on this model, it was noted that for Germany, the persistence of the shocks in the long-run is 0.983, very close to one, meaning that an unanticipated shock will have a strong impact on tourism demand of these tourists to Portugal and will perdure for a considerable period of time. The same conclusion can be reached in the case of France and the United Kingdom. However, for Germany and for the United Kingdom, α is not significant suggesting that shocks may have only a long-run impact). For domestic demand evidence of volatility is very low suggesting some resistance to demand shocks.

Since tourism is a relevant economic activity, it is important to note that an unanticipated shock, will have implications on tourism demand for Portugal. In addition to the economic impacts on employment and investment within the sector, other activities directly related to tourism, such as, for example, construction, agriculture, etc., will also be affected. On the other hand, it is necessary to

ascertain the extent to which a shock, may divert demand to other countries that offer the same type of products. Since Germany, Spain, France, the Netherlands, Portugal and the United Kingdom are the main source countries of tourists, it becomes increasingly necessary to improve competitiveness, develop new products, new centres of attraction, and new markets, as well as, look to the needs of qualified services and human resources. These and other measures are relevant for the industry to remain an important sector of the economy.

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APPENDIX

The ADF unit root test was applied to these series to test for the presence of unit roots. Test regressions with 12 seasonal dummies only and with 12 seasonal dummies and a time trend were considered, i.e.,

$$\Delta X_t = \gamma X_{t-1} + \sum_{i=1}^{12} \varphi_i D_{it} + \sum_{i=2}^{p} \beta_i \Delta X_{t-i-1} + \varepsilon_t \tag{7}$$

$$\Delta X_t = \gamma X_{t-1} + \phi t + \sum_{i=1}^{12} \varphi_i D_{it} + \sum_{i=2}^{p} \beta_i \Delta X_{t-i-1} + \varepsilon_t \tag{8}$$

The critical values for 372 observations were obtained by Monte Carlo simulation in *GAUSS 9.0* and the results for 1%, 2,5%, 5% and 10% significance levels are presented in Table A1.

Table A1

CRITICAL VALUES FOR DICKEY AND FULLER (1979) TEST WITH 12 SEASONAL DUMMIES AND WITH 12 SEASONAL DUMMIES AND A TIME TREND FOR 372 OBSERVATIONS

Deterministic Elements	Percentiles	Value
12 Seasonal Dummies	0.010	-3.381
	0.025	-3.090
	0.050	-2.806
	0.100	-2.508
12 Seasonal Dummies and Trend	0.010	-3.864
	0.025	-3.554
	0.050	-3.320
	0.100	-3.039

Source: Authors' calculations.

The results of the test are in Table A2.

These results and the graphical representation of the series (Chart 4), show that the first differences of the logarithms of the series are stationary.

Table A2

RESULTS OF THE DICKEY AND FULLER (1979) UNIT ROOT TEST

País/Variável		T	LogT	ΔLogT
	Variável Exógena			
Germany	Seasonal Dummies	-1.088 (13)	-1.143 (13)	-4.104 (12) ***
	Seasonal Dummies and Trend	-1.879 (13)	-2.334 (13)	-
Spain	Seasonal Dummies	-1.374 (13)	-2.881 (12)	-6.101 (12) ***
	Seasonal Dummies and Trend	-2.960 (13)	-3.215 (12)*	-
France	Seasonal Dummies	-1.361 (13)	-1.621 (12)	-6.284 (12) ***
	Seasonal Dummies and Trend	-4.617 (13) ***	-3.451(12) **	-
Nethelands	Seasonal Dummies	-1.223 (12)	-2.245 (13)	-4.766 (12) ***
	Seasonal Dummies and Trend	-2.612 (12)	-3.140 (13) *	-
Portugal	Seasonal Dummies	-2.931 (13) **	-2.816 (14) **	-3.953 (13) ***
	Seasonal Dummies and Trend	-5.018 (13) ***	-5.535 (14) ***	-
UK	Seasonal Dummies	-1.686 (12)	-4.108 (12) ***	-4.479 (12) ***
	Seasonal Dummies and Trend	-1.713 (12)	-3.503 (13) **	-

Source: Authors' calculations.

THE MARGINS OF EXPORTS: FIRMS, PRODUCTS AND DESTINATIONS*

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1. INTRODUCTION

The recent literature on international trade has emphasized the importance of firms' decisions. As such, even aggregate variables like a country total export flows can be seen as the consequence of firms' decisions along different margins. In this article we focus on Portugal-based firms' decisions in terms of entry and exit into international markets (the participation margin), and in terms of the mode of participation with a focus on the decision of which country to export to (the destination margin) and which product to sell (the product margin). Expansion into foreign markets is an important decision for any firm. It can be defined as a risky decision with high potential returns. Risks arise from devoting resources to sell in markets where there is more uncertainty about the market structure, the shape of the demand curve and the institutional background. Returns from expanding into foreign markets derive from higher sales and profits, benefiting also from the diversification of market specific risks and economies of scale. Overall, the decision to enter a foreign market seems as significant as the decision to create a new firm.

Expansion into foreign markets requires decisions about which countries to approach and which products to export. Firms' foreign product mix is the result of a complex combination of factors. The decision of which products to offer in each market depends on production costs, destination country-specific costs, market structure and consumer's preferences and income. Before making decisions on expansion, firms can learn from other domestic firms operating in those markets or from their own experience in other markets.

The decisions related with the recomposition of the product-mix of mature exporters are also interesting to examine. In mature stages of the internationalization process firms keep facing idiosyncratic or country-market related shocks, which prompts a recomposition of the export mix. Product switching allows firms to survive to changes in the underlying market conditions and, at the macro level, it contributes to reallocate economic activity towards more efficient uses.

