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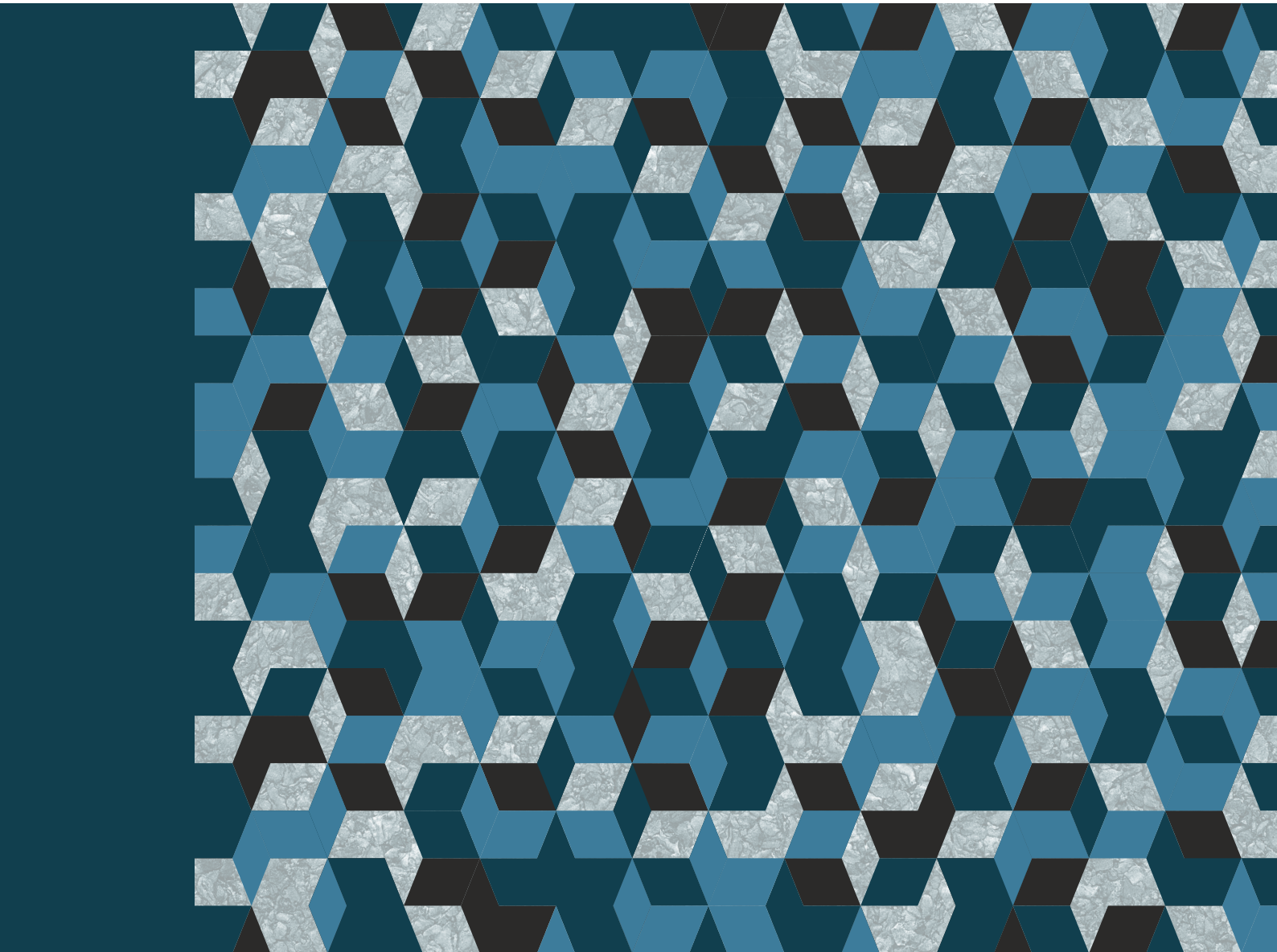
Economic Bulletin

December 2017



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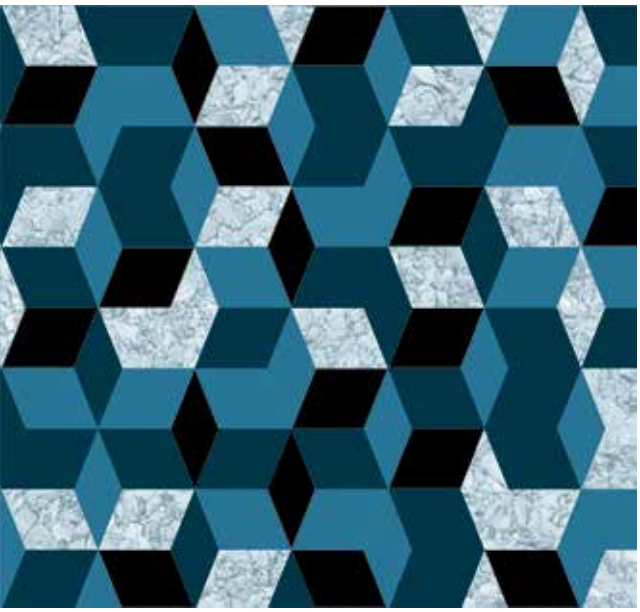


Projections for the Portuguese economy 2017-2020

1. Projections for the Portuguese economy 2017-2020[1]

1.1. Introduction

According to the projections in this *Economic Bulletin*, the Portuguese economy will continue to expand in the years ahead. After an increase of 2.6% in 2017, economic activity will maintain a growth profile over the projection horizon, albeit at a gradually slower pace (2.3%, 1.9% and 1.7% in 2018, 2019 and 2020 respectively) (Table 1.1). At the end of the projection horizon, GDP will stand approximately 4% above the level seen prior to the international financial crisis. Projected growth rates are above the average estimates of potential growth of the Portuguese economy and will translate into a positive output gap in coming years (Special issue 'Potential output: challenges and uncertainties'). GDP growth in Portugal will be close to the euro area average over the projection horizon. In terms of GDP *per capita*, the real convergence process towards the euro area is expected to continue moderately in the next few years, partly reflecting the decline in population in Portugal. Therefore, this trend will be insufficient to offset the real divergence accumulated until 2013 (Chart 1.1).

Table 1.1 • Projections of Banco de Portugal for 2017-2020 | Annual rate of change, in percentage

	Weights 2016	EB December 2017					EB October 2017	EB June 2017		
		2016	2017(p)	2018(p)	2019(p)	2020(p)	2017(p)	2017(p)	2018(p)	2019(p)
Gross domestic product	100	1.5	2.6	2.3	1.9	1.7	2.5	2.5	2.0	1.8
Private consumption	66	2.1	2.2	2.1	1.8	1.7	1.9	2.3	1.7	1.7
Public consumption	18	0.6	0.1	0.6	0.4	0.2	0.3	0.4	0.6	0.3
Gross fixed capital formation	15	1.6	8.3	6.1	5.9	5.4	8.0	8.8	5.3	5.5
Domestic demand	99	1.6	2.7	2.5	2.2	2.1	2.5	2.6	2.2	2.1
Exports	40	4.1	7.7	6.5	5.0	4.1	7.1	9.6	6.8	4.8
Imports	39	4.1	7.5	6.7	5.5	4.8	6.9	9.5	6.9	5.2
Contribution to GDP growth, net of imports (in p.p.) (a)										
Domestic demand		0.7	1.2	1.2	1.0	1.0	1.0	0.8	0.8	0.8
Exports		0.9	1.5	1.2	0.9	0.7	1.5	1.8	1.2	0.9
Employment (b)		1.6	3.1	1.6	1.3	0.9	3.1	2.4	1.3	1.3
Unemployment rate (in % of the labour force)		11.1	8.9	7.8	6.7	6.1	9.0	9.4	8.2	7.0
Current plus capital account (% of GDP)		1.7	1.5	2.3	2.2	2.2	1.8	2.1	2.4	2.4
Trade balance (% of GDP)		2.2	1.8	1.6	1.6	1.5	1.7	2.0	2.2	2.0
Harmonized index of consumer prices		0.6	1.6	1.5	1.4	1.6	1.6	1.6	1.4	1.5

Sources: Statistics Portugal and Banco de Portugal.

Notes: (p) – projected, (p.p.) – percentage points. For each aggregate, this table shows the projection corresponding to the most likely value, conditional on the set of assumptions considered. (a) The demand aggregates net of imports are obtained by subtracting an estimate of the imports needed to meet each component. The import content calculations were based on 2013 data. For more information, see the Box 2 of this Bulletin 'The import content of global demand in Portugal'. (b) Total employment, in number of persons according to the national accounts concept.

The Portuguese economy will further benefit from a favourable external environment over the projection horizon. In effect, the current economic expansion cycle extends to all euro area countries, where Portugal's main trading partners are located, with both growth and inflation dispersion reaching their troughs.[2] Outside the euro area, a sustained expansion is also expected in activity and trade. Monetary and financial conditions will also remain favourable. Monetary policy will also continue to be characterised by high accommodation levels in most developed economies. In turn, the technical assumptions of the projection exercise imply an additional appreciation of the effective exchange rate of the euro in 2017 and 2018, which contributes to moderate the growth of commodity prices in euros, which will be significant in 2017 (Box 1: 'Projection assumptions').

Compared with previous cycles, the current recovery shows a GDP profile very close to the recovery started in 2003 (Chart 1.2). However, the 2003 recovery was interrupted by the international financial crisis, whereas, according to the projection assumptions, the current overall expansion is expected to continue into 2018-2020. In addition, the recovery of activity shows differences in composition between the two cycles, with corporate GFCF and tourism exports showing a more favourable behaviour in the current recovery compared with 2003.

Turning to developments in global demand, GFCF is expected to be the most dynamic component over the projection horizon. Nevertheless, in 2020 GFCF will stand still 11% below the level observed in 2008. Exports will also maintain robust growth over the projection horizon, explained by developments in external demand and continued gains in market share. In 2020, exports are projected to reach a level exceeding by 68% that recorded in 2008 (Chart 1.3).

Private consumption growth will continue to be relatively stable and lower than GDP growth over the projection horizon. This profile reflects the unwinding of pent-up demand effects, as well as developments in real disposable income, influenced by the moderate growth of real wages and the continued recovery of the labour market, albeit at a gradually slower pace. As a result of these developments, and with very limited growth of the labour force, the unemployment rate is projected to maintain a downward trend.

Inflation will increase significantly to 1.6% in 2017, in a context of recovery in the import deflator and slight acceleration in unit labour costs. In the remaining projection horizon, inflation projections will remain relatively unchanged, with gradually lower rates of change in energy prices being offset by a moderate acceleration in the HICP excluding energy goods. In average terms, in the projection period, these developments point to inflation developments broadly in line with that projected by the Eurosystem for the euro area.

The Portuguese economy is expected to maintain a net lending position as a percentage of GDP over the projection horizon. The current and capital account surplus as a percentage of GDP is expected to remain relatively stable in 2017 and increase moderately in the 2018-2020 period. These developments comprise a slight decline in the goods and services account balance as a percentage of GDP, with a reallocation which is unfavourable for the goods balance, albeit partially offset by the services account, where tourism developments stand out. The increase in net lending in 2018-2020 reflects favourable assumptions regarding public debt interest and, in 2018, the profile of structural funds received from the European Union.

1.2. Recent information

Projections for the Portuguese economy in this Bulletin are an integral part of the projections for the euro area recently published by the ECB. In this context, projections include the information available up to 28 November 2017 and the technical assumptions underlying the Eurosystem projection exercise (Box 1 'Projection assumptions'). In particular, they include a GDP

flash estimate for the third quarter of 2017, but information on the breakdown of these developments into the main GDP components was only published after the cut-off date of this Bulletin. Therefore, the analysis of developments in GDP aggregates in the third quarter of 2017 is based on recent short-term indicators and qualitative information included in the press release on the flash estimate.

Slowdown in economic activity in year-on-year terms in the third quarter of 2017 after robust growth in the first half of the year

In the third quarter of 2017, according to the flash estimate published by Statistics Portugal (INE), economic activity grew by 2.5% from the same period in the previous year (2.9% in the

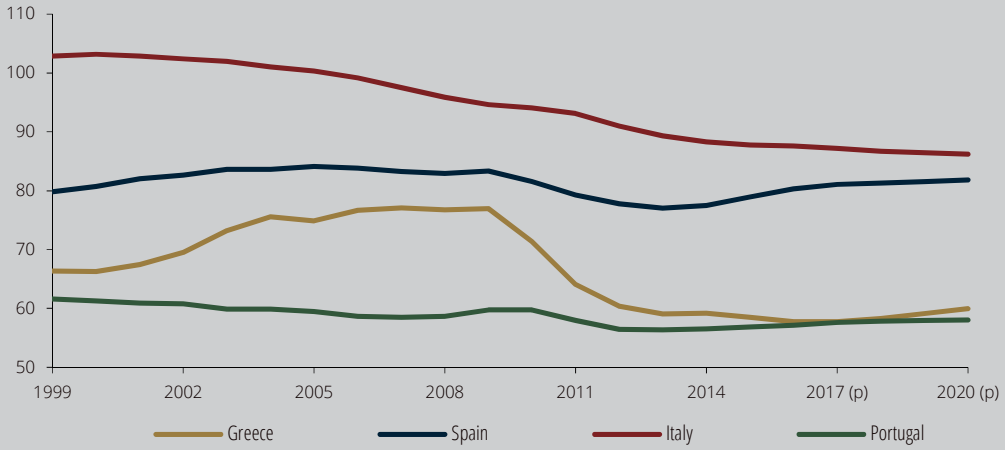
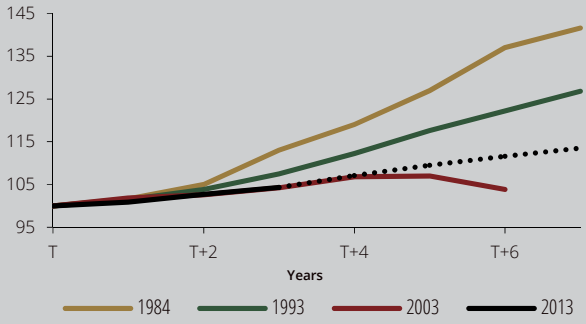


Chart 1.1 • GDP *per capita* | In percentage of the euro area GDP *per capita*

Sources: Banco de Portugal, ECB and European Commission.

Notes: (p) – projected. Population figures correspond to the Autumn 2017 projections of the European Commission for 2018-2019. The underlying assumption for 2020 was the rate of change projected for 2019.

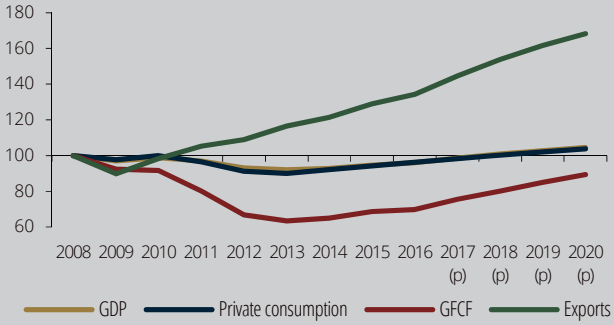
Chart 1.2 • Developments in GDP in different economic recoveries | Index T=100



Sources: Banco de Portugal and Statistics Portugal.

Notes: The economic recoveries considered were determined on the basis of the Portuguese business cycle and had their turning point (T) in 1984, 1993, 2003 and 2013. The 2009 recovery was not considered due to its limited duration. The dotted line corresponds to the projection period.

Chart 1.3 • GDP breakdow | Index 2008=100



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

first half year) and 0.5% from the previous quarter. These developments reflect a slowdown in activity, in year-on-year terms, after the marked upward profile between the third quarter of 2016 and the second quarter of 2017.

The deceleration in economic activity in the third quarter, in year-on-year terms, is reflected in developments of a range of short-term quantitative indicators, but was not broadly based. Exports decelerated, in both goods and services, after the high buoyancy observed in the first half of the year. As regards domestic demand, private consumption accelerated and GFCF slowed down, although maintaining a strong pace of growth.

