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# THE PORTUGUESE ECONOMY IN 2013

### Overview

- 1. International environment
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## Overview

In 2013 the Portuguese economy continued the adjustment process of macroeconomic imbalances accumulated over past decades, simultaneously showing the first signs of recovery.

Indeed, the current and capital account, which reflects additional external financing needs, was close to zero in 2012. In 2013, however, it was clearly positive, reaching 2.6 per cent of GDP. This capacity of the Portuguese economy to manage and raise more external funds than those used is a key element in the process for sustained reduction of the high Portuguese external debt. In 2013 the goods and services account recorded its first surplus in many decades. A contribution to these developments was made, in addition to declining imports, by the growing reorientation of production to the tradable sectors, translated into an expressive increase in the market share of Portuguese exports.

In 2013 the fiscal consolidation process continued, in line with the framework defined in the Economic and Financial Assistance Programme (EFAP). The fiscal deficit stood at 4.9 per cent of GDP, falling short of the 5.9 per cent objective for 2013 (entered in October into the State Budget for 2014). The fiscal consolidation effort was the result of an increase in the fiscal burden, in particular taxes on households, which more than offset the impact on expenditure of the reinstatement of the Holiday and Christmas bonuses of civil servants and pensioners. As a result of a persisting deficit in the budgetary balance, the public debt ratio continued to increase in 2013, reaching 129 per cent of GDP at the end of the year.

This capacity to correct macroeconomic imbalances with no nominal depreciation, in a single currency context, was followed, after the second quarter of 2013, by a reversal of the downward trend of GDP observed in the preceding 10 quarters. Indeed, although GDP declined, in annual average terms, by 1.4 per cent in 2013, it underwent a marked intra-annual recovery that led GDP to stand, in the last quarter of the year, 1.7 per cent above the level recorded in the last quarter of 2012.

The behaviour of the Portuguese economy continued to be determined by two types of factors: the external environment that either restricts or stimulates activity in Portugal, and the domestic framework that results, on the one hand, from the implementation of the EFAP and, on the other hand, from the nature of the institutional environment, whose reform is still incipient.

As regards the international context, the behaviour of the Portuguese economy in 2013 continued to be influenced, in an unfavourable manner, by weak growth of activity in the economies that are more relevant for the Portuguese economy, despite showing signs of recovery throughout the year; and, in a positive manner, by the decline in commodity prices, especially oil prices.

Against a background of low inflationary pressures overall, the decline in the ECB's key rates and the announcement of explicit guidance on the maintenance of low interest rates in the future might have been a stimulus for the Portuguese economy. However, financial fragmentation in the euro area between peripheral and core countries, resulting from the sovereign debt crisis, continued to jeopardise the pass-through of monetary stimulus to the non-financial sector in Portugal, limiting the cut in interest rates applicable to loans to the private sector. As a result, the bank lending spreads applied to non-financial corporations remained at high levels and it was aggravated by higher sensitivity to risk of the financial system operating in Portugal. Building banking union is crucial to eliminate financing cost differences among corporations facing the same risk level but situated in different euro area jurisdictions. This distortion in competition has significantly penalised Portuguese enterprises.

Economic activity growth since the second quarter of 2013 has been supported by a

gradual recovery of domestic demand and the continued significant buoyancy of exports. Employment rose, in line with the behaviour of economic activity, in parallel with a gradual decline in the unemployment rate that, however, remains at a historical high. Labour market developments maintained some of the characteristics seen in recent years, namely the rise in fixed-term contracts and the increase in long-term unemployment.

Nevertheless, the Portuguese economy shows some fragility. In particular, it is necessary to continue the debt-reduction process in both the State and other over-indebted sectors, as well as to deepen the structural reform process started in the recent past, namely to enable the absorption of the current unemployment levels. The sustainability of public finances, the rise in financial autonomy of non-financial corporations and the soundness and stability of the financial system are other indispensible conditions required to start a resource-utilisation process underpinning productive investment in tradable sectors. Otherwise, it will not be possible to ensure the sustainability of the adjustment and to reduce its costs.

# 1. International environment

# Low growth in economic activity and global trade flows

In 2013 the international environment of the Portuguese economy was characterised by low growth in economic activity and global trade flows, which nevertheless increased in the second half of the year. According to information published in the International Monetary Fund's April World Economic Outlook, global economic activity grew by 3.0 per cent in 2013, close to the levels recorded in 2012 (Table 1.1). Developments in 2013 exhibited an intra--annual profile of acceleration from the first to the second half of the year, mainly reflecting developments in advanced economies, as emerging market and developing economies grew only modestly.

In 2013, annual GDP growth averaged 1.3 per cent in advanced economies. Economic growth in the United States and Japan contrasted with a contraction observed in the euro area for the second year in a row. Growth in emerging and developing economies (4.7 per cent in 2013) remained markedly higher than that of advanced economies, although clearly below the levels recorded in the period before the beginning of the international economic and financial crisis.

In 2013 the contraction in euro area economic activity reflected an ongoing fiscal

consolidation effort in a large number of economies, tight financing conditions prevailing in stressed countries and a continued reduction in household and corporate debt levels. The impact of these factors - contributing to a decrease in economic activity similar in size to that seen in 2012 (Chart 1.1) - was heterogeneous, reflecting the specific situation of each economy. However, from the second quarter of 2013, euro area economic activity recorded a recovery that may have been consolidated in the second half of the year. These more positive intra-annual developments reflected a recovery in domestic demand (private consumption and investment), together with a continued positive contribution from exports. Increasingly favourable financing conditions, improved confidence, decreasing uncertainty and a more favourable external environment are likely to have contributed to the recovery of economic activity throughout the year. These factors also helped to stabilise labour market conditions.

## External demand for the Portuguese economy grew throughout the year

External demand for the Portuguese economy was greatly affected by these developments, as Portuguese exports are strongly oriented towards euro area economies that

	· · · · · ·	0		
	2010	2011	2012	2013
World economy	5.2	3.9	3.2	3.0
Advanced economies	3.0	1.7	1.4	1.3
USA	2.5	18	2.8	1.9
Japan	4.7	-0.4	1.4	1.5
Euro area	1.9	1.6	-0.6	-0.4
Germany	3.9	3.4	0.9	0.5
France	1.6	2.0	0.0	0.3
Italy	1.7	0.6	-2.4	-2.4
Spain	-0 2	0.1	-1.6	-1.2
United Kingdom	1.7	1.1	0.3	1.7
Emerging markets and developing economies	7.5	63	5.0	4.7

Table 1.1 •	Gross Domestic Product	Real growth r	rate, in perce	ntage
-------------	------------------------	---------------	----------------	-------

Sources: Eurostat, IMF and Thomson Reuters.

experienced declines in economic activity (e.g. the Spanish economy) or very low growth (e.g. the French and German economies) (Table 1.2). In 2013 as a whole, the weighted growth of imports of the main destination markets for Portuguese exports stood at 1.3 per cent, a slight improvement compared to the stagnation experienced in 2012, but considerably below average growth recorded in the period before the severe global recession. Imports from the Portuguese economy's main trading partners recovered moderately in the second half of the year (from 0.4 per cent year-on-year growth in the first half to 2.3 per cent in the second). Although Portuguese exports have diversified their destination markets over the past decade, the Portuguese economy has relatively little exposure to emerging market

Table 1.2	<ul> <li>External demain</li> </ul>	and of goods and	d services   Real	yearly growth	rate, in percentage
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	Share <sup>(b)</sup>	2011	2012	2013	2013 H1	2013 H2
External demand (a)	100.0	4.0	-0.1	1.3	0.4	2.3
Intra euro area external demand	66.3	3.2	-2 5	0.2	-1.0	1.4
of which:						
Spain	27.1	-0.1	-5.7	0.4	-0.9	1.6
Germany	13.7	7.5	18	1.0	0.0	2.1
France	12.5	5.3	-0.9	0.8	-0.5	2.0
Italy	3.9	1.4	-7.1	-2.9	-4.7	-1.0
Extra euro area external demand	33.7	5.5	48	3.6	3.4	3.9
of which:						
United Kingdom	5.6	0.3	3.4	0.5	-0.2	1.2
USA	3.5	4.9	22	1.4	0.6	2.2
Memo:						
World trade on goods and services		6.2	28	3.0		
World merchandise imports		6.2	1.9	2.8	1.9	3.6

Sources: CPB, ECB, IMF.

Chart 1.1 • Economic activity in the euro area

Notes: (a) External demand is computed as weighted average of the imports volume of Portugal's main trading partners. Each country/region is weighted by its share in Portuguese exports. (b) Shares computed using 2011 data.



Chart 1.2 • Foreign demand and world trade | Index 2008=100



Note: The Composite PMI in the chart is the deviation of the 3-months moving average from the benchmark value of 50. The Economic Sentiment indicator is is the deviation of the 3-months moving average from the average level in the period 2004-2013.

Sources: ECB and IMF

and developing economies (Chart 1.2), reducing the impact on external demand of more significant growth in these economies.

# Continued low inflationary pressures

In 2013 inflationary pressures remained contained at a global level. In developed economies, low growth in economic activity, prevailing capacity utilisation levels and high unemployment contributed to low inflationary pressures. In the context of depressed global demand, commodity prices also decreased, particularly in the first half of the year, contributing to a slowdown in inflation in emerging market and developing economies. In particular, oil prices decreased, remaining nevertheless at levels above USD 100 per barrel, against a background of continued instability in the Middle East and a slowdown in economic activity in emerging market economies, particularly China.

In the euro area, the annual average inflation rate stood at 1.4 per cent in 2013 (2.5 per cent in 2012). The marked drop in the euro area year-on-year rate of inflation throughout the year (from 2 per cent in January to 0.8 per cent in December) reflected a decline in the energy component and continued low domestic inflationary pressures associated with high unemployment levels and a low capacity utilisation. However, available evidence suggests longterm inflation expectations remained anchored in line with the European Central Bank (ECB) definition of price stability.

## Continued accommodative monetary policy and recourse to nonstandard policy measures

Against an international background of low inflationary pressures and economic growth, the monetary policy stance of the main developed economies remained accommodative in 2013, with authorities maintaining key rates at

levels close to zero and continuing to resort to non-standard policy measures. In particular, the world's main central banks adopted or maintained some form of forward-guidance in an attempt to influence market expectations regarding the path of short-term interest rates.<sup>1</sup>

As regards standard policy measures, the ECB decreased its key rates twice in 2013, against a background of decreased underlying pressures on prices over the medium term. In May, the ECB decreased the interest rate on the Eurosystem main refinancing operations by 25 basis points and the interest rate on the marginal lending facility by 50 basis points. In November, the ECB decreased both rates again by 25 basis points. Thus, at the end of 2013, the rate on the main refinancing operations stood at 0.25 per cent, the interest rate on the marginal lending facility at 0.75 per cent and the rate on the deposit facility at 0.0 per cent.

In line with other central banks, in July the ECB announced forward guidance with respect to the future path of interest rates, admitting that interest rates were expected to remain at current or lower levels for an extended period of time, considering the subdued outlook for inflation extending into the medium term, the broad-based weakness in the economy and subdued monetary dynamics. This forward guidance was reiterated in the following months. In addition, in November 2013, the ECB decided to continue conducting the Eurosystem main refinancing operations as fixed rate tender procedures with full allotment until July 2015, resulting in continued looser liquidity conditions for an extended period of time.

## Euro area financial market fragmentation continued to affect monetary policy transmission throughout 2013

Overall, financing conditions improved throughout 2013, against a background of continued accommodative monetary policies and prospects that interest rates would remain at low levels for an extended period of time.

In the euro area, sovereign debt interest rate differentials decreased between stressed countries and countries with high credit ratings, consistent with a decrease in sovereign risk perception (Chart 1.3). However, financial fragmentation continued to hamper the transmission of monetary policy impulses, reflected in a persistently high heterogeneity of bank loan interest rates between euro area countries.

The results of the Bank Lending Survey for the euro area point to a tightening of credit standards for the corporate sector and households in 2013, which nevertheless eased throughout the year, reflecting a smaller contribution from credit risk and the overall economic conditions. This survey also points to a continued decline in demand for loans although with less marked decreases in net terms throughout the year - specifically from non-financial corporations, reflecting reduced funding needs associated with weak fixed--asset investment. The effect of these factors as a whole has resulted in a continued decrease in loans to the non-financial private sector in the euro area in 2013. Developments in credit aggregates remained rather mixed between countries (Chart 1.4). As for loans to non-financial corporations, growth rates close to zero seen in highly rated countries contrast with a marked decrease in stressed countries (around 7 per cent).

### Note:

1. In December 2012, the Federal Reserve modified its policy on the provision of information regarding the future path of interest rates, specifying its intention to maintain the federal funds rate at the current levels, conditional on quantitative thresholds for the unemployment rate and projected inflation. In August 2013 the Bank of England also opted for conditioning the future monetary policy stance to explicit thresholds for the unemployment rate, provided this does not entail material risks to either price stability or to financial stability. In April 2013 the Bank of Japan indicated that it would maintain its monetary policy accommodation programme for as long as it was necessary to achieve the inflation target of 2 per cent in a stable manner.





### **Chart 1.4** • Loans to non-financial corporations | Yearly growth rate, in percentage



Sources: ECB and Banco de Portugal calculations.

Note: The high-rated countries are Austria, Belgium, Germany, France, Finland and the Netherlands. The countries under stress are Spain, Portugal, Italy, Greece, Ireland and Cyprus.

Source: Thomson Reuters

# 2. Fiscal policy and situation<sup>1</sup>

# Fiscal consolidation continued in 2013

In 2013, the general government deficit in national accounts stood at 4.9 per cent of GDP, which compares with 6.4 per cent in the previous year (Table 2.1). This outcome reflects a more favourable budgetary execution than expected at the time of the preparation of the 2014 State Budget last October. Indeed the estimate for the deficit stood then at 5.9 per cent of GDP, in line with the commitments undertaken in the context of the Economic and Financial Assistance Programme.<sup>2</sup>

The budgetary execution of 2013 was affected by temporary measures that should be excluded when analysing fiscal developments. The effect of these measures on the fiscal balance amounted to 0.3 per cent of GDP, as a result of the revenue collected under a special scheme for the payment of tax arrears<sup>3</sup> (0.8 per cent of GDP) and, conversely, of the reclassification of the capital injection in Banif as a non-financial transaction (-0.4 per cent of GDP). Hence, the deficit excluding temporary measures and special factors amounted to 5.3 per cent of GDP in 2013, declining by 0.8 p.p. *vis-à-vis* the previous year.<sup>4</sup>

Considering that the ratio of interest expenditure to GDP remained virtually unchanged and that the evolution of economic activity continued to contribute negatively to fiscal developments (increasing the deficit by 0.8 p.p. of GDP), the improvement of the structural primary balance amounted to 1.5 p.p. of GDP. As such, the fiscal policy stance in 2013

	2010	2011	2012	2013	<b>2012-2013</b> change (in p.p.)
Overall balance	-9.8	-4.3	-6.4	-4.9	1.5
Temporary measures	0.4	3.6	0.0	0.3	0.3
Special factors <sup>(a)</sup>	1.5	0.9	0.5	0.0	-0.5
Overall balance excluding temporary measures and special factors	-8.7	-7.1	-6.0	-5.3	0.8
Cyclical component	1.4	0.5	-1.4	-22	-0.8
Structural balance <sup>(b)</sup>	-10.1	-7.6	-4.6	-3.0	1.6
Interest expenditure	2.8	4.0	4.3	4.3	-0.1
Structural primary balance	-7.3	-3.5	-0.3	1.2	1.5
Structural revenue (in percentage of trend GDP)	39.2	41.0	41.1	43.6	2.5
Structural primary expenditure (in percentage of trend GDP)	46.7	44.6	41.3	42.4	1.0
Public debt	94.0	108.2	124.1	129.0	4.9
Change in public debt (in p.p.)	10.3	14.3	15.8	4.9	-
Contribution of primary balance	7.0	0.3	2.1	0.6	-
Differential between the effects of interest and of GDP growth	0.7	5.0	8.3	3.8	-
Deficit-debt adjustments	2.6	9.0	5.4	0.4	-

Table 2.1 • Main fiscal indicators | In percentage of GDP

Sources: INE and Banco de Portugal.

Notes: (a) Special factors are operations that transitorily affect the general government deficit, but cannot be treated as temporary measures according to the definition adopted in the Eurosystem. (b) Structural figures are adjusted for the impacts of the cycle, temporary measures and special factors. The cyclical components and temporary measures are computed by Banco de Portugal according to the methodologies adopted in the Eurosystem.

continued to be restrictive and pro-cyclical. Notwithstanding, the consolidation effort in 2013 was less important than in the two previous years, where an improvement of around 3.5 p.p. was recorded in the structural primary balance in each year.

### The improvement in the structural position in 2013 resulted solely from an increase in revenue

With regard to the composition of the structural adjustment, consolidation in 2013 stemmed exclusively from the evolution of structural revenue (contribution of 2.5 p.p. of trend GDP), given that the ratio of structural primary expenditure to trend GDP increased by 1.0 p.p. (Chart 2.1). Structural primary expenditure was affected by the reinstatement of the payment of the holiday and Christmas bonuses to part of the public sector workers and pensioners, which had been suspended in 2012⁵ and had an impact of around 2 per cent of trend GDP. Considering the developments from 2011 to 2013, the cumulative contributions from revenue and expenditure to fiscal consolidation were of a similar magnitude.

## The increase in the tax burden was mainly due to the evolution of Personal Income Tax revenue

The increase in the tax burden in 2013 (8.8 per cent) had underlying different developments of its main components. In fact, while revenue from taxes on income and wealth increased rather significantly (27.8 per cent), the collection of taxes on production and imports remained virtually unchanged. As a whole, social contributions grew by 5.2 per cent. These developments were negatively affected by the evolution of economic activity, as a result of the continuing decline in the actual value of the macroeconomic bases considered in the cyclical adjustment methodology. Conversely, the tax burden in 2013 was affected by the special scheme for the payment of tax arrears already mentioned. Hence, the structural tax burden increased by 9.2 per cent, which corresponds to 2.6 p.p. of trend GDP. The performance of taxes on household's income made a decisive contribution to this evolution (Chart 2.2), largely as a result of changes in the Personal Income Tax (for further details



Chart 2.1 • The composition of structural consolidation | In percentage points of trend GDP

Chart 2.2 • Breakdown of the change in structural revenue | In percentage points of trend GDP



Sources: INE and Banco de Portugal.

Note: Expenditure contribution is the symmetrical of the change in structural primary expenditure as a percentage of trend GDP while the revenue contribution is the change in total structural revenue as a percentage of trend GDP. Sources: *INE* and Banco de Portugal. Note: (a) Other revenue includes other current and capital revenue see "Box 2.1 A disaggregated analysis of developments in the structural tax burden in 2013" in this Bulletin). There was also a positive contribution from the taxes on firms' income and a negative contribution from VAT receipts, of a similar but not significant magnitude. The rise in the ratio of structural social contributions to trend GDP is almost fully accounted for by the component associated with public employees' wages, in the wake of the reinstatement of the two bonuses.

With regard to other current revenue, it recorded a 6.7 per cent increase in 2013 despite the fall in the sales of goods and services (-2.2 per cent). This evolution stemmed from an increase in the interest, dividends and transfers of the European Social Fund received by the general government.

Actual capital revenue recorded a significant reduction (-39.8 per cent). However, this was partly the result of a base effect determined by the implementation of temporary measures in the previous year. As such, in structural terms there was a -29.9 per cent change, which translated into a decline in this item's ratio to trend GDP (-0.4 p.p.), mainly due to a reduction of capital transfers from the European Union to general government entities.

# The rise in expenditure stemmed essentially from wages and pensions

In 2013 primary current expenditure grew by 4.8 per cent, recording a similar change in structural terms, which translated into a 1.2 p.p. increase in trend GDP. This was mainly due – as already mentioned – to the reinstatement of the payment of the two bonuses. In this context, the rise in expenditure was primarily a result of the evolution of expenditure on wages and pensions, which increased by 0.4 and 0.7 p.p. of trend GDP respectively (Chart 2.3).

However, considering only the effect of the reinstatement of the bonuses, a sharper increase in the expenditure on wages and pensions would be expected. In fact, the reduction of the number of public employees(-4.1 per cent) played an important role in the containment of expenditure on wages that, despite the rise in 2013, was lower than in 2011 by 0.8 p.p. of trend GDP. In turn, the redesign of the solidarity surcharge set out in the State Budget for 2013,<sup>6</sup> with an impact of 0.3 p.p.





Sources: ///E and Banco de Portugal. Notes: (a) The composition of primary expenditure is corrected for the effects of the transformation of public hospitals into corporations in the 2002-2010 period, according to estimates by Banco de Portugal. (b) Other primary expenditure includes social payments excluding pensions, general government social contributions, subsidies and other current and capital expenditure.



of trend GDP, made it possible to partly offset the effects of the reinstatement of the bonuses and of the structural upward trend of this item of expenditure, associated to the increase in the number of pensioners and average pensions.

Expenditure on unemployment benefits grew by 5.1 per cent, which was higher than the structural growth (1.8 per cent), due to the expansion in the number of unemployed receiving benefits (8.0 per cent in monthly average terms). Expenditure on other social benefits in cash continued its downward trend seen already in previous years. The 1.5 per cent increase in expenditure on social benefits in kind stemmed from an increase in the payment of services to corporate hospitals, given that expenditure on health co-payments declined. Conversely, intermediate consumption recorded a 1.2 per cent decrease, which was common to all general government subsectors, with the exception of local government. Finally, current transfers to firms grew by 15.4 per cent, partly as a result of a rise in expenditure on professional training courses co-financed by the European Social Fund.

Excluding temporary measures and special factors<sup>7</sup>, capital expenditure declined by 8.3 per cent (-0.2 p.p. of trend GDP). Investment fell further rather sharply (-13.5 per cent), notably via a reduction of expenditure in the autonomous services and funds subsector, in particular, by the enterprises *Parque Escolar, EPE* and

6.0

*Estradas de Portugal, SA*. On the contrary, other capital expenditure increased by 7.9 per cent, chiefly due to the payment associated with the tariff deficit (0.1 per cent of trend GDP).

### The public debt ratio continued to increase, but market access was resumed

The year 2013 was marked by the start of Portugal's return to sovereign debt markets. Reference should be made in particular to the issue of five-year Treasury bonds (through the reopening of already existing lines) and ten--vear Treasury bonds in January and May respectively, and also to a bond exchange offer in December.8 Furthermore, in the course of 2013 Treasury bills were issued at average rates around 1.5 per cent for one-year maturity, *i.e.*, lower than in the two previous years (Chart 2.4). Interest expenditure, according to the definition adopted under the excessive deficit procedure, declined by 0.9 per cent in 2013, and the implicit interest rate on public debt, i.e., the ratio of interest expenditure to the simple average of the debt stock at the end of the year and of the previous year, decreased from 3.7 per cent in 2012 to 3.4 per cent in 2013.

The gross public debt ratio reached 129.0 per cent at the end of 2013, which compares with 124.1 at the end of 2012 (Table 2.1). This indicator continued to be influenced by the

Chart 2.4 • Interest rate on treasury bills issuances | In percentage



Source: IGCP.

high amount of general government deposits. The ratio of public debt net of these deposits increased from 112.5 per cent of GDP in 2012 to 116.4 per cent of GDP in 2013.

The rise in the gross debt ratio over the year essentially resulted from interest expenditure (4.3 per cent of GDP), given that deficit-debt adjustments were not very significant (+0.4 p.p.) and that the primary deficit effect (+0.6 p.p.) was partly offset by the impact of nominal GDP growth (-0.4 p.p.).

The most significant positive deficit-debt adjustments recorded in 2013 were related, notably, to an accumulation of deposits (1.0 p.p. of GDP) and the payment of previous years' debts of the regional and local governments (0.5 p.p. of GDP). Conversely, there were in particular, adjustments relating to the amount received from the concession of the public airport service to ANA – Aeroportos de Portugal, SA (-0.7 p.p. of GDP) and debt valuation effects via exchange rate fluctuations on the value of loans from the International Monetary Fund (-0.6 p.p. of GDP). In 2013 deficit-debt adjustments placed a much lower pressure on the debt ratio than in the two previous years (see "Box 3.3 Deficitdebt adjustments in the context of the Economic and Financial Assistance Programme", in the 2012 Annual Report).

Box 2.1 | A disaggregated analysis of developments in the structural tax burden in 2013

The purpose of this box is to analyse the developments in the main tax burden items in 2013, in light of the disaggregated approach used in the context of the European System of Central Banks. This methodology focuses on the analysis of the structural evolution of the different items by excluding the transitory impacts stemming from the economic cycle, temporary measures and special factors.

In 2013 the increase in the structural tax burden by 2.6 p.p. of trend GDP is largely accounted for by the introduction of several tax policy measures, with an impact of 1.8 p.p. of trend GDP (Chart 1). The decoupling between the macroeconomic bases and GDP accounted for a negative contribution of 0.5 p.p. reflecting the lower nominal trend growth of the macroeconomic bases compared with that of GDP. Out of 1.3 p.p. of the change in the tax burden which cannot be explained by the usual factors, 0.4 p.p. stems from an increase in social contributions associated with public employees' wages, following the reintroduction of the holiday and Christmas bonuses.