The main contribution of this article is to describe the joint destination/product strategies of exporters using a new transaction-level database for Portugal for the period 1996-2005. The database covers

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the universe of export and import transactions for firms located in Portugal and it provides extremely detailed information on products, values, quantities and other characteristics of the transactions.

We highlight two main aspects of our analysis.[1] Firstly, we find a high degree of firm heterogeneity in terms of international trade. Multi-product and multi-destination exporters (which do not necessarily coincide) are dominant and account for a more than proportional share of total exports. The range of products that they export is very diversified in several respects: it frequently spans multiple sectors (2-digits of the Harmonized System nomenclature), being the top product (and destination) in terms of firm export sales important but not dominant even for two- or three-product exporters. Moreover, we find evidence of frequent product (and destination) switching by firms. Secondly, we study how this heterogeneity is correlated with the growth rate of aggregate exports using a decomposition that involves three margins: firms, destinations and products. The breakdown of firms' sales growth rates along different margins is standard in the industrial organization (IO) literature. In our context, the different extensive margins in total exports reflect the foreign sales attributed to new exporters, new destinations or new products, while the different intensive margins reflect exports attributed to existing firms, existing markets or existing products. We show that while the intensive margin (sales of continuing products by continuing firms in continuing destinations) generally accounts for most of the yearly variation in exports, the gross contribution of the destination and product extensive margins (for continuing exporters) are as important as the gross contribution of entering and exiting firms and that all of them are as important as the intensive margin.

Our study is related to the recent (and still scarce) literature on multi-product firms and product switching (see Bernard *et al*. (2006)). Our paper differs from Bernard *et al*. (2006) in two respects: firstly, it explores jointly the destination and product dimensions instead of the product dimension only and, secondly, it focuses on the mix of exported products instead of on the mix of produced products. Other papers exploring the product dimension for exporting firms are Arkolakis and Muendler (2007), Bernard, Jensen, Redding and Schott (2007), Iacovone and Javorcik (2008) and Schott (2004). Arkolakis and Muendler (2007) shows that the distribution of the exporters' number of goods (the exporter scope) is approximately consistent with a Pareto distribution, thereby being strongly right-skewed, with most firms selling only one or two goods. In addition, it shows that the exporter scope is positively associated with average sales per good within destinations but not across destinations. Schott (2004) extends the analysis into the price dimension, showing that firms tend to specialize in some products. Furthermore, it should be noted that all these papers somehow link firm's entrance in foreign markets with classical IO results on firm survival (see for instance Klette and Kortum (2004) for some stylized facts). Finally, our article follows a recent strand of research based on the analysis of extensive international trade micro data. Other studies based on transaction-level data are Eaton, Eslava, Kugler and Tybout (2007) for Colombia; Eaton, Kortum and Kramarz (2007) for France; Muûls and Pisu (2007) for Belgium and Bernard, Jensen and Schott (2007) and Mayer and Ottaviano (2007) for a sample of European firms.

(1) An extended version of the analysis performed in this short paper can be found in Amador and Opromolla (2008) and Amador *et al*. (2009).

The paper is organized as follows. The next section describes the database used. Section 3 provides evidence on the behaviour of multi-product and multi-destination firms, on their product and destination portfolio and on the extent of product and destination switching. Section 4 decomposes Portuguese export growth along the firm, destination and product dimensions. Section 5 concludes.

2. DATA

Our analysis of product and destination mix is made possible by the use of a new database that combines detailed and comprehensive information on trading behaviour of firms. The database includes all export transactions by firms that are located in Portugal, on a monthly basis, from 1995 to 2005. A transaction record includes the firm's tax identification, an eight digit Combined Nomenclature product code, the value of the transaction, the quantity of exported goods (expressed in kilos), the destination country, the mean of transportation, the relevant international commercial term (FOB, CIF, etc.) and a variable indicating the type of transaction (transfer of ownership after payment, return of a product, etc.).[2] The data used comes from customs returns forms in the case of extra-EU trade and from the Intrastat form in the case of intra-EU trade and it adds up to total Portuguese exports as reported by Statistics Portugal (*Instituto Nacional de Estatística*). In the analysis, we consider only transactions that are worth more than 100 euros. Still, our data covers, on average, more than 99 percent of total exports and about 75 percent of the exporters. The data is aggregated at the annual level and all values are expressed in current euro. The analysis focuses on the 1996-2005 period. The consideration of this long time span requires adjustments in some six digit product codes in order to ensure the compatibility of two versions of the product classification. Although it would be possible to work at the six digit level of the Combined Nomenclature, we define products at four-digit level according to the HS. This approach avoids other possible classification problems related to Combined Nomenclature and still allows for a set of 1241 potential products.[3] Appendix 1, shows an example of a HS four-digits product classification.

As shown in Table 1, our sample includes 13,632 exporters in 1996, exporting 1,117 products to 200 countries. The average exporter in 1996 ships 4.7 products to 3.6 destinations for a revenue of about 1.4 millions euro.[4] Table 1 shows that, at the aggregate level, the number of exporters has increased considerably (more than 50 percent) between 1996 and 2005. The number of products exported and the number of destinations served has been instead quite stable. At the firm-level, the average number of products exported by a firm has not changed while the average number of destinations reached has decreased from 3.6 to 2.8. The lack of dynamics for the total number of products exported or destinations served and for the average number of products exported by a firm suggested by Table 1 are misleading. There is a high degree of reallocation of resources across firms

(2) The Combined Nomenclature system is comprised by the Harmonized System (HS) nomenclature with further European Community subdivisions. The Harmonized system is run by the World Customs Organisation (WCO). This classification of commodities is used by most trading nations and in international trade negotiations. The first six digits of the Combined Nomenclature system approximately coincide with the Harmonized System classification. While the Combined Nomenclature system is changed almost every year, the Harmonized System, created in 1988, was updated on January 1st 1996, January 1st 2002 and January 1st 2007. The adjustments were made at the six digit level and implied the aggregation of some categories.