Net of imports, i.e., subtracting from each demand component an estimate of the imports needed to meet such demand (Box 2, 'The import content of global demand in Portugal'), the contribution of domestic demand is estimated to remain close to that observed in the first half of the year, while that of exports declined. For the fourth quarter, GDP is expected to decelerate, year on year, reflecting a smaller contribution of domestic demand and exports (Chart 1.4).

In the first three quarters of 2017, economic activity developments in Portugal translated into a positive growth differential *vis-à-vis* the euro area, interrupting a long period of negative annual average differentials observed from 2000 to 2016 (only excluding 2009). In effect, the year-on-year growth of Portuguese GDP exceeded the euro area's in the first half of 2017 (by 0.8 p.p.) and was close to the euro area's in the third quarter of the year (Chart 1.5).

Information on the labour market for the third quarter of 2017, obtained from monthly estimates on employment and unemployment, point to continued favourable developments, after the improvement observed in the first half of the year. Year-on-year employment growth in the third quarter was 3%, only slightly below that observed in the first half of the year (3.3%) and the unemployment rate declined to 8.8%, after 9.6% in the first half of 2017 (Chart 1.6). The labour force recovered, with accumulated year-on-year growth of 0.7% in the first three quarters of the year, in contrast with the negative annual rates of change observed from 2011 to 2016.

Acceleration of private consumption and deceleration of GFCF

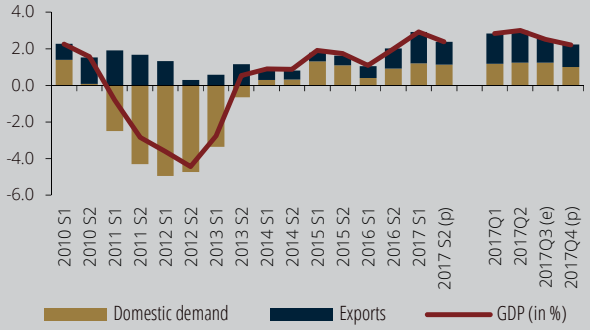
In the context of an increase in real disposable income, gradual improvement in labour market conditions and maintenance of favourable financing conditions, consumer confidence levels maintained the upward profile, after a marked increase in the first half of the year. Against this background, private consumption showed higher growth in the third quarter of 2017 than that observed in the first half of the year, particularly in the durable goods component. The indicator for private consumption of vehicles, although maintaining growth rates well below those observed in the 2014-2016 period, accelerated in the third quarter of 2017 from the first half year and more significantly from the second quarter (Chart 1.7). According to the turnover index in retail trade of durable goods, the buoyancy of expenditure in the other durables continued to be high in the third quarter of 2017.

As regards consumption of non-durable goods, consumption indicators in the national territory[3] point to a deceleration in the third quarter of 2017. This is suggested by developments in the deflated turnover index of retail trade of non-durable goods, in the turnover index in services (considering the items more directly related to final consumption) and in the ATMs withdrawals and payments. This deceleration in the indicators, however, is probably associated with developments in tourism of non-residents. Tourism exports slowed down in the third quarter after very strong growth in the first half of the year, especially in the second quarter (Chart 1.11). Growth of consumption by residents in non-durable goods and services is

estimated to stand slightly above that observed in the first half of 2017.

GFCF maintained robust growth, although below that observed in the first half of the year. In the first half of 2017, however, GFCF showed strong year-on-year growth (approximately 10% after 3.9% in the second half of 2016), reflecting the high buoyancy of its main components (construction, machinery and equipment and transport material). The slowdown in the third quarter seems to have been broadly based across the main types of investment, and may be seen in the indicators

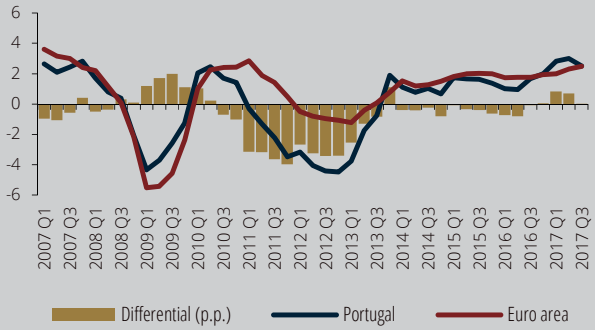
Chart 1.4 • Net contributions to GDP growth, in year-on-year terms | In percentage points



Sources: Statistics Portugal and Banco de Portugal.

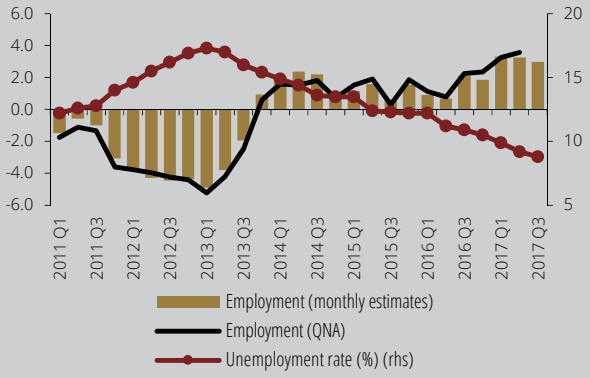
Notes: The demand aggregates net of imports are obtained by subtracting an estimate of the imports needed to meet each component. The calculation of import content was based on data for 2013. For more information, see the Box entitled 'The import content of global demand in Portugal', in this *Economic Bulletin*. (p) – projected. (e) – The GDP decompostion for 2017 Q3 is estimated by Banco de Portugal.

Chart 1.5 • Gross domestic product in Portugal and in the euro area, in real terms | Year-on-year rate of change, in percentage



Sources: Statistics Portugal, Eurostat and Banco de Portugal.

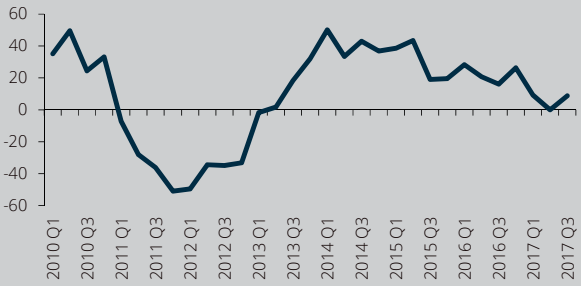
Chart 1.6 • Employment and unemployment rate | Year-on-year rate of change, in percentage



Note: Data for unemplomet rate (15-74 years) are seasonally adjusted.

Sources: Statistics Portugal (QNA and Monthly Employment and Unemployment Estimates).

Chart 1.7 • Private consumption of automotive vehicles indicator | Year-on-year rate of change, in percentage



Sources: ACAP and Banco de Portugal.

for imports of machinery and equipment and cement sales (Charts 1.8 and 1.9). Notwithstanding this deceleration, GFCF continued to show high growth rates in the third quarter of 2017.

In the fourth quarter, domestic demand is expected to maintain robust growth, although lower than that observed in the previous quarter with private consumption and investment projected to decelerate in year-on-year terms.

Deceleration of exports

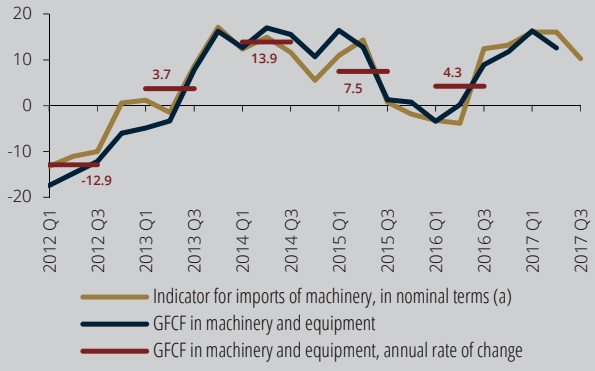
In the third quarter of 2017, exports in volume decelerated from the first quarter of the year, but maintained significant growth. Deceleration was common to goods (especially energy goods, which had grown very strongly in the first half of the year) and services.

Considering the nominal values of international trade in goods (Chart 1.10), the deceleration in goods was relatively broad-based, and the main contribution to that development was made by consumer goods and fuels. The nominal deceleration of fuels reflected the slowdown in oil prices. As regards consumer goods, there was a marked deceleration, in nominal terms, in food and other consumer goods (excluding motor vehicles). In turn, passenger cars grew strongly in the third quarter, partly associated with a rise in the productive capacity of an industrial unit in the motor vehicle sector (this effect is expected to translate into a more significant impact on exports in the fourth quarter).

Tourism exports decelerated in the third quarter from the first half year, but maintaining high buoyancy (Chart 1.11). As regards nominal exports of services excluding tourism, data from the services account show that the deceleration in the third quarter from the first half year was largely due to the behaviour in exports of transports. These developments were the result of a slowdown in passenger transport by air, after very strong growth in the first half year (the nominal year-on-year change was 11.9% in the third quarter, after 22.2% in the first half of the year).

In the fourth quarter, exports are expected to maintain high buoyancy, although with smaller year-on-year growth than in the previous quarter, with special reference to the positive contribution of exports in the motor vehicle sector

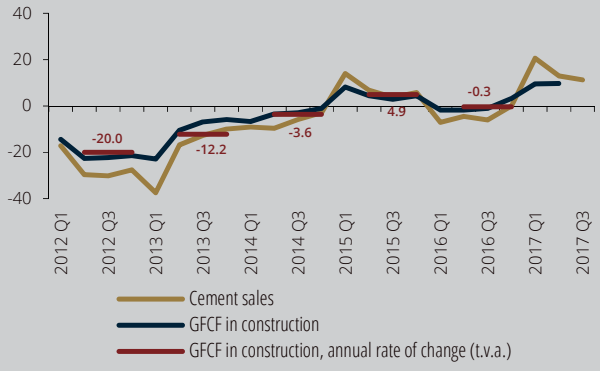
Chart 1.8 • GFCF in machinery and equipment, in real terms | Year-on-year rate of change, in percentage



Souces: Statistics Portugal and Banco de Portugal.

Note: (a) Proxy to GFCF corresponding to the aggregation of machinery and equipment items related to investment.

Chart 1.9 • GFCF in construction,in real terms | Year-on-year rate of change, in percentage



Sources: Cimpor, Statistics Portugal, Secil and Banco de Portugal.

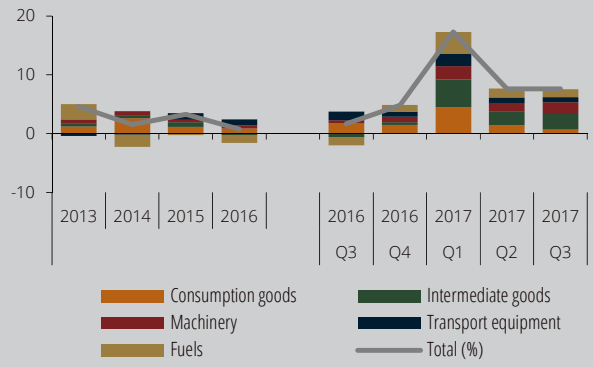
and the continued high pace of growth of tourism exports.

Imports in volume decelerated also slightly on year-on-year terms in the third quarter from the first half of the year, although accelerating from the previous quarter. This reflected the slower pace of growth of non-tourism goods and services, while tourism imports grew at a rate similar to that recorded in the first half of the year. As regards imports of goods, the energy component is estimated to have decelerated significantly, whereas the other goods accelerated. Indications from international trade data in nominal terms are qualitatively similar, in spite of a more marked deceleration in goods, resulting from the additional effect of a deceleration in energy prices.

Imports in volume are projected to decelerate in the fourth quarter, in line with the deceleration expected for global demand weighed by import content.

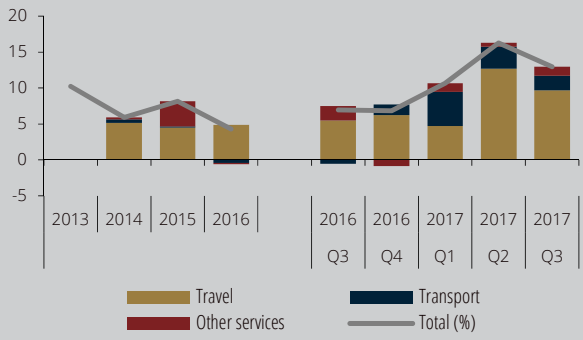
In the three first quarters of 2017 as a whole, the current and capital account surplus as a percentage of GDP declined slightly from 2016, reflecting a fall in the goods and services account surplus. The fall in the goods and services account balance was due to an increase in the goods account deficit which was not fully offset by the favourable developments of the services account. The deterioration in the goods account was largely the result of the unfavourable developments in terms of trade (particularly in the first half year) associated with the strong growth of the energy component prices. The current and capital account balance is projected to improve as a percentage of GDP in the fourth quarter, assuming a significant recovery of the allocation of Community funds to beneficiary institutions, after the fall observed in the first months of the year.

Chart 1.10 • Nominal exports of goods
| Contributions to the year-on-year rate of change, in percentage points



Source: Statistics Portugal.

Chart 1.11 • Nominal exports of services
| Contributions to the year-on-year rate of change, in percentage points



Source: Statistics Portugal.

Box 1 | Projection assumptions

The projections released in this Bulletin are based on a range of assumptions for the external framework of the Portuguese economy, consistent with the Eurosystem's projection exercise published on 14 December. The main technical assumptions can be found in Table C.1.1. and the cut-off date was 28 November.

As regards the international framework, world activity is expected to accelerate in the 2017-2018 period, followed by a slight deceleration in 2019 and 2020. World trade is projected to maintain robust growth over the projection horizon, but slowing down from 2018 onwards. After the significant improvement observed in 2017, external demand for Portuguese goods and services may accelerate slightly in 2018 (to 4.9%, after 4.8% in 2017), followed by a downward profile. In comparison to the assumptions published in previous projection exercises, both world activity and external demand were revised upwards in 2017 and 2018. The deceleration projected for 2018 onwards will be more marked in extra-EU markets, which also saw a sharper aceleration in 2017. On average, in the 2018-2020 period, external demand from intra and extra-EU markets will show similar growth rates (4.1% in the euro area and 4.3% in extra-EU markets).

Considering information implied in the futures market as at the cut-off date, in annual average terms, the oil price (in USD and in euros) will grow more than 20% in 2017 from the previous year, discontinuing the downward trend observed in the 2013-2016 period. Subsequently, the oil price in USD will increase moderately, to stand on average at USD 59 between 2018 and 2020. Compared with previous projection exercises, oil prices are revised upwards when expressed both in USD and euros, although in the latter case at a lower magnitude, due to the upward revision of the euro exchange rate.

Table C.1.1 • Projection assumptions

		EB December 2017					EB October 2017	EB June 2017		
		2016	2017	2018	2019	2020	2017	2017	2018	2019
International environment										
World GDP	tva	3.0	3.5	3.7	3.6	3.5	3.5	3.3	3.6	3.5
World trade	tva	1.5	5.0	4.7	4.3	3.8	5.3	4.5	3.9	4.0
External demand	tva	2.0	4.8	4.9	4.0	3.6	4.5	4.5	3.9	4.0
Oil prices in dollars	vma	44.0	54.3	61.6	58.9	57.3	51.8	51.6	51.4	51.5
Oil prices in euros	vma	39.8	48.2	52.5	50.2	48.9	46.0	47.6	47.0	47.1
Monetary and financial conditions										
Short-term interest rate (3-month EURIBOR)	%	-0.3	-0.3	-0.3	-0.1	0.1	-0.3	-0.3	-0.2	0.0
Implicit interest rate in public debt	%	3.3	3.1	3.0	3.0	3.0	3.2	3.2	3.1	3.1
Effective exchange rate index	tva	2.9	2.3	2.2	0.0	0.0	2.5	0.3	0.4	0.0
Euro-dollar exchange rate	vma	1.11	1.13	1.17	1.17	1.17	1.13	1.08	1.09	1.09

Sources: ECB, Bloomberg, Thomson Reuters and Banco de Portugal.