Revenue from taxes on household's income, defined in structural terms, grew by 36.9 per cent in 2013, corresponding to 2.1 p.p. of trend GDP (Chart 2). With regard to permanent legislation changes in the Personal Income Tax, there is an estimated effect of 1.5 p.p. of trend GDP, chiefly resulting from a decline in the number of brackets (which led to a considerable increase in this tax's average rate), the introduction of a 3.5 per cent extraordinary surcharge applicable to the share of taxable income exceeding the national minimum wage, an increase in final withholding taxation on capital income and a reduction in tax credits and lump-sum family credits. The estimate for the residual component of this tax amounts to 0.6 p.p. of trend GDP, to a small extent explained by a decline in the refunds. As for the remainder, and given the magnitude of the adopted measures, one cannot exclude some uncertainty in the initial quantification of the impact of the legislative changes.

Structural revenue from taxes on firm's income grew fairly sharply in 2013 (11.5 per cent), corresponding to a 0.3 p.p. increase in the ratio of this item to trend GDP. With regard to the tax policy measures with an impact in 2013, the most relevant were the introduction of limits to deductions of losses (a 2012 State Budget measure, but only with effect on the 2013 revenue) and net interest costs. However, the estimated impact of the abovementioned is negligible. The residual component is positive and shows a magnitude of 0.2 p.p., and may be explained by the fact that the chosen macroeconomic base does not adequately capture the behaviour of taxable profits and by some uncertainty in the initial quantification of the measures mentioned.

VAT revenue in 2013 dropped by 1.8 per cent in structural terms, accounting for a 0.3 p.p. decline in trend GDP. This was affected by a slightly negative decoupling between trend nominal growth rates of the respective macroeconomic base, private consumption, and of GDP. The negative albeit negligible residual value corresponds almost fully to an increase in this tax's refunds.

Structural revenue from other taxes on production and imports rose by 2.6 per cent in 2013, slightly below the actual change. Actual revenue from the Tax on Oil Products declined by 1.6 per cent given the negative trend of fuel sales (more specifically a fall of 3.6 and 2.5 in petrol and diesel sales, respectively). This was, however, mitigated by the introduction of a tax on natural gas. With regard to the Tax on Vehicle Sales, actual revenue declined by 2.6 per cent despite the increase in the number of light passenger vehicles sold. Notwithstanding the legislative changes introduced to the Tobacco Tax in 2013, its revenue declined by 2.4 per cent. By contrast, in addition to the effect of the special scheme for the settlement of tax arrears, the revaluation



of the values of real estate for tax purposes and the introduction of a tax on prizes from some forms of gambling previously exempt led to increases of 15.8 and 2.1 per cent in the collection of the Municipal Tax on Real Estate and Stamp Duty, respectively. Finally, there was a decline in the receipts from the Municipal Tax on Real Estate Transactions (-4.7 per cent). As a whole, legislative changes to these taxes amounted to 0.2 p.p. of trend GDP.

In 2013, structural revenue from social contributions increased by 5.4 per cent, translating into a 0.4 p.p. change in trend GDP. This outcome can almost fully be explained by the effect of the payment of the holiday and Christmas bonuses in 2013, after their suspension in the previous year, which is considered as a residual in the adopted methodology. With regard to the legislative measures affecting this item, it is worth highlighting the introduction of new contributions on unemployment benefits and sickness allowances. This measure came into force in July 2013, after having been restructured in the wake of the Constitutional Court's ruling declaring the initial measure unconstitutional.

#### Notes:

1. In the analysis developed throughout the chapter, references to structural values are cyclically adjusted, and exclude temporary measures and special factors, according to Eurosystem methodologies. However, structural values include the measure to suspend holiday and Christmas bonuses for some public employees and pensioners, which was fully reversed in 2013 following rulings of the Constitutional Court. Structural values also include the impact of measures that were presented as transitional but with no end-date specified.

2. The objective for the deficit set out in the 7th review of the Economic and Financial Assistance Programme was 5 5 per cent of GDP, excluding the effect of the reclassification of the capital injection in Banif as a non-financial transaction, which had a negative impact of 0.4 per cent of GDP on the fiscal balance.

3. This measure is under the extraordinary debt settlement scheme for tax and social contributions arrears (RERD in Portuguese), pursuant to Decree-Law No 151-A/2013 of 31 October.

4. For a description of the temporary measures and special factors for years prior to 2013, see the Annual Reports of Banco de Portugal for 2010, 2011 and 2012. In the course of 2013 the definition of temporary measures used at the Eurosystem level changed to include transactions related to financial system support, previously classified as special factors.

5. The State Budget for 2013 envisaged a partial reversal of the suspension of the payment of bonuses introduced in 2012. However in its Decision No 187/2013 of 5 April the Constitutional Court ruled this measure as unconstitutional, thus determining the full reversal of the suspension.

6. On a national accounts basis, the solidarity surcharge, which as of 2013 affected monthly pensions above €1,350, is deducted from expenditure on pensions.

7. The impact of excluded measures on capital expenditure was more significant in 2012 (0.7 per cent of trend GDP) than in 2013 (0.4 per cent of trend GDP).

8. In the course of 2014 Treasury bonds maturing in 2019 and 2024 were issued through the reopening of already existing lines and several debt repurchase operations were conducted.

9. The first Supplementary State Budget for 2013 envisaged the introduction of a minimum safeguard value for unemployment benefits and sickness allowances, in response to the Constitutional Court's Decision No 187/2013 of 5 April declaring the initial measure unconstitutional.

# 3. Supply

Recovery of economic activity throughout the year, resulting in a smaller contraction than in 2012

In 2013, Gross Value Added (GVA) declined by 1.2 per cent, compared with a 2.3 per cent decline in the previous year as a whole. In intra-annual terms, there was a recovery in the level of economic activity throughout the year. This quarterly evolution of activity is consistent with the upward trends of the coincident indicator of Banco de Portugal and of the economic sentiment indicator of the European Commission (Chart 3.1). Confidence indicators in the main sectors of activity also improved in the course of 2013, maintaining that profile in the first quarter of 2014 (Chart 3.2). At the end of 2013, confidence indicators in the main sectors of activity stood above their averages of the last decade, which was especially evident in industry and services.

The evolution of activity at the sectoral level continued to reflect the productive restructuring under way in the Portuguese economy, which started before the international economic and financial crisis (Chart 3.3). The construction sector showed again a substantial

Chart 3.1 • GVA, coincident indicator of activity and economic sentiment indicator | Year-on-year rate of change, in per cent



Chart 3.2 • Confidence indicators | Balances, 3-month moving average, seasonally adjusted



Sources: European Commission, //VE and Banco de Portugal. S Note: The value of the coincident indicator of activity in the first quarter of 2014 refers to the average of the results of january and february 2014.





Supply

decline in GVA in 2013 (13.9 per cent, compared with 14.8 per cent in 2012). The downward trend of activity in this sector should largely reflect a stabilisation of the housing stock, after the strong investment made in the nineties. The recent dynamics in the construction sector are also affected by the evolution of investment in public works, as well as by the recent reform of the rental market and the decline in the resident population.

GVA in the industrial sector declined slightly in 2013 (-0.5 per cent), after a 2.0 per cent fall in 2012. The evolution of activity throughout the year followed the recovery in domestic demand and is consistent with the robust growth of exports of goods in 2013.

GVA in the services sector also had a less negative change than in the previous year (-1.5 per cent in 2012 and -0.8 per cent in 2013). This evolution reflected mostly the 0.8 per cent growth of activity in the trade and repair of motor vehicles and hotels and restaurants subsectors, which contrasts with the 1.3 per cent reduction observed in the previous year. The recovery of activity in this sector should have mainly reflected the significant growth of spending by non-residents, in line with the increase in tourism exports.

## Gradual improvement in labour market conditions. which, however, remain unfavourable

In annual average terms, the labour market in 2013 continued to be characterised by a fall in employment and a rise in unemployment, although less marked than in the previous year. From the second quarter of 2013, there was a gradual improvement in the situation in the labour market, in line with the evolution of economic activity. Year-on-year changes in employment were gradually less negative throughout the year, reaching a year-on-year growth in employment of 0.7 per cent in the fourth quarter. Intra-annual developments in unemployment were more marked, with a strong increase in the first half of the year, followed by a substantial decline in the number of unemployed in the second half of the year.

In 2013, the reduction of the resident population and of the labour force deepened, a phenomenon already observed in the previous year. In particular, the 1.9 per cent decrease in the labour force in 2013 is very significant in historical terms (Table 3.1). The reduction in the population was particularly sharp among

Table 3.1 • Population, en	nployment and unemployment	Year-on-year	rate of change, in per
cent, unless otherwise stated			

	2012	2013
Population	-0.4	-1.0
Population 15-34 years	-3 3	-4.0
Labour force	-0.9	-1.9
Labour force 15-34 years	-4.7	-6 2
Participation rate 15-64 years (in % of population)	73.9	73.6
Total employment	-4 2	-2.6
Employees	-4.9	-2.4
Permanent contract	-3.0	-3.4
Fixed-term contract	-12.6	18
Self-employment	-1.7	-3.4
Total unemployment	21 8	18
Unemployment rate (in % of labour force)	15.7	163
Unemployment rate 15-34 years (in % of labour force)	22.9	23 5
Long-term unemployment (in % of total unemployment)	54 2	62.1
Discouraged inactives (in % of labour force)	42	52

Source: INE - Labour Force Survey. Notes: Long-term unemployment includes the unemployed individuals that have been actively seeking employment for 12 months or more. The discouraged inactives include the inactive individuals who were available for work but had not looked for a job during the period.

younger age groups (individuals aged between 15 and 34 years), in which the resident population and the labour force declined by 4.0 and 6.2 per cent, respectively. As in 2012, this decrease in population should continue to be related with the recent dynamics in migration flows.<sup>1</sup>

According to data of the Labour Force Survey of Statistics Portugal (INE), total employment declined by 2.6 per cent in 2013, after a 4.2 per cent fall in the previous year. The decline in the number of employees was less marked than in 2012, while the fall in self-employment was higher in 2013. The decrease in the number of employees resulted from a decline in the number of permanent contracts, given that the number of fixed-term contracts rose by 1.8 per cent, after the strong contraction observed in 2012. This evolution of fixed-term contracts is consistent with the fact that the recovery of activity is at an initial stage, subsisting elements of uncertainty about the future trend of economic activity.

In 2013, the evolution of employment by sector of activity followed broadly the sectoral behaviour of activity, although the fall in employment in industry was much higher than the reduction in activity (Chart 3.4). The strong decline in employment in industry cannot be separated from the restructuring in course in the Portuguese economy, which implies job destruction in some more labour-intensive sectors. The sustainability of the restructuring process requires job creation in the private sector and in activities with growing markets and above average productivity levels.

Employment in the services sector changed by 0.5 per cent in 2013, after a 2.5 per cent decline in the previous year. It showed a marked recovery profile throughout the year, which culminated in a year-on-year growth of 3.7 per cent in the last quarter. In annual average terms, employment in this sector registered differing behaviours by subsector of activity. The strongest contributions to the increase in employment in services resulted from the growth in the number of workers in the subsectors of transports, storage, and communications, hotels and restaurants, and scientific, technical and similar consulting activities. Conversely, the reductions in employment in the subsectors of wholesale and retail trade, education, and financial and insurance activities gave the most significant negative contributions in 2013.

Employment in the construction sector declined again substantially in 2013, which is consistent with the ongoing adjustment in this sector. In the sector of agriculture, animal production, hunting, forestry and fishing, the number of workers declined by 7.8 per cent this year, which contrasts with a 1.6 per cent rise in 2012.

The total number of unemployed increased by 1.8 per cent in 2013, which compares with a 21.8 per cent growth in the previous year. The unemployment rate stood at 16.3 per cent in 2013, slightly higher than the level observed in 2012. In addition, the number of discouraged individuals, i.e., individuals not actively seeking a job but available for work, rose again significantly in 2013. These marginally inactive individuals, whose degree of attachment to the labour market is equivalent to the unemployed, represented 5.2 per cent of the labour force in 2013. In intra-annual terms, the unemployment level showed a rather marked profile over 2013, reaching the highest value of this phase of the economic cycle in the first guarter and ending the year with a year-on-year reduction of 10.5 per cent in the last guarter. Against this background, the unemployment rate stood at 15.3 per cent at the end of 2013, compared with 16.9 per cent at the end of 2012.

One of the most worrying aspects of the recent developments in the Portuguese labour market is the strong increase in the incidence of long-term unemployment, which tends to lead to a sharp depreciation of human capital with adverse effects on economic growth. The share of unemployed workers seeking work for 12 months or more rose significantly in 2013, to stand, in annual average terms, at 62.1 per

cent. This is the highest value observed since the early nineties. Additionally, very long-term unemployment (lasting 25 months or more) continued to increase, representing 38.1 per cent of the unemployed in 2013 (33.3 per cent in 2012). On the contrary, the number of individuals seeking work for less than 12 months declined by 15.7 per cent in 2013, which contrasts with the strong growth observed in the previous year and should reflect mainly the lower flow of new unemployed in the course of 2013.

The dynamics in the labour market may be broken down into flows occurring between its three states: employment, unemployment and inactivity (Chart 3.5). The analysis of these quarterly average flows illustrates the improvement in the labour market situation throughout 2013, versus the deterioration registered in the previous year. In fact, compared with 2012, there was an inversion in the sign of net average flows in employment and in unemployment. This evolution reflected mainly a decline in the moves from employment into unemployment and an increase in the transitions from unemployment into employment.

Over the four quarters of 2013, the transitions among the different states of the labour market were equivalent, on average, to around 17 per cent of the labour force, a value similar to the one recorded in 2012. The analysis of quarterly flows into employment also reveals the high segmentation between types of contracts in the Portuguese labour market. Job creation was concentrated in non-permanent contracts. In effect, among total transitions into employment, either from unemployment or from inactivity, only 13.2 per cent corresponded to permanent contracts in 2013.

### Note:

1. It is somewhat difficult to rigorously assess the recent dynamics in Portuguese emigration, given the lack of accurate statistics in this field. Moreover, *INE's* estimates on net migration in 2013 are not available as yet. However, according to *INE's* demographic statistics, the decrease in the resident population in 2011 and 2012 reflected mainly the negative contribution of net migration. Similar developments are expected in 2013.



Chart 3.4 • Change in employment by main sectors of

activity | Index 2008Q1 = 100

Chart 3.5 • Quarterly average flows in the labour market | As a percentage of the labour force



Employment 0.3 (-0.6)

Sources: INE and Banco de Portugal. Notes: Flows are computed using the common component of the sample of quarters t and t-1 and the population weights of quarter t. Quarterly average values of the years 2012 and 2013. Values of 2012 in brackets.

Source: INE - Labour Force Survey. Note: Break in the series in 2011 due to the change in the methodology of the Labour Force Survey.

# 4. Demand

In 2013 GDP decreased by 1.4 per cent, in real terms, following a 3.2 per cent drop in 2012. The contraction of economic activity in Portugal continued to be more marked than in the euro area, which points to a -1.0 p.p. growth differential between Portugal and the euro area in 2013 (Chart 4.1).

Economic activity recovered as of the second quarter, following a continued fall over ten consecutive quarters (Chart 4.2). A recovery in domestic demand contributed to these developments, in line with an improvement in consumer and corporate confidence, and the ongoing significant contribution from exports (Table 4.1). The more sizeable growth of a number of more import-intensive demand components also contributed to an increase in imports, in contrast to the two previous years. Despite this intra-annual profile, GDP fell in annual average terms, reflecting the lagged effects of the marked downward path observed in 2012 and the first guarter of 2013.

### Private consumption contraction amid lower household indebtedness

In 2013 private consumption contracted by 1.7 per cent (after a 5.3 per cent fall in 2012), amid a further adjustment in household expenditure and indebtedness levels. This decline in Portuguese households' consumption over the 2011-13 period reflects an adjustment in aggregate demand to levels compatible with output and resident agents' income. However, intra-annual developments in private consumption in 2013 tended upwards, as shown by the growth of consumption of durable goods in the second half of the year, particularly in the motor vehicles component. This was due to an increase in consumer confidence (Chart 4.3) and a decline in debt service resulting from lower indebtedness. Conversely, consumption of non-durable goods and services decreased further in 2013, albeit less markedly than in 2012. The reduction in current consumption reflected, in particular, the non-food component, given that consumption of food commodities continued to be relatively stable, reflecting the lower elasticity of expenditure in food to changes in income.

The contraction in private consumption in 2013 was associated with a decline in households' real disposable income for the third consecutive year, against a background of continued tight financing conditions. Total credit granted to households for consumption continued to fall markedly in 2013, in an environment of



—Euro area





Sources: Eurostat and INE.

Diferential (in p.p.) -Portugal

Area | Real growth rate



high interest rates on consumer credit, albeit a slight decline.

The decline in nominal disposable income in 2013 (-0.7 per cent) largely reflects significant increases in direct taxes (Chart 4.4). Conversely, domestic transfers to households grew significantly in 2013, mainly reflecting the reinstatement of holiday and Christmas subsidies for pensioners. Amid a fall in employment, wages in the private sector declined in 2013. However, after decreasing in 2011 and 2012, wages in the economy as a whole grew in 2013, reflecting an increase in public sector compensation, following the reinstatement of holiday and Christmas subsidies for civil servants. The fall in real disposable income in 2013 was less marked than in 2012, to which a marked acceleration in prices contributed in 2013. The savings rate stood at 12.6 per cent in 2013, *i.e.*, 0.6 p.p. higher than in 2012, thus remaining above the level seen before the onset of the financial crisis.

The volume of public consumption fell by 1.8 per cent in 2013, following a 5.0 and 4.7 per cent decline in 2011 and 2012 respectively. Amid a virtual stabilisation of expenditure

	% of GDP	2014	2012	2012	2012		20	13	
	in 2013	2011	2012	2013	Q4	Q1	Q2	Q3	Q4
GDP	100	-1.3	-3.2	-1.4	-3 8	-4.0	-2.0	-0.9	1.6
Domestic demand	99	-5.1	-6.6	-2.6	-4.4	-5.9	-2.9	-1.6	0.1
Private consumption	65	-3.3	-5.3	-1.7	-5.1	-4.0	-2.3	-0.9	0.6
Public consumption	19	-5.0	-4.7	-1.8	-3.9	-3.3	-2.4	-1.4	0.0
Investment	15	-11.1	-13.4	-7.3	-2.4	-16.1	-6.2	-4.4	-1.8
GFCF	15	-10.5	-14.4	-6.6	-12.4	-16.2	-6.2	-5.1	2.7
Stockbuilding <sup>(a)</sup>		-0.2	0.1	-0.1	1.8	0.1	0.0	0.1	-0.7
Exports	41	6.9	3.2	6.1	0.2	0.7	7.4	72	9.4
Imports	40	-5.3	-6.6	28	-1.6	-4.4	5.2	55	5.2
Domestic demand corntibution <sup>(a)</sup>		-5.5	-6.9	-2.6	-4.4	-6.0	-2.9	-15	0.1
Exports contribution(a)		2.2	1.1	23	0.1	0.3	2.7	2.7	3.5
Imports contribution <sup>(a)</sup>		2.2	2.6	-1.1	0.6	1.7	-1.9	-2.1	-2.0

### Table 4.1 • GDP and main expenditure components | Real growth rates

Sources: ///E and Banco de Portugal calculations.

Note: (a) Contribute to real GDP growth, in percentage points.

Chart 4.3 • Private consumption, consumption coincident indicator and consumer confidence indicator | Year-on-year growth rate



Chart 4.4 • Personal disposable income | Contribution to the annual growth rate, in percentage points



in goods and services, the fall in public consumption mainly reflected a reduction in wage expenditure (for more details, see "Chapter 2 Fiscal policy and situation", in this Bulletin). Estimates point to a 4.1 per cent reduction in the number of civil servants in 2013 (cumulative reduction in the number of civil servants of 12 per cent in the 2011-13 period). The stabilisation of expenditure in goods and services reflects, on the one hand, a fall in intermediate consumption and, on the other hand, an increase in social transfers in kind and lower sales of goods and services. Finally, the increase in public sector working hours as of the last quarter of 2013 contributed to an acceleration in public consumption at the end of the year.

### Fall in investment in 2013, but with an upward intra-annual trend

Investment fell by 7.3 per cent in 2013, following a 13.4 per cent decline in the previous year. Underlying these developments is a 6.6 per cent contraction in gross fixed capital formation, after a 14.4 per cent fall in 2012.

The decline in gross fixed capital formation in 2013 was broadly based across institutional sectors. Residential investment fell more markedly than in 2012. Developments in residential investment are in line with the stabilisation trend in the Portuguese housing stock, following a considerable increase in the 1990s, which was most recently reinforced by the need to lower household indebtedness, high uncertainty about the prospects of future income, the maintenance of tight financing conditions and a reform in the rental market. The contraction in public GFCF remained high, reflecting the fiscal consolidation process (-13.0 per cent, after falls of 32.4 and 38.5 per cent in 2011 and 2012 respectively).

Corporate GFCF decreased further in 2013, albeit less markedly than in 2012. The significant fall in corporate GFCF over the 2011-13 period (20 per cent, in cumulative terms) is a cause for concern due to the key role played by investment as an economic growth factor. However, intra-annual developments in corporate investment in 2013 followed an upward path, in line with confidence in manufacturing, particularly as regards investment in machinery and equipment and transport equipment (Charts 4.5 and 4.6). In this context, in the year as a whole, both GFCF in transport equipment and GFCF in machinery and equipment increased compared with 2012 (11.4 and 2.5 per cent respectively), following decreases in the previous four years. Developments in GFCF in transport equipment were mixed, particularly due to the purchase of air transport equipment.1





Chart 4.6 • Behaviour of GFCF by type of investment | Index 2011Q1=100



Demand

The postponement of investment decisions in 2013 reflected a decline in domestic demand, the relative stabilisation in external demand, the need to pursue a corporate deleveraging process and uncertainty about demand prospects. The Investment Survey released in January 2014 shows that the share of firms claiming to have been limited investment-wise in 2013 was around 59 per cent (64 per cent in the case of exporting firms), which is a decrease from 2012, but still historical high. Among the firms claiming to be limited investment-wise, the main constraint is still the deterioration in sales prospects (64 per cent), followed by return on investment (10 per cent) and difficulties in obtaining credit (9 per cent). Turning to exporting firms, although most also claim that the deterioration in sales prospects is the main investment constraint, a sizeable share (27 per cent) points to difficulties in obtaining credit as the main constraint they face.

Lending, in turn, has been mostly geared towards the most buoyant sectors of the economy associated with the production of tradable goods, namely manufacturing and mining, particularly in the case of exporting firms (Table 4.2).<sup>2</sup> With regard to price conditions, interest rates on loans to non-financial corporations continued to follow a downward path in 2013, reflecting a decrease in spreads applied by banks, amid cuts in bank funding costs and their improved liquidity position. This is in line with the Bank Lending Survey results, which point to a slight narrowing in spreads applied to medium-risk loans, particularly as regards SMEs. Chart 4.7 illustrates the gradual decline in interest rates on new loans to private non--financial corporations, which also suggests an increase in risk differentiation, possibly reflecting mixed risk profiles. Despite this decrease, the interest rate on loans to non-financial corporations remains high compared with the euro area, reflecting perceived risk by banks and a continued fragmentation in financial markets since the onset of the crisis.

Total credit granted to non-financial corporations decreased slightly in 2013, while this aggregate's annual rate of change was relatively stabilised.<sup>3</sup> Underlying this trend was an increase in financing granted by non-residents, while lending by Portuguese banks remained somewhat tight, albeit less markedly than in the previous year (Chart 4.8). Developments

Table 4.2Credit to non-financial corporations by sector of activity | Annual growth rates, inpercentage

	Total credit				Bank credit				
	Share	2011	2012	2013	Share in the credit of each sector	2011	2012	2013	
	Dec.2013	Dec.	Dec.	Dec.	Dec.2013	Dec.	Dec.	Dec.	
Total	100.0	0.2	-0.1	0.0	50.7	-2.6	-6.2	-3.1	
Total excluding construction and real estate activities	76.7	1.1	1.8	1.5	47.7	-0.8	-3.4	-0.6	
Industry	11.9	-2.3	3.1	5.4	59.1	-3.1	-78	-0.6	
Eletricity, gas and water	9.0	5.6	83	-2.0	27.9	53	-4 5	-10.9	
Construction	12.9	-2.3	-5.7	-6.1	64.5	-3.9	-8.7	-8.2	
Trade	10.3	-1.2	-7.3	-28	57.5	-6.0	-10.6	-4.1	
Transportation and storage	9.6	8.5	1.4	9.9	45.3	52	6.4	6.4	
Accommodation and food service ativities	3.6	4.8	1.4	-1.1	62.9	9.4	-4.0	1.0	
Information and communication	2.8	-25.7	32 8	-4 2	19.3	-23.5	-8.6	-20.9	
Non-financial holdings	18.6	4.9	55	2.4	41.1	-6.2	-6.1	0.0	
Real state activities	10.4	-2.3	-6.2	-3.9	58.4	-5.4	-3.9	-6.3	
Consulting and administrative activities	s 6.2	7.2	-7.6	0.6	51.2	45	-142	0.5	
Education, health and social activities	3.0	-7.0	4.0	-4.9	61.7	-4.2	-4.4	-5.1	
Other activities	1.5	-27.0	-10.0	1.4	68.7	3.6	4.0	4.9	

Source: Banco de Portugal.

in non-financial corporate loans were considerably heterogeneous, not only in sectoral terms, but also as regards size and institutional sector. This contraction in credit remains concentrated in smaller enterprises, which are more dependent on access to bank funding. Conversely, growth rates of loans granted by Portuguese banks to state-owned enterprises remained high, given that they continued to face constraints in financing by non-residents.