(3) Robustness tests were performed and all results qualitatively hold at the six-digit HS level as well.

(4) Appendix 2, provides more information on Portuguese exports and exporters at the sectoral level.

Table 1

SUMMARY STATISTICS

	1996	1999	2002	2005
Firm-level				
Number of products				
mean	4.7	4.6	4.9	4.6
median	2.0	2.0	2.0	2.0
standard deviation	11.3	10.8	12.9	12.2
Number of destinations				
mean	3.6	3.5	3.3	2.8
median	1.0	1.0	1.0	1.0
standard deviation	5.2	5.3	5.4	4.9
Export (Million euro)				
mean	1.4	1.5	1.6	1.4
median	0.1	0.0	0.0	0.0
standard deviation	18.0	17.4	19.5	17.8
Aggregate-level				
Number of firms	13 632	15 054	17 199	21 127
Number of products	1 117	1 118	1 126	1 143
Number of destinations	200	201	207	202
Export (Million euro)	18 876	22 984.2	27 345.1	29 619.9

Sources: *INE* (Trade Data) and authors' calculations.
Note: The top panel shows firm-level summary statistics while the bottom panel shows country-level aggregate statistics. A product is defined as an HS four-digit code (see Appendix A.1 for more details).

and within firms along the product and destination dimensions. The stability in the average number of products exported by a firm or in the total number of products exported by Portugal hides not only considerable firm entry and exit flows but also frequent and pervasive product and destination switching within firms. As shown by the high standard deviation figures in Table 1, there is a high degree of heterogeneity in terms of the number of destinations served, number of products exported and, as a consequence, of the revenue resulting from exports. Such reallocation and heterogeneity stand as the main motivations of this paper and they are analysed in detail in the next sections.

3. DISSECTING EXPORTS: FIRMS, PRODUCTS, DESTINATIONS

Aggregate figures often hide a high degree of heterogeneity and a significant reallocation of resources. The labour market literature, for example, starting with the seminal work of Davis and Haltiwanger at the end of the 80's, has compared job and worker flows and analysed the degree and the determinants of excess worker rotation (or churning), defined as the difference between the total number of hires (or separations) in a firm and net job creation.[5] The industrial organization literature has, since many years ago, emphasized the differences between small and big firms or between young and old firms in terms of mean sales growth rates and in terms of volatility of sales. Recent developments in the international trade literature have also focused on firm heterogeneity and firm dynamics and

(5) See Centeno *et al.* (2008) for an analysis of jobs and workers flows in Portuguese firms.

studied, in some cases, the relationship between them and aggregate trade flows.[6] In this section, we study the dynamics of Portugal's export flows, identifying the contributions of firms, destinations and products.

3.1. The Firm Margin: Entry and Exit into International Markets

We start by looking at firms entry and exit into international markets. This is a major decision that a firm can take. It requires, for example, a careful consideration of the differences between the domestic and the foreign markets in terms of demand characteristics and in terms of the costs (both fixed and variable) that entry entails. Table 2 decomposes the total number of exporters in each year into those that have been exporting for some time (continuing), those exiting foreign markets, those entering and those that export for just one year. Here we follow Eaton, Eslava, Kugler and Tybout (2007) in defining firm categories. Entrants in year *t* are those firms that did not export in *t-1*, export in *t* and will export in *t+1* as well; exiters in year *t* are those firms that exported in *t-1*, export in *t* but will not export in *t+1*; continuing firms in year *t* are those firms that exported in *t-1*, export in *t* and will export in *t+1* as well; finally, single-year exporters in year *t* are those firms that did not export in *t-1*,

Table 2

CONTINUING, ENTERING, EXITING AND SINGLE-YEAR EXPORTERS 1997-2004

	Number of firms			
Year	Continuing	Exiting	Entering	Single-Year
1997	8187	1438	2075	2601
1998	8471	1791	1925	3001
1999	8683	1713	1924	2734
2000	8729	1878	2279	3355
2001	8992	2016	2137	3435
2002	9213	1916	2292	3778
2003	9430	2075	2410	5473
2004	9664	2176	2942	5907

	Exports per firm (thousands euro)			
Year	Continuing	Exiting	Entering	Single-Year
1997	2445	149	279	23
1998	2535	142	215	21
1999	2540	134	326	26
2000	2809	425	415	19
2001	2863	180	319	23
2002	2841	208	312	15
2003	2864	150	263	10
2004	2893	237	313	21

Sources: *INE* (Trade Data) and authors' calculations.
Note: Entering exporters in year *t* are those firms that did not export in *t-1* , export in *t* and will export in *t+1* as well; exiting exporters in year t are those firms that exported in *t-1* , export in *t* but will not export in *t+1*; continuing exporters in year *t* are those firms that exported in *t-1*, export in *t* and will export in *t+1*; single-year exporters in year *t* are those firms that did not export in *t-1*, export in *t* but will not export in *t+1*.