Notes: yoy – year-on-year rate of change, aav – annual average value. An increase in the exchange rate corresponds to an appreciation of the euro. The technical assumption for bilateral exchange rates assumes that the average levels observed in the two weeks prior to the cut-off date will remain stable over the projection horizon. The technical assumption for oil prices is based on futures markets. Developments in the three-month Euribor rate are based on expectations implied in futures contracts. The implicit interest rate on public debt is computed as the ratio of interest expenditure for the year to the simple average of the stock of debt at the end of the same year and at the end of the preceding year. Assumptions for the long-term interest rate on Portuguese public debt are based on an assumption for the implicit rate, which includes an assumption for the interest rate associated with new issuances.

Interest rate levels have not been substantially revised from those assumed in previous exercises. Reflecting the conduct of the ECB's accommodative monetary policy, the short-term interest rate level will remain low and slightly negative in the 2017-2019 period, reaching a positive value (0.1%) only at the end of the projection horizon. In turn, the long-term interest rate of Portuguese public debt, for which the calculation methodology is based on an estimate of the implied rate that adopts an assumption for the interest rate of new issues, indicates a slight and gradual decline over the projection period, to stand at 3% at the end of the period.

The technical assumption for exchange rates assumes that the average levels seen in the two weeks prior to the cut-off date will remain stable over the projection horizon, which is reflected in higher appreciation of the foreign exchange rate in 2018 than that implied in previous projections. In annual average terms, a similar appreciation is assumed for 2017 and 2018 (2.3% and 2.2% respectively). The euro exchange rate against the USD is also above that implied in the projection of the June issue of the *Economic Bulletin*, reflecting recent developments.

In line with Eurosystem rules, the projections for public finance variables include the policy measures that have already been approved (or are highly likely to be approved) and that have been specified with sufficient detail in official fiscal documents. Therefore, among the measures included in the State Budget for 2018, special reference should be made to the incorporation of the effect of the gradual unfreezing of salary progressions in the general government, the change in in the personal income tax brackets, and the extraordinary update of pensions in August 2018. In addition, the measures previously announced were taken into account, including the elimination of the surcharge on the personal income tax, the update of lower pensions in August 2017, the introduction of social inclusion benefits, and relaxed penalties for early retirement in the case of workers with long contributory careers.

The current estimate for real growth of public consumption in 2017 stands at 0.1 per cent. Underlying these developments is the assumption of an increase in the number of public employees which is only partly offset by the effect of a reduction in the number of hours worked in the general government from 40 to 35 in mid-2016. As regards expenditure in the acquisition of goods and services, it is projected to decline slightly, in real terms, in part due to the decrease in expenditure associated with public-private partnerships in the road sector in 2017. In 2018, the rate of change of public consumption will no longer be affected by the effect of the decline in working hours. On the other hand, lower savings are projected from public-private partnerships in the road sector (in line with the State Budget for 2018). Therefore, in 2018, public consumption in real terms is expected to accelerate. In coming years, in a context of gradual convergence towards the stabilisation of the number of public employees, real public consumption is projected to decelerate gradually.

A positive change is expected for the public consumption deflator over the projection horizon. In 2017 these developments derive from the remaining impact of the reversal of wage cuts previously in force in the general government and, from 2018 onwards, they will be due to the above-mentioned effect of the gradual unfreezing of salary progressions. In the last two years of the projection horizon, wages in the general government are updated in line with price development expectations.

As regards public investment, after the strong fall in 2016, it is expected to recover in 2017 and 2018, although less markedly than projected in the State Budget for 2018. In the other years of the projection horizon, public investment is forecast to evolve in line with nominal GDP.

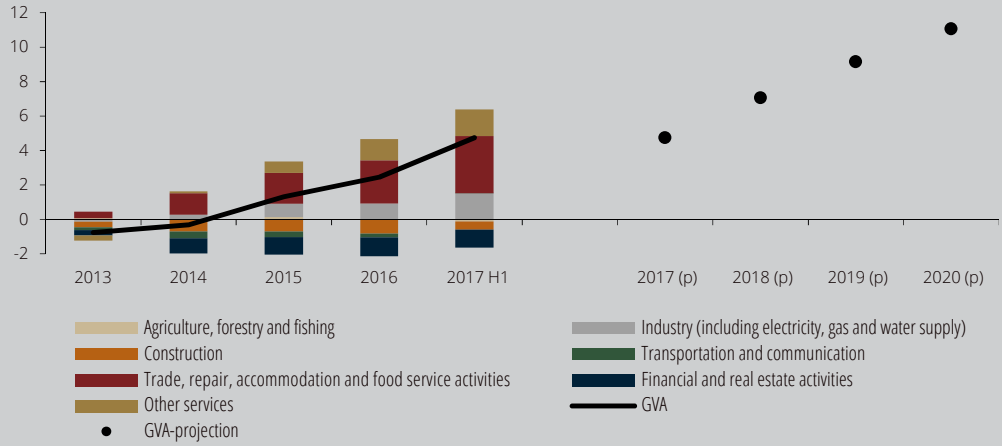
1.3. Demand, supply and external accounts

The current cycle of expansion of the Portuguese economy will extend into the projection horizon, with activity growth rates exceeding the average available estimates for potential GDP growth. According to current projections, GDP is expected to increase by 2.6% in 2017, decelerating gradually to 2.3% in 2018, 1.9% in 2019, and 1.7% in 2020. This pace of growth implies that GDP will resume by mid-2018 its level prior to the international financial crisis, to stand around 4% above that level in 2020.

As regards developments in the supply side of the economy, the recovery has been broadly-based across the main sectors of activity. In construction, the Gross Value Added (GVA) only started to recover at the end of 2016, after the previous declines, while in agriculture the GVA has shown a very volatile behaviour. Reference should be made to the contribution to the ongoing recovery made by the components of services more directly related to tourism (Chart 1.12). In the first half of 2017, construction and industry were the sectors with the highest GVA growth, but most sectors had higher year-on-year rates of change than in the second half of 2016, with the inter-sectoral dispersion levels of GVA growth standing at very low levels. Over the projection horizon, GVA in industry and construction is expected to slow down, in line with developments projected for investment and exports, while services are projected to maintain relatively stable growth.

The labour market is expected to carry on the recovery trend seen in recent years (Chart 1.13). Following very expressive growth in excess of GDP's in 2017 (3.1%), employment is expected to show a growth trend slightly below that of activity, more in line with the historical relationship between those two variables in recovery stages (Chart 1.14). Employment gains derive essentially from developments in private employment. Public employment is also expected to recover, albeit more moderately. At the end of the projection horizon, the employment level is projected to stand at levels approximately 2% below those observed prior to the international financial crisis. Slightly positive rates of change are projected for the labour force during the projection horizon, considering that the cyclical recovery of the economy will lead some inactive individuals, such as discouraged workers, back to the labour market,[4] a trend already observed in recent years. However, the maintenance of the recent population dynamics, characterised by negative natural and migratory balances, may not allow the active population to resume the levels observed prior to the

Chart 1.12 • GVA Breakdown | Cumulative contributions to the GVA rate of change, in percentage points



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected. The dots indicate GVA projections.

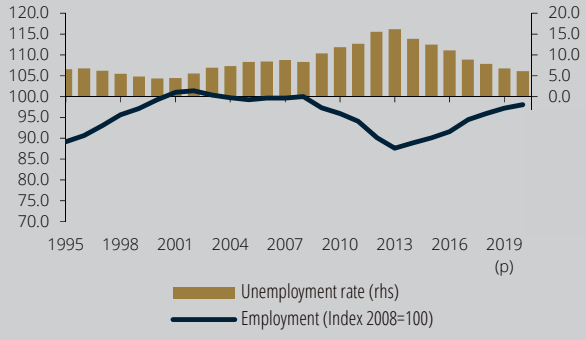
international financial crisis. The combination of these factors implies that the downward trend of the unemployment rate initiated in 2014 will continue, to reach 6.1% in 2020, which is slightly higher than the average observed up to the early 2000s, when the unemployment rate started to increase.

The employment growth in the most recent years, which was fast when compared with activity growth, has resulted in a decline in labour productivity since 2014, a trend that will continue into 2017. Weak productivity developments in this recovery cycle extend to other euro area countries, although the determinants of this phenomenon may differ across countries. In the Portuguese case, evidence available suggests that the source of that phenomenon is predominantly intra-sectoral,[5] which may be based on an allocation of resources short of that required to reach the production-possibility frontier. Among the factors to be taken into account in this context are the capital levels per employee, which are low when compared with those of the euro area,[6] and were severely affected by the recessive period started in 2008.

In effect, the capital stock is projected to maintain a marginally positive contribution to GDP *per capita* growth in 2017-2020, similarly to that observed in 2011-2016 (Chart 1.15). Compared with developments in previous recoveries, the contribution of this production factor has been very modest, reflecting the magnitude of the investment decline during the recession. The levels projected for investment only make it possible to offset capital depreciation (Chart 1.16). However, growth in the stock capital aggregate in the economy as a whole reflects different trends among its components. Whereas the component relating to the private sector excluding housing is expected to exceed, in the projection horizon, the level observed prior to 2008, this will not be the case for the components relating to the public sector and housing, which reflects different investment dynamics across institutional sectors, detailed later in this section.

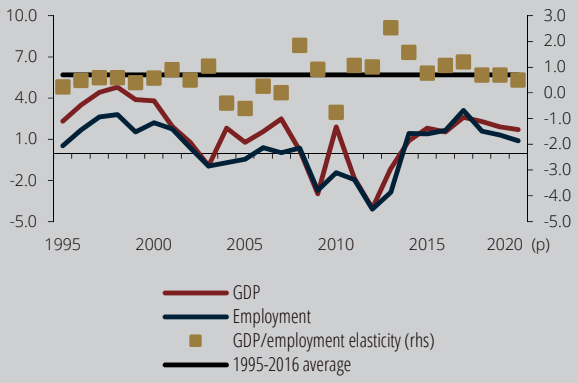
Based on a growth accounting exercise, it may be concluded that the labour factor is the main determinant behind average growth of GDP *per capita* over the projection exercise (approximately 1 p.p.). Human capital will maintain a positive contribution to GDP *per capita* growth, and is expected to be the factor with largest contribution by the end of the projection exercise (0.6 p.p.). These developments fall within a structural trend of increase in the average qualification of the Portuguese population, which is still relatively low, when compared with European standards (Special Issue 'Potential output: challenges and uncertainties' in this

Chart 1.13 • Labour market developments | Index 2008=100 and percentage of the labour force



Sources: Banco de Portugal and Statistics Portugal.
Note: (p) – projected.

Chart 1.14 • GDP and employment | In percentage



Sources: Banco de Portugal and Statistics Portugal.
Note: (p) – projected.

Bulletin). Finally, total factor productivity, obtained as a residual in this exercise, points to a marginally positive contribution during the projection exercise, after a negative average change since the start of the euro area. This should be the result of better allocation of resources in the economy, following a process of reorientation towards sectors more exposed to international competition.

Rebalancing of domestic demand, with more buoyant investment

Chart 1.17 illustrates the shift in expenditure seen over the past few years taking into account aggregates net of average import content, computed with reference to the year 2013. Since 2010 the share of domestic demand in GDP has decreased, particularly in the case of investment. This downward trend in the GFCF share, which started in the beginning of the decade, was reversed in 2014, but the fall during the crisis was strong enough to impact on the supply-side of the economy as of today. The share of private and public consumption in GDP has also followed a downward path in recent years, reflecting the need for fiscal adjustment and the household deleveraging process. In turn, the share of exports in GDP has increased markedly, with this buoyancy extending to the various components of exports of goods and services, most notably tourism. Overall, these trends should persist over the projection horizon, which points to a pattern of more sustainable growth for the Portuguese economy in the medium run.

These developments result in a relatively stable contribution of domestic demand net of import content to GDP over the projection horizon, with similar average contributions of investment and private consumption. The contribution of exports will decrease slightly, to a level below that of domestic demand in the 2018-20 period (Chart 1.18).

Private consumption is expected to continue to grow by approximately 2.1% in 2017-18, slowing down to around 1.8% in 2019-20 and, as such, slightly below GDP rates of change during most of the projection period. At the end of the horizon projection, the share of private consumption in GDP should stand close to the levels seen prior to the financial crisis (Chart 1.17). On average over the projection horizon, private consumption growth should be broadly in line with that expected for real disposable income, indicating an overall stable savings rate (Chart 1.19).

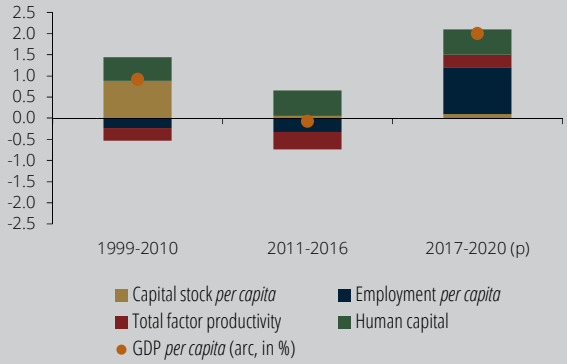
The projected profile includes a shift in private consumption, with a slowdown in consumption of durable goods associated with the unwinding of the pent-up demand effect that followed the recession period. However, rates of change in this consumption component should remain above those of non-durable consumption, which, according to projections, will grow at a relatively stable pace over the projection horizon. Underlying such developments is a slight acceleration in real disposable income in 2018, followed by a slowdown. Against a background of employment slowdown and moderate real wage growth, developments in this aggregate are favoured in 2018-19 by the public finance variables assumptions taken into account. Consumption should also benefit from the maintenance of favourable funding conditions, although a slight deterioration is expected at the end of the horizon, which will have a mild negative impact on disposable income (Box 3: 'Effect of the interest rate increase on household income: heterogeneity by age groups and income quartiles'). At the end of the projection horizon, the durable and non-durable components of consumption are expected to stand slightly above the levels seen prior to the international financial crisis (Chart 1.20).

Following a very substantial acceleration in 2017, to 8.3%, GFCF should continue to grow at a marked – albeit gradually more subdued – pace over the projection horizon, with a rate of change of approximately 6% in 2018-19 and 5.4% in 2020. This path means that, following slightly more dynamic developments than in previous cycles up to 2016, cumulative growth in GFCF will remain clearly above that seen in the recovery that started in 2003 (Chart 1.21). However, the fall in GFCF since the international financial crisis was unprecedented and resulted in a very substantial reduction in the share of this component in GDP,

only partly reversed at the end of the projection horizon. Notwithstanding, GFCF performed differently across institutional sectors (Chart 1.22).

The more buoyant GFCF compared with the recovery that started in 2003 reflects developments in corporate GFCF and, as of 2016, also residential GFCF. At the end of the projection horizon, corporate GFCF is expected to be approximately 5% higher than prior to the international financial crisis. Corporate investment developments benefit from a favourable macroeconomic environment, particularly as regards funding conditions, the maintenance of an expected growth outlook for demand, amid low uncertainty, as well as from

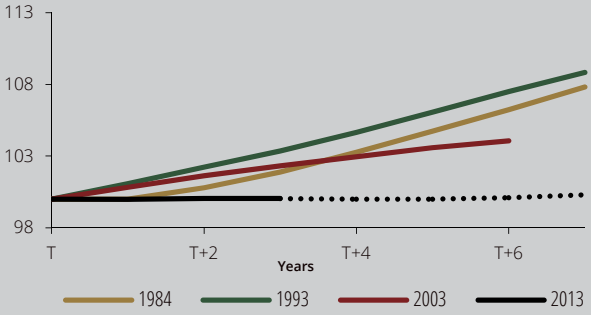
Chart 1.15 • Breakdown of the growth in real GDP *per capita* | Contributions in percentage points



Sources: Barro and Lee (2013), Banco de Portugal, Quadros de Pessoal and Statistics Portugal.