Exports of goods and services remained highly buoyant, leading to market share gains for the third consecutive year

Exports of goods and services in Portugal remained highly buoyant in 2013, growing by 6.1 per cent, in real terms (3.2 per cent in 2012). Growth of goods and services exports was once again clearly higher than that of external demand for Portuguese goods and services, reflecting market share gains for the third consecutive year (Chart 4.9).

Market share gains are one of the positive aspects of the Portuguese economy's adjustment process, reflecting a remarkable degree of adaptability of Portuguese firms to market conditions. In the current process of structural adjustment in the economy, export growth reflects increased efforts by Portuguese firms to find new markets in the tradable goods and services sectors. At the same time, information available up to 2012 pointed to a gradual reorientation of national inputs towards exporting activities, as shown by the greater share of firms involved in exporting activities, which is one of the stylised facts of the ongoing adjustment process.4

Market share gains cumulated over the past three years (approximately 10 per cent) puts the market share of Portuguese exports in 2013 marginally above the level seen in 1999, when the euro area was established. In this context, the weight of exports in GDP increased markedly over the past few years (from 28 per cent in 2009 to 40 per cent in 2013).

In disaggregated terms, the acceleration in exports in 2013 reflects the greater buoyancy of exports of tourism and other services, as well as an acceleration in exports of goods (5.7 per cent growth in 2013, after 4.0 per cent in 2012), particularly as regards exports of energy goods, which increased significantly in 2013, associated with a greater oil refining capacity. The increase in exports of energy goods in 2013 resulted in a very significant





Chart 4.8 • Credit granted to non-financial corporations | Contribution to the annual growth rate, in percentage points



Source: Banco de Portugal Note: Histogram of interest rates calculated for the new loans to non-financial corporations weighted by the operations amount

Source: Banco de Portugal. Notes: Contribution to the annual growth rate of credit granted to non-financial corporations (both private and public). Credit aggregates defined in the Banco de Portugal Monthly Economic Indicators.

Demand

contribution to export growth, with a positive impact on the aggregate market share. Exports of non-energy goods, in turn, grew somewhat more in 2013 than in the previous year.

International trade statistics, in nominal terms, together with the strong buoyancy of exports of energy goods, signal a marked contribution of exports of consumer goods, particularly food and clothing and footwear. It should be noted that, over the past few years, the growth rate of nominal exports of goods has been lower when their import content is taken into account (see "Box 4.1 *Developments in nominal exports of goods weighted by the non-import content"*, in this Bulletin).

In 2013 exports of tourism and other services grew by 7.2 per cent (1.2 per cent in 2012). Therefore, after a three-year period where the weight of services in the structure of total Portuguese exports decreased, in contrast with the trend seen in the second half of the previous decade, exports of services again increased more than exports of goods. In nominal terms, exports of tourism and transport services remained buoyant and exports of technical and professional services provided by firms grew markedly, following a fall in 2012.

## Import growth reflects more favourable developments in overall demand components with higher import content

Imports of goods and services grew by 2.8 per cent, in real terms, in 2013, after a cumulative fall of 11.6 per cent over two years. Although overall demand is estimated to have marginally declined in 2013, the components that grew the most were those with the greatest import content, such as consumption of durable goods, investment in machinery and transport equipment and exports of goods, particularly energy goods.



Sources: ECB, INE and Banco de Portugal calculations. Box 4.1 | Developments in nominal exports of goods weighted by the non-imported content

Typically, to satisfy the various components of global demand, it is necessary to import, other directly or indirectly (used as intermediate consumption). As such, developments in overall demand contribute to domestic value added depending on its import content. In particular, an increase in exports has a greater impact on GDP if it is based on goods with lower import content. Therefore, it is relevant to analyse not only aggregate developments in exports but also their sectoral composition, taking into account their import content. In this box, an indicator is calculated where nominal exports of goods are weighted by their non-imported content, taking into account a relatively high disaggregation level. This indicator reflects the domestic value added component implied in export developments. The methodology is based on a recent article of Banco de Portugal's Economic Bulletin, which calculates import contents for the various global demand components in Portugal over the past three decades, pointing to some heterogeneity in terms of import contents for the various products.<sup>5</sup>

Despite changes in import contents over the most recent period, this analysis is based on 2008, which is the last year for which all the information needed to calculate import contents is available (namely, input-output matrices based on national accounts and their import matrix). Approximately 40 categories of products were taken into account. The indicator was calculated as the sum of nominal exports of each product category weighted by its non-imported content. Naturally, this weighting procedure is reflected in the change of relative weights of the various groups of products. For instance, the weight of refined oil products is reduced (from 7.8 in total nominal exports of goods to 1.9 per cent according to the indicator), while that of clothing increases (from 5.5 to 7.1 per cent).

Chart 1 illustrates developments in total nominal exports of goods and the calculated indicator, in year-on-year terms. Over the past few years, the rate of nominal exports of goods has been lower for most months when taking into account their import contents. This differential results from both the different rates of change in components and the different import contents (Table 1). In particular, it largely reflects the marked increases in exports of fuels, together with their high import content.



Table 1 illustrates an exercise that breaks down, for 2013, the differential between the weighted indicator and developments in nominal exports of goods across the various groups of products,

### Table 1 • Evolution of nominal exports of goods in 2013

		Nomina of g	l exports oods		Nomin of good by non co	al exports s weighted -imported ntent	
	Growth rate in 2013	Weight in 2012	Contri- bution to the growth rate	Total non- -imported content	Weight in 2012	Contribu- tion to the growth rate	- Difference <sup>(a)</sup>
 Coke and refined petroleum products	27.4	78	2.1	0.12	1.9	0 5	-1.62
Crude oil and natural gas	207.3	0.1	0.2	0.09	0.0	0.0	-0.15
Products related to sewerage and waste treatment	-7.1	12	-0.1	080	1.8	-0.1	-0.05
Products of fishing and aquaculture	-11.8	0.4	0.0	0 86	0.7	-0.1	-0.03
Chemical products	6.7	62	0.4	0.47	5.8	0.4	-0.03
Metalic minerals and other products of extractive industries	-4.5	13	-0.1	0.78	2.0	-0.1	-0.03
Machinery and electrical equipment	3.4	5.6	0.2	0.43	4.7	02	-0.03
Wholesale and retail trade, repair of motor vehicles and motorcycles	-20.3	0 2	0.0	0.73	0.3	-0.1	-0.02
Machinery and equipment n.e.c.	4.5	4.7	0.2	0.47	4.4	0.2	-0.02
Beverages	-1.1	2.5	0.0	0.69	3.3	0.0	-0.01
Products related to creative, artistic and entertain-					0.0		
ment services	-38.3	0.0	0.0	0 82	0.0	0.0	-0.01
Products related to publishing services	-7.7	02	0.0	0.74	0.3	0.0	-0.01
Products related to architecture and engineering services	-81.2	0.0	0.0	0 86	0.0	0.0	0.00
Wholesale trade, except of motor vehicles and							
motorcycles	-1.1	0.0	0.0	0 84	0.0	0.0	0.00
Products related to other personal services	-100.0	0.0	0.0	0 85	0.0	0.0	0.00
Unclassified	-	0.0	0.0	0 56	0.0	0.0	0.00
Products related to the production of video and audio services	3.4	0.0	0.0	0.77	0.0	0.0	0.00
Products related to other advisory, scientific, techni- cal and similar	23.3	0.0	0.0	0 83	0.0	0.0	0.00
Coal and lignite	-14.4	0.0	0.0	0.00	0.0	0.0	0.00
Printing and recording	33.4	0.0	0.0	0.74	0.0	0.0	0.00
Products related to libraries, archives, museums and other cultural services	50.8	0.0	0.0	0.90	0.0	0.0	0.00
Other transport equipment	-7.9	1.1	-0.1	0.46	1.0	-0.1	0.01
Rubber and plastic	5.4	5.2	03	0.53	5.4	03	0.01
Wood and cork	1.4	2.9	0.0	0.69	3.9	0.1	0.01
Products of forestry	8.6	0.2	0.0	0.89	0.4	0.0	0.02
Textiles	6.2	33	0.2	0 55	3.5	0.2	0.02
Pharmaceutical products	3.2	1.6	0.1	0.71	2.3	0.1	0.02
Agriculture and animal production	4.2	1.7	0.1	0.67	2.3	0.1	0.02
Electricity, gas, steam and air conditioning supply	500.6	0.0	0.2	0 57	0.1	03	0.03
Other manufacturing	10.3	1.1	0.1	0.64	1.4	0.1	0.03
Footwear and leather products	9.1	4.0	0.4	0 56	4.4	0.4	0.04
Clothing	2.4	55	0.1	0.65	7.1	0 2	0.04
Manufacture of tobacco products	13.2	0.7	0.1	0 80	1.1	02	0.05
Manufacture of paper and paper products	5.7	4.6	0.3	0.62	5.6	03	0.06
Furniture	10.2	23	0.2	0.66	3.0	03	0.07
Machinery and information equipment, medical and							
surgical appliances	-6.8	42	-0.3	0 37	3.1	-0 2	0.08
Other non-metallic mineral products	6.1	3.6	0.2	0.70	5.0	03	0.08
Basic metals	-19.0	5.1	-1.0	0.46	4.5	-0.9	0.10
Fabricated metal products, except machinery and							
equipment	8.6	55	0.5	0.62	6.7	0.6	0.10
Food products	12.2	62	0.8	0.61	7.4	0.9	0.15
Motor vehicles, trailers and semi-trailers	-3.8	108	-0.4	0 31	6.5	-0 3	0.16
Total	4.7	100.0	4.7	0 56	100.0	38	-0.90

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Sources: *INE* and Banco de Portugal. Note: (a) Difference between the contribution to growth rate of nominal exports of goods weighted by the non-imported content and the contribution to growth rate of nominal exports of goods.

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as regards contributions to the annual rate of change. In aggregate terms, the annual rate of change differential between both variables was -0.9 p.p. in 2013. In particular, the component associated with fuels (including refined oil products and natural gas) contributed -1.8 p.p. to the differential.

Conversely, developments in the remaining export components in 2013 were favourable to domestic activity, with a higher contribution to weighted export growth. In particular, exports of some products with lower import content grew considerably (food; metal products; furniture) while a number of goods with high import content recorded negative developments (*e.g.*, transport equipment). This composition effect seems to have offset around half of the negative impact associated with developments in fuels.

### Notes

1. Purchases of air transport equipment, which are mostly imports, do not have an impact on GDP value at the time of its accounting, but only on its composition.

2. In 2013 loans granted by the resident financial sector to exporting firms grew by 3 0 per cent (4.6 per cent in 2012).

3. Total credit includes loans granted by financial institutions, debt securities and trade credits, regardless of where the lender is based. It also includes household loans and Treasury loans, in the case of state-owned enterprises not consolidating in the general government.

4. For a more detailed analysis on recent developments in Portuguese exports, see the Special Issue "Portuguese firms in export markets", in the winter 2013 issue of the Economic Bulletin.

5. Cardoso, F., P. Esteves and A. Rua (2013) "The import content of global demand in Portugal", Autumn 2013 issue of Banco de Portugal's Economic Bulletin.



# 5. Prices

The inflation rate, as measured by the Harmonised Index of Consumer Prices (HICP), stood at 0.4 per cent in 2013, *i.e.*, 2.4 percentage points lower than in 2012 (Table 5.1). The decline in the inflation rate in 2013 was also observed in the euro area, particularly in countries undergoing an adjustment process. The interest rate differential in 2013 between Portugal and the euro area was -0.9 p.p., similarly to 2009 and 2010 (Chart 5.1).

## Lower inflation rate in 2013, reflecting the dissipation of the impact of fiscal measures implemented in 2012

The decline in inflation in Portugal in 2013 largely reflected the dissipation of the impact of fiscal consolidation measures implemented in 2012, particularly the increase in VAT rates on a number of goods and services (*e.g.* electricity, cafes and restaurants and cultural services) and the increase in some prices subject

to regulation. The estimated contribution of the increase in indirect taxes and prices subject to regulation to inflation in 2012 was 2.2 percentage points (Table 5.1). In turn, in 2013 there were no major changes in indirect taxes, excluding an increase in the tobacco tax. Prices subject to regulation recorded an annual average increase of 2.5 per cent, which compares with 4.3 per cent in 2012.

## Decrease in inflation broadly based across the main components

The deceleration in prices in 2013 was relatively broadly based across the main components (see Chart 1 in "Box 5.1 *Analysis of inflation determinants between 2008 and 2013*", in this Bulletin). The downward path followed by inflation was particularly marked over the last months of the year. Energy goods prices fell by 0.7 per cent in 2013 (compared with a 9.5 per cent increase in 2012), reflecting, on the

	Weights	Annua	al rate of c	hange	Year-on-year rate of change			
	2013	2011	2012	2013	13Q1	13Q2	13Q3	13Q4
Total	100.0	3.6	2.8	0.4	0.4	0.8	0.4	0.1
Total excluding energy	92.1	23	1.7	0.6	0.4	1.1	0.7	03
Total excluding unprocessed food and energy	81.5	22	1.6	0.4	02	0.8	0.4	03
Goods	57.6	4.4	2.5	0.0	-0.4	0.5	0.0	-0.3
Food	24.2	3.0	3.4	2.3	2.6	2.8	2.5	1.1
Unprocessed food	10.6	2.9	2.8	2.6	25	3.8	3.6	05
Processed food	13.5	3.1	4.0	2.0	2.6	2.1	1.7	1.6
Industrial	33.5	52	2.0	-1.5	-2.1	-0.9	-1.7	-1.1
Non-energy	25.6	1.4	-2.1	-1.5	-3 3	-0 8	-1.1	-0.8
Energy	7.9	12 8	9.5	-0.7	15	-1.1	-1.4	-1.9
Services	42.4	2.4	3.2	1.1	1.6	1.4	0.9	0.6
Memo:								
Contribution of prices subject to regulation (in p.p.)	-	0.7	0.3	0.3	0.1	0.3	0.4	0.4
Contribution of indirect taxes (in p.p.)	-	13	1.9	0.1	02	0.1	0.0	0.0
CPI	-	3.7	2.8	0.3	02	0.6	0.3	-0.1
HICP – Euro area	-	2.7	2.5	1.4	1.9	1.4	1.3	08

### Table 5.1 HICP – Main components | Per cent

Sources: Eurostat, INE and Banco de Portugal calculations.

one hand, a marked fall in fuel and lubricant prices, amid a decline in global oil prices and the appreciation of the euro and, on the other hand, a more muted increase in electricity and gas prices than in 2012. The squeeze on refining margins, particularly in the second half of the year, seems to have also contributed to a fall in fuel prices.

The non-energy component of HICP decelerated significantly in 2013, with an annual average growth rate of 0.6 per cent (1.7 per cent in 2012). This was mostly due to a deceleration in services prices, which largely reflected the dissipation of the effect of an increase in the VAT rate on restaurants in 2012, with an annual growth rate of 1.1 per cent in 2013 (3.2 per cent in 2012). For the second consecutive year, the price of non-energy industrial goods fell (by -1.5 per cent), with a negative contribution of -1.1 p.p. from clothing and footwear. The inflation rate excluding components that are typically more volatile (non-processed food and energy) also declined, from 1.6 per cent in 2012 to 0.4 per cent in 2013. This reduction was also observed in the euro area, albeit less markedly.

In line with developments in the euro area, particularly in countries undergoing an adjustment process, the share of HICP items with negative year-on-year rates of change in 2013 increased significantly (Chart 5.2). The weight of these items moved from below 30 per cent at the end of 2012 to 47 per cent in December 2013, *i.e.*, close to their level in 2009. Similarly to 2012, non-energy industrial goods are the aggregate with the greatest share of items with negative year-on-year changes. However, services prices recorded an increasing number of items with negative year-on-year rates of change in 2013 and stood at 12 per cent in December 2013 (4 per cent at the end of 2012).

According to the latest data, expectations about developments in the inflation rate in Portugal over a 12-month horizon decreased markedly in 2013, albeit remaining in positive territory and close to actual inflation (Chart 5.3).

# Sharp decrease in unit labour costs

Subdued price growth in 2013 reflected negligible external and domestic inflationary pressures. At international level, import prices of goods fell by 2.3 per cent, amid weak world demand growth. At domestic level, the contraction in Portuguese economic activity, as



HICP – Portugal and euro area | year-on-year rate of change, in percentage

Sources: Eurostat and Banco de Portugal.


well as continuing unfavourable labour market conditions, resulted in a subdued increase in wage costs, with private sector wages growing by 1.0 per cent.

Against a background of lower employment in the private sector, apparent labour productivity increased further in 2013 (1.6 per cent). In this context, unit labour costs in the private sector decreased by 0.6 per cent, i.e., close to 2012 levels.

The subdued price increase in 2013, together with a fall in unit labour costs in the private sector, led to a widening of the gross operating surplus per unit of output. These developments, seen over the past few years, are an important feature of the Portuguese economy's structural adjustment process. The readjustment of the corporate structure in Portugal due to the need to restructure some firms' balance sheets and the exit of firms that were economically inviable in current market conditions seems to have contributed to a widening of the gross operating surplus per unit of output over the past few years.

Chart 5.2 • HICP - Share of items with negative yearon-year rate of change | Per cent 60

2011

Food

Services

2012

Energy

2013

—Total

Sources: Eurostat and Banco de Portugal calculations.

Non-energy industrial goods

2009

2010

50

40

30

20

10

0

2008

3 2 1 0 -1 -2 2008 2010 2011 2012 2013 2009

Chart 5.3 • Inflation expectations | Per cent

#### Sources: Consensus Economics and Eurostat.



#### Box 5.1 | Analysis of inflation determinants between 2008 and 2013

In September 2009 the year-on-year inflation rate – measured by the Harmonised Index of Consumer Prices (HICP) – attained its lowest value since 2008, -1.8 per cent. Inflation followed an upward trend thereafter, reaching 4 per cent in April and October 2011, but it started to decline throughout 2012. This decline became more marked in 2013, with the year-on-year inflation rate ranging between 0 and 1 per cent. This box analyses the factors that influenced these developments based on the inflation model used by Banco de Portugal, addressing simultaneously its explanatory power over this horizon.

The model used by Banco de Portugal to analyse and project inflation, termed MIMO (Monthly Inflation Model), is based on a disaggregated approach, wherein the inflation projection results from the aggregation of projections for several HICP components: unprocessed food, processed food, non-energy industrial goods, energy goods, and services. For a detailed explanation of MIMO, see Félix *et al.* (2007).<sup>1</sup>

Chart 1 breaks down the inflation rate into each HICP component's contribution, suggesting that most inflation dynamics in the period under scrutiny were driven by price developments in energy goods and in services. Price developments in energy goods are largely influenced by oil price developments, as well as by the impact of changes in VAT rates on electricity and gas implemented in October 2011. Developments in services prices mainly reflect their sizeable weight in the HICP (approximately 40 per cent), thought they were also affected by changes in VAT rates on restaurants implemented in January 2012.

Chart 1 shows that, with the exception of services, all components contributed negatively to the inflation rate in 2009. This was gradually reverted in 2010, and in 2011 all components contributed positively to the year-on-year inflation rate. These developments cannot be dissociated from the increase in indirect taxes and administered prices on a wide range of products, which affected inflation between mid-2010 and the end of 2012 (see also Chart 2). In 2012 the contribution of energy goods prices decreased, while the contribution of non-energy industrial goods prices turned negative, triggering a slowdown in inflation throughout the year. This slowdown was more marked in 2013, mainly due to developments in energy prices and in services.





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Prices

authorities (the so-called administered prices). It must be stressed that MIMO is based on HICP including indirect taxes, due to the absence of historical series for the Harmonised Index of Consumer Prices at Constant Tax rates (HICP-CT) with a sufficient long time span to allow a reliable estimation of the model. As such, in MIMO, market-based prices contain a component influenced by fiscal policy decisions.

For market driven prices, with the exception of energy goods, one can estimate the contribution of unit labor costs and of import prices, key driving forces in production costs developments. For food, MIMO also takes into account food commodity prices. Concerning energy goods, MIMO disentangles only the part that is influenced by the government or regulatory authorities. The difference between the IHPC and the HIPC-CT yields the contribution of indirect taxes to inflation.

Hence, inflation can be decomposed in contributions arising from:

- 1. Production costs unit labor costs and import prices excluding energy goods;
- 2. Food commodity prices;
- 3. Fuel prices;
- 4. Indirect taxes and administered prices.

Since MIMO is based on a dynamic specification, contributions take into account not only contemporary developments in the relevant variables, but also lagged effects, in terms of both production costs and food commodity prices. The difference between the sum of contributions and the actual inflation rate corresponds to the model's residual, which comprises all unidentified remaining factors that have contributed to inflation, including profit margins changes.

Chart 2 depicts the year-on-year inflation rate, as well as its breakdown, between 2008 and 2013. MIMO captures relatively well inflation dynamics in the period under scrutiny, except for 2009, when the residual takes comparatively large values. This may be explained by a global crisis scenario in 2009 that has never been observed during the model's estimation period, which led to inflation adjustments stemming from factors not considered in the model.

The model yields an inflation rate higher than the actual rate in the course of 2009, mainly due to a considerable contribution from unit labour costs. The acceleration in actual inflation at the end of 2009 and in 2010 is mainly explained by a recovery in import prices and by the increase in the standard VAT rate in July 2010. Fuel prices also contributed positively, though in a lesser extent.



Conversely, developments in unit labour costs contributed to curb the increase in inflation.

The increase in inflation in 2011 and its continuing high level up to mid-2012 reflect the positive contribution of import prices, together with increases in administered prices and in indirect taxes. In this context, a special focus must be placed in the increase in the standard VAT rate and the above-mentioned changes to VAT rates on restaurants, electricity and gas. In fact, changes in indirect taxes and in administered prices played a key role in inflation developments in 2011 and 2012, with a contribution of between 50 and 80 per cent over this horizon. Fuels and unit labour costs also contributed positively to the inflation rate, though in a lesser extent. Their effects on inflation were, however, offset by opposing contributions from factors not considered in the model.

Inflation slowed down as of mid-2012, due to the dynamics displayed by import prices, unit labour costs and fuel prices. The slowdown was more marked in 2013, particularly due to the negative contribution of unit labour costs and, in a lesser extent, of import prices and fuel prices. The dissipation of the effects stemming from indirect taxes played also an important role. Contributing positively to inflation in 2013 were administered prices – which explain most of the "IT & ADM" item in Chart 2 – as well as other factors not considered in the model, which may be associated with profit margin increases.

Note:

1. Ricardo Félix, José Maria and Sara Serra, MIMO – A monthly inflation model, winter 2007 issue of Banco de Portugal's Economic Bulletin.

## 6. Balance of payments

#### Increase in the financing capacity of the Portuguese economy *vis-à-vis* the rest of the world in 2013

In 2013 the Portuguese economy continued to correct its external imbalance, which is one of the most relevant aspects of the ongoing adjustment process. The combined current and capital account increased to 2.6 per cent of GDP, after being marginally positive in 2012 (0.3 per cent). These developments corresponded to a cumulative increase of approximately 12 per cent of GDP in the period 2011-2013 (Table 6.1). The decline in external borrowing requirements in 2013 reflected simultaneously a decline in investment and an increase in domestic savings, as a percentage of GDP (Chart 6.1).

The adjustment made in 2013 was largely due to the decline in borrowing requirements of non-financial corporations and the general government, which dropped by 1.8 and 1.5 per cent of GDP respectively from 2012. This reflected the ongoing deleveraging processes of the private sector as well as fiscal consolidation (Chart 6.2). The slight increase in households' ability to borrow is also worth highlighting.

# Surpluses in the current account and in the goods and services balance in 2013

The improvement in the combined current and capital account in 2013, of approximately 2.3 p.p. compared with 2012, was largely brought about by developments in the goods and services balance which posted a surplus for the first time in decades (1.7 per cent of GDP) (Chart 6.3). These developments reflected simultaneously a decline in the goods deficit and an increase in the services surplus.

The marked decline in the goods deficit was chiefly due to a volume effect associated with strong export growth (6.1 per cent in volume) and, to a smaller extent, to terms of trade gains basically resulting from the fall in oil prices.

Reduction in the income account deficit and slight increase in the current transfers surplus

The improvement in the combined current and capital account in 2013 was also due to a reduction in the income account deficit and, to

#### Table 6.1 • Current and capital accounts | As a percentage of GDP

	2010	2011	2012	2013
Current and capital accounts	-9 5	-58	0.3	2.6
Current account	-10.6	-7.0	-2.0	0.5
Goods and services account	-7 2	-3 8	-0.1	1.7
Goods	-11.1	-8 3	-5.4	-4.3
Services	3.9	4.5	5.3	6.0
of which:				
Travel and tourism	2.7	3.0	3.4	3.7
Income account	-4.6	-5.0	-4.2	-3.6
Current transfers	13	1.7	2.3	2.4
of which:				
Emigrants/immigrants remittances	1.1	1.1	1.3	1.5
Capital account	1.1	1.2	2.3	2.1

Sources: INE and Banco de Portugal.

a smaller extent, to the slight increase in the current transfers surplus. The main components of the income account (direct investment, portfolio investment and other investment) recorded a decline in the respective deficits, with the exception of labour income. In this period, the decline in the direct investment income deficit as a percentage of GDP was particularly significant, following a reduction in income paid abroad and an increase in receipts from abroad. The slight increase in the current transfers surplus was associated with the rise in private transfers, in particular the increase in emigrants' remittances. This positive effect was partly offset by a decline in public transfers with the European Union, in

particular, transfers within the framework of the European Regional Development Fund (FEDER). Finally, the reduction in the capital account surplus reflected the small decline in net capital transfers from the European Union.