(6) See, among others, Bernard *et al.* (2003), Melitz (2003) and Irarrazabal and Opromolla (2008).

export in *t* but will not export in *t+1*. The top panel of Table 2 reports the number of firms falling in each category over time and the bottom panel reports average exports per firm for each category. Results show that about half of the firms are continuing exporters, single year firms represent about 20 percent of the total and entering exporters are slightly more numerous than exiting ones. The share of continuing firms in total exports is overwhelming, representing more than 95 per cent. In contrast, single year firms represent less than one per cent of total exports. Thus the gap between exports per firm in each group is very wide. Entering and exiting firms, just like in the IO literature, are on average smaller, in terms of sales per firm, than incumbents. The numerous presence of single-year exporters is common to other countries as well (Eaton, Eslava, Kugler e Tybout (2007), for example, also find that single-year Colombian exporters are numerous but count little in terms of exports) and has generated significant interest in the literature. Two facts seem to characterize new exporters: (i) most of them do not survive (*i.e*. stop exporting) more than one year and (ii) those that survive thrive as their sales increase at high rates. In a companion paper (see Amador and Opromolla (2008)) we show that these two facts are confirmed in the Portuguese case. As a consequence of these (and other) findings the theoretical literature has started to investigate the role played by search frictions and learning processes in determining the entry and the success of firms in international markets (*e.g*. Eaton and Tybout (2009)).

3.2. Within The Firm: Multi-product and Multi-destination Exporters

We now depart (for a while) from the data longitudinal dimension and explore cross-sectional firm heterogeneity along two dimensions: products and destinations. We find that most of the firms export multiple products and multi-product exporters are responsible for 91 percent of total exports. Similarly, a large fraction of firms exports to multiple destinations and those firms are responsible for 94 percent of total exports. Table 3 reports the joint distribution of exporters over the number of products and the number of destinations while Table 4 reports the joint distribution of exports over the same two variables. The last rows of Tables 3 and 4 (the marginal distributions along the product dimension) show that almost half of the firms export only one product but they are responsible for

Table 3

JOINT DISTRIBUTION OF FIRMS OVER NUMBER OF PRODUCTS AND COUNTRIES, AVERAGE 1996-2005

	Products						
Destinations	**1**	**2**	**3**	**4-10**	**11-50**	**51+**	**Total**
1	36.0	8.3	3.5	6.0	2.4	0.4	56.6
2	3.9	3.6	1.7	3.1	1.2	0.2	13.7
3	1.8	1.3	1.0	2.1	0.7	0.1	7.0
4-10	3.1	3.0	2.1	5.6	1.9	0.2	15.9
11-50	0.5	0.8	0.8	2.9	1.6	0.1	6.7
51+	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Total	45.3	17.0	9.1	19.7	7.9	1.0	100.0

Sources: *INE* (Trade Data) and authors' calculations.
Note: Each cell in the table represents the share of firms exporting a certain number of products (column category) to a certain number of destinations (row category). A product is defined as an HS four-digit code (see Appendix A.1 for more details).

Table 4

JOINT DISTRIBUTION OF EXPORTS OVER NUMBER OF PRODUCTS AND COUNTRIES, AVERAGE 1996-2005

	Products						
Destinations	**1**	**2**	**3**	**4-10**	**11-50**	**51+**	**Total**
1	2.4	1.0	0.5	1.3	1.1	0.2	6.5
2	1.1	0.7	0.5	1.6	1.0	0.1	5.0
3	0.8	0.7	0.5	1.4	0.6	0.1	4.1
4-10	2.5	3.9	2.3	9.3	5.0	0.3	23.3
11-50	2.0	3.2	3.3	16.3	26.5	4.7	56.0
51+	0.0	0.1	0.2	2.1	1.9	1.0	5.3
Total	8.9	9.7	9.2	31.8	35.2	5.4	100.0

Sources: *INE* (Trade Data) and authors' calculations.
Note: Each cell in the table represents the share of total exports associated to firms exporting a certain number of products (column category) to a certain number of destinations (row category). A product is defined as an HS four-digit code (see Appendix A.1 for more details).

less than 10 percent of total exports. Multi-product firms represent the majority of the exporters: within this group, firms exporting between 4 and 50 products represent about one third of the exporters and account for two thirds of total exports. A small percentage of firms, about 9 percent, export more than 11 products but this accounts for about 40 percent of total exports. In terms of destinations, the results are similar: the last columns of Tables 3 and 4 (the marginal distributions along the destination dimension) show that more than half of the firms export to one destination and that these firms are very small, accounting for only 6 percent of total exports. Firms exporting to a number of countries between 4 and 50, on the contrary, are responsible for more than three fourths of total exports. The joint distribution shows that multi-product exporters are not always multi-destination and vice versa. For example, among firms that ship between 4 and 10 products, one out of three is reaching only one destination while 20 percent of the firms that sell to a number of countries between 4 and 10 export one product only. This said, firms that sell multiple products to multiple countries are very important: the subset of firms selling from 4 to 50 products to 4 to 50 countries account for two thirds of total exports. Bernard *et al*. (2006) obtain similar results while describing U.S. firms in terms of products (they use a more detailed product classification, do not consider export markets and ignore the destination dimension): 59 percent of U.S. firms are single-product and this set of firms accounts for 9 percent of total output. They also find that the average multi-product firm produces 4 goods.

We proceed by describing the product and destination portfolio in terms of shares of firm's exports and diversification across sectors. Table 5 reports the sales share of the top five products and destinations by firm type. The top panel shows that, although the main product exported by a firm is important, in terms of the firm's total exports, a sizeable share of firm's exports comes from the remaining products. For example, three-product firms get one fourth of their export sales from two of their products, with the least sold still accounting for 6 percent of total revenues. The bottom panel of Table 5 shows that the same holds in terms of destinations. Bernard *et al.* (2006) also find similar within-firm shares of products on total output.