Notes: (p) – projected. The growth accounting exercise of GDP *per capita* is based on a Cobb-Douglas production function. The measures of human capital were constructed from the data of Barro and Lee (2013) 'A new data set of educational attainment in the world, 1950-2010', *Journal of Development Economics 104*, pp. 184-198. For Portugal, these series were annualized and extended using the profile of the average years of education of employment of Quadros de Pessoal (until 2012), the Labour Force Survey of INE (from 2013 to 2015) and the projections available in http://www.barrolee.com/.

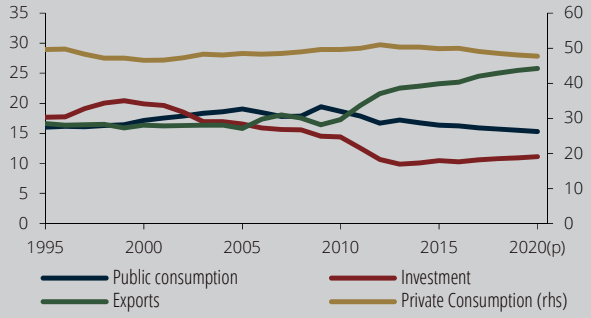
Chart 1.16 • Developments in the contribution of the capital stock *per capita* in different economic recoveries | Index T=100



Sources: Banco de Portugal and Statistics Portugal.

Notes: The economic recoveries considered were determined on the basis of the Portuguese business cycle and had their turning point (T) in 1984, 1993, 2003 and 2013. The 2009 recovery was not considered due to its limited duration. The dotted line corresponds to the projection period.

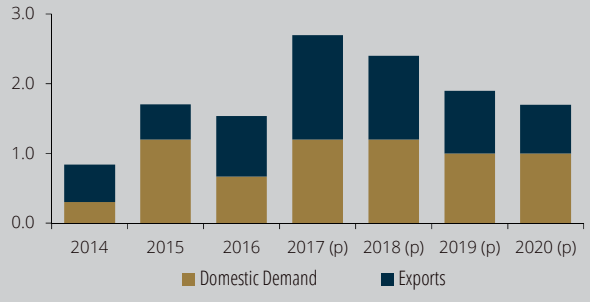
Chart 1.17 • Developments in GDP breakdown | In percentage



Sources: Banco de Portugal and Statistics Portugal.

Notes: (p) – projected. The expenditure components considered are net of imports, i.e., adjusted by the respective average import content.

Chart 1.18 • Net contributions to GDP growth | In percentage points



Sources: Banco de Portugal and Statistics Portugal.

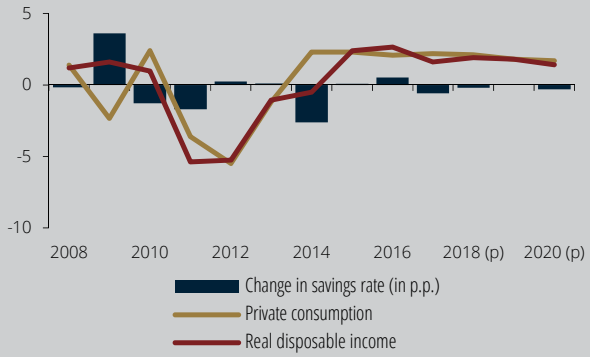
Notes: (p) – projected. The expenditure components considered are net of imports, i.e., adjusted by the respective average import content.

more structural factors, associated with the need to restore the levels and update the quality of productive capital following the recession. These developments also reflect a number of temporary effects, associated with investments by an automotive company in 2017 and the construction of major infrastructures in 2017-18.

Investment in housing, which had followed a downward path since the beginning of the 2000s, started to recover in 2015, with stronger growth projected for this component in 2017-20. Investment in this sector has benefited from increased demand from residents and non-residents, against a background of favourable funding conditions and greater attractiveness of these assets given the marked growth in house prices, which should persist over the projection horizon, albeit more moderately.

Following a very marked reduction in 2016, which led to the slowdown in total GFCF that year, public investment is expected to grow markedly in 2017 and 2018, decelerating to a pace of growth broadly in line with GDP over the remaining projection horizon (Box 1: 'Projection assumptions').

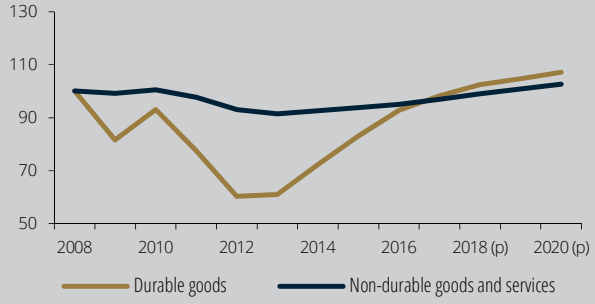
Chart 1.19 • Developments in private consumption, disposable income and saving | In percentage



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

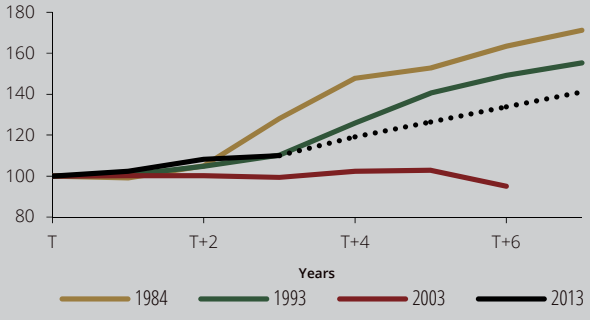
Chart 1.20 • Developments in the private consumption breakdown | Index 2008=100



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

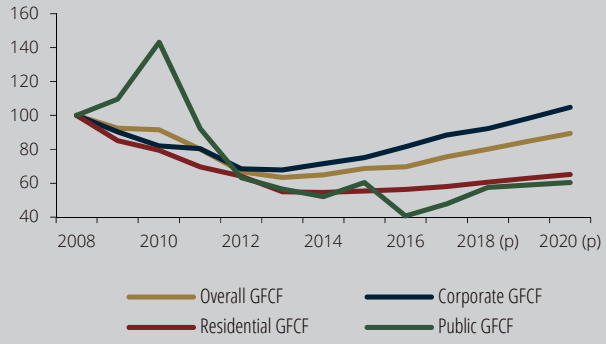
Chart 1.21 • Developments in GFCF in different economic recoveries | Index T=100



Sources: Banco de Portugal and Statistics Portugal.

Notes: The economic recoveries considered were determined on the basis of the Portuguese business cycle and had their turning point (T) in 1984, 1993, 2003 and 2013. The 2009 recovery was not considered due to its limited duration. The dotted line corresponds to the projection period.

Chart 1.22 • Breakdown of GFCF by institutional sectors | Index 2008=100



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

Projected developments in consumption and investment imply an increase in financial debt of households and firms over the projection horizon, in line with credit recovery, but at a slower pace than growth in disposable income and GDP (Chart 1.23).

Buoyant export growth, albeit slowing down

Following great buoyancy in 2017 (7.7%), exports of goods and services are expected to continue to grow strongly over the projection horizon, although with some moderation, from 6.5% in 2018 to 4.1% in 2020. This path reflects a slight moderation in growth in external demand for Portuguese goods and services in 2019-20, together with progressively lower market share gains (Chart 1.24). Developments in total and goods exports in the current recovery cycle have remained very close to those seen in the 2003 cycle, but have stemmed from a comparatively larger contribution from market share gains. In 2017 the very substantial market share gain has also been related with a number of base effects and, at the end of the year, with the impact of the increase in productive capacity in one specific automotive business unit, which will persist in 2018. Behind market share gains is also the contribution of tourism exports, which should continue to grow more than total exports and aggregate external demand for goods and services. Indeed, tourism has performed exceptionally well during the current recovery cycle compared with previous cycles (Chart 1.25). This sector has benefited from an improvement in the competitive position of the Portuguese market, as well as from exogenous factors such as geopolitical tensions in a number of competing destinations. Such exports have made an important contribution to the increase in the share of exports in GDP since 2010 (Chart 1.26).

The unwinding of the aforementioned temporary effects favourable to exports and, to a lesser extent, the possible negative impact on export competitiveness of the appreciation of the euro, is expected to result in gradually lower market share gains, although still positive at the end of the projection horizon.

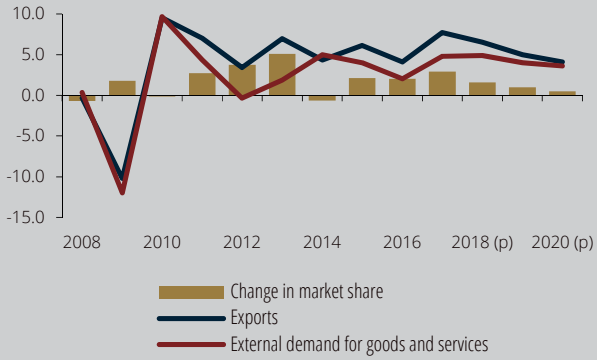
Following a marked acceleration in 2017 (7.5%), imports are expected to progressively decelerate

Chart 1.23 • Debt of the non-financial private sector in Portugal | End of period figures in percentage of GDP and disposable income

Sources: Banco de Portugal and Statistics Portugal.

Notes: (p) – projected. Consolidated values. (a) It includes loans granted to non-financial corporations by other institutional sectors; commercial paper and bonds issued by non-financial corporations held by other sectors and trade credits received from other sectors. (b) The debt of households corresponds to loans and debt securities issued by the sector and trade credit and advances.

Chart 1.24 • Exports and external demand | Annual rate of change, in percentage



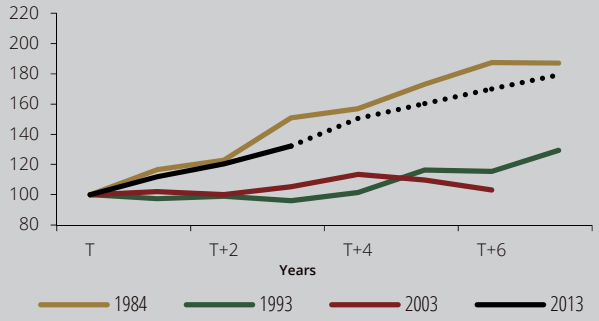
Sources: Banco de Portugal, ECB and Statistics Portugal.

Notes: (p) – projected.

throughout the 2018-20 period, reaching 4.8% growth at the end of the projection horizon. The projected dynamics extend to goods and services components and point to developments broadly in line with the average import-content-weighted global demand elasticity seen in the past. This leads to a greater penetration of imports over the projection horizon (Chart 1.27). The slowdown in imports in 2018-20 – taking into account the average import content of the expenditure components, i.e. the counterpart of Chart 1.18 – chiefly results from the projected profile for exports and, to a lesser extent, from the shift in private consumption towards lower growth in the durable goods component, which has greater import content (Chart 1.28).

Strengthening of the economy's net lending position

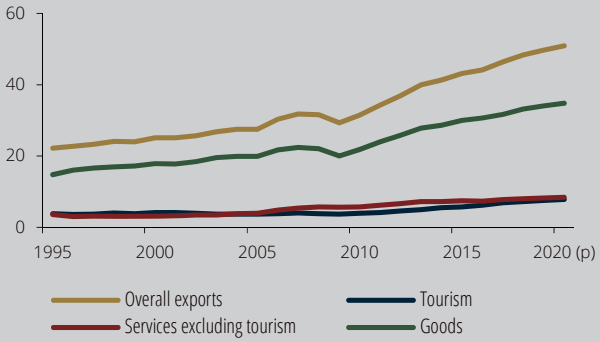
Chart 1.25 • Developments in tourism exports in different economic recoveries | Index T=100



Sources: Banco de Portugal and Statistics Portugal.

Notes: The economic recoveries considered were determined on the basis of the Portuguese business cycle and had their turning point (T) in 1984, 1993, 2003 and 2013. The 2009 recovery was not considered due to its limited duration. The dotted line corresponds to the projection period.

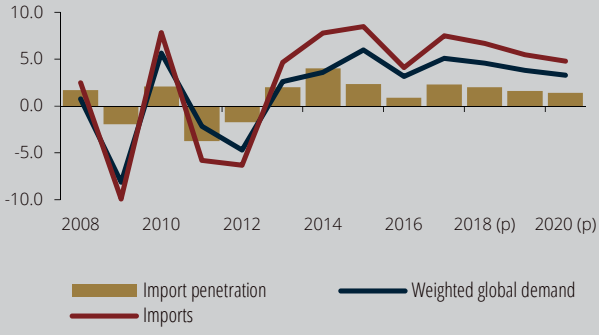
Chart 1.26 • Weight of exports on GDP | In percentage



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

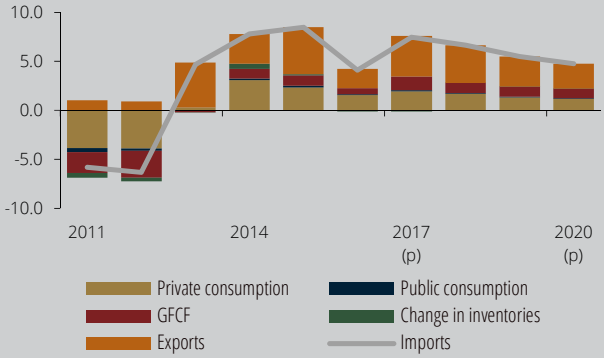
Chart 1.27 • Imports and import-content weighted global demand | In percentage



Sources: Statistics Portugal and Banco de Portugal.

Note: (p) – projected.

Chart 1.28 • Breakdown of imports by global demand components | Contributions in percentage points



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected.

The Portuguese economy is expected to maintain a net lending position over the projection horizon, similarly to that seen since 2012. Following a slight reduction in the current and capital account balance as a percentage of GDP in 2017 (1.5%), net lending is expected to increase in 2018, remaining at around 2.2% of GDP up to 2020.

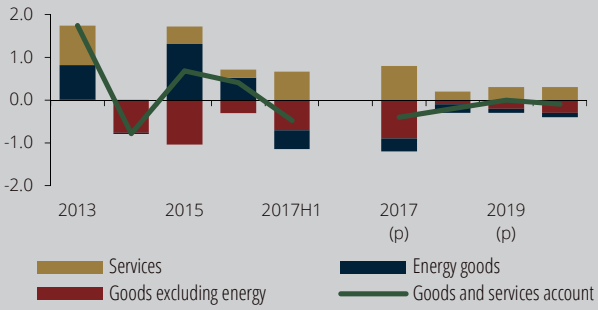
The goods and services account balance as a percentage of GDP should gradually decrease in 2017-20, although slightly. This reduction, already recorded in the first half of 2017, comprises a shift, with an increase in the services account balance, favoured by very dynamic developments in tourism exports, partly offsetting a deterioration in the goods account deficit (Chart 1.29). The increase in the goods account deficit is largely due to a negative volume effect (Chart 1.30), which, in 2017, is exacerbated by a negative terms of trade effect, given that the marked upturn in oil prices tends to hamper an economy with a deficit energy account, such as the Portuguese economy. Also in 2017 there was a negative price effect, stemming from the recovery in the goods exports and imports deflator.

The primary income account deficit as a percentage of GDP is expected to fall gradually in 2017 and 2018, benefiting from the expected path for interest on public debt and the normalisation of inflows from EU structural funds in 2018, after a relatively low degree of implementation in 2016 and 2017. The second factor also explains the projected improvement in the capital account balance in 2018. In 2019-20 the capital and primary income accounts balance is projected to stabilise as a percentage of GDP. The secondary income account balance, in turn, is expected to be relatively stable as a percentage of GDP over the projection horizon, following an increase in 2017.