## The financial account reflected net outflows of funds

In 2013 there was a net outflow of funds as a result of the combined current and capital account surplus. In this context, there was a decline in both financial assets and liabilities *vis-à-vis* non-residents, which was higher than in 2012 (Chart 6.4).

Chart 6.1 • Current and capital account | As a percentage of GDP



Chart 6.2 • Net borrowing/lending, capacity by institutional sector | As a percentage of GDP



Source: INE.



Note: (a) Includes acquisitions less disposals of non-financial non-produced assets



Chart 6.3 • Breakdown of change in the current and capital accout | As a percentage of GDP

Sources: INE and Banco de Portugal

These developments were driven by net outflows of EUR 3.34 billion in other investment. reflecting the increase in net foreign assets of monetary financial institutions (as the repayment of liabilities was higher than the reduction in this sector's assets under the form of loans and deposits) and the decline in liabilities associated with TARGET2.1

The combined balance of direct and portfolio investment recorded net inflows of EUR 328 million in 2013, compared with net outflows of EUR 14.99 billion in 2012. After the ECB's announcement regarding the Outright Monetary Transactions (OMTs) in September 2012, financial market conditions improved in the euro area countries subject to an adjustment programme. Against this background, foreign investors increased their exposure to these countries' equity and government debt securities. In this context, in 2013 foreign investors increased the purchase of Portuguese short and long-term public debt securities and of private debt securities issued by the non--financial sector.<sup>2</sup> Despite this improvement, net liabilities of portfolio investment decreased slightly (-1.1 per cent of GDP), reflecting the redemption of bonds and other short and

long-term debt securities held by non-residents. It should be noted that the slight decline in portfolio investment liabilities in 2013 clearly contrasts with the sizeable reductions recorded since 2010 (Chart 6.5). In addition, there were net inflows of funds associated with the acquisition by non-residents of equity securities in Portuguese companies (reflected in the foreign direct investment item), albeit lower than in 2012.

It should be noted that in addition to the issuance of short and long-term securities, the general government external financing was achieved through the disbursement of loans obtained under the Economic and Financial Assistance Programme, but whose amount was considerably lower than in 2011 and 2012.

These financial account developments, which reflect the current and capital account surplus, are in line with the gradual decline in the international indebtedness of the Portuguese economy. However, the change in the international investment position is also affected by other factors, in particular by price and exchange rate changes.

Chart 6.4 • Financial account - balance and changes in assets and liabilities | As a percentage of GDP



Chart 6.5 • Financial account - balance and changes in assets and liabilities by instrument | As a percentage of GDP



Sources: INE and Banco de Portugal.

Sources. *mc* and Banco de Portugal. Notes: A (+) sign means an increase in foreign liabilities or a decrease in foreign assets, *i.e.*, a financial inflow. A (-) sign means decrease in foreign liabilities or an increase in foreign assets, *i.e.*, a financial outflow. Figures for "Other investment" of monetary authorities and other monetary and financial institutions are adjusted for temporary end-of-year operations between these two sectors, which were reversed in the first days of the following year. The change in assets includes financial derivatives net of liabilities.

Sources: INE and Banco de Portugal.

#### Slight deterioration of the Portuguese economy's international debt position

In 2013 price changes dominated the favourable impact of developments in the financial account, with a deterioration of the (net) debt position of the Portuguese economy *vis-à-vis* the rest of the world, which stood at 118.6 per cent of GDP at year-end (rise of 2.4 per cent of GDP compared with end-2012) (Chart 6.6). Price changes were associated with the gold devaluation, which was reflected in the monetary authority's reserve assets, and with the valuation of portfolio investment liabilities, in particular debt securities issued by the Portuguese State and shares of resident banks and non-financial corporations held by non-residents.

#### Notes:

1. Trans-European Automated Real-time Gross settlement Express Transfer system.

2. In 2013 the general government resumed the issuance of Treasury bonds, as follows: in January 5-year Treasury bonds to the amount of EUR 2,500 million, in May 10-year Treasury bonds to a total of EUR 3,000 million and in December 5-year and 6-year Treasury bonds to a total of EUR 6,642 million, in parallel with the repurchase of Treasury bonds maturing in 2014 and 2015 to the same amount.



Chart 6.6 • International investment position - by institutional sector | As a percentage of GDP





PROJECTIONS FOR THE PORTUGUESE ECONOMY: 2014-2016

## Projections for the portuguese economy: 2014-2016

The projections for the portuguese economy point to a gradual recovery of economic activity over the horizon. For 2014, Gross Domestic Product (GDP) is projected to grow 1.2 per cent, accelerating to 1.4 per cent in 2015 and 1.7 per cent in 2016 (Table 1). This projection entails that, in the 2014-2016 period, the Portuguese economy resumes growth rates close to the ones projected for the euro area.<sup>1</sup>

Reversal of the decline in economic activity and employment in 2013

Since the second guarter of 2013 there was an increase in the level of economic activity, interrupting the downward trend registered since 2011 (Chart 1). Despite this increase, GDP in 2013 decreased 1.4 percent in annual average terms, reflecting the sharp downfall profile recorded in 2012.

Economic activity in 2013 was characterized by a recovery in domestic demand since the second quarter, stemming in particular from private consumption and private investment, alongside with the maintenance of a robust growth in exports, clearly outweighing that of the external demand targeted to the Portuguese economy. Employment recorded a downfall in annual average terms, of 2.8 percent in 2013, albeit with a recovery pattern since the second quarter. This profile reflected employment developments in the private sector, as the public sector employment recorded sharp reductions throughout the year. The current and capital account stood at 2.6 per cent of GDP in 2013, while the goods and services account registered a surplus (1.7 per cent of GDP) for the first time in several decades.

Moderate recovery of economic activity and employment over the projection horizon

The projection for the Portuguese economy considers the information available by

	Weights	Рі	rojection	March 20	EB Winter 2013			
	2013	2013	2014 <sup>(p)</sup>	2015 <sup>(p)</sup>	2016 <sup>(p)</sup>	2013 <sup>(p)</sup>	2014 <sup>(p)</sup>	2015 <sup>(p)</sup>
Gross Domestic Product	100.0	-1.4	1.2	1.4	1.7	-1.5	0.8	1.3
Private Consumption	64 5	-1.7	1.3	1.1	12	-2.0	0.3	0.7
Public Consumption	19.1	-1.7	-0.9	-0 5	03	-1.5	-2.3	-0 5
Gross Fixed Capital Formation	148	-6.6	1.8	4.4	45	-8.4	1.0	3.7
Domestic Demand	98.9	-2.6	1.2	12	1.6	-2.7	0.1	0.9
Exports	40.6	6.1	5.3	5.1	5.4	5.9	5.5	5.4
Imports	39 5	2.8	5.4	4.7	5.1	2.7	3.9	4.5
Contribution to GDP growth (in p.p.):								
Domestic Demand		-2.6	1.2	12	15	-2.7	0.1	0.9
Exports		2.3	2.1	2.1	23	2.2	2.2	2.3
Imports		-1.1	-2.1	-1.9	-2 2	-1.0	-1.5	-18
Current plus Capital Account (% of GDP)		2.6	3.3	3.7	42	2.5	3.8	4.7
Trade Balance (% of GDP)		1.7	2.6	3.1	3.6	1.7	2.7	3.5
Harmonized Index of Consumer Prices		0.4	0.5	1.0	1.1	0.5	0.8	1.2

#### Table 1 • Projections of Banco de Portugal: 2014-2016 | Annual rate of change, per cent

Sources: *INE* and Banco de Portugal. Note: (p) - projected. For each aggregate, this table shows the projection corresponding to the most likely value, conditional on the set of assumptions considered.

#### Box: Assumptions of the projection exercise

The main technical assumptions framing the projection exercise are presented in Table 2. With regard to international trade developments, the assumptions reflect the latest information underlying the projections released by the European Central Bank and comprise a recovery in global trade, although with lower growth rates than those recorded before the financial crisis. In this context, the external demand targeted to the Portuguese economy should accelerate significantly over the projection horizon, with an estimated growth rate of 5.3 percent in 2016.

The assumed developments for the 3-month EURIBOR rate are based on the implicit rate in futures contracts. These contracts point to the maintenance of short-term interest rates at historically low values in 2014 and 2015, and to a gradual increase towards the end of the forecast horizon. The assumptions for the long-term interest rate on Portuguese debt are based on an estimate of the implicit rate on government debt. The projection assumes the maintenance of regular financing conditions in the economy.

Exchange rates assumptions consider the maintenance of the observed average levels in the two weeks preceding the closing date of the information. In the case of oil prices, the implicit information in the futures markets points to a reduction in the price in dollars over the projection horizon.

Regarding public finance variables, the projections incorporate the measures included in the original budget for 2014 and the changes introduced as a result of the Constitutional Court's decision in December 2013. In terms of public consumption, it is worth noting the effect on the volume of anticipated savings in intermediate consumption and the reduction in the number of civil servants, as well as the impact on the deflator of the reduction in earnings. In turn, it is worth noting that the projection is influenced by the increase of the regular working hours of public sector workers from 35 to 40 hours per week, which came into force on September 29, 2013. This change has an estimated impact on public consumption of about 0.3 and 0.9 percent, respectively, in 2013 and 2014. As regards public investment, after a significant cumulative decline in recent years, a near stabilization is envisaged in 2014, at levels close to those registered in 2013. The projection for 2015 and 2016 does not incorporate the effect of the introduction of additional fiscal consolidation measures, following the procedure used in the context of the Eurosystem projection exercises in cases where fiscal measures are not yet well specified.

		Projection March 2014				EB Winter 2013		
		2013	2014	2015	2016	2013	2014	2015
External demand	уоу	1.3	3.7	4.8	5.3	1.2	3.9	5.0
Interest rate								
Short-term (3 month EURIBOR)	%	0.2	0.3	0.4	0.7	0.2	0.3	0.5
Implicit in public debt	%	3.4	3.5	3.6	3.7	3.4	3.5	3.6
Euro exchange rate								
Effective exchange rate index (1999Q1=100)	aav	101.6	103.9	103.9	103.9	101.5	102.3	102 3
Euro-dollar	aav	1.33	1.37	1.37	1.37	1.33	1.34	1 34
Oil prices								
in dollars	aav	108.8	107.6	102.4	97.8	108.2	103.9	99 2
in euros	aav	82.0	78.4	74.5	71.1	81.6	77.3	73 8

#### Table 2 • Projection assumptions

Sources: Bloomberg, ECB, Thomson Reuters and Banco de Portugal calculations. Notes: yoy - year-on-year rate of change, % - per cent, aav - annual average value. An increase in the exchange rate corresponds to an appreciation. The implicit interest rate on public debt is computed as the ratio between interest expenditure for the year and the simple average of the stock of debt at the end of the same year and at the end of the preceding year.

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mid-March 2014 and entails an underlying set of assumptions about the future evolution of the external environment of the Portuguese economy, analogous to those embodied in the Eurosystem projection exercises (see Box). For the first time, Banco de Portugal publishes projections for an horizon of three years, in line with the decision adopted within the Eurosystem.

Current projections point to a moderate GDP growth over the projection horizon, though at an increasing rate. However, GDP at the end of the horizon still lies below the level recorded before the inception of the global financial crisis (Chart 2).

The recovery in economic activity is supported by an acceleration of private domestic demand, with the contribution of this component to GDP growth rising over the horizon, from -2.6 p.p. in 2013 to 1.5 p.p. in 2016. In a context of accelerating global trade, exports are expected to maintain a robust growth pattern, with a contribution to GDP growth relatively stable and slightly above 2 p.p.. The high indebtedness level of the private sector should continue to condition consumption and investment decisions by households and by business firms over the upcoming years. In the public sector, activity should continue to contract, conditioned by the fiscal consolidation process, albeit at a progressively slower pace. Implicit in the projections is the maintenance of the economic reallocation pattern recorded in the most recent period, characterized by the transfer of productive resources from non-tradable to tradable sectors. Within this framework, some recovery in private employment and a gradual reduction in the unemployment rate are anticipated.

Sustained recovery in domestic demand and robust developments in exports

The projection points to a gradual recovery of private consumption over the horizon, having implicit the maintenance of the savings rate at a higher level vis-à-vis the average values recorded since the inception of the euro area. Real disposable income should present a marginal growth in 2014 and a moderate recovery in 2015 and 2016. In terms of composition, a gradual increase in the consumption of nondurable goods is projected, in line with projected developments for real disposable income. For the consumption of durable goods, and taking into account the information already available for the first quarter, a strong growth in the current year and an increase of around 2



Chart 1 • GDP Portugal and euro area | Quarter-onquarter rate of change, in percentage





Sources: Eurostat and INE.

Sources: INE and Banco de Portugal Note: (P) - projected. per cent in the period 2015-2016 is projected.

Gross fixed capital formation, particularly the business component, is expected to increase over the projection horizon. The developments in this component reflect a more favourable outlook for demand, both internal and external, coupled with the need for capital stock renewal after a long period of reduced investment, and with the recent increase observed in the productive capacity utilization rate in some sectors of the economy. Additionally, the increase in economic confidence and the downfall in uncertainty, as well as some improvements registered in financing conditions, should also contribute to the aforementioned recovery. However, developments in this aggregate should remain constrained by the need to reduce the indebtedness level of nonfinancial corporations, which remains at very high levels when compared with other euro area countries. Residential investment should present a path of moderate recovery over the projection horizon, against a background characterized by a slight recovery in household disposable income and by a slight improvement in financing conditions.

Exports of goods and services should present a relatively stable growth pattern over the horizon, slightly above 5 per cent. The robust growth in exports extends to both the goods component and the services component. The projected evolution for exports reflects, on the one hand, the recovery in external demand targeted to the Portuguese economy and, on the other, additional market share gains in 2014, although significantly lower in magnitude than those observed in 2013. For 2015 and 2016 marginally positive market share gains are anticipated, in annual average terms. For 2016, a stabilization of the market share at slightly higher levels than those observed at the inception of the euro area is projected. In 2016, exports are expected to correspond to about 45 percent of GDP (an increase of 13 p.p. relative to 2008), which is one of the most

prominent features of the recent adjustment process of the Portuguese economy.

Projected developments for imports reflect the usual elasticity of this component relative to the change of the global demand weighted for imported contents, which implies an increase in import penetration over the projection horizon.

# Increased financing capacity of the economy

The macroeconomic projections described above are consistent with the continued adjustment process of external imbalances and, in particular, with an increase in the financing capacity of the economy. The current and capital account is expected to increase, to 3.3, 3.7 and 4.2 per cent of GDP in 2014, 2015 and 2016, respectively. These developments reflect, to a large extent, the combination of buoyant exports with an acceleration of imports, coupled with a favourable effect in the terms of trade, against the background of declining oil prices in euros embodied in the technical assumptions of this exercise.

#### Inflation should remain low

Over the projection horizon, inflation should remain low, although a moderate acceleration in prices is projected, in line with the recovery in economic activity. The HICP is expected to grow at an annual average rate of 0.5 per cent in 2014 and around 1 per cent in 2015 and 2016.

The maintenance of low internal and external inflationary pressures, against a background of moderate recovery of the global economy and of continued adjustment of the Portuguese economy, should lead to a moderate increase in the prices of services and non-energy goods. In turn, the energy component of the HICP should present a marginal reduction in

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2014-2016, mainly reflecting the evolution of oil prices in euros.

#### Upward revision of the projection for economic activity vis-à-vis the Winter Economic Bulletin

The current projections imply an upward revision of 0.1 p.p. in annual GDP growth for 2013 vis-à-vis the previous Economic Bulletin, reflecting more favourable developments in domestic demand, in particular of private consumption and investment. For 2014, the projection was revised upwards by 0.4 p.p., reflecting, to a large extent, more favourable economic developments in the second half of 2013, as compared with the previous projection. For 2015, the revision is marginally positive and amounts to 0.1 p.p.. The current projection incorporates some changes in the GDP composition, reflecting a larger contribution of domestic demand and a smaller contribution of exports, in line with recent developments of the Portuguese economy. Inflation projections were revised slightly downwards, reflecting the incorporation of the latest HICP figures, which proved to be lower than anticipated in the Winter Economic Bulletin

## Balanced risks to economic activity and inflation

The projection includes balanced risks to economic activity, encompassing external downside risks and globally upside internal risks. At the external level, there is a risk associated with the possibility of a more moderate recovery in global activity. In particular, there exists the risk of a slower recovery in economic activity in the euro area and emerging economies. The materialization of this risk would result in lower external demand growth for the Portuguese economy in 2014-2016, with negative effects on exports and investment. At the internal level, the upside risks stem from a more pronounced recovery in private consumption and private investment, due to the potential impact of ongoing structural reforms on productivity and income levels, which were not considered in the projection. Additionally, there are upside risks associated with more sizable growth in private consumption, against a background of recovery in disposable income and in consumer confidence. In this context, risks to inflation are balanced.

#### Higher growth rates should result from additional productivity gains

The projection for 2014-2016 points to a gradual recovery of the Portuguese economy, envisaging a growth rate close to the one projected for the euro area. Some features of the current phase of the Portuguese economy net external financing capacity, ongoing fiscal consolidation, transfer of resources from the non-tradable to the tradable sector - represent favourable elements to a sustainable growth process. Nevertheless, the pace of recovery will inevitably be dependent on international developments. Additionally, the current indebtedness levels of the economy will tend to condition the pace of output growth, which should be lower than the one registered at other phases of recovery of the Portuguese economy. In this context, the materialization of higher levels of growth should result from productivity gains stemming from ongoing structural reforms.





## ARTICLES

Household Income Mobility in the European Union and in Portugal: an Analysis of Labor Market and Demographic Events

Portuguese Exports in the Global Value Chains

Capitalization and Credit Provision: Evidence from the United States

Early Warning Indicators of Banking Crises: Exploring New Data and Tools

## Household Income Mobility in the European Union and in Portugal: an Analysis of Labor Market and Demographic Events<sup>1</sup>

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#### ABSTRACT

This article aims to assess the impact on income mobility of transitions in the labor market and of changes in the composition of households in Portugal and in the European Union. The analysis combines two concepts of income mobility: the growth in household income and the changes in the relative position of each household in the income distribution. Based on longitudinal microdata for the period 2004-2008, the article highlights the role of social transfers and income generation at the household level in cushioning shocks on individuals. The events identified have a material impact on income mobility. For example, in the European Union, the point estimates suggest that in the case of households who experience an increase in the number of unemployed, the average fall in equivalized household income is about 19 percent. In the case in which individuals move from employment to retirement, the average fall in equivalized household income is about 6 percent. The corresponding estimates for Portugal are not statistically different from those obtained for the European Union. Additionally, the article reveals some heterogeneity in the impact of those shocks along the income distribution.

### 1. Introduction

Household income fluctuates significantly over time.<sup>3</sup> This observation is as valid when analyzing the percentage changes in household income, as well as when considering changes in the relative position of each household income *vis-à-vis* the remaining households. Based on each of these concepts, charts 1 and 2 illustrate the high income mobility across European Union countries (see Alves and Martins, 2012). Underlying this mobility is a set of events – of a more or less permanent nature and of a more or less expected nature - that determines individual and household income at each point in time and over the life cycle. In particular, the literature has highlighted the importance of labor market transitions and demographic changes in determining income mobility (see Jenkins, 2011). The analysis of the role of these events in determining household income mobility is the focus of this article.

This study is based on the microdata from the European Union – Survey of Income and Living Conditions (EU- SILC) for the period 2004-2009.<sup>4</sup> Given the characteristics of the database, the impact of events on income mobility will be assessed between consecutive years. The analysis focuses on Portugal and in the set of European Union countries. It should be noted that the empirical literature focusing on the events underlying income mobility in a cross-country perspective is not abundant (see Aristei and Perugini, 2012). The limitations of available databases, including the EU-SILC, definitely contribute to this outcome.

This article includes three contributions which should be emphasized. Firstly, the analysis explicitly combines two concepts of income mobility: the percentage changes in household income and the changes in the relative position of each household in the income distribution. The combination of these two dimensions is important because the profile of percentage changes in income does not necessarily coincide with the profile of percentile changes in the income distribution. This finding may be particularly relevant in the tails of the income distribution. Secondly, the EU-SILC database allows disaggregating the several sources of income of individuals and of the household. Thus, it is possible to trace the role of the family and of social transfers (at the individual and household levels) in cushioning the impact of labor market and demographic events. Thirdly, the article includes an analysis of the heterogeneity of the impact of events by income decile. This contribution extends the analysis usually undertaken in the literature for individuals in the left tail of the income distribution, which focuses on events that determine entries and exits from poverty (see Bane and Ellwood, 1986).

The remainder of the paper is organized as follows. Section 2 presents the database and characterizes the demographic and labor market events under analysis. Section 3 describes a decomposition of the evolution of household income after the events, starting from gross income at an individual level and adding the several income sources yielding household disposable income. Section 4 presents a multivariate analysis aimed at quantifying the impact of each event on household income in light of the two income mobility concepts described above. Section 5 concludes.

## 2. The database and the events

#### 2.1. The data

The sample used in this article is based on the EU-SILC longitudinal data. This database resulted from the creation at the European level of a program on harmonized statistics on income and living conditions of households, taking place annually since 2004. Each year, the EU-SILC project involves the collection of information at the individual level and for the respective household, resulting in a cross section database, as well as a longitudinal database. The sample underlying each longitudinal database is based on four subgroups of equal size and each one representative of the total population. Each year, the subgroup that completes four years is dropped from the



Chart 1 • Distribution of the rate of change of income

between t-1 e t





Sources: EU-SILC 2004-2009 and authors' calculations. Note: Stronger colour intensity reflects an higher frequency.





This study is based on longitudinal databases between 2005 and 2009. The unit of analysis consisted in pairs of incomes for a given household or individual in two consecutive years, to ensure the computation of annual changes in income (or changes in percentiles of the income distribution). To exclude extreme percentage changes, households with income smaller than the first percentile of the income distribution in the database (which corresponds to an annual income of 600 euros) were not included in the sample. The income percentiles and deciles for each country / year were computed with the cross-sectional database.

The household income in each year refers to the equivalent disposable income for a period of twelve months, at constant 2008 prices. Note that, in most countries, this period corresponds to the previous calendar year, which implies that information concerning income incorporated in our analysis ends in 2008. Household income is the sum of incomes earned by each individual in the household, including labor income, pensions or other social transfers, with other household income (including property income) and other transfers (in particular, from the government) received by the family as a whole, net of direct taxes. Once deflated, the household income, as well as the above mentioned components, are divided by the number of equivalent adults in each family (according to modified equivalence scale of the OECD, which takes into account the size and composition of the household) to calculate the equivalent income of each household member.<sup>5</sup> Thus, household income is assumed to be fully shared within the family.

All results presented in this study were calculated using the sample weights available in the longitudinal databases.<sup>6</sup> Given the characteristics of the sample, the two-year longitudinal weights from the database of the respective year were primarily used, and if these did not exist, the same weights of the database of the previous year. The records to which it was not possible to assign weights were excluded from the analysis.

Considering all these criteria, the final sample corresponds to about 530 000 pairs of income for households in the European Union and about 9500 pairs of income for households in Portugal.

Finally, it should be noted that all the computations for the European Union are based on data for each country individually considered. Accordingly, all references to income distribution in the European Union should be understood as an aggregation of income distributions of each individual country. For example, when reporting results on changes in percentiles of income in the European Union, these results are based on the aggregation of those changes calculated for each individual country.

#### 2.2. The characterization of events

This study aims to analyze household income mobility associated with events in the labor market and with demographic events. The events must concur with the reference period of household income. As mentioned previously, this period, in most countries, covers the calendar year immediately preceding the date of survey. Regarding the events in the labor market, the database includes information on the economic situation of each individual in each month of the income reference period, namely if the individual is employed (in full or part time), unemployed, retired, or in other types of inactivity. Thus, an individual is considered to be working (in full or part-time) if she works more than six months during the income reference period. A similar procedure was adopted for the other possible situations, that is, an individual is unemployed, retired or other inactive, if she is in that specific situation for more than six months during the income reference period.

Based on this hypothesis, it was possible to define transitions in the labor market for each individual in two consecutive years (for example, an individual moving from a situation of working, *i.e.* being more than six months working, to a situation of unemployment, that is, being more than six months unemployed). These individual events were then redefined at the household level in the five events considered in the analysis: (i) increase in the number of working individuals in the household, (ii) increase in the number of unemployed individuals in the household who were working in the previous year, (iii) increase in the number of unemployed individuals in the household who were working in another situation of inactivity in the previous year, (iv) increase in the number of retired individuals in the household who were working in the number of retired individuals in the household who were working in the number of retired individuals in the household who were working in the previous year, (iii) increase in the number of retired individuals in the household who were working in the previous year and, finally, (v) increase in the number of retired individuals in the household who were considered (i) increase in the number of individuals in the household (excluding increases due to births), (ii) decrease in the number of individuals in the household and (iii) households in which one or more births were registered in the income reference period.