Table 6 shows that the product mix of multi-product firms is quite diversified in terms of two-digit sec-

Table 5

TOP 5 PRODUCTS AND DESTINATIONS SHARES, BY FIRM TYPE, AVERAGE 1996-2005

	Firm's product scope					
Product rank	**1**	**2**	**3**	**4-10**	**11-50**	**51+**
1	100	82.5	76	65.9	49.6	25.1
2		17.5	18.1	18.8	17.4	12.0
3			5.9	8.1	9.3	7.8
4				4.0	5.9	5.8
5				2.4	4.1	4.7
	Firm's destination scope					
Destination rank	**1**	**2**	**3**	**4-10**	**11-50**	**51+**
1	100	82.4	74.9	62.3	43.2	24.8
2		17.6	19.2	20.7	19.2	13.8
3			5.9	9.4	11.3	9.8
4				4.4	7.3	7.7
5				2.6	5.1	6.3

Sources: *INE* (Trade Data) and authors' calculations.
Note: The top panel shows the average sales share of each of the top five products exported by a firm, by firm type. Firms are classified according to the number of products in their export portfolio (product scope). A product is defined as an HS four-digit code (see Appendix A.1 for more details). The bottom panel shows the average sales share of each of the top five destinations served by a firm, by firm type. Firms are classified according to the number of destinations reached (destination scope).

Table 6

DISTRIBUTION OF FIRMS ACCORDING TO THE NUMBER OF 2-DIGIT SECTORS THEIR PRODUCTS BELONG TO, BY FIRM TYPE, AVERAGE 1996-2005

	Firm's product scope (4-digits)					
Sectors (2 digits)	**1**	**2**	**3**	**4-10**	**11-50**	**51+**
1	100.0	49.1	27.7	9.9	0.1	0.0
2		50.9	42.1	22.0	2.3	0.0
3			30.2	24.4	3.8	0.0
4				20.7	5.9	0.0
5+				23.0	87.9	100.0

Sources: *INE* (Trade Data) and authors' calculations.
Note: The table shows the share of firms that exports products belonging to one, two, three, four or more than five sectors, by firm type. Firms are classified according to the number of products in their export portfolio (product scope). A product is defined as an HS four-digit code (see Appendix A.1 for more details).

tors. For type of exporter, we report the fraction of firms whose product portfolio is concentrated in one sector, two sectors, three sectors and so on. About half of the two-product exporters ship goods belonging to two different sectors. Almost two thirds of three-product exporters have a product portfolio that includes more than one sector and 30 percent ship three goods belonging to three different sectors. Multi-product firms export products which can be very different.

3.3. The Product and Destination Margins

Having established the importance of multi-product and multi-destination firms and the characteristics of their portfolio, we now ask how frequently exporters change products and destinations over time. We consider firms that export every year in the period from 1996 to 2005 and we consider two subperiods: (1) 1996-2000 and (2) 2001-2005. In each subperiod we classify firms in four categories: (1) None – the firm does not change its mix of products (2) Drop – the firm only drops products (3) Add – the firm only adds products (4) Both – the firm both adds and drops products. We compute the average percentage of firms in each category (across the two subperiods). The same calculations are also performed in terms of destination switches. The results are shown in Table 7. They indicate that product and destination switching are very frequent among all types of firms. Among single-product firms, 38 per cent add products within five years and 45 per cent add or drop products. Among multi-product firms, the percentage of firms that switch products goes from a minimum of 80 to a maximum of 100. Similarly, among single-destination firms, 40 percent of the firms add destinations within five

Table 7

PRODUCT AND DESTINATION SWITCHING BY PORTUGUESE EXPORTERS, 5 YEARS SPELLS, 1996-2005

		Multi-product				
	Single-product	**2**	**3**	**4-10**	**11-50**	**51+**
None	55.3	19.5	6.2	1.4	0.1	0.0
Drop product(s) only	n.a.	26.8	29.3	20.6	5.7	0.6
Add product(s) only	38.0	24.8	13.4	6.1	0.4	0.0
Add and drop product(s)	6.7	28.9	51.2	72.0	93.8	99.4
		Multi-destination				
	Single-destination	**2**	**3**	**4-10**	**11-50**	**51+**
None	48.3	13.6	5.7	1.3	0.0	0.0
Drop destination(s) only	n.a.	22.5	22.3	18.7	5.8	4.8
Add destination(s) only	41.1	24.9	18.8	7.7	1.7	0.0
Add and drop destination(s)	10.6	39.0	53.2	72.4	92.5	95.2

Sources: *INE* (Trade Data) and authors' calculations.
Note: The top panel classifies exporters according to their product-switching behavior and their product scope. The bottom panel similarly classifies exporters according to their destination-switching behavior and their destination scope.

years and one out of two firms add or drop destinations. Among multi-destination firms, the percentage of firms that switch destinations goes from a minimum of 86 to a maximum of 100. Bernard *et al.* (2006), looking at U.S. firms production decisions, find that most firms switch products, that product switching is more frequent in multi-product firms compared to single-product firms and in large firms compared to small firms. These results are consistent with the behaviour of Portuguese firms in export markets. Gorg *et al.* (2007) also find that many firms add as well as drop products from the export mix in any given year and they study what determines the survival of products in the export mix. They find that characteristics of the products as well as characteristics of the firm matter.

4. FIRMS, PRODUCTS, DESTINATIONS AND AGGREGATE GROWTH

In this section we ask how our findings in terms of firms entry and exit patterns, heterogeneity in products and destinations and portfolio rotation affect aggregate exports flows. Our strategy is to decompose the growth rate of Portuguese exports into the contribution of firms, destinations and products. We find that yearly changes in the growth rate are explained mainly by the intensive margin, namely by the contribution of continuing firms selling continuing products in continuing destinations. However we also find that the gross contributions of the destination and product extensive margins (for continuing firms) are as important as the gross contribution of entering and exiting firms and that all of them are as important as the intensive margin.