Projections for GDP revised upwards from previous issues

The projection for GDP growth in 2017 is revised slightly upwards from that released in the two previous issues of the *Economic Bulletin*, with an also marginal upward revision in domestic demand. Compared with the October exercise, the upward revision mainly reflects the incorporation of the flash GDP estimate for the third

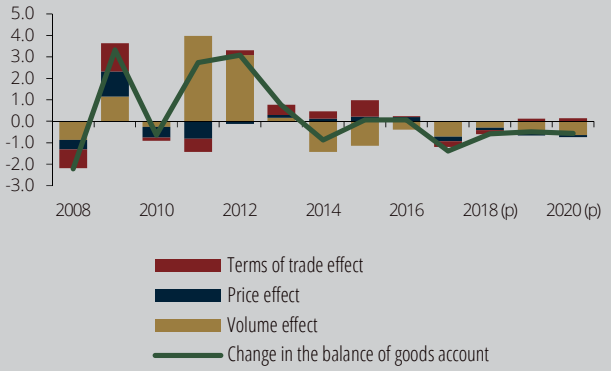
Chart 1.29 • Decomposition of the change in the goods and services account balance | In percentage points of GDP



Sources: Banco de Portugal and Statistics Portugal.

Note: (p) – projected. The 2017H1 change is with reference to the same period of the previous year.

Chart 1.30 • Decomposition of the change in the goods account balance | In percentage points of GDP



Sources: Banco de Portugal and Statistics Portugal.

Notes: (p) – projected. For a description ot the underlying methodology, see Box 4.2 "Change in the goods account balance in the first half of 2012", Banco de Portugal *Economic Bulletin, Autumn 2012*.

quarter of 2017 and recent conjunctural data, with more favourable than expected developments. Compared with the June *Economic Bulletin*, projections of more subdued growth in exports and imports result from the incorporation of National Accounts information for the first half of the year. Such revisions produce dynamic effects with an impact that extends into the following year, which, however, are offset by stronger domestic demand growth in 2018 and 2019. This growth reflects updated public finance assumptions (Box 1: 'Projection assumptions') as well as, in 2018, the positive effects stemming from the incorporation of more recent conjunctural information. This rebalancing in global demand implies an upward revision of GDP growth projected for 2018 and 2019 from the June *Economic Bulletin*.

1.4. Prices and wages

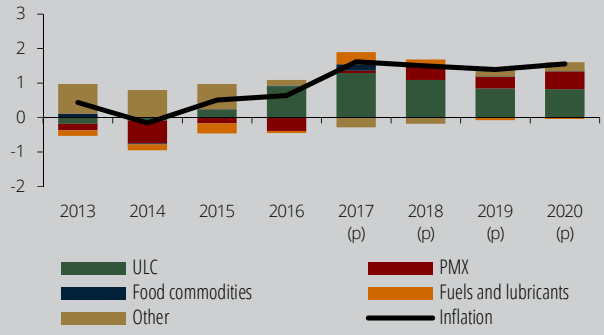
Inflation, as measured by the rate of change in the HICP, rose markedly in 2017, and an annual rate of 1.6% is projected, after a 0.6% increase in 2016. The acceleration in prices in 2017 stemmed from both the energy and the non-energy components. Energy prices are expected to grow by approximately 4% in 2017, following a 1.8% decrease in 2016. Behind price developments in the non-energy component (up by 1.4% from 0.9% in 2016) was, most notably, the substantial growth in services prices, which was considerably influenced by an acceleration in prices of tourism-related activities. In terms of determinants, the acceleration in prices in 2017 reflected the increase in import prices of energy and non-energy goods and an increase in unit labour costs, largely stemming from a reduction in productivity (Chart 1.31).

Compared with the euro area, inflation in Portugal is expected to stand close to projected inflation in the euro area, with a virtually nil differential, on average.

> Relatively stable inflation over the projection horizon, after an increase in 2017

During the 2018-20 period, inflation is expected to stabilise at around 1.5% (Table 1.1). The inflation rate is projected to decline slightly in

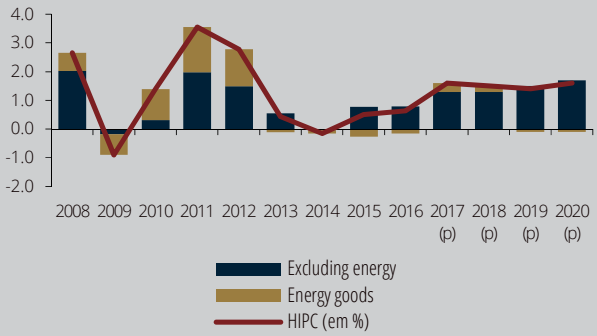
Chart 1.31 • Inflation rate disaggregation in its determinants using MIMO model | Contributions to the annual rate of change, in percentage points



Sources: Eurostat and Banco de Portugal.

Notes: ULC – unit labour costs; PMX – import prices excluding energy; other – includes the effects of indirect taxes, the admnistered prices and the residuals. (p) – projected. MIMO – Monthly Infation Model: for more details see Felix *et al.* (2007) – 'MIMO – A Montly Inflation Model', *Economic Bulletin Winter*, Banco de Portugal.

Chart 1.32 • Harmonised index of consumer prices | Contributions to the annual rate of change, in percentage points



Sources: Eurostat and Banco de Portugal.

Note: (p) – projected.

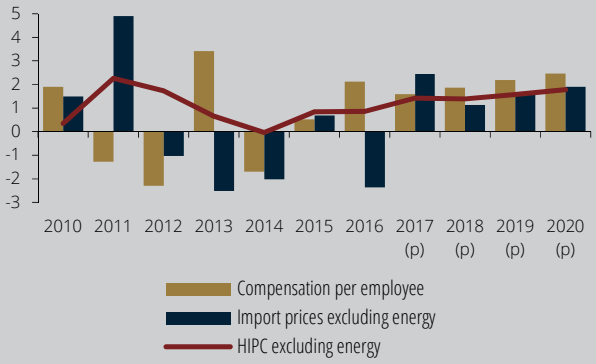
2018, influenced by developments in the energy component, with a subdued price increase below that seen in 2017. In 2019 and 2020, contributions of energy prices to inflation should be virtually nil, in line with the assumptions for oil prices. Non-energy prices are expected to make a positive and increasingly greater contribution in the 2018-20 period (Chart 1.32), chiefly reflecting the acceleration in non-energy industrial goods prices, after falls in prices since 2012. Compared with the June and October issues of the *Economic Bulletin*, inflation levels for the 2017-19 period have remained virtually unchanged.

Underlying the slightly upward developments expected for inflation excluding energy goods in the 2017-20 period is a favourable domestic and external environment, with the protraction of an upturn in activity, the continued impact of monetary policy measures implemented by the ECB, and the maintenance of favourable financing conditions. At domestic level, nominal wages per employee are expected to grow moderately, against an improvement in labour market conditions, via an increase in employment and the maintenance of the downward profile in the unemployment rate and a slight rise in productivity (Chart 1.33).

Import prices have accelerated markedly in 2017, reflecting a strong increase in oil and other commodity prices. Developments in the export deflator were similar, but growth was more muted (given the greater share of oil products in the case of imports), which led to a decrease in terms of trade in 2017. During the 2018-20 period, these deflators are expected to grow at a moderate and relatively stable pace, amid a lack of pressure from the energy component. Export prices should grow slightly more than those in imports, which would result in a slight improvement in terms of trade.

The GDP deflator is expected to follow a slightly upward path between 2017 and 2020. Unit labour costs should decelerate in 2018 – chiefly due to the recovery in productivity growth – and subsequently maintain relatively stable growth, reflecting the combined effect of an acceleration in nominal wages and greater productivity growth. Gross operational surplus per unit of output is expected to increase moderately between 2018

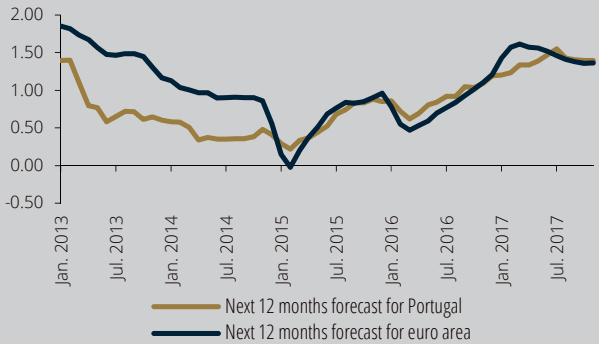
Chart 1.33 • HICP excluding energy | Annual rate of change, in percentage



Sources: Statistics Portugal and Banco de Portugal.

Note: (p) – projected.

Chart 1.34 • Inflation forecasts for Portugal and the euro area | Annual rate of change, in percentage



Source: Consensus Economics.

and 2020 after a decline in 2017, partly reflecting adverse developments in terms of trade.

Higher inflation expectations in 2017

Inflation expectations for the next 12 months, calculated on the basis of Consensus Economics data, point to an increase in 2017 in Portugal and the euro area. Available information indicates that inflation expected in the first half of 2017 has followed an upward path, decelerating somewhat in recent months (up to November). In 2017 and compared with the previous year, projected figures were closer, although still below, the ECB's price stability objective of a rate of change in HICP close to, but below, 2% in the medium term (Chart 1.34). Additionally, inflation expectations for Portugal and for the euro area have converged in recent months.

1.5. Uncertainty and risks

Downside risks to activity and upside risks to inflation in the medium run

Over the projection horizon, a number of risk factors may affect the most likely scenario reflected in the current projections. Risks to activity are mostly external. Downside risks to activity include a possible deterioration in geopolitical tensions at international level, most notably developments in Catalonia (Box 4: 'Macroeconomic impact of the crisis in Catalonia'). The possibility that advanced economies may adopt protectionist measures in the medium run, including the possibility of a more adverse impact of the UK's exit from the EU, may also add to global political uncertainty. Finally, a more substantial economic adjustment in a number of highly indebted emerging market economies, particularly China, cannot be ruled out. In addition to the negative downside impact on external demand for Portuguese goods and services, these risks may also have repercussions on the confidence of economic agents, commodity prices and on a possible further appreciation of the euro. The possibility of an upsurge in financial market tensions may make the monetary and financial environment less favourable than anticipated, with an impact on developments in consumption and investment, taking into account the possible increase in funding costs. In the euro area, the persistence of vulnerabilities in the banking system of some countries may amplify this risk.

However, these risks may be mitigated by the possibility that the current cyclical moment will turn out to be stronger than anticipated at global and domestic level, taking into account the continued improvement in economic agents' confidence and the potential impact of the announced US fiscal policy measures. Moreover, at domestic level, it must also be considered that the recent house price dynamics may have a greater-than-expected impact on investment in this sector and on private consumption.

Turning to inflation, upside risk factors are associated with possible further increases in the minimum wage in 2018 and 2019 and, to a lesser extent, with the aforementioned possibility of a more protectionist trade policy. These risks are partially offset by the possibility that non-energy industrial goods prices maintain the downward path seen since 2012.

As a result of this analysis, there is a low probability that external demand will post more adverse developments than those considered in the most likely scenario in 2018-19 (for 2017, the aforementioned risk factors are considered to cancel out) (Table 1.2). The possibilities of an appreciation of the euro and marginally higher long-term interest rates in 2018-19 were also taken into account.

At domestic level, a probability of 55% was considered that private consumption and investment may grow above projections for 2017, due to more marked cyclical dynamics. In the medium term, however, this effect is more than compensated by downside factors that may affect consumer and entrepreneurs' confidence. As such, there is a marginal probability

that these aggregates show more muted developments in 2018-19. Furthermore, a probability of 55% was considered that real wages grow more than projected for 2018-19, as well as a marginal probability that inflation is above projections for 2018-19.

This analysis points to slightly upside risks to activity in 2017 and downside risks in 2018-19. Upside risks to nominal wages result in a marginally upside risk to inflation in 2018-19.

Table 1.2 • Risk factors – Probability of an outcome below the implicit in the projections | In percentage

	2017	2018	2019
Projection assumptions			
Long-term interest rate	50	51	51
Exchange rate	50	46	44
External demand	50	53	51
Endogenous variables			
Private consumption	45	51	52
GFCF	45	53	53
Wages	50	45	45
HICP	50	49	49

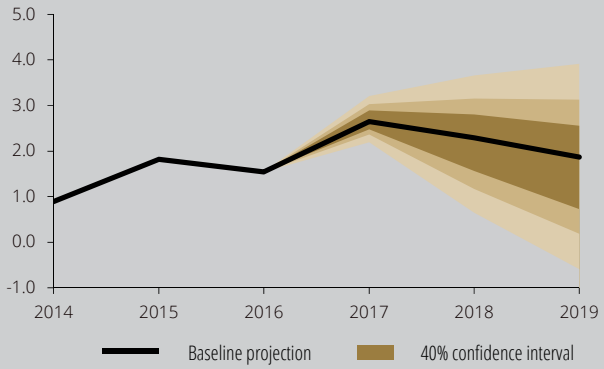
Source: Banco de Portugal.

Table 1.3 • Probability of an outcome below the projections | In percentage

	Weights	2017	2018	2019
Gross domestic product	100	47	54	55
Private consumption	66	40	51	54
GFCF	15	43	54	55
Exports	40	50	53	53
Imports	39	45	53	55
HICP		51	47	45

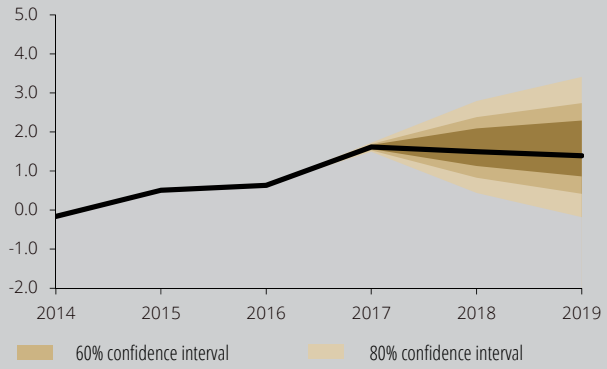
Source: Banco de Portugal.

Chart 1.35 • Gross domestic product | Rate of change, in percentage



Sources: Banco de Portugal and Statistics Portugal.

Chart 1.36 • Harmonized index of consumer prices | Rate of change, in percentage



Sources: Banco de Portugal and Statistics Portugal.

1.6. Conclusions

The global economy is undergoing a cyclical recovery that should extend into the projection horizon. In the euro area, this recovery is synchronised across Member States, with growth and inflation dispersion levels falling to historical lows. The Portuguese economy should continue to be favoured by this dynamic, through a strong behaviour of exports, particularly tourism. The economy has also benefited from particularly favourable monetary and financial conditions, which should continue over the projection horizon, increasing incentives to investment and private consumption. Private consumption has also benefited from the upturn in the labour market, where employment is growing more markedly than activity. Following these developments, GDP growth in 2017-20 is expected to stand above potential and approximately in line with the euro area. This growth should be consistent with the maintenance of major macroeconomic equilibria, particularly as regards the current and capital account surplus.

Over the past few years, there has been increasing reallocation of resources to the tradable goods and services sector, which led to an increase in potential growth of the Portuguese economy. However, some structural fragilities must be taken into account, as they result in the projected slow pace for real convergence of the Portuguese economy. The current cyclical moment should be seized to correct major macroeconomic imbalances, more specifically, to reduce public and private indebtedness. Investment should be increasingly channelled to areas that enhance potential output, via an increase in capital per worker levels and better resource allocation. Another challenge is related with the labour market, given that, despite progress made since 2013, the reintegration of a share of long-term unemployed into the labour market remains challenging. Between 2011 and 2016, labour force has declined, partly due to negative migration flows, which should only be partially offset in the projection horizon. Amid a negative natural balance, demographic developments are, therefore, a constraint to potential growth of the Portuguese economy. An integrated approach to these various dimensions is key to an increase in productivity and economic well-being in the long run.

Box 2 | The import content of global demand in Portugal

This box analyses the import content of the main global demand aggregates, using data recently published by Statistics Portugal. This is an important analysis, notably for assessing the impact of changes in demand components on other macroeconomic variables, such as GDP and the balance of payments. In particular, this information is used to calculate the contribution from each global demand component, less the respective imports, to GDP growth, and to calculate global demand weighted by import content, which is an important indicator for forecasting imports.