The sample frequency of events in the European Union and Portugal is presented in table 1. The table shows that the most frequent events are those that are associated with an increase in the number of working individuals in the household (with around 8 and 9 percent of occurrences in the sample). The second most frequent events are changes in the household size (not resulting from births). It is also possible to observe that the frequency of households where more than one event occurred simultaneously is relatively small, both in the European Union and in Portugal, although not negligible in terms of magnitude.

		European Un	ion		Portugal	
	Event	Intersection with other labor market events	Intersection Intersection with other with other labor market demographic events events		Intersection with other labor market events	Intersection with other demographic events
Labor market events						
Increase in the number of individuals in the household:						
working	8.3	0.5	1.4	9.1	08	1.1
unemployed (working in t-1)	1.7	0.2	0.3	3.2	03	0.5
unemployed (inactive in t-1)	1.4	0.2	0.2	1.7	0 2	0.3
retired (working in t-1)	1.9	0.2	0.2	3.3	03	0.3
retired (not working in t-1)	2.0	0.2	0.2	2.6	03	0.3
Demographic events						
Increase in the number of individuals in the household:	4.9	0.9	0.2	3.4	0.7	0.1
Decrease in the number of individuals in the household:	5.2	1.1	0.1	5.4	1.4	0.0
At least 1 birth in the household	2.3	0.3	02	1.5	0.4	0.1
Total number of observations in the sample		526065			9539	

#### Table 1 • Frequency of events | Values in percentage of total sample

Sources: EU-SILC 2004-2009 and authors' calculations.



# 3. A decomposition of the impact of the events: from individual income to household income

The transmission of an idiosyncratic event in the labor market to household income occurs through several mechanisms. In particular, there are mechanisms that smooth the impact of those events, particularly through the increase in the labor supply of other household members, transfers between households and net transfers from the government (see Blundell *et al.*, 2014). This section aims to explore the richness of the EU-SILC data to illustrate some of these mechanisms.

In this context, chart 3 shows, for the households involved in each of the five events identified in the labor market, a decomposition of the average rate of change of household income into the following contributions: (i) labor income of individuals affected by the event; (ii) social transfers and pensions of individuals affected by the event; (iii) labor income, social transfers and pensions of other household members; (iv) other household income; (v) taxes paid. Note that the underlying sample in chart 3 excludes all the cases in which events in the labor market occur simultaneously with demographic events, in order to focus on the impact of the former.

The chart clearly illustrates the important role of the household and the government in cushioning the impact on family income of individual transitions in the labor market.

In the case of an increase in the number of working individuals in the household, in the European Union, household income increases 18.5 percent on average. The positive contribution of labor income earned by individuals who become workers (27.8 percentage points) is moderated both by a reduction in the respective social benefits (contribution of -2.2 percentage points) and by an increase in taxes paid by the household (contribution of -6.5 percentage points). Similarly, in the case of an increase in the number of unemployed individuals who were workers in the previous year, the direct negative contribution in labor income (-33.3 percentage points) is mitigated by an



Chart 3 • Decomposition of the impact of labor market events | Contribution of each component to the rate of change of equivalized household income

increase in unemployment and other social benefits (contribution of 10.9 percentage points), by the reduction of taxes paid (contributing 2.5 percentage points), as well as by a positive contribution from income earned by other household individuals who did not suffer the shock (contribution of 9.3 percentage points). Notice that the positive contribution of income earned by other household members is common to both events in which there is an increase in the number of unemployed in the household. This suggests that, in a situation of unemployment, the remaining household members tend to intensify their participation in the labor market (see Bredtmann *et al.*, 2014). This conclusion is similar both in the European Union and in Portugal.

Finally, in a situation of transition to retirement, the significant reduction of labor income is largely offset by an increase of social transfers and pensions. Again, the income of other household members increases, both in the European Union and (sizeably) in Portugal. The transition from inactivity to retirement increases the income of these individuals, reflecting an increase in pensions. There is also an increase in the income of other household members, as well as a reduction of taxes paid by these families. These effects are similar in the European Union and in Portugal.

An additional event that deserves attention is the birth of a child. This event is associated with a decrease in equivalent household income (about 4 per cent in the European Union and around 1.5 percent in Portugal). This result is largely determined by the increase in the size of the household reflected in the equivalence factor. In fact, expunging this scale effect, the total income of these households increases by about 10 percent, both in the European Union and in Portugal. This rise is primarily supported, as would be expected, by the increase in social transfers.

# 4. The impact of events on household income mobility

#### 4.1. The empirical model

In this section, the impact of events on household income mobility is assessed based on multivariate regressions that control for several demographic and socioeconomic characteristics of families. Two econometric models were estimated. In the first model, we assess the impact of events on the annual rate of change of household income. In the second model, the dependent variable is the change in the households' position in the percentiles of the income distribution, calculated for each year and country.

The panel built with the EU-SILC is inevitably limited in the time series dimension. The final sample used to estimate the models has an average time-series length of only 1.7 years. Thus we chose to present the results obtained by estimating a pooled OLS model, with binary variables to capture information concerning each period and every country. It should be noted that the estimation of models with random effects or fixed effects pointed to similar results *vis-à-vis* the pooled OLS.

To control for the effects of demographic and socioeconomic characteristics, the models include a set of variables observed at the household level in the year prior to the event. In particular, these variable are related to the share of individuals in the household in different age groups (between 16 and 34 years, 35 and 49 years, 50 and 64 years and over 64 years) and to the share of individuals with different levels of education (primary, secondary and tertiary education). Additionally, to take into account the degree of participation of the household in the labor market the models include the share of months in which the individuals in the family were working, unemployed, retired or in other forms of inactivity. Finally, variables related to the size of the household and to the number of children were also considered.

#### 4.2. The results

Table 2 presents the main results of the model. Columns (1) and (2) present the estimates of the impact of each event on the percentage change in household income, respectively for the European Union and for Portugal. In turn, columns (3) and (4) report the estimates of the impact on percentile changes in the income distribution. The results point to conclusions which are globally consistent with the descriptive analysis presented in Section 3.

Firstly, as expected, the participation in the labor market has a significant impact on household income mobility. In the case of the European Union, an increase in the number of individuals working in the household is associated with an increase of about 22 percent in household income, which represents an increase of 7.3 percentiles in the income distribution. The corresponding figures for Portugal are 31 percent and 9.4 percentiles, respectively.

Secondly, the impact on income mobility due to transitions to unemployment or to retirement depends crucially on the prior status of the individual in the labor market (as already observed in Section 3). In the European Union, in the case in which individuals move from employment to unemployment, the average fall in household income is about 19 percent (a fall of about 10 percentiles in the income distribution). In the case in which individuals move from employment to retirement, the average drop in family income is around 6 percent (around 5 percentiles in the income distribution). In the case of individuals not previously working, the transition to unemployment or retirement has a small or non-significant impact on household income mobility.

Thirdly, the estimates obtained for Portugal do not differ qualitatively from those obtained for the European Union. In quantitative terms, the point estimates suggest that the impact on household income from an increase in the number of workers is stronger in Portugal and that the negative impact on income from transitions to unemployment or to retirement is relatively smaller in Portugal. However, in these latter cases, the differences are not statistically significant.

Finally, demographic changes also have a significant impact on household income mobility. In case of changes in household composition and size (excluding births), the evidence for the

	Income change (per cent)				Number of percentiles				
Dependent variable	European Union		Port	ugal	Europea	in Union	Port	Portugal	
	(	(1) (2)		(3)		(4	(4)		
Labor market events (between t-1 and t)									
Increase in the number of individuals in the household:									
working	22,1	***	31,0	***	7,3	***	9,4	***	
unemployed (working in t-1)	-18,8	***	-14,3	***	-10,1	***	-9,1	***	
unemployed (inactive in t-1)	0,7		1,7		-0,4		0,6		
retired (working in t-1)	-6,0	***	-3,8		-4,7	***	-1,8	*	
retired (other inactive or unemployed in t-1)	1,3		9,4	**	1,5	***	2,9	**	
Demographic events (between t-1 and t)									
Increase in the number of individuals in the household: ${}^{\scriptscriptstyle (a)}$	3,6	***	3,3		0,3		1,0		
Decrease in the number of individuals in the household	-3,8	***	-4,2	*	-3,9	***	-4,8	***	
At least 1 birth in the household	-12,1	***	-6,6		-6,6	***	-4,7	***	
Number of observations	526065		9539		526065		9539		

## Table 2 $\,\cdot\,$ The impact of transitions in the labor market and of demographic changes on household income mobility

Sources: EU-SILC 2004-2009 and authors' calculations.

Notes: 1) Model: Pooled OLS. 2) All regressions include country and year fixed effects. In addition, the share of household individuals in different age groups, the share of individuals with different levels of education, the share of months that household individuals were working, unemployed, retired or in other forms of inactivity as well as variables related to the size of the household and to the number of children are included as explanatory variables. 3) All models were weighted with sample weights. 4) \*\*\* 1% significance; \*\* 5% significance; \* 10% significance (based on robust t-ratios). 5) EU-SILC 2005-2009 longitudinal data. (a) except births.

European Union is close to the one estimated for Portugal, although the significance of the coefficients is clearly stronger in the former. These events cover a wide variety of situations, with very heterogeneous implications on income mobility. Thus, on average, the estimated impact is likely to be associated with the increasing or declining economies of scale (depending on the event), as captured in the OECD equivalence scale.<sup>7</sup> This contributes to explain the estimated decline in (equivalent) income and in the percentiles of the income distribution stemming from a reduction in the number of individuals in the household. Conversely, the birth of a child is associated with a decline in household equivalent income, mechanically contributing to a downward mobility of family income. In this case, the estimated impact for the European Union is higher than the one estimated for Portugal (this result is partly associated with the fact that the average size of households with births is relatively higher in Portugal).

The estimates presented in table 2 reflect the average household mobility after the identified events. An interesting question that can arise in this context is whether this mobility varies along the income distribution. Chart 4 contributes to answer this question in the case of three labor market events: (i) an increase in the number of individuals working; (ii) an increase in the number of unemployed individuals (after working); (iii) an increase in the number of retired individuals (after working). The three panels on the left show the percentage change in income in each of the events, for each decile of the income distribution. The three panels on the right show the estimates for the change in percentiles. The analysis focuses on the European Union, given that the sample for the case of Portugal becomes rather small (however, the chart shows the point estimates for Portugal whenever statistically significant).

In the case of an increase in the number of individuals working (first row in chart 4), the evidence suggests that the impact on income mobility is decreasing along the income distribution. In fact, in the lowest deciles of the income distribution, an increase in the number of workers implies a very substantial increase in household income (in the case of the first decile of the distribution, the percentage change in income amounts to over 50 percent, which corresponds to an increase of more than 10 percentiles in the income distribution). These values converge to zero in the highest decile of the income distribution. The figure referring to the percentage change in income also shows the sensitivity in the case of low incomes (even after excluding from the sample the households in the lowest income percentile, as mentioned in Section 2). This issue does not affect the analysis of changes in income percentiles.

The case of an increase in the number of unemployed individuals (second row of the panel) shows the importance of combining the analysis of percentage changes in household income with the changes in the relative position of each household in the income distribution. In fact, focusing on the change of household income, the conclusion is of a relatively stable impact over the income distribution (excluding the first decile). However, the analysis of percentile transitions reveals a different conclusion, with the negative impact of an increase in the number of unemployed increasing over the income distribution, from about -7 percentiles in the first decile to around -16 percentiles in the tenth decile.

In the case of an increase in the number of retirees, the analysis by income deciles reveals that the statistical significance of the estimated fall in household income, as well as in the percentiles of the income distribution, is associated with upper median of the income distribution. Again, this finding illustrates the importance of taking into account the heterogeneity across the income distribution when analyzing the mobility of household income.







Rate of change in income

#### Chart 4 • Impact on household income mobility, by decile of the household income distribution

Percentile change in income distribution

Increase in the number of working individuals



Increase in the number of unemployed individuals who were working in the previous year



Increase in the number of unemployed individuals who were working in the previous year



Increase in the number of retired individuals who were working in the previous year

Household income decile

Increase in the number of retired individuals who were working in the previous year



Sources: EU-SILC 2004-2009 and authors' calculations

2 3 4 5 6 7

10.0

0.0

Per cent -10.0

-20.0

-30.0

1

## 5. Conclusions

This article assesses the impact of labor market transitions and of changes in the composition of households on income mobility in Portugal and in the European Union. Given the limitations of the database, the analysis aimed at documenting the impact of these events on household equivalent income, rather than finding the corresponding fundamental explanations. Additionally, it should be noted that the available information does not allow identifying the full set of events that contribute to the mobility of household income.

The evidence supports the idea that household income mobility depends significantly on idiosyncratic events in the labor market, on the family context (and changes in this context), as well as on the set of State transfers. For example, in the European Union, the point estimates suggest that in the case of households where the number of unemployed increases the average fall in family income is about 19 per cent. In the case in which individuals move from employment to retirement, the average fall in household income is about 6 percent. The corresponding estimates for Portugal are not statistically different from those obtained for the European Union. Additionally, there is significant heterogeneity in the impact of events along the income distribution. The average impact on household income is thus an insufficient statistic for a full analysis of these events. The study also confirmed the importance of complementing the analysis of changes in income with changes in the relative position of households in the income distribution. The combination of these two perspectives is especially relevant when analyzing the tails of the distribution.

Extending the sample period with new waves of the EU-SILC should strengthen the results, as well as allow extending the work in new directions. In particular, it should be interesting to undertake the analysis for the different countries of the European Union, as well as evaluating the impact of the European recession that began in 2009, particularly taking into account the heterogeneity along the income distribution.

#### Notes:

- 2. Banco de Portugal, Economics and Reseach Department.
- 3. In this article, the terms family and household will be used interchangeably.
- 4. For more details, see http://epp.eurostat ec.europa.eu/portal/page/portal/microdata/eu\_silc.

5. According to this equivalence scale, the first adult in the family has a weight of 1, the remaining adults have a weight of 0.5 and children (under 14 years) have a weight of 0.3.

6. These weights are constructed to allow an extrapolation from the sample to the entire population.

7. For example, in the case of a household with two adults which earn, on average, 7500 euros each, the equivalent income of each household member is 10000 euros ((7500+7500)/1 5). In case the household breaks up, each individual would be attributed an equivalent income of 7500 euros.

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## Portuguese Exports in the Global Value Chains<sup>1</sup>

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#### ABSTRACT

A very important part of world production is nowadays organized along Global Value Chains (GVCs). The success of individual countries in the global economy depends on their ability to combine domestic and foreign value added in order to produce exports, which are later embodied in other products or consumed as final goods and services. The pervasiveness of GVCs strongly affects the interpretation of classical international trade measures computed in gross terms, emerging the need to assess trade flows in value added terms. This article analyzes the participation of the Portuguese economy in GVCs in the period 1995-2011. On the one hand, the level of foreign value added in exports indicates the degree of integration in GVCs. On the other hand, the re-export of national value added incorporated in imports provides indications on the positioning in the value chain.

## 1. Introduction

Global Value Chains (GVCs) became the paradigm for the production of most goods and services around the world. Production is nowadays vertically fragmented across different countries, *i.e.*, parts and components are produced in distinct locations and are assembled either sequentially along the supply chain or in a final location. The international fragmentation of production has always existed, being associated with the import of manufactured goods to be later incorporated in exports.<sup>4</sup> However, the reduction of transport and communication costs, the acceleration of technological progress and the removal of political and economic barriers to trade greatly increased the opportunities for international fragmentation of production. The growth observed in GVCs in the recent decades interlinks with the strong expansion of international trade and foreign direct investment flows, as well as with the growing importance of transnational corporations, which are the main players in the organization these activities.

The economic literature has been making progress in the measurement and mapping of this phenomenon. Building on the initial contributions by Feenstra and Hanson (1999) and Hummels *et al.* (2001), broader frameworks for computing the foreign and domestic content in exports have been suggested by Koopman *et al.* (2010), Johnson and Noguera (2012) and Stehrer (2012). These broader measurement frameworks rely on global input-output (I-O) matrices, which identify the sources and uses of output in the economy, decomposing by sectors and partner countries.

This article analyzes the integration of Portuguese exports on GVCs and provides indications about their positioning in these chains in the period 1995-2011. This period covers the accession of Portugal to the European Monetary Union in 1999, the great trade collapse of 2008/2009 and the beginning of the Economic and Financial Assistance Program to the Portuguese economy in 2011.

The level of integration in GVCs is associated with the import content of exports, while the positioning in the value chain can be related with the re-export of domestic value added embodied in imports. The re-export of value added implies a larger presence in the initial and final stages of the productive process, where most of value added is typically created. The interpretation of trade in value added indicators is now essentially established but the consequences of GVCs for the



This article shows that the participation of the Portuguese economy in GVCs is still limited, especially if compared with that of other EU members with similar size. Albeit foreign value added in exports increased from 1995 to 2007, there was a significant reduction in 2009, which had still not been recovered by 2011. In addition, the re-export of domestic value added embodied in imports is very small, indicating the need for a repositioning in stages of the value chain that create larger value added. The foreign value added in exports is larger in intra-EU trade and its main geographical origins are Spain, Germany and the "Rest of the world".<sup>5</sup> In sectoral terms, manufacturing presents the largest share of foreign value added in Portuguese exports.

Other studies have analyzed the import content of Portuguese exports, though using only domestic I-O tables. For example, Amador and Cabral (2008) examine the vertical specialization of the Portuguese economy from 1980 to 2002 and Cardoso *et al.* (2013) discuss the import content of global demand in the last three decades. As for studies focusing on the participation in GVCs and exports of value added in other European countries, recent examples are Stehrer and Stöllinger (2013) for Austria, Duprez and Dresse (2013) for Belgium and Cappariello and Felettigh (2014) for Italy.

In methodological terms, international trade flows associated with the operation of GVCs cannot be explained by the classic concept of comparative advantages defined at the country level. Instead, they should be modeled in terms of the capability of firms to integrate value added from different origins. Although articles by Jones and Kierzkowski (2001, 2005), Deardorff (2001, 2005), Markusen (2006) and Baldwin and Robert-Nicoud (2014) have formalized some dimensions of international fragmentation of production, a full theoretical model of GVCs is still missing.

The paper is organized as follows. Section 2 presents the database and the methodology used to measure value added in exports. Section 3 presents the main aggregate results for Portugal and provides some comparison with other euro area countries. Next, section 4 looks at the foreign value added embodied in exports from the perspective of its geographical origin. Section 5 develops the analysis along the sectoral dimension. Finally, section 6 presents some concluding remarks.

## 2. The nature of GVCs and their measurement

This section briefly discusses the nature of GVCs and reviews the methodology underlying the computation of the foreign value added content in a country's gross exports (FVAiX). In addition, the measure of domestic value added in imports (DVAiM) and the re-exported domestic value added in imports (RDVAiE), *i.e.*, the domestic value added that returns back home embedded in imports and is subsequently exported, are also presented.

The concept of GVC is based on the idea that domestic value added combines with foreign value added in order to produce exports, which are later embodied in other products or consumed as final goods and services. Therefore, imports of intermediate products to be embodied in exports are an important part of the production process, making the gross value of exports much larger than their domestic value added component. In addition, the domestic value added embodied in exports can circulate in the global economy as part of intermediate products used along the



production chain and part of it can return to the domestic economy in this process. The domestic value added that returns home through imports can be either recombined with domestic and foreign value added and re-exported or consumed as part of a final product or service. Chart 1 presents these dynamic linkages in a stylized way, highlighting the fact that international flows of value added provide a clearer picture of international trade than the classical gross trade measures.

One of the consequences of the enlargement and strengthening of GVCs is the strong growth of trade flows in the world economy, mostly driven by intermediate products that circulate around the world as part of complex production chains. Panel a) of chart 2 plots the path of nominal exports and imports of goods and services in Portugal in the period 1995-2013, showing that nominal trade flows grew more that the GDP. Panel b) plots the path of international trade flows but only in the subset of intermediate and energy goods. The growth rate of these flows is more in line with GDP up to the mid-2000s but grows substantially faster in more recent years. Although this pattern is affected by the adjustment process of the Portuguese economy, which led to lower GDP growth in recent years and a stronger orientation towards exports, it also signals the participation of the Portuguese economy in GVCs.

The computation of coefficients of trade in value added requires the existence of a global I-O matrix. Although the internal organization of a global I-O matrix is similar to that of classical I-O matrices, its information content is much larger because country-sector pairs of inputs are disentangled along country-sector pairs of outputs. Chart 3 presents the structure of a global I-O matrix in a stylized manner. Each column lists the intermediates (domestic and imported, by geographic origin) used in the production of the respective sector in a given country, as well as the value added generated, summing up to the value of output. Each line decomposes the usage of output in each industry in a given country along intermediate consumption for other sector-country pairs and final consumption. The construction of global I-O matrices combines supply and use tables for individual countries with bilateral trade flows at the sectoral level and it is a very demanding process. As a result, there are some limitations in global I-O matrices. For example, in some countries, the allocation of imports to using sectors is based on a straightforward proportionality assumption based on their share within total supply (Dietzenbacher *et al.* (2013)).



#### Chart 1 • Flows of value added in a global value chain

The analysis presented in this article is based on the World Input-Output Database (WIOD), which links national supply and uses tables with bilateral trade data in goods and services to produce a unique global I-O table. This database builds on national official statistics, it covers 27 European Union (EU) countries and 13 other major world economies and comprises 35 sectors, corresponding to a broad NACE classification for the period 1995-2011 (see Timmer *et al.* (2012) and Dietzenbacher *et al.* (2013)).<sup>6</sup>

The coefficients of FVAIX, DVAIM and RDVAIE are useful proxies of the participation of economies in GVCs. We follow Trefler and Zhu (2010) and Stehrer *et al.* (2012) for a stylized presentation of these indicators. The most intuitive way to introduce them involves defining the domestic value added in exports (DVAIX).

The global Leontief inverse matrix is denoted as  $L = (I - A)^{-1}$ , with dimension  $NC \times NC$ , where N stands for the number of sectors and C for the number of countries. Additionally I is the identity matrix and A is the  $NC \times NC$  global I-O matrix. The Leontief inverse matrix is the sum of a converging infinite geometric series with common ratio A, that is,  $\left[I - A\right]^{-1} = \left[I + A + A^2 + A^3 + ... + A^*\right]$ , when  $x \to \infty$ .

The vector of value-added coefficients, *i.e.*, value-added created per unit of gross output in country r, is denoted by  $v^r$ . This  $1 \times NC$  vector contains the value-added coefficients for country r and zeros otherwise. Further, country r's exports are written in a vector  $e^r$ , which is of dimension  $NC \times 1$  and reports the exports as positive elements and zeros otherwise. The DVAiX basically takes the on-diagonal block in the Leontief inverse for country r, pre-multiplies by the value-added coefficients in each sector and post-multiplies by the values of exports, that is:

$$DVAiX^r = v^r L^r e^r \tag{1}$$

The FVAiX provides the value-added directly and indirectly created in the country from which intermediates are imported (source country *s*) for production of country *r*'s exports and is calculated in a similar way. It implies pre-multiplying the Leontief inverse by the vector containing the value-added coefficients for country *s* and zeros otherwise, denoted as  $v^s$ , and post-multiplying by country *r*'s exports vector.



#### Chart 2 • Annual nominal growth rate of trade flows

Source: INE.



This can be written as:

$$FVAiX^{sr} = v^s L^{sr} e^r \tag{2}$$

Summing over all partner countries, total foreign value-added embodied in country *r*'s exports is:

$$FVAiX^{r} = \sum_{s,s \neq r} v^{s} L^{s} e^{r}$$
(3)

This calculation is similar to that suggested by Hummels *et al.* (2001) to evaluate the import content of exports, designated as "vertical specialization". However, in equation 3 the calculation is based on the concept of value-added and uses a global Leontief inverse rather than a basic matrix with the country's import coefficients.

Summing up the domestic and foreign value-added in exports, as presented in equations 1 and 3, provides the value of total exports in gross terms. In fact, through national accounts' identities, the value-added created along the supply chain for the production of the exported good must correspond to factor income generated in domestic and foreign economies. The same procedure can be applied when the value-added content of exports of a particular sector is analyzed. In this case only the exports of the selected sector are included in the export vector  $e^r$ .

It should be noted that the calculations consider a country's total exports, *i.e.*, both exports of intermediates and final goods. Although intermediate goods do not account for the calculation of total value-added, this is justified from a national accounting perspective. In fact, to include only exports of final goods would be misleading. For example, a country exporting only raw materials would show zero value-added in exports, in a context where the production of raw materials genuinely creates domestic income. In other words, the consideration of exports of intermediates and final goods leads to double counting in overall trade statistics (which is precisely the motivation for the proposal of value-added measures) but from an individual country's perspective both types of exports have to be considered as sources of value-added (see Koopman *et al.* (2010), Stehrer *et al.* (2012) and Stehrer (2012), for detailed discussions).