4.1. Decomposing Exports Growth: Firms, Destinations and Products

We decompose Portugal's total exports growth in the contribution of three distinct decisions: the decision to entry/stay/exit in export markets, the decision of where to export and the decision of what to export. Firstly, we break down total exports growth in the contribution of "entering", "exiting" and "continuing" exporters, that is, in the extensive and intensive margin at the aggregate level along the firm dimension.

$$\Delta Y_t = \sum_{j \in N} \Delta Y_{jt} + \sum_{j \in X} \Delta Y_{jt} + \sum_{j \in C} \Delta Y_{jt}, \tag{1}$$

where ΔY_t is the change in Portugal exports from year *t-1* to year *t* , *N* is the set of entering exporters, *X* is the set of exiting exporters and *C* is the set of continuing exporters. The next step is to break down the change in exports shipped by continuing exporters into "added destinations" (*AD*), "dropped destinations" (*DD*) and "continuing destinations" (*CD*), that is, in the extensive and intensive margins at the firm level along the destination dimension.

$$\sum_{j \in C} \Delta Y_{jt} = \sum_{z \in AD} \Delta Y_{zjt} + \sum_{z \in DD} \Delta Y_{zjt} + \sum_{z \in CD} \Delta Y_{zjt}, \tag{2}$$

Finally, we consider the product that firms choose to export in "continuing" destinations. We distinguish among "added" (*AP*), "dropped" (*DP*) and "continuing" (*CP*) products exported by firms in "continuing destinations", that is, the extensive and intensive margins at the firm level along the product dimension.

$$\sum_{z \in CD} \Delta Y_{zjt} = \sum_{v \in AP} \Delta Y_{vzjt} + \sum_{v \in DP} \Delta Y_{vzjt} + \sum_{v \in CP} \Delta Y_{vzjt}, \tag{3}$$

Substituting the previous equations we can write the change in Portuguese exports as:

$$\Delta Y_t = \sum_{j\in N}\Delta Y_{jt} + \sum_{j\in X}\Delta Y_{jt} + \sum_{j\in C}\left[\sum_{z\in DD}\Delta Y_{zjt} + \sum_{z\in CD}\left[\sum_{v\in AP}\Delta Y_{vzjt} + \sum_{v\in DP}\Delta Y_{vzjt} + \sum_{v\in CP}\Delta Y_{vzjt}\right] + \sum_{z\in AD}\Delta Y_{zjt}\right] \quad (4)$$

We compute the percent aggregate change in total exports by dividing each term in equation (4) by $(Y_t+Y_{t-1})/2$, *i.e.* the average between exports in *t* and *t-1*.[7]

Results from this breakdown are presented in Table 8. The table shows that the yearly change in total nominal exports is mainly driven by the change in exports of continuing firms, even though less so in the second half of the period. For example, this was the main force underlying the slowdown in nominal export growth in the 2000-2002 period and in the 2004-2005 period. This latter period is also characterized by a lower contribution of net entry, mostly because of a higher than usual impact of exiting firms. Over the whole period, from 1997 to 2005, average nominal aggregate export growth was 4.4 percent. One fifth of this average growth rate is accounted for by the extensive margin along the firm dimension. Eaton, Eslava, Kugler and Tybout (2007), using Colombian data for the 1997-2005 period, find that continuing firms drive most of the yearly fluctuations in aggregate exports. This is due to the fact that entering and exiting firms are, like we showed in Table 2, much smaller than incumbent firms. However, they also find that net entry over the course of the sample period accounts for one quarter of the cumulative total export expansion, while gross entry explains about half of total growth. This is due to the fact that surviving new exporters are typically able to rapidly expand (see Amador and Opromolla (2008)). When we focus on destinations, we see that the intensive margin, that is export growth in continuing destinations, accounts for almost the entire intensive margin along the firm dimension. However, the gross contribution of added destinations and dropped destinations among continuing firms is quite high. Therefore, there is a substantial reallocation of economic resources associated with destination switching. The decomposition at the product level also offers some interesting patterns. The net contribution of added and dropped products at continuing firms is usually small but the level of churning is very high. Bernard *et al*. (2006), looking at the growth of real U.S. output during the 1972-1997 period, also find that U.S. firms, selling on the domestic market, alter their productive capacity far more than reflected by their net contribution to total growth. The role of continuing products in continuing firms is crucial to explain changes in Portugal exports growth.

(7) As Eaton, Eslava, Kugler and Tybout (2007) explain, computing the growth rate as the change between two dates divided by the average level in the two dates rather than the change divided by the level in the earlier date has at least two advantages: (i) x percent growth followed by -x percent growth returns us to the same level and (ii) values close to zero in the first year have a less extreme effect on the growth rate.

Table 8

DECOMPOSITION OF PORTUGAL TOTAL EXPORTS GROWTH RATE, EXTENSIVE AND INTENSIVE MARGINS, 1997-2005

		Extensive margin			Intensive margin
	Aggregate growth	Net	Entering firms	Exiting firms	Cont firms
1997-1998	6.2	0.9	2.2	-1.3	5.3
1998-1999	3.4	1.7	3.1	-1.4	1.7
1999-2000	13.6	2.9	4.1	-1.2	10.7
2000-2001	2.0	-0.3	2.9	-3.2	2.4
2001-2002	1.8	1.3	2.9	-1.6	0.5
2002-2003	2.4	0.9	2.5	-1.6	1.6
2003-2004	5.2	2.3	3.6	-1.3	2.9
2004-2005	0.4	0.8	3.0	-2.2	-0.5
Average	4.4	1.3	3.1	-1.8	3.1

		Extensive margin			Intensive margin
	Cont firms	Net	Added dest	Dropped dest	Cont dest
1997-1998	5.3	0.8	3.9	-3.1	4.5
1998-1999	1.7	0.0	2.9	-2.9	1.8
1999-2000	10.7	0.0	2.9	-2.9	10.7
2000-2001	2.4	-1.5	2.7	-4.2	3.9
2001-2002	0.5	0.2	3.0	-2.8	0.3
2002-2003	1.6	0.9	3.3	-2.4	0.7
2003-2004	2.9	0.9	3.1	-2.2	2.0
2004-2005	-0.5	-1.2	2.8	-4.0	0.8
Average	3.1	0.0	3.1	-3.1	3.1