Typically, each final demand unit – final consumption, investment or exports – can be met with recourse to domestic output or imports. These imports may be direct or – in the case of imports of intermediate goods needed to domestically produce a good or service – indirect. The calculation of import content by product is based on symmetric matrices of domestic output (at basic prices) and imports containing information both from intermediate consumption (by product and homogeneous branch of production) and final uses by product.[7] These matrices correspond to a breakdown of national accounts data, but are not available with the same frequency, and are expected to be updated every five years. In September 2017 the content of primary inputs for final demand components by product (with a disaggregation of 82 products) for 2013 was released on Statistics Portugal's website.[8] Previously the most recent matrices available were for 2008, calculated by the Department of Prospective and Planning (DPP).[9]

Total import content by major global demand component: 2013 vs 2008

Table C.2.1 presents the total import content (i.e. the sum of direct and indirect imports needed to meet each demand unit) for the main global demand components in 2013 and 2008.[10] The import content presented in this box correspond to values per unit of demand at purchase prices, and thus the non-import content reflects domestic value added and taxes less subsidies. The global demand components with the highest import content are exports and investment (at 45% and 32% respectively in 2013) and the component with the lowest import content is public consumption (9%). Imports needed to meet private consumption are equivalent to 22%.

From 2008 to 2013 the import content of global demand did not undergo considerable changes, although the import content of exports was higher and there was a decline in the import content of domestic demand. Given that data for the import content at the elementary product level were relatively stable over time (Cardoso, Esteves and Rua, 2013), changes in total demand components are generally associated with changes in the disaggregated structure of that component at product level. In addition, the available information by product, even considering the greater detail calculated by Statistics Portugal (82 products), in itself corresponds to a product aggregation. As such, an increase (decrease) in the import content of each category of products might only reflect an increase (decrease) in expenditure on products within that category with greater import content. The shift to base 2011 and the change in the European system of national accounts (entry into force of ESA 2010), which occurred in national accounts data between 2008 and 2013, should also be taken into account. It implied some changes in concepts, with an impact on the expenditure structure, and therefore in the aggregate values of import content. Two of the most important changes were a considerable increase in the level of private consumption of rents and the inclusion of the value of research and development (R&D) expenditure in GFCF, previously considered as intermediate consumption. These two cases, for corresponding to products with very low import content, might partly account for the reduction of import content in total private consumption and GFCF. In turn, the slight increase in the import content of exports is partly associated with a positive structure effect resulting from a rise in the relative importance of some products with higher import content, such as energy.

Some disaggregation of import content by product in 2013

Table C.2.1 shows the import content for the main groups of GFCF products. Investment in construction incorporates relatively low import content (16%), while investment in transport equipment and machinery and equipment contains high shares of import per demand unit (71% and 75% respectively). Public consumption expenditure has a high share of non-tradable services, such as education and health, and thus its import content is comparatively lower.

Given the high share of private consumption and exports in global demand, it is interesting to analyse in greater detail the import content of these demand components by product.[11] Chart C.2.1, shows the import content of private consumption for the main groups of products. Firstly, durables have much higher import content (50%) than non-durables (21%). The consumer products with the highest import content are transport equipment, machinery, chemicals and fuels, while those with the lowest import content are generally services, particularly real estate and education services.

In the case of exports it is also evident (Table C.2.1) that the import content of exports of services (22%) is much lower than that of exports of goods (51%). Chart C.2.2 shows the import content of exports of goods. The highest import content is observed in fuels, transport equipment, chemicals and machinery (all above 40%), while exports of products of wood and cork, other mineral products and fishing products are among those with the lowest import content.

It is interesting to note that both fuels and transport equipment – which in the case of exports essentially corresponds to cars – have very high import content per exported unit (93% in the former and 68% in the latter), which translates into a lower domestic value added compared with other products.

Table C.2.1 • Import content of demand at purchasers' prices | By unit of demand of each component

	2008	2013
Private consumption	**0.26**	**0.22**
Durable	0.53	0.50
Non-durable	0.24	0.21
Public consumption	**0.10**	**0.09**
GFCF	**0.38**	**0.32**
Machinery and equipment	0.68	0.71
Transport equipment	0.76	0.75
Construction	0.22	0.16
Other products	0.19	0.15
Domestic demand	**0.26**	**0.21**
Exports	**0.44**	**0.45**
Goods	0.49	0.51
Services	0.24	0.22
Global demand	**0.29**	**0.27**

Sources: Dias (2016) (see endnote 9), Statistics Portugal and Banco de Portugal.

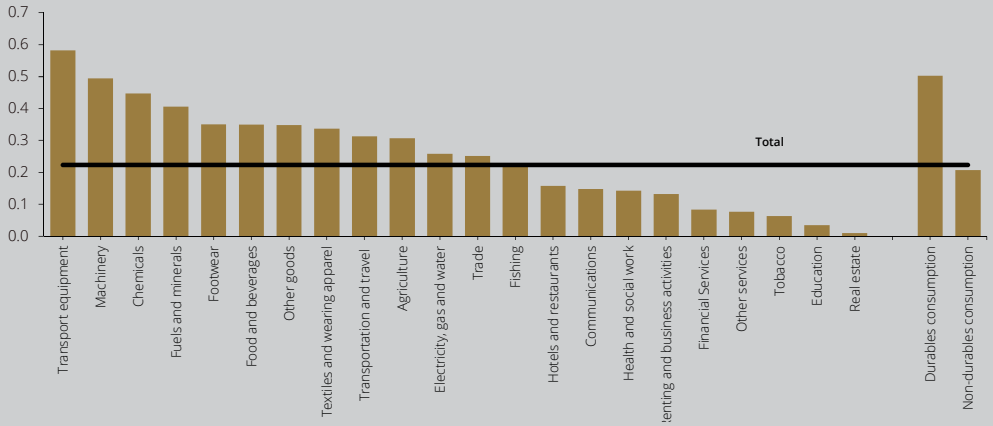
Calculation of net contributions from imports to the rate of change in GDP

The information on the import content of global demand is important to assess the actual contribution from each demand component to GDP growth. Each demand component less its import content equals the so-called net contributions from demand components, which add up to the GDP value.

The calculations of net contributions from the import content to the GDP rate of change presented in this Bulletin are based on the 2013 import content, as shown here for the various components (Table C.2.1). The contribution from each component to GDP growth roughly results from a change in each component weighted by its non-import content, which corresponds to its domestic content.

For 2013 the sum of nominal contributions from demand components less imputed imports equal nominal GDP exactly. For those years when no calculation of import content is available there may be small discrepancies between total imports and the sum of imports deducted from each demand component, assuming said import content is maintained. These discrepancies reflect short-term changes in the degree of import penetration, as well as changes in the components' relative prices.

Chart C.2.1 • Import content of private consumption by products | 2013

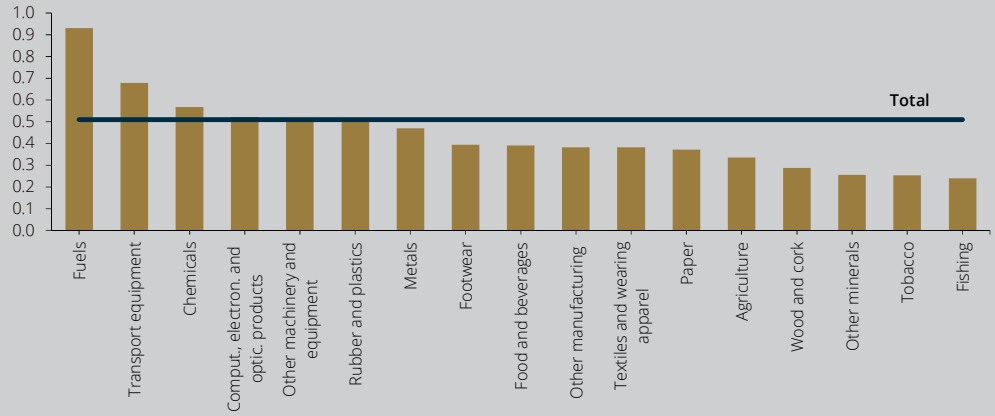


Sources: Statistics Portugal and Banco de Portugal.

The calculation of net contributions assumes that percentage changes in the degree of import penetration are the same for all global demand components.

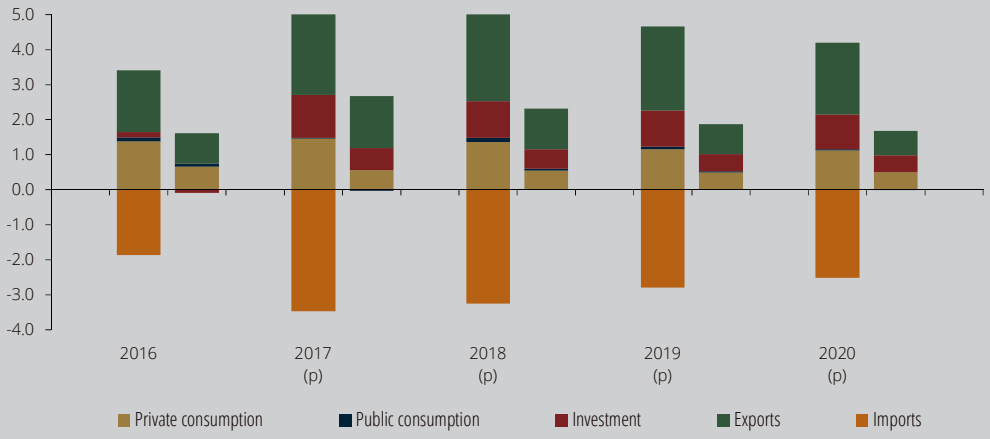
Chart C.2.3 shows the gross and net contributions from demand components to GDP growth implied in this *Economic Bulletin*'s projections. In gross terms, an increase in the contribution from both domestic demand (mainly investment) and exports is expected for 2017, against an increase in the negative contribution from imports. It is also possible to observe that in net terms, given the high import content of investment and exports, these components' contribution is positive, but much lower than in gross terms. For the next few years the net contribution from exports to GDP growth will remain positive, but lower than projected for 2017. Over the course of the projection horizon, the net contribution from exports to GDP growth will continue to be higher than that of private consumption and investment.

Chart C.2.2 • Import content of goods exports | 2013



Sources: Statistics Portugal and Banco de Portugal.

Chart C.2.3 • Gross and net contributions to GDP growth | In percentage points



Sources: Statistics Portugal and Banco de Portugal.

Note: (p) – projected. For each year, the left-hand bar refers to gross contributions from each GDP component and the right-hand bar to the corresponding net contributions.

Box 3 | Effect of an interest rate rise on household income: heterogeneity by age class and income quartiles

This box presents an exercise simulating the effect on household income of a 1 p.p. increase in the short-term market interest rate. Data from the 2013 Household Finance and Consumption Survey (HFCS)[12] were used in order to calculate differentiated effects for households with different characteristics, specifically according to the level of income and age of the reference person.[13]

The exercise is conducted assuming that the change in the interest rate does not affect the composition of household wealth and debt. In addition, the increase in the market interest rate is assumed to pass through to the interest rates on new saving accounts and that households replace all saving accounts with deposits with the new rate.[14] In the case of loans, a total pass-through to interest rates on adjustable interest rate contracts is considered, given that most loans in Portugal are indexed to short-term market rates. Consequently, the exercise calculated, for each household, the effect of a 1 p.p. increase in the interest rate on income through a change in interest on saving accounts and loans with an adjustable interest rate.[15]

Table C.3.1 shows the results of the simulation broken down by income quartiles.[16] The results either considering all households or only the subset with adjustable interest rate debt are presented separately. The effects, measured as a percentage of income, are the average of the individual effects weighted by income. The aggregate impact of the 1 p.p. increase in the interest rate stands at -0.7% of income. The effect is negative for all income quartiles, and is less pronounced in the two lower quartiles, where only a small share of households have adjustable interest rate debt (13% in the first quartile and 23% in the second quartile, compared with 35% for all households). When only households with adjustable interest rate debt are taken into account, the aggregate effect is -2%. The impact is still negative in all income quartiles, albeit more pronounced in households with lower income, partly reflecting the high average level of debt compared with that of deposits.

Table C.3.2 shows the results broken down by age class. When all households are taken into account, the effect on income is positive in age classes where the reference person is aged over 65 and negative for classes with persons aged under 55. The latter have a much higher share of indebted households than the remaining classes and the amount of debt is also higher. Considering only households with adjustable interest rate debt, the interest rate rise has a negative effect on income in all age classes, except in the class where the reference person is aged over 75. The negative effect is particularly pronounced in the two youngest age classes.

To sum up, according to the results and under the assumptions of this exercise, the 1 p.p. increase in interest rates on saving accounts and loans with an adjustable interest rate has differentiated results for households with different characteristics. The effect on income is negative for households with adjustable interest rate debt, in particular younger households and those in lower income quartiles. For all households, i.e. also taking into account households without debt, the aggregate effect is -0.7% of income. This effect may be more pronounced in the case of only partial pass-through of the interest rate rise to deposit rates. In any case, the effect on aggregate consumption is expected to be damped by the fact that in lower income classes, where the propensity to consume is higher, the share of households affected by the increase in interest rates on loans is small.

Table C.3.1 • Results by income quartiles

	% of households	Income	Saving accounts	Debt with adjustable interest rate	Effect of a 1 p.p. increase in the interest rate on:		
					Interest received	Interest paid	Income
		average value in thousand EUR			average change in % of income		
				All households			
q1	25.0	5.9	5.3	6.3	0.9	1.1	-0.2
q2	25.0	12.2	8.7	12.6	0.7	1.0	-0.3
q3	25.0	20.1	11.5	30.3	0.6	1.5	-0.9
q4	25.0	48.0	24.3	58.0	0.5	1.2	-0.7
Total	**100.0**	**21.5**	**12.5**	**26.8**	**0.6**	**1.2**	**-0.7**
				Households having debt with adjustable interest rate			
q1	9.4	6.6	5.2	34.5	0.8	5.2	-4.4
q2	16.5	12.7	3.3	42.2	0.3	3.3	-3.1
q3	32.4	20.3	6.3	59.0	0.3	2.9	-2.6
q4	41.7	46.6	16.7	92.1	0.4	2.0	-1.6
Total	**100.0**	**27.5**	**9.7**	**65.9**	**0.4**	**2.4**	**-2.0**

Memo

	% of households having:		Consumption/Income – average value in %	
	Saving accounts	Debt with adjustable interest rate	All households	Households having debt with adjustable interest rate
q1	30	13	91	100
q2	43	23	65	66
q3	53	45	52	52
q4	68	58	33	34
Total	**48**	**35**	**46**	**43**

Source: HFCS 2013.

Table C.3.2 • Results by age classes

	% of households	Income	Saving accounts	Debt with adjustable interest rate	Effect of a 1 p.p. increase in the interest rate on:		
					Interest received	Interest paid	Income
		average value in thousand EUR			average change in % of income		
				All households			
< 35	11.2	20.6	7.4	50.3	0.4	2.4	-2.1
35-45	20.8	23.8	10.0	54.8	0.4	2.3	-1.9
45-55	20.1	24.9	10.6	32.7	0.4	1.3	-0.9
55-65	18.0	23.9	13.4	13.7	0.6	0.6	0.0
65-75	**15.2**	**18.7**	**17.0**	**4.1**	**0.9**	**0.2**	**0.7**
>=75	**14.7**	**14.6**	**16.4**	**0.5**	**1.1**	**0.0**	**1.1**
Total	**100.0**	**21.5**	**12.5**	**26.8**	**0.6**	**1.2**	**-0.7**
				Households having debt with adjustable interest rate			
< 35	15.3	23.9	6.8	88.4	0.3	3.7	-3.4
35-45	38.3	26.1	10.0	77.1	0.4	2.9	-2.6
45-55	27.1	30.3	9.6	62.1	0.3	2.0	-1.7
55-65	14.4	31.3	11.8	40.1	0.4	1.3	-0.9
65-75	4.4	24.7	5.7	28.3	0.2	1.1	-0.9
>=75	0.4	20.5	30.8	14.0	1.5	0.7	0.8
Total	**100.0**	**27.5**	**9.7**	**65.9**	**0.4**	**2.4**	**-2.0**

Memo

	% of households having:		Consumption/Income – average value in %	
	Saving accounts	Debt with adjustable interest rate	All households	Households having debt with adjustable interest rate
< 35	45	48	45	41
35-45	53	64	46	45
45-55	44	47	44	41
55-65	48	28	45	41
65-75	51	10	51	43
>=75	49	1	49	50
Total	**48**	**35**	**46**	**43**

Source: HFCS 2013.