		Country 1	Country 2		Country 1	Country 2		
		Sector 1 Sector 2	Sector 1 Sector 2		Final consumption	Final consumption		Total use of output
Country 1	Sector 1 Sector 2	Use of domestic inputs (classical single country input-output table)	Use of foreign inputs		Final use of domestic products	Final use of exports of country 1 (imports country 2)		
Country 2	Sector 1 Sector 2	Use of foreign inputs	Use of domestic inputs (classical single country input-output table)		Final use of exports of country 2 (imports country 1)	Final use of domestic products		Sum of lines
Value-a	added	Use of primary inputs	Use of primary inputs		Final use of primary inputs	Final use of primary inputs		
Gross	output	Sum of columns	Sum of columns					

#### Chart 3 • Structure of a global input-ouput matrix
#### Articles

In order to discuss the characteristics of GVCs it is useful to calculate the domestic value-added that returns to the country (embodied in imports), which is incorporated again in goods and services that are exported. This would be the case of a country exporting prototypes of parts and components for automobiles, which would be produced abroad and re-imported for final assembly before being exported as final products.

The calculation of the DVAiM involves a strategy similar to the one presented above, denoting country *r*'s imports by  $m^r$ . This vector of dimension  $NC \times 1$  includes bilateral imports values of country *r* from other countries as positive entries and zeros otherwise. The domestic value-added in a country's imports is computed as:

$$DVAiM^r = v^r L^{rs} m^r \tag{4}$$

Equation 4 picks up the off-diagonal blocks of the rows of country r in the global inverse Leontief, which are pre-multiplied by input coefficients of this country and post-multiplied by its bilateral imports.<sup>7</sup> Finally, the coefficient that proxies RDVAiE departs from the principle that exports use domestic value added in a given proportion, independently of whether such domestic value added is being exported for the first time or re-exported (after being imported as part of intermediate products), that is:

$$RDVAiX^{r} = DVAiX^{r} \cdot \frac{Im^{r}}{Ie^{r}} DVAiM^{r}$$
(5)

where I is a unitary vector of dimension  $1 \times NC$  .

## 3. Value added in exports

The coefficient of FVAiX increased in the Portuguese economy from 27.6 per cent in 1995 to 31.4 per cent in 2007 (table 1). There was a significant reduction in 2009, also visible in other economies, as a result of the great trade collapse. The events that lead to the economic and financial crisis had a strong impact on international trade due to GVCs. The so-called "Bullwhip effect" refers that the variance of sales in the final customer are smaller than those faced by the producers upstream in the supply chain.<sup>8</sup> More recently, although gross exports have been growing fast, the FVAiX in the Portuguese economy did not recover to its pre-crisis level. This somewhat contrasts with the experience of other countries. Amador *et al.* (2013) show that such a recovery took place in the euro area and the US. One explanation for this path lies on the structure of

Foreign value added in exports (FVAiX) (% exports)							
Total	Intra euro area 17	Extra euro area 17	Agriculture	Manufactu- ring	Services	DVAIM	RDVAIE
27.6	37.9	11 3	11.3	31 2	15.4	0.17	0.16
30.0	43.0	12.6	14.2	34.7	15.4	0 21	0.22
31.4	44.5	14.9	17.1	37 3	17.1	0 31	0.28
27 5	37.5	13 2	16.2	32 3	16.4	0 24	0.29
27.9	40.1	13.7	17.0	33.0	16.5	0 26	0.25
	<b>Total</b> 27.6 30.0 31.4 27 5 27.9	Foreign value           Total         Intra euro area 17           27.6         37.9           30.0         43.0           31.4         44.5           27.5         37.5           27.9         40.1	Foreign value added in e           Total         Intra euro area 17         Extra euro area 17           27.6         37.9         11 3           30.0         43.0         12.6           31.4         44.5         14.9           27.5         37.5         13 2           27.9         40.1         13.7	Foreign value added in exports (FVAiX           Total         Intra euro area 17         Extra euro area 17         Agriculture           27.6         37.9         11.3         11.3           30.0         43.0         12.6         14.2           31.4         44.5         14.9         17.1           27.5         37.5         13.2         16.2           27.9         40.1         13.7         17.0	Foreign value added in exports (FVAiX) (% exports)           Total         Intra euro area 17         Extra euro area 17         Agriculture         Manufactu- ring           27.6         37.9         11.3         11.3         31.2           30.0         43.0         12.6         14.2         34.7           31.4         44.5         14.9         17.1         37.3           27.5         37.5         13.2         16.2         32.3           27.9         40.1         13.7         17.0         33.0	Foreign value added in exports (FVAiX) (% exports)           Total         Intra euro area 17         Extra euro area 17         Agriculture         Manufactu- ring         Services           27.6         37.9         11.3         11.3         31.2         15.4           30.0         43.0         12.6         14.2         34.7         15.4           31.4         44.5         14.9         17.1         37.3         17.1           27.5         37.5         13.2         16.2         32.3         16.4           27.9         40.1         13.7         17.0         33.0         16.5	Foreign value added in exports (FVAiX) (% exports)         DVAIM           Total         Intra euro area 17         Extra euro area 17         Agriculture         Manufactu- ring         Services         DVAIM           27.6         37.9         11.3         11.3         31.2         15.4         0.17           30.0         43.0         12.6         14.2         34.7         15.4         0.21           31.4         44.5         14.9         17.1         37.3         17.1         0.31           27.5         37.5         13.2         16.2         32.3         16.4         0.24           27.9         40.1         13.7         17.0         33.0         16.5         0.26

Table 1 •	Measures	of partici	pation in	global	value	chains
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Source: Authors' calculations

Notes: DVAiM - Domestic value added in imports (as a percentage of total imports); RDVAiX - Reexported domestic value added in exports (as a percentage of total exports).

(71

Portuguese recent export growth, which has benefited from the contribution of extra EU markets and some non-manufacturing sectors. Table 1 shows that FVAiX outside the euro area is one--third of that of exports to euro area countries, which links with the fact that GVCs have a strong regional nature, with significant importance in Europe. In the same vein, FVAiX in services and agriculture is half of that in manufacturing. Therefore, composition effects play an important role in the recent path of overall Portuguese FVAiX.

The last two columns of table 1 present the coefficients of DVAiM and RDVAiE for the Portuguese economy, which are small and broadly stable in the period under analysis. These indices reflect a reduced incidence of activities placed in the initial and final stages of the production chain, where there is typically a high incorporation of value added, *i.e.*, low usage of processing activities from abroad. In addition, these small indices reflect the low specialization in products that are widely used as inputs in most sectors (*e.g.*, energy products) and also the relatively small scale of the Portuguese economy. Larger economies tend to export a broader range of products and such scale amplifies the pervasiveness of their value added.

Chart 4 compares the level of the indices referred above across euro area countries. In this context, the Portuguese economy presents an intermediate position, though showing a bias towards lower levels of FVAiX.<sup>9</sup> As for DVAiM and RDVAiE, Portugal is also in an intermediate position, though coefficients are much lower than those of the countries with the highest values. The Portuguese RDVAiE is one-tenth of that of Germany, one-fifth of that of France and one-third of that of the Netherlands, countries largely engaged in processing and logistics.

## 4. Geographic dimension

One important dimension of the analysis is the decomposition of FVAIX according to countries of origin. Chart 5 presents this breakdown for Portugal in 2011. The foreign value added coming from the euro area to be incorporated in exports represented about 15 per cent of gross exports, *i.e.*, about half of total FVAIX in 2011. In 1995 the share of the euro area in total FVAIX was about 60 per cent. The second largest origin of FVAIX is the block "Rest of the world", which represented about 6 and 8 per cent of gross exports in 1995 and 2011, respectively.

#### Chart 4 • Measures of participation in global value chains (2011)



Domestic value added in imports (DVAiM) and reexported domestic value added in exports (RDVAiX)



Source: Authors' calculations.

Amongst the set of sources of FVAiX outside the euro area, some relevant patterns exist. Firstly, UK, Denmark and Sweden decreased their importance, while recent EU members that are outside the euro area slightly gained relevance. Secondly, China moved from virtually zero to 1 per cent of total FVAiX from 1995 to 2011.

As for individual countries inside the euro area, the foreign value added coming from Spain and Germany to be used in exports represented in 2011 about 6 and 3 per cent of gross exports, respectively. In addition, as seen in gross export flows, Spain has significantly increased its importance as a source of value added that is embodied in national exports, while Germany has decreased. Therefore, there is evidence pointing towards some strengthening of Iberian GVCs in the period under analysis.

Another approach is to examine the geographical origin of the value added embodied in Portuguese exports directed to Spain and Germany, which are the main destinations of gross exports. Table 2 presents this breakdown signaling shares higher than 2 per cent in grey. Notsurprisingly, most of the value added embodied in Portuguese exports to Spain and Germany is originated in these same countries, which is in line with the nature of GVCs. The increasing role of Spain is visible from 1995 to 2011, while Germany decreased its share in the same period, even in exports directed to itself. The significant share of the "Rest of the world" is partially explained by its role as supplier of energy, which is embodied in virtually all activities. Furthermore, the relative importance of France, Italy and the block composed by UK, Denmark and Sweden has significantly decreased in the period under analysis.

Another aspect that is worth mentioning is the existence of positive shares (though small) for a large number of countries, *i.e.*, Portugal uses diversified value added in its exports to Spain and Germany, which is a symptom of how intricate are GVCs in the world economy. With the exception of very small countries like Cyprus, Estonia, Malta and Slovenia, shares reach at least 0.1 per cent of total Portuguese exports to the two selected countries. Even a small economy like Luxembourg reaches this threshold, probably due to its relevance as provider of financial services in the world economy.

Panel a) of chart 6 presents the Portuguese coefficients of DVAiM from each country in the sample as a percentage of imports from to the respective country in 2011. The striking result is the comparatively large coefficient obtained for Spain (0.4 and 0.6 per cent in 1995 and 2011,







Source: Authors' calculations.

respectively), *i.e.*, almost three times larger than what is observed for the second country. This reveals the strong integration of the Iberian economies also translated into GVCs. Moreover, the coefficients of DVAiM for extra-EU countries are notoriously small. Panel b) of chart 6 presents the contributions of the different countries to the aggregate DVAiM coefficient in table 1. The very large role of Spain in Portuguese DVAiM emerges in an even clearer way, increasing from 1995 to 2007 but reducing since then (panel c) of chart 6).

As for the RDVAiE coefficient, is not possible to perform a geographical decomposition because it involves a complex representation of origins and destinations of Portuguese value added across the set of countries in the sample.

## 5. Sectoral dimension

This section discusses the sectoral dimension of GVCs in the Portuguese economy. Table 3 provides the details on the FVAiX for the different sectors and periods, with values above 25 per cent shaded in gray. As expected, the coefficients are higher in the manufacturing sector, notoriously in "Coke and petroleum" since this activity largely embodies external energy inputs. The second largest coefficient is that of "Transport equipment", which is typically highlighted in the empirical literature because the automotive industry is one example of strong integration in GVCs.<sup>10</sup> The same is valid for the sector "Electrical and optical equipment", though in a smaller scale. The

			Germany					Spain		
	1995	2000	2007	2009	2011	1995	2000	2007	2009	2011
Austria	03	03	0.4	0.3	0.3	02	02	0.3	0.3	0.2
Belgium	1.0	0.9	0.7	0.8	0.7	1.0	08	0.7	0.7	0.6
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Germany	6.1	6.1	5.6	4.0	3.9	4.7	4.1	4.1	3.3	3.1
Spain	48	63	7.5	7.1	7.6	48	55	7.0	6.5	6.6
Estonia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finland	02	03	0.3	0.2	0.1	03	02	0.2	0.2	0.1
France	3.1	3.4	2.4	2.1	1.9	2.9	2.6	2.1	1.9	1.6
Greece	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Ireland	0.1	02	0.4	0.4	0.2	0.1	02	0.3	0.4	0.2
Italy	2.4	2.6	2.1	1.7	1.8	18	1.9	1.8	1.4	1.5
Luxembourg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	1.1	1.1	1.1	1.2	1.1	1.0	0.9	0.9	1.0	0.9
Portugal (DVAiX)	69.1	64.9	65.3	70.7	69.6	70 5	68.1	67.0	71.9	71.3
Slovakia	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UK, Sweden and Denmark	2.6	3.0	2.1	1.7	1.7	23	2.9	1.9	1.6	1.5
New EU members, not members of the Euro	03	05	0.7	0.8	0.6	02	03	0.6	0.6	0.5
USA	1.9	2.0	1.3	1.3	1.6	1.7	1.6	1.3	1.3	1.6
China	02	0.4	1.1	0.9	1.3	02	03	0.9	0.8	1.0
Asia	23	2.1	1.4	1.0	1.2	1.4	13	1.2	0.9	1.0
Rest of the World	43	5.7	7.3	5.7	6.2	6.9	8.7	9.6	7.2	8.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

## Table 2 • Decomposition of foreign value added in Portugese exports to Spain and GermanyAs a percentage of exports to these countries

Source: Authors' calculations.

Note: Cells with values higher than 2 per cent are shaded in gray.

only non-manufacturing sector that surpasses this threshold is "Air Transport", where imports of energy and business services play an important role.

The sectoral and geographical dimensions of the analysis can be crossed in order to identify additional patterns. Chart 7 takes the eleven main sectors in terms of the level of foreign value added embodied in Portuguese exports and decomposes along its main geographical origins. These sectors represent about 78 per cent of total Portuguese FVAiX in 2011. In all sectors except "Coke and petroleum", the euro area is the origin of more than 40 per cent of FAViX. This share is smaller in "Air Transport" and, to a lesser extent, in "Food", where the importance of US and "Rest of the world" as sources of value added embodied in Portuguese exports is larger. As it would be expected, in what concerns the FVAiX in "Coke and petroleum" the share of the "Rest of the world" is larger than 80 per cent.

As for the change in the share of the different countries as origins of foreign value added embodied in Portuguese exports from 1995 to 2011 (Chart 8), it is worthwhile signaling the growing role of China, though still accounting for low levels, as well as the growing role of "Rest of the world". Conversely, the euro area has reduced its share in many of the selected sectors. Most notably, in sectors "Rubber and plastics", "Air transport", "Chemicals" and "Textiles", the euro area



Sources: Authors' calculations.



has reduced its share as source of FVAiX, as a counterpart of important increases in China and "Rest of the world". In addition, the set of countries comprising UK, Denmark and Sweden, old EU members that are not in the monetary union, have lost share in all selected sectors. Overall, although international price changes may play a role in these developments, there is some evidence of changes in the architecture of GVCs in the recent years.

## 6. Concluding remarks

The Portuguese economy initiated its process of economic integration in the beginning of the 1960's with the accession to the European Free Trade Association. This process was deepened with the accession to the European Economic Community in 1986 and the subsequent participation in the euro area in 1999. The degree of openness of the economy increased against a background of stronger liberalization, participation of new players in the world trade system and the emergence of the GVCs as a paradigm for the organization of international production.

At present the Portuguese economy is fully integrated in the world trade system. Nevertheless, there is substantial room to increase the intensity of its participation in GVCs, coming closer to

	NACE rev 1	1995	2000	2007	2009	2011
Agriculture, Hunting, Forestry and Fishing	AtB	10.6	14.0	17.6	16.6	17.6
Mining and Quarrying	С	12.3	15 5	16.4	152	15.5
Food, Beverages and Tobacco	15t16	21.6	23.0	25.5	24.0	25.5
Textiles and Textile Products	17t18	26.8	29 5	25.8	22.1	22.9
Leather, Leather and Footwear	19	28.0	29 5	28.7	24.4	26.8
Wood and Products of Wood and Cork	20	22.6	27.0	25.1	20.7	21.4
Pulp, Paper, Printing and Publishing	21t22	18.9	22 5	24.6	21.9	22.6
Coke, Refined Petroleum and Nuclear Fuel	23	75.9	83.6	77.5	72.7	73.9
Chemicals and Chemical Products	24	28.1	32.9	35.4	32 3	34.8
Rubber and Plastics	25	30.1	35.0	36.3	33.0	35.4
Other Non-Metallic Mineral	26	17.2	193	21.8	19.4	20.0
Basic Metals and Fabricated Metal	27t28	31.4	36 8	43.0	35.4	35.9
Machinery, Nec	29	31.1	33 5	35.4	31 8	33.3
Electrical and Optical Equipment	30t33	39.3	42.9	47.2	40.0	37.3
Transport Equipment	34t35	43.6	43 2	46.0	42 2	42.9
Manufacturing, Nec; Recycling	36t37	25.7	30 5	30.4	26.0	26.9
Electricity, Gas and Water Supply	E	12.8	195	23.1	21.0	21.2
Construction	F	18.2	20 5	21.0	18.6	19.1
Sale, Maintenance and Repair of Motor Vehicles Retail Sale of Fuel	50	12.2	143	12.4	11.7	11.9
Wholesale Trade and Commission Trade, Except of Motor Vehicles	51	12.4	13.1	12.5	11 5	11.6
Retail Trade, Except of Motor Vehicles ; Repair of Household Goods	52	9.4	98	9.1	85	8.6
Hotels and Restaurants	Н	14.4	14.6	13.4	128	13.7
Inland Transport	60	12.2	165	19.5	18.4	18.6
Water Transport	61	16.7	19.1	24.7	24.1	24.2
Air Transport	62	28.3	26.6	26.8	27.0	27.2
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	63	6.2	10.6	13.1	128	12.9
Post and Telecommunications	64	9.5	12.6	15.3	138	13.0
Financial Intermediation	J	5.8	72	6.2	5.9	5.9
Real Estate Activities	70	4.6	4.4	3.7	35	3.5
Renting of M&Eq and Other Business Activities	71t74	12.8	12.0	12.8	12.0	12.0
Public Admin and Defence; Compulsory Social Security	L	6.0	7.1	7.9	75	7.6
Education	Μ	3.5	3.7	3.3	3.1	3.2
Health and Social Work	Ν	13.5	143	14.0	12.9	13.6
Other Community, Social and Personal Services	0	17.1	163	16.1	15 2	15.4
Total		27.6	30.0	31.4	27 5	27.9

#### Table 3 • Foreign value added in exports As a percentage of exports

Source: Authors' calculations.

Note: Cells with values higher than 25 per cent are shaded in gray.

the figures recorded by other European countries of similar size. The regional nature of GVCs and the geographic location of the Portuguese economy pose a challenge to this process. Although foreign value added in exports increased from 1995 to 2007, there was a significant reduction in 2009, which had still not been recovered by 2011. Structure effects linked to the geographical and sectoral composition of exports have been playing an important role in this evolution. In addition, the part of domestic value added that is re-exported is relatively small, signaling a positioning in the intermediate stages of the production chain.

The analysis of the sources of foreign value added embodied in exports reveals the dominant role played by the set of euro area countries, notably Germany and, mostly, Spain. The increasing role of the Iberian GVCs is also visible in the relatively large share of Portuguese value added returning to Portugal embodied in the imports of Spanish products. Moreover, the Chinese economy has gained relevance as origin of value added incorporated in national exports, though remaining at low levels. In the sectoral dimension, manufacturing presents the largest share of foreign value added in gross exports. Services have been increasing their share in the period under analysis, mostly in transport sectors.

The orientation towards foreign markets is an important feature in the restructuring process of the Portuguese economy and a necessary condition for higher potential GDP growth. In terms of policy consequences it is important to note that the participation in GVCs is not a sufficient condition to ensure good economic performance. The ability to accelerate real GDP growth through exports depends on the scale of trade but also on the ability to incorporate domestic value added in exports. Therefore, it is crucial to have firms placed in the stages of the GVC where significant value added is created. According to Baldwin (2012), these stages are either pre-fabrication, where R&D, product concept and design are defined, or stages closer to the final user, corresponding to post-fabrication services (sales, marketing and after sales services). Intermediate levels of production, especially assembly, are most likely to add less value added. This dimension of the analysis is still incomplete in the empirical literature of international trade.

There is substantial room for further investigation on the nature, impacts and interpretation of Portuguese international trade from the perspective of GVCs. This research may involve a more precise mapping of GVCs and also the utilization of firm-level data in order to identify the characteristics of successful exporters and their ability to create value added in the global economy.





Chart 8 • Change in the origin of foreign value added incorporated in main using sectors from 1995 to 2011 | Percentage points



#### Notes:

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

2. Banco de Portugal, Economics and Research Department.

3. The Vienna Institute for International Economic Studies.

4. See Yeats (1998) for a discussion.

5. The composition of the geographical areas is listed in Appendix A.

6. Given the hypothesis used in the construction of the global input-output matrices, trade flows do not strictly correspond to those in national accounts.

7. Koopman *et al.* (2010) shows that subtracting this re-imported value-added from the domestic value-added content of exports yields the "value added in exports" (VAX) as defined in Johnson e Noguera (2012). See Stehrer (2013), for a detailed bilateral assessment.

8. See Altomonte et al. (2012) for an analysis of the "Bullwhip effect" along GVCs in the context of the great trade collapse.

9. Results obtained from the OECD Trade in Value Added Database place Portugal in an intermediate position amongst industrialized economies (Backer e Yamano (2012)).

10. See Lall *et al.* (2004) for an analysis of Electronics and Automobiles sectors in East Asia and Latin America and Timmer *et al.* (2013) for an analysis of GVC income and jobs in German transport equipment production.

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# Appendix A

(80)

Geographical area Country				
Geographical area	country			
	Austria			
	Belgium			
	Cyprus			
	Germany			
	Spain			
	Estonia			
	Finland			
	France			
Euro area	Greece			
	Ireland			
	Italy			
	Luxembourg			
	Malta			
	Netherlands			
	Portugal			
	Slovak Republic			
	Slovenia			
	Denmark			
EU-old (accession before 2004)	Sweden			
(accession before 2004)	UK			
	Bulgaria			
	Czech Republic			
	Hungary			
EU-new	Latvia			
(accession alter 2004)	Lithuania			
	Poland			
	Romania			
	USA			
	China			
	India			
	Indonesia			
Asia	Japan			
	Korea			
	Taiwan			
	Australia			
	Canada			
	Brazil			
Rest of the World	Mexico			
	Russia			
	T			



Sudipto Karmakar<sup>2</sup>

#### ABSTRACT

This article tries to study the relationship between capital ratios and lending patterns of banks. Using an unbalanced panel of around nine thousand commercial banks in the United States, from 1996:Q1 to 2010:Q4, we find a moderate relationship between loan growth

rates and capital ratios. We use three different capital ratios to perform the analysis. The sensitivity is higher for banks with lower capital ratios. We also find a higher sensitivity, of lending to capital ratios, in the crisis period, compared to the pre crisis period.

## 1. Introduction

"The reason I raise the capital issue so often, is that, in a sense, it solves every problem." - Alan Greenspan to the Financial Crisis Inquiry Commission

The recent financial crisis has been an eyeopener in many ways. It has thrown many challenges at us, economists. It is imperative that we develop a better understanding of these issues so that we do not witness a relapse of the crisis. One of the issues of paramount importance, is understanding the linkages between the real and financial sector. We live in a world where the various sectors are interconnected. Hence a stress in one sector can easily be transferred to another, if sound policies are not in place.

In this article, we ask one main question. How sensitive is bank lending to bank capital ratios? The effect of changes in bank capital on the provision of credit is a key determinant of the linkage between financial conditions and real activity. Quantifying this relation has therefore been one of the most important research questions post the recent financial crisis. When the Troubled Asset Relief Program (TARP) moved to inject capital into banks through the Capital Purchase Program (CPP), the impact of the program on real activity largely focused on the effect of these injections on bank lending. More recently, this question has re-emerged in light of proposals announced by the Basel Committee on Banking Supervision to raise banks capital requirements and limit leverage ratios, Berropside and Edge (2010).

The impact of capitalization on lending is expected to depend on the banks current capital position. If a bank is sufficiently capitalized, or has access to financial markets, then a reduction in capital does not have to be accommodated by a reduction in assets. The worsening of the capital position could come from (say) increased credit risk materialization. On the other hand, a bank that is not well capitalized and finds it difficult to raise fresh equity will have to actively manage its assets. Such banks will often try to maintain a constant equity to asset ratio (leverage ratio) to avoid violating the capital requirements. For these banks, the impact of capital, on lending, is expected to be greater, than their well capitalized counterparts.

In this article, we are mainly concerned about the bank capital channel of how capital affects credit provision.<sup>3</sup> The bank capital channel is based on a few hypothesis and these are well summed up in Gambacorta and Mistrulli (2004). The primary hypothesis is that there has to be an

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imperfect market for bank equity. Secondly, there has to be a maturity mismatch, thereby exposing the bank to interest rate risk and thirdly, there has to be a direct impact of regulatory requirements on lending. The intuition is simple. When the economic scenario is adverse, banks often accumulate losses on its assets. Given maturity mismatch, the bank profits fall leading to a decline in bank equity. If the bank was well capitalized to begin with, then it will not have to adjust through a reduction in assets. However, if the bank equity is sufficiently low such that the regulatory constraint binds, the bank may have to reduce lending to boost the capital ratios. This theory obviously assumes that the market for bank equity has some imperfections.