		Extensive margin			Intensive margin
	Cont dest	Net	Added prod	Dropped prod	Cont prod
1997-1998	4.5	-0.1	3.2	-3.3	4.6
1998-1999	1.8	0.2	2.9	-2.7	1.6
1999-2000	10.7	0.8	3.7	-2.9	10.0
2000-2001	3.9	0.6	3.0	-2.4	3.4
2001-2002	0.3	-0.4	2.8	-3.2	0.7
2002-2003	0.7	0.4	3.6	-3.2	0.3
2003-2004	2.0	1.1	3.9	-2.8	1.0
2004-2005	0.8	-0.7	2.4	-3.1	1.4
Average	3.1	0.2	3.2	-3.0	2.9

Sources: *INE* (Trade Data) and authors' calculations.

5. CONCLUSIONS

Using a new transaction level trade database for the period 1996-2005, we describe the exports behaviour of Portugal-based firms in terms of the decision to export or not, which products to export and to which countries. Some of the facts shown are in line with and reinforce the conclusions of the still scarce literature on firm heterogeneity in terms of product and destination portfolio but some other are novel to the literature. Our main contribution is the analysis of the joint product and destination dimensions. We show that multi-product and multi-destination firms are crucial in explaining the level and growth rates of Portuguese exports. In particular, firms that export four or more products and operate in four or more destinations are responsible for over two thirds of total exports.

The exporter's portfolio is much diversified in terms of sectors and product tenure. Even when exporters are small in terms of product scope and ship only two products abroad, 50 percent of the times they export products that belong to two different Harmonized System 2-digits sectors. The product and destination portfolio changes frequently over time. Product and destination switching is widespread, even among single or two-product firms.

We break down the aggregate exports growth along three margins: firms, destinations and products. We show that while the intensive margin (sales of continuing products by continuing firms to continuing destinations) generally accounts for most of the yearly variation in exports, the gross contribution of the destination and product extensive margins (for continuing exporters) are as important as the gross contribution of entering and exiting firms and that all of them are as important as the intensive margin.

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APPENDIX 1

DATABASE
Product definition

The following is an example of a four-digits HS product. Out of 21 possible Chapters, consider Chapter XVIII entitled "optical, photographic, cinematographic, measuring,checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof". This includes three headings:

90 Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof;

91 Clocks and watches and parts thereof;

92 Musical instruments; parts and accessories of such articles.

The third heading, number 92, further divides into:

9201 Pianos, including automatic pianos; harpsichords and other keyboard stringed instruments;

9202 Other string musical instruments (for example, guitars, violins, harps);

9203 Keyboard pipe organs; harmoniums and similar keyboard instruments with free;

9204 Accordions and similar instruments; mouth organs;

9205 Other wind musical instruments (for example, clarinets, trumpets, bagpipes);

9206 Percussion musical instruments (for example, drums, xylophones, cymbals, castanets, maracas);

9207 Musical instruments, the sound of which is produced, or must be amplified, electrically (for example, organs, guitars, accordions);

9208 Musical boxes, fairground organs, mechanical street organs, mechanical singing birds, musical saws and other musical instruments not falling within any other heading of this chapter; decoy calls of all kinds; whistles, call horns and other mouth-blown sound signalling instruments;

9209 Parts (for example, mechanisms for musical boxes) and accessories (for example, cards, discs and rolls for mechanical instruments) of musical instruments; metronomes, tuning forks and pitch pipes of all kinds;

which is the disaggregation level which corresponds to our definition of products.

APPENDIX 2

Here we provide some background on the sectoral structure of Portuguese exports and exporters. Table 9 shows the percentage of country exports accounted for by each sector for each year in the sample period. Similarly, Table 10 shows the percentage of exporters belonging to each sector.

Table 9

SUMMARY STATISTICS BY SECTOR

	Total Exports (per cent)			
1-Digit sector	**1996**	**1999**	**2000**	**2005**
Animal products	1.5	1.5	1.6	1.7
Vegetable products	0.8	0.8	1.2	1.3
Animal or vegetable fats and oils	0.7	0.4	0.5	0.6
Prepared food, beverages and tobacco	4.3	4.3	4.5	4.9
Mineral products	3.4	2.5	2.5	5.6
Chemical products	3.4	3.6	4.2	5.3
Plastics and rubber	2.5	3.2	3.9	5.3
Leather and travel goods	0.4	0.3	0.4	0.3
Wood, cork products	4.6	4.8	4.8	4.5
Paper products	4.7	4.6	4.8	4.7
Textiles	22.8	20.7	18.0	13.1
Footwear	7.9	7.0	5.9	4.2
Plaster, cement, ceramic, glass	3.9	3.7	3.5	3.7
Jewellery	0.4	0.4	0.3	0.2
Base metals	3.9	4.9	5.5	7.6
Machinery, electrical equipment	16.2	19.1	19.7	18.6
Vehicles, aircraft, vessels	15.6	15.4	15.0	14.3
Optic., music, measur., med. instr.	1.0	0.8	1.0	0.7
Arms and ammunition	0.2	0.2	0.1	0.1
Miscellaneous manufactured articles	1.7	1.8	2.3	2.9
Works of art and antiques	0.0	0.0	0.0	0.0
Other	0.1	0.1	0.3	0.3

Note: Abbreviated Titles of the Chapters of the HS 1996 Description and Coding System.