Box 4 | Macroeconomic impact of the crisis in Catalonia

The political crisis in Catalonia represents a relevant downward risk to the Portuguese economy, given the importance of Spain in Portugal's international economic relations and the potential repercussions at European level. The growth outlook for the Spanish economy remains positive, although, as Banco de España recently pointed out,[17] protracted political tensions in Catalonia, and the associated uncertainty, may affect consumer and business confidence. This would have a negative impact on economic growth in Spain, with consequences on the demand for the goods and services of its trade partners. If the crisis in Catalonia were to deepen, political uncertainty might increase in Europe as a whole, and the discussion of the potential independence of Catalonia might trigger similar tensions in other countries. The empirical literature points to a negative impact on economic activity from an increase in uncertainty.[18]

The purpose of this box is to provide a quantified estimate of the potential impact on the Portuguese economy of an increase in uncertainty associated with political tensions in Catalonia.

The analysis is conducted on the basis of estimates by Banco de España of the impact of two potential scenarios on the Spanish GDP, specifically a scenario of a temporary increase in uncertainty and a scenario where this increase is more protracted. The impact of these scenarios on the Portuguese economy was assessed taking into account two transmission channels: a more direct one, associated with external trade with Spain, and a more indirect one, arising from greater uncertainty in Europe, partly reflecting contagion phenomena.

According to the analysis of Banco de España, the increase in uncertainty associated with the situation in Catalonia may have a significant impact on economic growth and financial stability in Spain. The first scenario, considering a temporary and limited increase in tensions and uncertainty, implies a cumulative negative impact of 0.3 p.p. on GDP growth in Spain, from the fourth quarter of 2017 to the end of 2019. The second scenario, assuming a marked and protracted increase in uncertainty associated with tensions in Catalonia, results in a more pronounced impact on GDP growth rates, reaching cumulative -2.5 p.p. by 2019.

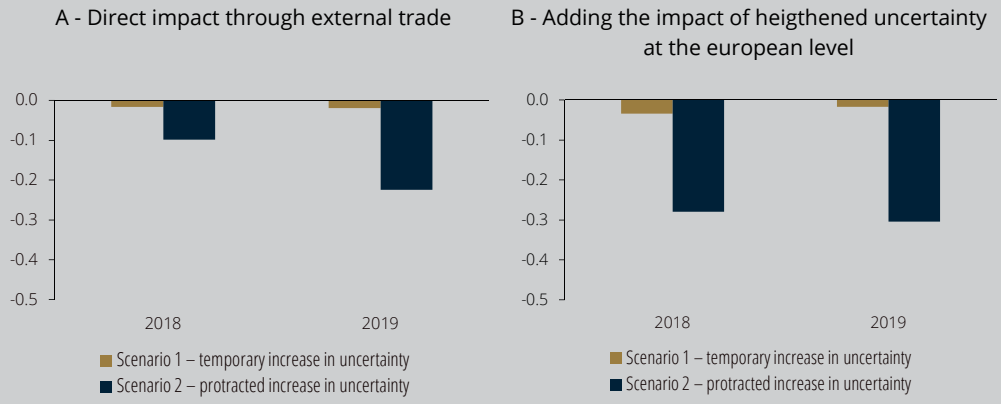
The impact on the Portuguese economy of lower growth in economic activity in Spain was estimated for the two alternative scenarios considered by Banco de España. In a first exercise, only direct repercussions from lower growth of Spanish economic activity and imports were taken into account, while other potential second-round effects were not considered.[19] Implementation of the scenarios considered required a number of working assumptions, specifically an estimate of the impact on Spanish imports, as the analysis conducted by Banco de España only shows the impact on GDP. The impact on imports was obtained using the average elasticity of imports to GDP underlying the macroeconomic projections produced by Banco de España for 2017-19.[20] Lower growth in Spanish imports results in lower growth in the indicator of external demand for Portuguese producers (Spain's share in this indicator is approximately 25%). Lastly, the elasticities implied in the main macroeconomic model for Banco de Portugal projections were used in order to assess the impact on GDP of the decline in external demand. The results obtained are summarised in Chart C.4.1A. In the first scenario, the impact on the rate of change in GDP is negligible, standing below 0.1 p.p. In the second scenario, the impact is of around 0.1 p.p. and 0.2 p.p. in annual GDP growth rates in 2018 and 2019 respectively.

In addition to the direct effect of the increase in uncertainty in Spain, an indirect effect may be considered arising from a simultaneous increase in uncertainty in Europe, in particular in the scenario

of protracted tensions in Catalonia. In order to estimate the impact of this increase in uncertainty at the European level on the Portuguese economy, a BVAR (Bayesian Vector Autoregression) model was used, which includes, in addition to a measure of uncertainty, GDP, employment, the interest rate and inflation.[21] Uncertainty is assessed through Banco de Portugal's Composite Indicator of Financial Stress for Portugal.[22] The modelling strategy for the shock closely follows the analysis carried out by Banco de España. Two alternative scenarios for an increase in uncertainty were estimated and compared with estimates for a scenario where the uncertainty indicator remains unchanged at the level observed in Q3 2017, in the period from Q4 2017 to Q4 2019.[23] The results for each of the alternative scenarios that had been previously considered, plus the effect of an increase in uncertainty at European level – including in Portugal – are shown in Chart C.4.1B.. These scenarios imply a more substantial decline in GDP growth relative to the direct effect scenario. In the scenario of a protracted increase in uncertainty, this impact reaches -0.3 p.p. in 2018 and 2019. However, the shock on uncertainty at European level may not be considered as fully independent from the shock on Spain, given the importance of the Spanish economy on a European scale.

Estimates shown must be interpreted with caution, as they depend on the assumptions considered when preparing the scenarios, as well as on the forecasting tools used. Nevertheless, this analysis illustrates the potential economic impact on the Portuguese economy from developments in the situation in Catalonia, which is a risk factor for projections shown in this *Economic Bulletin*.

Chart C.4.1 • Impact on the Portuguese GDP of alternative scenarios for the situation in Catalonia | Diferences vis-á-vis the baseline rates of change, in percentage points



Source: Banco de Portugal.

Notes

1. All values referring to the projection period included in this chapter are rounded to the first decimal place, and therefore the contributions to an aggregate may not add up.

2. Projections for the euro area and member countries mentioned in this article correspond to the Eurosystem's projection exercise, which also includes the projections for Portugal published in this *Economic Bulletin*. The results of the Eurosystem's projection exercise were published by the ECB on 14 December.

3. The relevant national account concept relating to private consumption is the resident concept, i.e., it refers to expenditure by residents in Portugal, whereas most short-term indicators relating to private consumption (ATM withdrawals/payments, turnover indices in services and retail trade) refer to expenditure made in the territory and therefore include expenditure made by tourists, which in the national accounts are registered as exports.

4. 'Discouraged' individuals are inactive workers who are available for work but not actively seeking a job, possibly because they do not believe the labour market offers jobs with the desired conditions.

5. Box 6 'The evolution of GVA, employment and productivity in the ongoing recovery: sectoral contributions', *Economic Bulletin*, October 2017 and Box 5.3 'Productivity and job reallocation in Portugal', *Economic Bulletin*, October 2016.

6. Box 5.1 'Capital per worker and productivity', *Economic Bulletin*, May 2017.

7. For the methodology used to calculate import content, as well as an analysis of its respective developments over time, see Cardoso, F., Esteves, P. and Rua, A. (2013) 'The import content of global demand in Portugal', Banco de Portugal, Autumn issue of the *Economic Bulletin*.

8. Import content was calculated from the symmetric matrices previously published in the Statistics Portugal's press release: 'Input-output matrices' of 29 December 2016.

9. Dias, A. and Domingos, E. (2011), 'Sistemas integrados de matrizes input-output para Portugal, 2008', *Documento de Trabalho n.º 7*, DPP (Departamento de Prospetiva e Planeamento). In addtion, the corresponding import contents detailed by product and by demand component were published in Dias (2016) "Evolução dos conteúdos importado, de valor acrescentado e de impostos da procura final em Portugal entre 1995 e 2015, com apresentação detalhada para 2008", Documento de Trabalho, Divisão de Estratégia, Planeamento e Estatística dos Serviços de Prospetiva e Planeamento (DEPE/SPP), Secretaria-Geral do Ministério do Ambiente.

10. In the press release on National Accounts for 2015 Statistics Portugal presented estimates of the 2015 import content only for total demand components, obtaining by weighing the 2013 import content by product with the expenditure structure of each final demand component in 2015 (the most recent year for which annual national accounts are available). These aggregated values for 2015 are similar to those for 2013 presented in this box.

11. The import content of 82 products for each (final) global demand component can be seen on Statistics Portugal's website (tables C.6.4 of the national accounts database).

12. The HFCS corresponds to the Portuguese version of the Eurosystem's Household Finance and Consumption Survey. In Portugal, the survey is conducted by Banco de Portugal and Statistics Portugal.

13. For a definition of the reference person and a detailed analysis of the results of the 2013 HFCS, see Costa, S. (2016) 'Financial situation of the households in Portugal: an analysis based on the HFCS 2013', *Banco de Portugal Economic Studies*, vol. 2, No 4, October 2016.

14. Given the assumptions for saving accounts, the positive impact obtained through interest on these deposits may be considered as an upper limit. Indeed, the pass-through of money market interest rates to interest rates on deposits tends to be partial (see Box 4.1, 'The impact of money market interest rates on Portuguese households' disposable income', Banco de Portugal, *Economic Bulletin*, Autumn 2012).

15. According to data from the 2013 HFCS, loans with an adjustable interest rate account for around 95% of the number of loans collateralised by real estate and around 25% of remaining loans.

16. The quartiles of a population, according to a given attribute, are the four groups comprising 25% of the elements of a population, obtained by listing the population in increasing order of this attribute. Consequently, the first income quartile of a population of households is the set of 25% of households with the lowest income and so on.

17. Banco de España, *Financial Stability Report*, November 2017.

18. For evidence on Portugal, see Manteu and Serra (2017), 'Impact of uncertainty measures on the Portuguese economy', *Banco de Portugal Economic Studies Vol. III/2*.

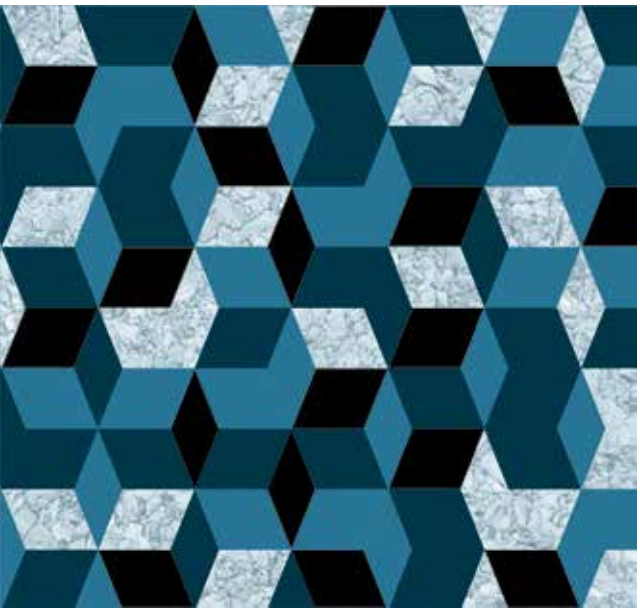
19. The crisis in Catalonia may also have a number of positive effects on the Portuguese economy, associated with phenomena of diversion of trade, tourism and investment flows from this region to Portugal. However, the intensity of this type of effect is very difficult to predict and was not taken into account in this analysis.

20. Banco de España, *Macroeconomic projections for the Spanish economy (2017-2019)*, September 2017.

21. This model and the uncertainty indicators used for Portugal are described in greater detail in Manteu and Serra (2017), 'Impact of uncertainty measures on the Portuguese economy', *Working Paper*, Banco de Portugal.

22. Braga, J. P., Pereira, I. and Reis, T. B. (2014), 'Composite Indicator of Financial Stress for Portugal', *Financial Stability Papers*, No. 1. In Manteu and Serra (2017) this indicator is considered the best proxy to assess the impact of uncertainty on GDP.

23. For scenario 1, the shock on the uncertainty indicator for Portugal assumes an increase in its level in the fourth quarter of 2017, corresponding to the 55th percentile in the distribution of the indicator (standardized). For scenario 2, this increase corresponds approximately to the 60th percentile of the indicator distribution. This increase in uncertainty is lower than that considered by Banco de España for the Spanish economy. In the first scenario, the shock on uncertainty is fully reversed in the following quarter. In the second scenario, the shock is linearly reversed over a period of two years, with the uncertainty indicator returning to the levels of the baseline scenario in the fourth quarter of 2019. The impact on Portuguese GDP growth is obtained as the difference between the conditional projections for developments in this aggregate in the alternative and baseline scenarios. These conditional projections also consider developments in the interest rate in line with the ECB's assumptions included in the projection exercise (Box 1).



Special issue

Potential output: challenges and uncertainties

Potential output: challenges and uncertainties

Introduction

Potential output is an analysis tool widely used by economists and various institutions, including central banks, the European Commission, the IMF and the OECD. The concept of potential economic growth requires a balance to be struck between two objectives, which are deemed crucial for social well-being: output growth and its sustainability over time.

Potential output is a concept associated with the aggregate supply of the economy and a long-term attractor of gross domestic product (GDP).The output gap, defined as the differential between actual real output and potential output, provides an indication of the positioning of the economy in terms of the business cycle. On a long-term basis and in the absence of shocks to the economy, the gap would be nil and the growth rates of potential output would drive economic activity growth. The level and the growth of potential output depend on a number of factors, namely the allocation and quality of resources in the economy, as well as the total factor productivity, i.e. the capacity to use and combine these resources in the most efficient way. Total factor productivity is related to very different aspects such as technological progress, efficient use of production factors or the institutional framework.

The characteristics of potential output are useful for economic policymaking. From a longer-term perspective, the level of *per capita* output is one of the key elements used to define economic well-being in society, strengthening the importance of designing reforms that promote its growth over the long run. From a more cyclical perspective, understanding the position of the economy in terms of the output gap is important for defining an appropriate cyclical policy. Specifically, as far as the public accounts are concerned, the sustainability of public finances and the fiscal consolidation effort are regularly assessed on the basis of potential output, for example, in the calculation of the cyclically adjusted fiscal balance (see Banco de Portugal, 2015a). The use of the concept of potential output is quite common in various research areas; for example, it can be used to assess the role played by international trade in long-term growth, namely in the correlation with the degree of openness of the Portuguese economy (Banco de Portugal, 2017a).

The use of potential output as an analysis tool requires special caution however. Unlike GDP, there are no official estimates of potential output calculated by the statistical offices and harmonised at international level. Potential output is an unobserved variable, which has to be estimated on the basis of a specific methodology. Both the choice of the most adequate model and the degree of accuracy of the point estimate of the models chosen are sources of uncertainty. In addition, the concept of potential output can combine, to various degrees, elements building on the more traditional Keynesian tradition, where the output gap measures the over- and underutilisation of productive resources, and elements building on a more neoclassical tradition, where short-term fluctuations are widely determined on the supply side, reflecting points of equilibrium, that may be temporary, depending on market conditions.

Estimates available for the Portuguese economy indicate that the growth rate of GDP currently exceeds the growth rate of potential output. Turning to the output gap, most estimates suggest that the particularly negative gap recorded

during the international financial crisis is approaching zero. The current expansionary phase is an opportunity for renewed discussion about future challenges, considering the need to implement policy measures intended to increase the pace of sustainable growth of the Portuguese economy. These measures should affect the supply side of the economy, and have a lasting and structural nature.