## 2. Literature Review

There are not many recent estimates for the United States of the impact of bank capital on lending. Hancock and Wilcox (1993, 1994) estimated models relating changes in individual banks loan growth to measures of loan demand and bank capital. They measure the response of lending to excess/shortfall of capital from a target ratio. Berger and Udell (1994) specified an equation relating the growth rate of various bank assets to measures of bank capital. Finally, Bernanke and Lown (1991) developed equations linking bank loan growth to bank capital ratios and employment, for a single state (New Jersey). If we look beyond the United States, there are some studies that seek to quantify this relationship between bank equity and credit extension. Peek and Rosengren (1997), Puri, Rocholl and Steffen (2010) use loan applications from German Landesbanks to examine the effect of shocks to capital on the supply of credit by comparing the performance of affected and unaffected banks. Gianetti and Simonov (2010) use Japanese data to perform a similar exercise concerning bank bailouts. These papers do find a relevant role for capital in determining loan volumes, although they do not explicitly compare the magnitudes of the effects they find with those implied by the constant leverage view.<sup>4</sup> Another group of papers use firm and bank loan-level data; these include Jimenez, Ongena and Peydro (2010), who use Spanish data, and Albertazzi and Marchetti (2010), who use data on Italy. These papers find sizeable effects of low bank capitalization and scarce liquidity on credit supply. Also, Elliot (2010) uses simulation based techniques to find small effects of capital ratios on loan pricing and loan volumes for U.S. banks. De Nicolo and Lucchetta (2010) use aggregate data forthe G-7 countries and conclude that credit demand shocks are the main drivers of bank lending cycles. Last but not least, Berropside and Edge (2010) use data on US bank holding companies and also find a subdued effect of bank capital and lending. We will undertake a similar exercise by using data for commercial banks in the United States. It must be noted that this is not an article about the impact of regulation. We simply wish to study the strength of the relationship between bank capital ratios and loan growth rates.

## 3. Data Description

The data mainly come from the call report database of the Federal Reserve Bank of Chicago. It is an unbalanced panel of around nine thousand commercial banks in the US. We cover sixty quarters, from 1996:Q1-2010:Q4. For the macro variables, the FRED database was used. Let us now look at some descriptive statistics. Charts 1-3, below show how the distribution of capital ratios has changed in our sample period. We use three different measures of capital ratios, namely the capital adequacy ratio (CAR), the tier 1 ratio (T1 Ratio) and the equity asset ratio (ETA). The

capital adequacy ratio is the sum of tier 1 and tier 2 ratio divided by the risk weighted assets. It is computed as:

# $CAR = \frac{Tier1 \ Capital + Tier2 \ Capital}{Risk \ Weighted \ Assets}$

Tier 1 capital is the core measure of a banks financial strength from a regulators point of view. It primarily consists of common stock and retained earnings. Tier 2 capital represents supplementary capital such as general loan-loss reserves and subordinated debt. The denominator is a risk adjusted measure of assets on the banks balance sheet. The tier 1 ratio is the tier 1 capital normalized by the risk weighted assets. It is computed as:

 $Tier1 \ Ratio = \frac{Tier1 \ Capital}{Risk \ Weighted \ Assets}$ 

Lastly, the equity asset ratio (or the leverage ratio) is the total equity (computed by subtracting total liabilities from total assets) divided by total assets. Equity asset ratio is non risk adjusted while the other two are. It is computed as:

$$ETA = \frac{Total \ Equity}{Total \ Assets}$$



Source: Author calculations.

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The charts show the distribution of capital ratios in the last quarter of 1996, 2002, 2006 and 2010. In other words, we see a snapshot at four different points in time. The x-axis shows the capital ratios while the y-axis shows the number of banks. From the charts,<sup>5</sup> it is evident that there is a shift in the distribution across the time series. There seems to be more mass near the left tail of the distribution towards the end of the sample period, *i.e.*, 2010:Q4. In other words, more banks were reporting lower capital ratios and this holds true irrespective of which ratio we use.

Table 1 gives a broad overview of the entire dataset. We drop the observations where the loan growth rate (Loan\_Gr) exceeds 50% as this might be indicating a merger or an acquisition. We also drop the observations if the capital adequacy ratio (CAR) is above 25%. The rationale there is that at such high levels of capitalization, we do not expect to find a significant relationship between capital ratios and lending. Also banks that report very high capital ratios are typically very small banks. Dropping them does not alter our analysis. We have more than three hundred thousand observations. Looking at the simple mean, it looks like the average bank is well capitalized, irrespective of which ratio we look at. However, we need to remember that there is sufficient heterogeneity among banks in our sample, as is evident from the charts (1)-(3). The loan growth rate (Loan\_Gr) has been around 2.25% on average, per quarter. The loans included are real estate loans, commercial and industrial loans, personal loans and agricultural loans. This is our dependent variable in the regression analysis. The fed funds rate (FFR) has been 3.46% on average. The mean non performing loan (NPL) is around 0.28% of total loans. The output gap



Source: Author calculations.

(85)

Variable	Mean	Median	Std. Dev.	Observations
Loan_Gr	0.0225	0.0178	0.0631	331 048
CAR	0.1493	0.1416	0.0376	331 048
ETA	0.0974	0.0931	0.0238	331 048
T1 Ratio	0.0934	0.0892	0.0218	331 048
NPL	0.0028	0.0009	0.0067	293 832
Size	11.5884	11.538	0.8212	331 048
FFR	3.46	4.33	2.0704	
GDP Gap	-0.0002	-0.0028	0.0127	

#### Table 1 • Descriptive Statistics

Source: Author calculations.



Source: Author calculations.

(GDP Gap), is the HP filtered real GDP with smoothing parameter,  $\lambda = 1600$ . The variable size (Size) is the natural logarithm of total assets. FFR and GDP Gap are the macro control variables. They help us control for the factors that affect loan demand. NPL and SIZE are the bank specific control variables and have been widely used in other papers, in the literature.<sup>6</sup>

Now that we have a brief overview of the data, we can proceed to our empirical model to try to study the relationship between the capital ratios and lending. We will be using our various measures of capital ratios for this analysis. We will also try to see if the relationship is different for high vs low capitalized banks. Lastly, we will try to see if there are any differences in behaviour in the pre crisis and crisis periods.

## 4. The Empirical Framework

We estimate an equation for loan growth rate on the bank capital ratios. As discussed earlier, we will be using three different measures of capital ratios, namely the capital adequacy ratio, the tier 1 ratio and the equity asset ratio. The model we estimate is as follows:

$$Loan\_Gr_{i,t} = \alpha K_{i,t-1} + \beta BSC_{i,t-1} + \gamma Macro_{i,t-1} + v_{i,t-1}$$

The left hand side is the quarterly growth rate of loans. The right hand side contains measures of bank capital ratios, some bank specific control variables and some additional macro controls. An issue here is that the bank typically decides on its retained earnings and lending simultaneously rather than sequentially. So there could be some endogeneity among banking variables. All the variables on the right hand side are lagged to mitigate this problem.  $K_{i, t-1}$  is the capital ratio of bank i at time *t-1*. *BSC* consists of some bank specific variables. In this specification we will use the size and the ratio of non-performing loans. Size is measured as the natural logarithm of total assets. The non performing loans, as a fraction of total loans, are simply a measure of the risk in the banks balance sheet.

The macro variables are included to control for the overall economic scenario. Since we are mainly concerned with a supply side analysis, the inclusion of the macro variables helps us control for the demand side factors. We use the fed funds rate and the output gap. The standard random error term is  $v_{ir}$ . The model is estimated with fixed effects.

We will first estimate the equation (1) by using the three different capital measures. Next we will split up the sample at the median capital ratio<sup>7</sup> and try to see if there is a difference in behavior between high and low capitalized banks, by estimating equation (1) separately for the two groups. This is an interesting exercise because the current level of capitalization should affect the way in which capital ratios affect lending.

To emphasize the last point more, we will do a third exercise. We will estimate equation (1) only for the lowest quartile of banks. The 25th percentile for T1 ratio is 7.8%, for CAR it is 12.1% while for ETA it is 8.1%. These are the banks for whom the relationship between capital ratios and lending is expected to be particularly strong.

Lastly, we will also be doing a pre crisis vs. crisis period analysis to see if the regression coefficients differ in the two sub samples. To this effect, we will split up the sample at the end of 2006. In other words, observations from 1996:Q1-2006:Q4 represent our pre crisis sub sample while observations from 2007:Q1-2010:Q4 represent our crisis period sub sample.

## 5. Results

The results are reported in tables (2)-(5). Table 2 reports the results of the fixed effects estimation using three different measures of capital. We find a moderate relationship between capital ratios and loan growth rates. From the regressions, a one percentage point increase in the capital ratio is associated with a rise in loan growth rate between 0.12% and 0.19%. These magnitudes are moderate given that a one percentage point increase in capital ratio is quite substantial.<sup>8</sup>

The signs on the respective variables are intuitive. With higher NPLs, it could be that the banks are willing to lend less. For bigger banks the loan growth rate seems to be lower. This could be because the big banks are sufficiently diversified and have other activities besides credit provision, like trading in securities.

In table 3, we see the results for high vs. low capitalized banks. For this analysis, the sample was split at the median for the different measures of capital. The banks above the median are henceforth referred to as high capitalized banks and conversely. From the table, we observe that the coefficients for the lower capitalized banks are higher, for all measures of capital ratios. For a 1% increment in capital ratio, the loan growth rate increases by 0.13% - 0.17% for high capitalized banks. This range, for the low capitalized banks, is 0.28% - 0.45%. This is intuitive. Well capitalized banks will not have to adjust assets as much as their lower capitalized counterparts, in response to changes in capital.

Table 4 presents results obtained by estimating equation (1) but for the bottom quartile of banks, by capital ratios. Let us focus on the coefficients of capital ratios. The magnitudes are remarkably higher than those reported in tables 2 and 3 and are also significant at the 1% level. This endorses our initial hypothesis that the impact of capitalization on lending is indeed dependent on the capital position of banks. The banks in the lowest quartile are the closest to the minimum capital requirements. These banks could well be trying to maintain a constant level of equity asset ratio and remain compliant with the regulatory requirements. This theory could explain the large coefficients.

Table 5 presents results from our pre crisis vs. crisis period analysis. It is worth reminding the reader that the years 1996-2006 are called pre crisis, while 2007-2010 are called crisis periods. From the table we observe that the sensitivity of lending to capital ratios has substantially increased, irrespective of which measure we look at. For the pre crisis period the regression coefficient ranges from 0.12% – 0.19%. In the crisis period, the range is 0.35% – 0.46%. This means that with increased capitalization, banks are now willing to extend more credit.

## 6. Conclusion

In this article we find a moderate relationship between bank capital ratios and credit provision, in the United States. For a 1% point increase in capital ratios, the growth rate of loans is less than 0.20%. This relationship is stronger for less capitalized banks. To emphasize this point a bit more, we find that banks in the lowest quartile report greater sensitivity of lending to capital ratios. Lastly, we find that the relationship between lending and capital ratios is stronger in the crisis periods (*i.e.*, in recent years) when compared to the pre crisis period. It must, however, be mentioned that this article exclusively focuses on the United States. It would not be suitable to extrapolate the results to other countries with different institutional frameworks.

	(1) Loan_Gr	(2) Loan_Gr	(3) Loan_Gr
_	Tier 1 Ratio	CAR	ETA
Variables	FE	FE	FE
Tier 1 Ratio	0.193***		
	(0.019)		
CAR		0.127***	
		(0.010)	
ETA			0.160***
			(0.016)
NPL	-1.388***	-1.403***	-1.395***
	(0.142)	(0.143)	(0.143)
Size	-0.022***	-0.021***	-0.023***
	(0.001)	(0.001)	(0.001)
FFR	0.001***	0.000***	0.001***
	(0.000)	(0.000)	(0.000)
GDP Gap	0.173***	0.199***	0.184***
	(0.018)	(0.018)	(0.017)
Constant	0.258***	0.248***	0.270***
	(0.011)	(0.011)	(0.010)
Number of observations	293,832	293,832	293,832
F Statistic	776.46***	788.90***	769.54***
Number of banks	9,108	9,108	9,108

#### Table 2 • Fixed Effects Estimation

Source: Author calculations. Notes: Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

	(1) Loan_Gr	(2) Loan_Gr	(3) Loan_Gr	(4) Loan_Gr	(5) Loan_Gr	(6) Loan_Gr
Variables	Tier 1 Hight FE	Tier 1 Low FE	CAR Hight FE	CAR Low FE	ETA Hight FE	ETA Low FE
Tier 1 Ratio	0.175***	0.452***				
	(0.021)	(0.061)				
CAR			0.134***	0.286***		
			(0.012)	(0.033)		
ETA					0.148***	0.309***
					(0.021)	(0.047)
NPL	-1 283***	-1.322***	-1.366***	-1.267***	-1.218***	-1.396***
	(0.208)	(0.093)	(0.102)	(0 210)	(0.170)	(0.168)
Size	-0.023***	-0.022***	-0.018***	-0.025***	-0.023***	-0.025***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
FFR	0.000***	0.000	0.001***	-0.000	0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP Gap	0.157***	0.240***	0.120***	0.317***	0.149***	0.284***
	(0.020)	(0.033)	(0.025)	(0.024)	(0.023)	(0.026)
Constant	0 265***	0.248***	0.205***	0.289***	0.269***	0.296***
	(0.013)	(0.018)	(0.019)	(0.013)	(0.016)	(0.014)
Number of observations	206,531	87,301	149,120	144,712	162,063	131,769
F Statistic	465.07***	292.39***	290.86***	505.70***	307.41***	425.16***
Number of banks	8,635	6,049	7,898	7,030	8,110	7,007

#### Table 3 • High vs Low Capitalized Banks

Source: Author calculations. Notes: Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

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	(1) Loan Gr	(2) Loan Gr	(3) Loan Gr
	Tier 1 Ratio	CAR	ETA
Variables	FE	FE	FE
Tier 1 Ratio	0.544***		
	(0.071)		
CAR		0.585***	
		(0.075)	
ETA			0.488***
			(0.059)
NPL	-1.220***	-1.126***	-1.384***
	(0.096)	(0.248)	(0.075)
Size	-0.022***	-0.028***	-0.026***
	(0.002)	(0.001)	(0.001)
FFR	0.000	-0.001***	-0.001*
	(0.000)	(0.000)	(0.000)
GDP Gap	0.266***	0.396***	0.341***
	(0.037)	(0.032)	(0.035)
Constant	0.247***	0.302***	0.302***
	(0.020)	(0.017)	(0.018)
Number of observations	73,518	74,354	75,400
F Statistic	248.21***	338.19***	352.23***
Number of banks	5,637	5,305	5,633

#### Table 4 • Bottom Quartile by Capital Ratios

Source: Author calculations. Notes: Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

	(1) Loan_Gr	(2) Loan_Gr	(3) Loan_Gr	(4) Loan_Gr	(5) Loan_Gr	(6) Loan_Gr
Variables	Tier 1 Ratio Pre crisis	Tier 1 Ratio Crisis	CAR Pre crisis	CAR Crisis	ETA Pre crisis	ETA Crisis
Tier 1 Ratio	0.194***	0.460***				
	(0.026)	(0.038)				
CAR			0.153***	0 350***		
			(0.013)	(0.024)		
ETA					0.127***	0.426***
					(0.021)	(0.031)
NPL	-1.492***	-0.745***	-1.499***	-0.793***	-1.506***	-0.748***
	(0 244)	(0.094)	(0.245)	(0.096)	(0 247)	(0.095)
Size	-0.020***	-0.047***	-0.018***	-0.052***	-0.021***	-0.050***
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
FFR	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP Gap	0.091***	0.149***	0.122***	0.160***	0.121***	0.142***
	(0.032)	(0.017)	(0.031)	(0.017)	(0.031)	(0.017)
Constant	0.230***	0.531***	0.212***	0 579***	0.250***	0.572***
	(0.017)	(0.051)	(0.016)	(0.049)	(0.016)	(0.049)
Number of observations	217,991	75,841	217,991	75,841	217,991	75,841
F Statistic	239.01***	459.31***	256.84***	456.41***	223.67***	471.29***
Number of banks	8,524	6,028	8,524	6,028	8,524	6,028

#### Table 5Pre Crisis vs Crisis Period Analysis.

Source: Author calculations. Notes: Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



#### Notes

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2. Economic Research Department, Banco de Portugal.

3. The other channel is of course the bank lending channel. We, however, do not elaborate on this further as this is beyond the scope of this article. Refer Gambacorta and Mistrulli (2004) for a more detailed discussion on bank lending channel.

4. Adrian and Shin (2010) show pictorally how commercial banks in the US might be actively managing assets to target a constant leverage ratio.

5. Source: Karmakar and Mok (2013)

6. Refer Tabak et. al. (2011).

7. This is done for CAR, T1 Ratio and ETA.

8. Alternative specifications using further lags of capital were estimated but the results remain unchanged.

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# Early warning indicators of banking crises: exploring new data and tools<sup>1</sup>

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#### ABSTRACT

Forecasting rare events is a challenge, especially if these events are driven by many different factors and assume different characteristics. We explore the dynamic dimension of discrete choice models to improve the forecasting accuracy of early warning models of systemic banking crises. Our results show that introducing this dynamic component into the models significantly improves the quality of the results.

## 1. Introduction

Is it possible to predict the next banking crisis? Almost certainly not. On the one hand, it may be argued that it is econometrically very challenging to predict these very rare events, which in many cases have different causes and consequences. On the other hand, if accurately predicting an emerging banking crisis with some anticipation were feasible, policymakers would ideally be able to take all the necessary measures to avoid its materialization, which would then make the method fail.

The aim of this paper is to contribute to improve the early warning toolkit available to policymakers. Over the last decades, there have been many and diverse contributions to this literature to help understand the main drivers of financial crises, as well as to aid policymakers in forecasting the next crisis. A large part of this literature focuses on currency crises, most notably in emerging market economies (Krugman, 1979, Obstfeld, 1986, Burnside *et al.*, 2004, Chang and Velasco, 2001). Nevertheless, currency crises frequently go hand in hand with banking crises, as noted by Kaminsky and Reinhart (1999). When a financial crisis is characterized by serious disruptions and losses in the banking system, the negative effects on the economy usually last longer and are more pronounced (Cecchetti *et al.*, 2009, Jordà et al, 2010, 2012).

Though every crisis seems different and unique (Reinhart and Rogoff, 2011), we explore the commonalities in a dataset of European systemic banking crises. Our main contribution relies on exploring the dynamics embedded in the time series of the dependent and independent variables. We find that using a dynamic probit specification contributes to improve the forecast accuracy of early warning models, both in and out of sample.

This paper is organized as follows. In section 2 we describe the data and introduce the models and the estimation methodology used. In section 3 we discuss our main results, analyze the forecasting accuracy of the models and perform robustness checks. Finally, in section 4 we summarize our main findings.



## 2. Data and methodology

#### 2.1. Data

This article was initially developed as a contribution to the ECB Workshop on Early Warning Tools and Tools for Supporting Macroprudential Policies. As described in Alessi *et al.* (2014), in this workshop a common set of rules and data were given to all participants. The participants were free to use additional data sources, as long as they were publicly available. Furthermore, the variables contained in the dataset could be rescaled or used to create new variables. The only constraint in this domain was that trend and filter calculations could only consider real-time data, in order to replicate as closely as possible the data available to policymakers in each moment of time. This implies, for instance, using lags of variables to consider the period until data is released or computing one-sided or recursive trend filters.<sup>6</sup>

Though participants were able to use different methodologies and data sources, the list of systemic banking crises episodes was common, in order to ensure the comparability of results. Indeed, as noted by Chaudron and de Haan (2014), there are sizeable differences across the databases of systemic banking crises publicly available. Furthermore, Boyd *et al.* (2009) argue that in many cases crisis dates reflect government actions undertaken in response to bank distress and not the emergence of distress in itself. To ensure the best quality possible for this critical variable, the systemic banking crises database collected by the Czech National Bank (Babecky *et al.*, 2012) was used. This database benefited from the inputs of the Heads of Research of the Eurosystem. The database was recently updated with contributions from the ESRB/IWG Expert Group (for further details, see Detken *et al.*, 2014). This database considers two different definitions of crises: one with actual banking crises and another which also includes episodes of heightened vulnerability which could, *ex-post*, have justified the implementation of macroprudential tools, even if no crisis effectively occurred.<sup>7</sup> While for the exercise presented at the ECB Workshop on Early Warning Tools and Tools for Supporting Macroprudential Policies the former definition was considered, in this paper we use the broader crisis definition.

In the abovementioned workshop there was a horse race between different methodologies, as discussed in Alessi *et al.* (2014). To allow for the comparability of the results achieved with different techniques, all participants were asked to report values for a contingency matrix, as well as for the area under the receiver operating characteristic (AUROC) curves.<sup>8</sup>

The exercise was performed in three different time windows: total, early and late periods. The total period comprises the 20 to 4 quarters prior to a crisis, grouping the early and late periods. The early period, defined as 20 to 12 quarters before a crisis, should work better as an early warning tool, giving enough time for policymakers to act. The late period, defined as 12 to 4 quarters before the crisis, explores the information content immediately before the emergence of a crisis, when signals may be stronger and policy action may need to be prompter. A similar reasoning is presented by Oet *et al.* (2010).

Finally, participants were asked to compare not only the in-sample performance of their methodologies, but also the out-of-sample performance. Two exercises were suggested: one excluding the global financial crisis and the other excluding Denmark, Finland and Sweden, where there was a systemic banking crisis in the late 1980s/early 1990s.

Besides the banking crises data, the dataset provided also included several macroeconomic and financial variables from various data sources: private credit (from BIS and from IMF); house prices (EU, BIS and OECD data); equity prices (EU and IMF); nominal and real GDP (EU, IMF); debt service

ratio (BIS, ECB and EUROSTAT; calculations performed by the ECB based on the methodology by Drehmann and Juselius, 2012). In addition, several bank variables were available: net interest income (OECD), net pre-tax income (OECD), capital and reserves (OECD, EU), leverage ratio (EU), total assets (EU). We tried to maximize the information set available. For that purpose, in some cases we combined the series from a given source with data from other sources available in the dataset. Most variables are provided on a quarterly basis. The longest series span from 1970Q1 to 2010Q4. Moreover, the results presented in this paper rely on an updated version of the dataset initially provided by the ECB, using Thomson Reuters. When the data sources were not the same, the series were extended using chain growth rates with data up to 2013Q2.<sup>9</sup> In some cases, the series were also extended back to previous periods.

We implemented a few transformations of the variables provided. First, we computed several ratios, such as credit-to-GDP and total assets of the banking system as a percentage of GDP. Second, we computed year-on-year growth rates for most of the variables. Finally, we estimated deviations from long-term trends, using one-sided Hodrick-Prescott filters with different smoothing parameters.<sup>10</sup>

After these transformations, we obtained 37 possible explanatory variables. In order to select the potentially more relevant variables, we performed an univariate analysis similar to the one described in Bonfim and Monteiro (2013), examining the AUROC of each series. In addition, the availability of information was also considered and the shorter series were not included in this analysis. The best performing variables are equity price indices, the year-on-year growth rate of the debt-to-service ratio, the credit-to-GDP gap with a smoothing parameter of 400 000<sup>11</sup> and the year-on-year growth rate of house prices.

Table 1 presents some descriptive statistics on these variables for the whole sample, while table 2 displays country by country summary statistics. For some countries, there is no information for some of the variables used, thereby implying that these countries are not included in the multivariate analysis (Belgium, Bulgaria, Cyprus, Estonia, Croatia, Hungary, Lithuania, Luxembourg, Latvia, Malta, Poland, Romania, Slovenia and Slovakia). The final sample thus consists of 14 European countries.

Several features are worth highlighting from table 2. Equity prices reached higher values in Portugal and France and were more subdued in Finland, Sweden and Spain. The highest growth in the debt-to-service ratio was observed in Greece and the UK, while in Germany and Finland this ratio did not change much during most of the sample period. The credit-to-GDP gap, which has been found to be one of the best predictors of banking crises (Drehmann *et al.*, 2010), displays relatively low median values in Germany, Netherlands and Austria. The highest median values for this gap are observed in Portugal, Ireland and Italy. Finally, house prices have increased more significantly in Greece, UK, Spain, Ireland and Finland. House price dynamics displayed a smaller magnitude in Germany, Austria, France and Portugal.

#### 2.2. Methodology

Since the seminal work of Estrella and Hardouvelis (1991), binary response models have played an important role in the estimation and forecasting of recessions (see also *e.g.* Wright, 2006, Kauppi and Saikonnen, 2008, and Nyberg, 2009).

In this paper we consider variants of the general dynamic probit model representation,

$$y_{it}^{*} = \alpha + \sum_{k=1}^{p} \sum_{j=1}^{d} \beta_{kj} x_{ij,t-k} + \sum_{k=1}^{p} \gamma_{k} y_{i,t-k} + u_{it}$$
(1)



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#### Table 1 • Summary statistics

	Total s	ample	_			
	Ν	Mean	St. dev.	Min	Median (p50)	Max
Crisis dummy	4816	0.10	0 29	0	0	1
Equity price index	2678	58 5	44 2	1	48.0	265.1
Debt-to-service ratio (yoy)	2827	0.03	0.11	-0.63	0.02	1.24
Credit-to-GDP gap	2285	4.6	12.0	-47.2	2.4	62.5
House price index (yoy)	2834	0.11	0.44	-0.42	0.06	14.42

Sources: Babecky *et al.* (2012), BIS, Detken *et al.* (2014), ECB, Eurostat, IMF, OECD, Thomson Reuters, and authors' calculations. Notes: yoy - year on year growth rate. The crisis dummy takes the value 1 during banking crises or during periods of heightned vulnerability in which a crisis could be eminent. The equity price index combines data from Eurostat and the IMF, to obtain the longest series possible. The debt-to-service ratio series were provided by the ECB, following the methodology of Drehmann and Juselius (2012). The credit-to-GDP ratio was computed as the ratio between domestic private credit series provided by the BIS (and in some cases extrapolated with IMF data) and nominal GDP. In turn, the credit-to-GDP gap was computed as the deviation from the long-term trend of the credit-to-GDP ratio using a one-sided Hodrick-Prescott filter, using a smoothing parameter of 400.000. The house price index combines data from the BIS and OECD.