Table 10

SUMMARY STATISTICS BY SECTOR – CONTINUED

	Total Exporters (per cent)			
1-Digit sector	**1996**	**1999**	**2000**	**2005**
Animal products	2.5	2.1	2.0	2.1
Vegetable products	2.4	2.3	2.0	1.8
Animal or vegetable fats and oils	0.6	0.6	0.5	0.4
Prepared food, beverages and tobacco	5.1	4.8	4.5	4.2
Mineral products	1.2	1.0	1.0	1.1
Chemical products	3.9	4.1	3.8	3.3
Plastics and rubber	3.8	4.0	4.2	3.9
Leather and travel goods	1.0	0.9	1.0	0.8
Wood, cork products	4.8	4.4	4.0	3.4
Paper products	3.7	3.8	3.8	3.3
Textiles	19.8	18.2	16.4	12.2
Footwear	6.4	5.3	4.6	3.4
Plaster, cement, ceramic, glass	8.0	7.6	7.3	5.7
Jewellery	0.7	0.7	0.8	0.5
Base metals	5.9	6.5	6.4	6.2
Machinery, electrical equipment	16.0	18.5	17.5	16.1
Vehicles, aircraft, vessels	3.9	4.8	9.1	22.2
Optic., music, measur., med. instr.	2.3	2.5	2.7	2.3
Arms and ammunition	0.1	0.1	0.1	0.1
Miscellaneous manufactured articles	6.4	6.6	7.2	6.3
Works of art and antiques	0.2	0.2	0.3	0.2
Other	1.1	0.8	0.6	0.5

Note: Abbreviated Titles of the Chapters of the HS 1996 Description and Coding System.

CHRONOLOGY OF MAJOR FINANCIAL MEASURES

January to March 2010

2010

January

• 4 January (Circular-Letter No 1/2010/DET, Banco de Portugal, Issue and Treasury Department)	Informs that, within the scope of application of Decree-Law No 195/2007 of 15 May, regarding contracts on the euro banknote recycling activity, the cash-in-transit companies ESEGUR, S.A., PROSEGUR, Lda., LOOMIS, S.A. and GRUPO 8, Lda., shall maintain in 2010 the conditions under which they are authorised to carry on such activity. In 2009, they concluded with success the process of full adjustment to the above legal system.
• 5 January (Decree-Law No 2/2010, Official Gazette No 2, Series I Ministry of Finance and Public Administration)	Approves the reprivatisation process of the whole capital stock of BPN (Banco Português de Negócios), SA.
• 5 January (Decree-Law No 3/2010, Official Gazette No 2, Series I, Ministry of Finance and Public Administration)	Establishes that the collection of any charges for payment services and cash operations in ATMs shall be prohibited.
• 7 January (Instruction No 1/2010, Official Gazette No 16, Series II, Part C, Ministry of Public Administration, Portuguese Treasury and Government Debt Agency)	Approves the conditions of issue of Treasury bills and the market operator status.
• 14 January (Instruction of Banco de Portugal No 01/2010 BNBP 2/2010)	Establishes the procedures to be followed when retaining counterfeit/suspect banknotes and coins. Revokes Instruction No 9/2009, published in the Official Bulletin No 8/2009 of 17 August 2009.
• 15 January (Instruction of Banco de Portugal No 27/2009 BNBP 1/2010)	Determines, without prejudice to other regulations, which Instructions shall be applicable to payment institutions.
• 15 January (Instruction of Banco de Portugal No 28/2009 BNBP 1/2010)	Amends a number of Instructions, so that they may apply to payment institutions, i.e. the new type of payment service providers.
• 15 January (Instruction of Banco de Portugal No 29/2009 BNBP 1/2010)	Determines which accounting data shall be reported to Banco de Portugal by payment institutions which carry out any business other than the provision of payment services.
• 26 January (Notice of Banco de Portugal No 1/2010, Official Gazette No 27, Series II, Part E)	Lays down the information to be released in the statement on the remuneration policy of management and auditing board members of institutions subject to the supervision of Banco de Portugal. This Notice shall enter into force on the day following its publication and shall apply to financial years started on 1 January 2010 or thereafter.

February

- 1 February (Circular Letter No 2/10/DSBDR, Banco de Portugal, Banking Supervision Department)

  Lays down the recommendations applicable to the remuneration policy of management and auditing board members of institutions subject to the supervision of Banco de Portugal as well as of the respective staff earning variable remuneration and carrying on their activities at auditing level or any other level that may have a material impact on the institution's risk profile. This is aimed at bringing compensation mechanisms closer into line with prudent and appropriate risk control and management.

- 22 February (Instruction of Banco de Portugal No 4/2010, BNBP 3/2010)

  Amends Instruction No 10/2007, published in the Official Bulletin No 5/2007 of 15 May 2007, relating to external rating agencies.

March

- 4 March (Instruction of Banco de Portugal No 7/2010, BNBP 3/2010)

  Publishes the maximum rates in credit agreements for consumers within the scope of Decree-Law No 133/2009 of 2 June, applicable in the second quarter of 2010.

- 10 March (Instruction of Banco de Portugal No 8/2010, BNBP 4/2010)

  Determines that credit institutions shall send to Banco de Portugal information on deposit and credit agreements, in line with the attached Table, for the analysis and evaluation of the number of customers' complaints.

- 15 March (Instruction of Banco de Portugal No 5/2010, BNBP 3/2010)

  Amends Instruction No 33/2007, published in the Official Bulletin No 1 of 15 January 2008, which regulates the operation of the TARGET2 national system.

- 15 March (Instruction of Banco de Portugal No 6/2010, BNBP 3/2010)

  Amends Instruction No 24/2009, published in the Official Bulletin No 11 of 16 November 2009, which regulates the granting of intra-day credit and the contingency liquidity facility.