	Equit in	ty price idex	Debt-to-service ratio (yoy)		Credit-to-GDP gap		House price index (yoy)	
	Ν	median	Ν	median	Ν	median	Ν	median
Austria	177	33 5	167	0.02	169	0.5	132	0.03
Belgium	0		127	0.02	129	6.9	161	0.06
Bulgaria	59	49 8	60	0.15	0		132	0.03
Cyprus	0		75	0.04	0		0	
Czech Republic	84	59.1	66	0.01	80	4.4	80	0.04
Germany	177	54.4	166	0.00	169	-1.4	132	0.03
Dennmark	98	68 8	35	0.02	141	2.9	132	0.05
Estonia	66	54.6	61	0.10	0		30	0.07
Spain	177	26.6	167	0.01	169	1.4	132	0.07
Finland	177	24.0	167	0.00	169	2.4	132	0.06
France	105	79.0	167	0.01	169	1.9	132	0.04
Greece	85	63 3	41	0.10	129	1.2	132	0.12
Croatia	61	89.1	3	-0.06	0		62	0.03
Hungary	93	43 8	67	0.05	0		88	0.09
Ireland	177	32 3	127	0.01	129	8.0	132	0.06
Italy	177	39.7	167	0.01	168	6.1	132	0.05
Lithuania	48	77.4	68	0.14	0		55	0.06
Luxembourg	77	59.6	126	-0.01	0		141	0.09
Latvia	67	65.9	68	0.20	0		26	0.03
Malta	0		160	0.03	0		0	
Netherlands	177	35.1	166	0.01	141	0.1	149	0.04
Poland	0		27	0.08	84	4.1	96	0.09
Portugal	105	79.7	139	0.01	141	12.5	130	0.04
Romania	0		20	-0.04	0		89	0.49
Sweden	177	25.0	167	0.01	129	2.4	132	0.05
Slovenia	62	55 2	32	0.08	0		22	-0.01
Slovakia	75	44.7	24	0.04	0		80	0.07
United Kingdom	177	46.6	167	0.04	169	2.5	173	0.09
Total	2678	48.0	2827	0.02	2285	2.4	2834	0.06

#### Table 2 • Summary statistics by country

Sources: Babecky et al. (2012), BIS, Detken et al. (2014), ECB, Eurostat, IMF, OECD, Thomson Reuters, and authors' calculations. Note: All variables defined in table 1.

where  $y_{it}$  is a binary crisis indicator,  $y_{it}^*$  is a latent variable such that  $y_{it} = 1$  if  $y_{it}^* > 0$  and 0 otherwise;  $x_{ij,t}$ , j = 1, ..., p corresponds to a set of p exogenous covariates, and  $y_{i,t-k}$ , k=1,...,p corresponds to the kth lag of the crisis indicator.

Hence, based on (1), for empirical purposes two distinct models will be considered: i) a marginal model which results from setting  $\gamma_1 = ... = \gamma_p = 0$ , *i.e.*, only considers the effects of covariates on the probability outcomes and treats serial dependence as a nuisance which is captured through association parameters; ii) a transitional model which explicitly incorporates the history of the response in the regression for  $y_{it}^*$  (complete model (1)). Hence, in this way, each unit specific history can be used to generate forecasts for that unit, as opposed to the marginal model which makes forecasts solely on the basis of the values of the exogenous variables.

Estimation of these models is done by maximum likelihood estimation (MLE). The maximization of the likelihood function is a highly nonlinear problem but can be straightforwardly carried out by standard numerical methods. De Jong and Woutersen (2011) showed, for an univariate time series context, that under appropriate regularity conditions, the conventional large sample theory applies to the MLE estimator of the regression parameter vector.

## 3. Results

#### 3.1 Main results

The first step in the analysis consisted of the estimation of the models previously indicated. Thus, denoting the endogenous binary response indicator of crisis by  $y_{it}$  (taking value 1 if a banking crisis is observed and zero otherwise), multistep ahead projections can be obtained through the pooled panel probit specification, where the probability forecast of observing a crisis at time t,  $P(y_{it} = 1)$  is given by  $\Phi(y_{it}^*)$ . In particular,  $\Phi(.)$  is the Gaussian cumulative distribution function and  $y_{it}^*$  is thus a latent variable. Defining h as the forecast horizon, we can adjust (1) to produce the necessary forecasts, *i.e.*,

$$y_{it}^{*} = \alpha + \sum_{k=1}^{p} \sum_{j=1}^{d} \beta_{kj} x_{ij,t-k-h} + \sum_{k=1}^{p} \gamma_{k} y_{i,t-k-h} + v_{it}$$
(2)

The model was estimated with three different lag structures, as discussed above. First we considered 20 to 4 lags of all explanatory variables. This allows us to analyse the determinants of banking crisis 1 to 5 years in advance. In addition, we estimated the model in a so-called "early period", exploring the crisis determinants with a lag between 20 and 12 quarters. This allows us to explore the variables with stronger early warning signals. Finally, we estimate the model in the "late period", using information lagged between 12 and 4 quarters, thus exploring which variables may be more relevant to signal a crisis in the near future.

For all models, we began by estimating the model with all the lags of the four selected explanatory variables (equity price index, the year-on-year growth rate of the debt-to-service ratio, the credit-to-GDP gap, and the year-on-year-growth rate of the house price index). From that estimation, we selected only the variables which were statistically significant at a 10% level, thereby estimating a more parsimonious model. These are the results presented in table 3.

The results regarding equity price indices are not remarkably strong. In the parsimonious representation, the equity price index provides statistically significant signals (10%) at t-6, t-9 and t-10 quarters. The growth of the debt-to-service ratio provides signals with a significant anticipation (at t-16, t-17 and t-20), thereby confirming the results of Drehmann and Juselius (2012). The

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				Si	mple	Probit							Dyr	namic	probit			
	Т	otal P	eriod	Ea [*	arly P 12;20]	eriod   lags	I	Late Pe [4;12]	eriod lags	Т	otal P	eriod	E [	arly P 12;20]	eriod   lags	L	ate Pe [4;12]	riod lags
	Lag	s Coef	P>  z	Lag	s Coef	. P> .  z	Lag	s Coef.	P>  z	Lags	s Coef	. P> .  z	Lag	s Coef	. P> .  z	Lag	s Coef.	P>  z
Crisis dummy										L4. L5.	6.66 -4.09	0.00	L12. L13.	1.33 -0.20	0.00 0.27	L4. L5.	7.44 -4.66	0.00 0.00
										L9. L10. L13. L18.	-0.02 -0 52 0.44 -0.90	0.98 0.22 0.07 0.08						
Equity price index																		
	L5.	0.00	0.44	L12.	0.01	0.06	L5.	-0.01	0.00	L6.	0.02	0.01	L12.	0.01	0.01	L6.	0.01	0.05
	L6.	0.01	0.00	L14.	0.00	0.44	L6.	0.01	0.00	L9.	0.00	033	L13.	0.00	0.10	L9.	-0.01	022
	L9.	-0.01	0.04	L16.	0.00	0.88	L7.	0.00	0.91	L11.	-0.01	0.02	L16.	0.00	0.34			
	L10.	0.01	0.00	LIð.	0.00	0.49	LIU.	0.01	0.17	LIZ.	-0.01	0.00	LIð.	0.00	0.40			
	116.	0.00	0.66							116.	-0.01	0.03						
	L18.	0.00	0.52							L18.	0.01	0.11						
Debt-to- -service ratio (yoy)																		
	L9.	0.73	0.66	L16.	4.76	0.00				L5.	9.10	0.00	L12.	5.59	0.00	L4.	4.47	0.01
	L11.	0 88	0.63	L17.	2.18	0.00				L6.	-5 33	0.08	L16.	3.60	0.02	L12.	4.48	0.00
	L16.	8.62	0.00	L20.	227	0.11				L9.	429	0.02	L17.	2.80	0.11			
	120	4 80	0.00							L10.	2 1 1	0.75						
	L20.	100	0.01							L13.	2.65	0.19						
										L16.	387	0.02						
										L20.	3.40	0.02						
Credit-to- -GDP gap																		
	L4.	-0.03	0.24	L12.	0.06	0.00	L4.	-0.05	0.06	L5.	-0.03	029	L14.	0.01	0.78	L12.	0.00	0.63
	L6.	0.03	0.12	L14.	-0.05	0.01	L6.	0.05	0.00	L6.	0.05	0.07	L17.	-0.04	0.00			
	LIU.	0.05	0.00	L17.	-0.06	0.00	LII.	0.06	0.00	L14.	-0.06	0.01	L20.	0.05	0.00			
	114	-0.07	0.02	LZU.	0.00	0.00	LIZ.	-0.05	0.05	LZU.	0.04	0.05						
	L15.	-0.02	0.16															
	L16.	-0.08	0.00															
	L17.	-0.02	0.14															
	L20.	0.10	0.00															
House price index																		
(уоу)	IЛ	-15 /17	0.00				IЛ	-12 00	0.00	IЛ	-6 27	0.01				IЛ	_11 71	0.00
	L5.	2.72	0.07				L5.	6.88	0.01	L	-0.54	0.74				L.5.	9.35	0.00
	L6.	1 55	0.25							L19.	1.46	0 29						
	L11.	3 27	0.00															
Constant R2 N		-1 83	0.00 0.4084 1316		-1.57	0.00 0.1919 1471		-1.10	0.00 0.2275 1521		-2 38	0.00 0.6145 1274		-1.79	0.00 0.2549 1480		-2.32	0.00 0 5723 1417
												!						

#### Table 3 • Regression results: simple and dynamic probits

Sources: Babecky et al. (2012), BIS, Detken et al. (2014), ECB, Eurostat, IMF, OECD, Thomson Reuters, and authors' calculations. Note: All variables defined in table 1. The total period refers to lags [4;20], the early period [12;20] and the late period [4;12]. Standard errors clustered by country. credit-to-GDP gap is the variable that displays more statistically significant coefficients, with useful signals many quarters ahead of crisis. However, the signs of these coefficients are not always consistent, i.e., in some quarters the estimated coefficients are positive, whereas in others they turn out to be negative. Finally, the year-on-year growth rate of house prices also displays mixed signals, with a positive coefficient at t-5 and t-11, and a perhaps more counterintuitive negative coefficient at t-4. This may suggest that systemic banking crises are more likely after periods of strong growth in house prices that are followed by sharp declines.

In the early period (t-20 to t-12), the results are somewhat different. House prices growth is never statistically significant, thereby showing that this variable does not have strong early warning properties in a multivariate setting. Debt-to-service ratio growth appears significant at t-16 and t-17, maintaining the positive signs of the total period estimation. Equity price indices display a significant positive signal with a lag of 12 quarters. The credit-to-GDP gap is also significant in several periods.

In the period closer to the crisis (*t*-12 to *t*-4), the growth of the debt-to-service ratio is never statistically significant. This means that this variable has strong early warning signalling properties, though not close to the emergence of a crisis. The other three variables continue to provide significant signals.

In the second part of table 3 we present the results for the dynamic models. As discussed before, by exploring the dynamics embedded in a crises time series, we hope to be able to improve the quality of our early warning model. Indeed, including lagged dependent variables in the model specification seems to substantially improve the model fit. Several lags of the dependent variable turn out to be statistically significant in explaining the likelihood of occurrence of a systemic banking crisis, in the three different estimation windows considered. The results concerning the other explanatory variables are broadly consistent. The main exception is the growth of the debt-to-service ratio, which is now significant also in the late period.

All in all, the growth of debt-to-service ratios seems to provide useful guidance for policymakers significantly ahead of crises. The credit-to-GDP gap provides strong signals in all horizons, though not always consistent.

#### 3.2 Model assessment

The main goal of this exercise is to provide useful early warning guidance to policymakers ahead of systemic banking crises. To test how useful the guidance provided by the models may be, several assessment metrics may be considered.

Since the model is a binary response one, we can define a cut-off value for the latent variable. The observation is classified by the model as "crisis" if the latent variable is above the cut-off; otherwise, the observation is "non crisis". This procedure defines, for each cut-off, a classification for each observation in the sample. Notice that we know, from the data, the actual classification of each observation, that is, what actually happened in each country-quarter pair of the sample. Against this background, it is possible to build a contingency matrix that includes four elements: number of true positives (TP - number of correctly predicted crises by the model), number of true negatives (TN – number of non-crises observations correctly predicted by the model), number of false positives (FP) and number of false negatives (FN).

Naturally, a perfect model would classify correctly all observations. This does not happen in practice. As a matter of fact, a very negative value for the cut-off means that a lot of non crisis observations are going to be classified by the model as crisis (this is the so-called type I error, which we



can think of as a false alarm). As we increase the cut-off, more and more non crisis observations are going to be classified as such by the model but some observations that actually are crisis are going to be classified as non crisis (this is the type II error, or a "wolf in a sheep's clothing"). When the cut-off is very high, all observations are classified as non crisis – and so all crisis observations will be wrongly classified as non crisis by the model.

We call specificity to the fraction of non crisis observations that are correctly classified by the model, and sensitivity to the fraction of crisis observations that are correctly classified by the model.

When the cut-off is minus infinity, all observations are classified as crisis by the model; therefore, sensitivity is 1 and specificity is 0. When the cut-off is plus infinity, sensitivity is 0 and specificity is 1. By varying the cut-off we obtain a set of values for these two measures. A possible representation of the model's performance is the Receiver Operating Characteristic curve (or ROC), which we can see in chart 1. This chart illustrates two hypothetical ROC curves. In the horizontal axis we represent 1 minus specificity, that is, the percentage of non crisis observations incorrectly classified as crisis by the model (i.e., type I errors). In the vertical axis we represent sensitivity, that is, the fraction of crisis observations correctly classified as crisis by the model. A given point (x,y)in the curve answers the following question: What percentage x of non crisis observations will be incorrectly classified by the model in order to classify correctly a percentage y of crisis observations? In a perfect model we would be able to correctly classify 100 percent of crisis observations without incorrectly classifying any non crisis observation (0 percent). This means that the perfect model's ROC curve would be the line segment between points (0,1) and (1,1). On the other hand, a model randomly classifying observations will have a ROC curve given by the line segment between points (0,0) and (1,1), i.e., a 45° degree line. In other words, the model would incorrectly classify 25 percent of the non crisis observations to correctly classify 25 percent of the crisis observations. This fact suggests that an adequate measure for the performance of the model is the area under the ROC curve, commonly known as AUROC.

Chart 2 plots the ROC curves for the six specifications presented in table 3, while table 4 presents several indicators to assess the quality of these models.

Examining the model's goodness of fit (evaluated using McFadden R<sup>2</sup>) and the AUROC provides consistent results. The best performance is always obtained for the total period estimation. In contrast, the early period estimations provide the weakest results. This is not surprising, as it



#### Table 4 • Model evaluation

		Simple Probit		[	Dynamic probi	t
	Total Period	Early Period	Late Period	Total Period	Early Period	Late Period
Ν	1316	1471	1521	1274	1480	1417
R <sup>2</sup>	0.408	0.192	0 228	0.615	0.255	0.572
AUROC	0.898	0.792	0 819	0.959	0.834	0.952
Confusion matrix - full sample						
True positives (TP)	149	79	96	190	106	204
False positives (FP)	46	34	42	29	41	37
False negatives (FN)	113	207	200	63	185	78
True negatives (TN)	1008	1151	1183	992	1148	1098
TOTAL	1316	1471	1521	1274	1480	1417
% false alarms	3.5	23	28	2.3	2.8	2.6
% missed crises	8.6	14.1	13.1	4.9	12.5	5.5
% correctly predicted	87.9	83.6	84.1	92.8	84.7	91.9
Sensitivity (TP/(TP+FN))	56.9	27.6	32.4	75.1	36.4	72.3
Specificity (TN/(FP+TN))	95.6	97.1	96.6	97.2	96.6	96.7

Sources: Babecky et al. (2012), BIS, Detken et al. (2014), ECB, Eurostat, IMF, OECD, Thomson Reuters, and authors' calculations. Notes: the results refer to the regressions presented in table 3. The total period refers to lags [4;20], the early period [20;12] and the late period [4;12].





Sources: Babecky et al. (2012), BIS, Detken et al. (2014), ECB, Eurostat, IMF, OECD, Thomson Reuters, and authors' calculations.



Regarding the methodology, the model's performance, assessed by the R<sup>2</sup> and the AUROC, is substantially better when we include dynamic effects, using the lagged dependent variable. This shows that exploring the dynamics of the dependent variable helps to significantly improve the performance of the model, in all the estimation horizons considered.

Though the model's goodness of fit and the AUROC are useful summary measures to assess the performance of each model, it is relevant to consider how many crises the model correctly predicts, how many it fails to predict and how many false alarms exist. This is relevant especially in a setting as ours, with potentially relevant implications for decision-making. Indeed, as noted by Alessi and Detken (2011), policymakers are not indifferent between missing a crisis or acting upon false alarms. As there is a trade-off between these two dimensions, which are subsumed in the AUROC, it might be relevant to look at them separately.

Dynamic probits are able to reduce the percentage of false alarms only for the total and late period estimations. Nevertheless, this percentage is very small in all the models, being at most 3.5 per cent (simple probit for the total period estimation). In contrast, dynamic probits significantly reduce the percentage of missed crises (from 8.6 to 4.9 per cent, in the total period estimation). Given that missing a crisis may be costlier than issuing a false alarm (Demirgüç-Kunt and Detragiache, 1999, Borio and Lowe, 2002, and Borio and Drehmann, 2009), this result suggests that dynamic models may be more useful for policymakers. In addition, dynamic models are able to correctly predict a larger percentage of crisis episodes, most notably in the total and late periods.

It is also interesting to see that dynamic probits allow to significantly increase the models' sensitivity. As mentioned above, sensitivity is defined as the number of true positives as a percentage of the total number of crises, thereby being a so-called true positive rate. This confirms that dynamic probits are more helpful in identifying crisis periods than marginal models. In turn, the specificity of the model, which is defined as the true negatives as a percentage of the total non-crises periods, decreases slightly in the dynamic models, though remaining very high.

All in all, a large battery of metrics confirms that adding a dynamic component to early warning crises models substantially improves the quality of the results, most notably in reducing the percentage of missed crises and in increasing the percentage of those that are correctly predicted. As discussed in Section 2.1, this methodology was part of a horse race between different methodologies presented in an ECB workshop. As mentioned in Alessi *et al.* (2014), dynamic probits were amongst the best performing methodologies.

#### 3.3 Robustness

The results presented so far assess the in-sample performance of the model. However, the quality of the model hinges on its forecasting accuracy. It is thus essential to test the model's out-of--sample performance. To do that, two different exercises were considered. First, an out-of-period estimation was implemented, excluding the global financial crisis period from the sample for all



The results of the simple and dynamic models' performance in these two exercises are presented in table 5. The table shows several evaluation metrics for the simple and dynamic probits, in the three estimation windows considered (total, early and late periods). The in-sample results are compared to the out-of-period and out-of-sample estimations. In these two cases, the models are estimated excluding, respectively, the period and countries mentioned above. The metrics refer to the performance of the prediction of the model for these excluded observations.

We find that the AUROC for the out-of-sample and out-of-period estimations does not decrease significantly in most of the specifications. On the contrary, it actually increases in the simple probit estimations for the total period, as well as in all the out-of-sample dynamic estimations. In turn, the AUROC for the out-of-period estimations decreases only slightly, thus confirming that the performance of the model does not critically depend on the global financial crisis. This could be a concern, as a significant part of the crisis observations in different countries is recorded after 2007.

Nevertheless, the percentage of false alarms increases somewhat, most notably in the out-of--sample estimations. Moreover, the percentage of missed crises increases more significantly in the out-of-period estimation, thus suggesting that the model would not be able to predict the global financial crisis in all the countries in the sample. The percentage of correctly predicted crises also decreases more in this estimation. These latter results are not unexpected, as this crisis was driven in many countries by exogenous shocks rather than by underlying vulnerabilities.

## 4. Concluding remarks

Systemic banking crises are rare, yet extremely costly, events. Accurately predicting them is still very challenging, despite the large body of literature in this domain. In this paper, we provide a methodological contribution to this literature, by exploring the role of dynamic probits in predicting these events.

Using a comprehensive dataset of systemic banking crisis in Europe, we find that equity prices, house prices growth, credit-to-GDP gaps and the growth of debt to service ratios are among the most useful indicators in signalling emerging crises. The last two indicators provide the strongest and most consistent signals in a multivariate setting.

We show that adding a dynamic component to the multivariate modelling of systemic banking crises substantially improves the models' accuracy. This result holds both in and out of sample.

	N	imple prot	bit	ġ Si	mple prok ut-of-perio	bit od	Sir ou	nple probi it-of-samp	it - le	Dy	namic pro	bit	Ρġ	namic prol ut-of-perio	d d	ryd o	namic prol It-of-samp	bit le
	Total	Early	Late	Total Period	Early Period	Late Period	Total Period	Early Period	Late Period	Total	Early	Late	Total Period	Early Period	Late Period	Total Period	Early Period	Late Period
AUROC	0.898	0.792	0.819	0.915	0.743	0.790	906.0	0.792	0.806	0.959	0.834	0.952	0.947	0.788	0.943	0.966	0.842	0.953
Confusion matrix - full	sample																	
True positives	149	79	96	72	12	37	28	∞	19	190	106	204	106	16	106	42	20	42
False positives	46	34	42	19	0	14	27	15	14	29	41	37	6	9	4	17	22	11
False negatives	113	207	200	82	142	119	30	50	48	63	185	78	42	140	47	16	40	18
True negatives	1008	1151	1183	155	174	166	154	197	239	992	1148	1098	153	169	176	156	191	190
TOTAL	1316	1471	1521	328	328	336	239	270	320	1274	1480	1417	310	331	333	231	273	261
% false alarms	35	2.3	2.8	5.8	0.0	4.2	11.3	5.6	4.4	2.3	2.8	2.6	2.9	1.8	1.2	7.4	8.1	4.2
% missed crises	8.6	14.1	13.1	25.0	43.3	35.4	12.6	185	15.0	4.9	12 5	5.5	13.5	42.3	14.1	6.9	14.7	6.9
% correctly predicted	87.9	83.6	84.1	69.2	56.7	60.4	76.2	75.9	80.6	92.8	84.7	91.9	83.5	55.9	84.7	85.7	77.3	88.9
Sensitivity (TP/(TP+FN))	56.9	27.6	32.4	46.8	7.8	23.7	48.3	13.8	28.4	75.1	36.4	72.3	71.6	10.3	69.3	72.4	33.3	70.0
Specificity (TN/(FP+TN))	95.6	97.1	96.6	89.1	1 00.0	92.2	85.1	92.9	94.5	97.2	96.6	96.7	94.4	96.6	97.8	90.2	89.7	94.5
Sources: Babecky et al. (2012), BIS, I	Detken et al. (20	114), ECB, Eurost	tat, IMF, OECD,	Thomson Reuter:	s, and authors' u	calculations.												

Table 5 • Out-of-sample and out-of-period estimation

Sources: Babedy *et al.* (2012), BIS, Detken *et al.* (2014), EGB, Eurostat, IMF, OECD. Thomson Reuters, and authors' calculations. Notes: the results for the out-of-sample exercise exclude Denmark, Finland and Sweden, where there was a systemic banking crisis in the late 1980s/early 1990s, and the results for the out-of-period exclude the global financial crisis that started in 2007. The total period refers to lags [4,20], the early period [12,20] and the late period [4,12].

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#### Notes

1. We are thankful to participants in the ECB/MaRs Workshop on Early Warning Tools and Tools for Supporting Macroprudential Policies and in a seminar at Banco de Portugal for insightful comments and suggestions. The analyses, opinions and findings of this article represent the views of the authors, which are not necessarily those of Banco de Portugal.

2. Banco de Portugal, Economics and Research Department and Nova School of Business and Economics.

3. Banco de Portugal, Economics and Research Department.

4. Banco de Portugal, Economics and Research Department.

5. Banco de Portugal, Economics and Research Department and Nova School of Business and Economics.

6. Despite these efforts, the information is not exactly the same as that that would be available to policymakers, as many macroeconomic variables are subject to ex-post revisions. Edge and Meisenzahl (2011) show that these differences can be sizeable when computing the credit-to-GDP ratio, thereby leading to potential differences when setting macroprudential instruments such as the countercyclical capital buffer ratio.

7. For instance, for Portugal, one additional stress episode that was not effectively a crisis, but in which sizeable vulnerabilities were building up was included. In this period, the occurrence of an endogenous or exogenous shock could have originated an abrupt adjustment of underlying vulnerabilities. Based on this, the quarters 1999Q1 – 2000Q1 were classified as a stress period. See Bonfim and Monteiro (2013) for further details.

8. See definitions of these concepts in Section 3.2 Model assessment.

9. The only series that was not possible to update was the debt-to-service ratio.

10. For an illustration of the impacts of using different smoothing parameters in a similar setting, please see Bonfim and Monteiro (2013).

11. According to the Basel Committee (2010) and Drehmann *et al.* (2010), the deviation of the ratio between credit and GDP from its long term trend is the indicator that better performs in signaling the need to build up capital before a crisis, when examining several indicators for different countries. Given this evidence, the Basel Committee (2010) proposes that buffer decisions are anchored on the magnitude of these deviations (though recognizing the need to complement the decisions with other indicators, as well as with judgment).

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