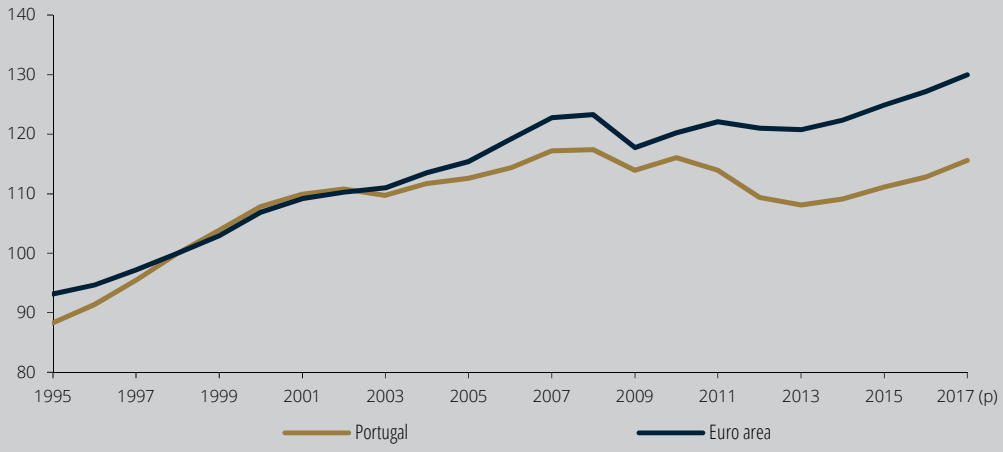
This Special issue presents the key questions around the use of potential output as an economic analysis tool and is organised as follows: the first part discusses the concept of potential output and some calculation methods referred to in literature. The second part presents several quantifications of potential output, as well as developments in some key factors for its calculation, building on information available for Portugal and the euro area. The third part discusses the uncertainties and restrictive factors underlying their quantification. Finally, the importance of structural changes for calculating potential output is discussed.

Concepts and methods

Potential growth requires a balance to be struck between increasing production and its sustainability over time. Overall, this indicator is understood as a measure of economic growth in the medium to long-term (European Central Bank, 2011), which may be above or below the actual GDP growth rates.

Chart 1 shows developments in GDP since 1995 for Portugal and the euro area. The results confirm the coexistence of (greater or smaller) expansionary periods with periods of economic recession, with special emphasis on the impact of the recent international financial crisis, followed by the sovereign debt crisis in the euro area. In Portugal, the fall in GDP after 2007 was very persistent and substantial, and higher than in the euro area, increasing a divergence that lasts until 2017. These developments are sufficient to raise a number of relevant questions. What should be expected for the Portuguese economy, ignoring short-term temporary swings? What should be expected in comparison with the euro area? Which factors may influence future developments? To get an answer to these questions potential output must be estimated.

Chart 1 • Developments in GDP | Index, 1998 = 100



Sources: Banco de Portugal and European Commission (AMECO).

Notes: For the year 2017 projected values are used: in the case of Portugal, these values correspond to the projections of Banco de Portugal presented in this *Economic Bulletin*; in the case of the euro area, these values correspond to the projections of the European Commission.

Potential output may be interpreted in the light of different economic theories. Historically, this discussion has been centred on two main poles: theories inspired by the neoclassical and keynesian views. Under the former, the economy is considered to have real economic cycles, with swings in potential output resulting from technology and productivity shocks. The economy is always in equilibrium, with output at its maximum possible level, given the constraints. Changes in supply conditions are gradually incorporated into the productive process, namely through optimal decision-making by market agents. Nominal aspects, ultimately, are irrelevant. In fact, theories inspired by neoclassical authors can be identified through a clear separation between real and nominal variables (Mankiw, 2003).

Under the latter, the economy has economic cycles associated with supply and demand conditions. Sticky prices and sticky wages have major implications for the dynamics of the quantities, with a clear separation between real and nominal variables ceasing to exist (Mankiw, 2003). In this context, in his seminal work of 1962, Okun defines potential output as what an economy is able to produce under full employment, understood as the maximum production that does not generate nominal instability (a different concept from that of maximum possible production). This definition associates the notion of long-term sustainability to price stability. The economic cycle is interpreted as a situation of over- or underutilisation of productive capacity, reflecting excess or insufficient aggregate demand respectively.

A significant number of the current macroeconomic models try to combine the two major theories described above. In general, it is considered that in the long term and in the absence of additional exogenous shocks to the economy, actual output and potential output would converge, both in terms of level and growth rates, while in the short term they would deviate. This combination is frequently used in central banking models. Bulligan *et al.* (2017) is a recent example of their application in macroeconomic forecasting of the Italian economy.

The main approaches used to estimate potential output, anchored, to a greater or lesser extent, in the theoretical considerations above, are (i) the calculation of statistical trends, (ii) the production function method, and (iii) the estimation of more structural models, which incorporate sticky prices and sticky wages.

Statistical trends

One of the common ways of quantifying economic activity growth, around which actual growth rates oscillate, is based on the estimation of trend GDP. The time series trend is a classical concept 'comprising the movements smoothly and consistently apparent over long periods of time' (Murteira, Müller and Turkman, 1993). This concept excludes temporary swings, without imposing any behavioural economic structure, and only using the information contained in that time series.

The calculation of trend GDP can be made on the basis of several filters. The simplest way is to estimate the trend in a univariate context, taking for example a linear trend. Almeida and Félix (2006) use the Christiano-Fitzgerald, Baxter-King and Hodrick-Prescott filters, the latter being the most commonly used in literature.

The time series trend is used in various contexts. For instance, prior to the estimation of dynamic stochastic general equilibrium models, it is common to subtract the series trend using the Hodrick-Prescott filter (for the case of Spain, see, for example, Martín-Moreno, Pérez and Ruiz, 2010), or to subtract the average chain growth rates of a number of variables (Christiano, Trabandt and Walentin, 2011; Júlio and Maria, 2017). In this case, the models do not consider the series trend, focusing only on the gap in relation to the actual series, which is seen as reflecting the economic cycle. In this type of modelling, the cycle can be explained by financial or real structural shocks, with internal or external origin (for the

case of Portugal, see Júlio and Maria, 2017). No macroeconomic imbalance or excess demand is assumed. The results are presented as deviations from the steady state, i.e. relative to a situation of stable and lasting equilibrium.[1]

Production function

Another common methodology for estimating economic activity growth, around which actual growth rates oscillate, is through a production function. This approach increases the degree of formalisation of the analysis, compared with the calculation of trends described above, as it relates the quantity produced by an economy to the quantity of production factors and their productivity. These functions may take several forms, the most commonly used being the so-called Cobb-Douglas production function (Box 1).

According to this approach, the calculation of potential output depends on the use of benchmark levels for the production factors and their productivity, which are smoother than actual levels. Benchmark levels are not observed, therefore they have to be estimated (Box 1). For example, the supply of potential labour depends inter alia on benchmark values for the population and for the activity rate. The benchmark value for the unemployment rate is commonly known by the acronym NAWRU (*Non-Accelerating Wage Rate of Unemployment*), when estimated in a context of stable wage growth rate, or NAIRU (*Non-Accelerating Inflation Rate of Unemployment*), subject to the same constraint in the case of inflation.

This method has the advantage of providing a richer interpretation of the estimates obtained, making it possible to build on the major drivers of potential output level and growth, as well as of the gap in relation to actual GDP. This approach, by relating productive capacity with labour supply, with the accumulation of capital or with total factor productivity, enables the analysis of potential output growth in the light of different drivers, such as demographic dynamics or structural reforms. It also has the advantage of providing projections of potential output in the medium to long-term, conditional on the components of the production function.

Box 1 | The Cobb-Douglas production function

GDP Y can be determined by aggregating the contributions of the labour L, and capital, K, inputs, as well as their productivity, *A*. Formally:

$$Y_t = A_t K_t^{1-\alpha} L_t^{\alpha}.$$

With this formula, percentage changes in labour and capital inputs produce percentage changes in GDP given by the constants α and (1- α), respectively. These impacts are usually referred to as output elasticities of labour and capital. Assuming output and labour markets operate in perfect competition, the constant can be inferred by the wage share in value added. The elasticity of substitution between the production factors is unitary, implying that any percentage rise in the price of the labour input, relative to the price of the capital input, is followed by a similar rise in the capital-to-labour ratio to maintain the same level of output.[2] This production function is also characterised by constant returns to scale. For instance, if the amount of labour and capital is doubled, then output will be doubled.

Total factor productivity is given by A, an unobserved variable that captures the share of output not associated with the direct utilisation of the labour and capital inputs. Total productivity has

quite a broad nature in the formula presented, including, for example, the level of technology, human capital, or the institutional framework. The current value of this variable is usually estimated as a residual, known as the 'Solow residual'. This residual also accommodates the differences resulting from alternative definitions of input and output, as well as potential measurement errors in these variables.

When the labour input is measured by the total number of hours actually worked in the economy, it can be broken down as follows:

$$L_t \simeq Population_t \times \frac{Labour\ force_t}{Population_t} \times Hours\ per\ worker_t \times (1 - \frac{Unemployment_t}{Labour\ force_t}).$$

In this expression it is possible to emphasise mechanically the relative importance of all its components in determining output, including the relevant population (namely the working-age population) or the participation rate.

The production function can be used to analyse developments in actual or potential output, depending on whether estimates used are for actual or benchmark values respectively. The aggregation of the benchmark values of production factors and total productivity gives an estimate of potential output. As to the stock of capital, it is normally considered that the actual level also corresponds to the benchmark stock of capital, implying that its contribution to the output gap is nil by definition.

When the potential output is analysed, L measures the benchmark level of labour supply. Where it is measured by hours worked, potential labour corresponds to the population adjusted for the benchmark values for the remaining variables, including the activity rate and the unemployment rate.

The calculation of potential output through the production function also requires the use of benchmark values for total factor productivity. Almeida and Félix (2006) use the trend of the Solow residual, calculated with the Hodrick-Prescott filter. Havik *et al.* (2014) use the Kalman filter and the information contained in an indicator of productive capacity utilisation.

A common restriction in this method of calculating potential output, namely in the long term, consists in considering that the capital-to-GDP ratio is steadily constant. In this case, the stock of capital increases at the same pace as GDP, whereby the buoyancy of economic activity is basically determined by population growth and by total factor productivity growth, illustrating the importance of this latent variable. This restriction is followed, for example, by the European Commission in its estimates for long-run potential growth, namely in the *2018 Ageing Report* of the European Commission (European Commission, 2017).

Price and wage stickiness

The calculation of potential output can be based on a relatively wide range of information, where the relationship between output and sticky prices and sticky wages takes on a predominant role. This relationship is closely associated with the so-called Phillips curve (Box 2), which in its most traditional form can be derived from a short-term aggregate supply curve (Mankiw, 2003). Potential growth underlying the traditional Phillips curve basically respects the Okun's definition presented above, which continues to be widely used in literature.

The Phillips curve can be estimated individually or inserted in a system of equations. In the latter, the trend and the cycle of the series are estimated in multivariate contexts where the range of information can be fairly broad. These specifications can contain domestic or international interest rates, as well as other variables, such as the price of oil. In determining agents' expectations, it is sometimes assumed that they are adaptive (i.e. they are only based on past information) and, in other instances, that they are rational (i.e. they are determined consistently with the model under analysis). Trends and gaps can obey quite disparate laws of motion, being characterised by statistical atheoretical processes subject to different levels of volatility, or by easily identifiable semistructural specifications. This methodology can be found in the works of Carabenciov *et al.* (2008) or Maria (2016).

Potential output underlying the traditional Phillips curve is consistent with the existence of a NAIRU or NAWRU, whereby the gap in relation to GDP and the gap in relation to the observed unemployment rate are sometimes used as substitutes. This was one of Okun's seminal suggestions (1962), who identified the unemployment gap as an acceptable proxy for the over- and underutilised resources available in the economy. This substitutability came to be known as Okun's law (Box 3). Both the output gap and the unemployment gap thus identify the cyclical position of the economy.

Recent versions of the Phillips curve, usually known as 'neokeynesian Phillips curve', are based on a concept of output gap defined differently (Box 2). As before, inflation also rises when GDP is above the potential. However, despite this similarity, there are substantial differences, such as the definition of potential output, typically called 'natural output', or expectations being conditional on future developments in the output gap.

The neokeynesian Phillips curve is deducted from general equilibrium structural models based on the existence of nominal stickiness, i.e. on the assumption that there are key inertia sources in price and wage developments, against a background of monopolistic competition between market agents. Therefore, it is possible to conceive the output level that would be obtained should the said monopolistic environment persist, but with non-sticky prices and wages, known in literature as the 'natural output'.[3] the natural output can fluctuate along the economic cycle due to disturbances that affect an economy's potential. Available estimates made according to this definition are not analysed in this Special issue.

Finally, a number of studies assign a very relevant role to the financial variables when calculating potential output. In the wake of the international financial crisis there were non-sustainable developments in output, amid contained inflationary pressures, with financial factors playing a key role. Borio, Disyatat and Juselius (2013) broadened the range of information used, having included data on credit and prices of residential property. Based on data for the United States, the United Kingdom and Spain, the authors concluded that the additional information has softened developments in potential output in the pre- and post-crisis period, and suggest that financial developments in the pre-crisis period are likely to have fuelled non-sustainable cyclical developments.

Box 2 | The Phillips curve

The 'Phillips curve' continues to attract intense debate in economic literature. It appeared towards the end of the 1950s, when A. W. Phillips observed an inverse relationship between changes in nominal wages and the level of unemployment in the United Kingdom. Higher wage growth was correlated with lower unemployment rates. The original Phillips curve was significantly modified in the following decades. Today, there are various formulations, which may include different definitions of wages, prices, unemployment, output, supply shocks, inflation expectations, etc. Overall, there are two broad types of quite common formulations using the output gap.

The first is more traditional and takes the following form:

$$\pi_t = \pi_t^e + \alpha(Y_t - \bar{Y}_t) + \vartheta_t.$$

The growth rate of wages was substituted in this equation by goods and services inflation, π, assuming that there is a close relationship between them. The right-hand side of the equation presents the expected inflation rate, π^e, largely resulting from the work of M. Friedman and E. Phelps; a constant, $\alpha > 0$, that determines the slope of the curve and therefore the impact on price behaviour resulting from fluctuations in the output gap, $Y - \bar{Y}$; and, finally, the term ϑ, that aims to capture cost-push shocks, associated for instance with supply shocks. Oil shocks are classical examples of this type of shock. Using Okun's law, $Y - \bar{Y}$ may have an equivalent representation based on the unemployment gap (Box 3).

Inflation can increase in this formulation for three reasons: (i) higher inflationary expectations (increase of π^e); (ii) above-potential GDP ($Y - \bar{Y} > 0$), sometimes called 'excess demand'; or (iii) positive cost-push shocks ($\vartheta > 0$). The final result on inflation depends on the combination of the various terms. This first type of formulation can be derived from an aggregate supply curve (see, for example, Mankiw, 2003), sometimes called 'triangle model'. The three vertices are 'expectations', 'excess demand' and 'supply shocks' (Gordon, 2013). If economic agents' expectations are anchored at a certain level, this characteristic should be reflected in the dynamics of π^e.

More traditional specifications assume that expectations are adaptive, such that π^e is defined by developments in past inflation (for example, Dias, Esteves and Félix, 2004; or Centeno, Maria and Novo, 2009). More recent versions assume that π^e depends on expectations of future values, in particular rational expectations (see, for example, Alichi *et al.*, 2017; or Maria, 2016).

This type of equation has been largely used for two main purposes. On the one hand, building on different estimates for the model's variables, the equation serves as a benchmark to assess the quality of other models' projections. On the other hand, assuming that this equation is robust, potential output $\bar{Y}$ can be treated as an unobserved variable and econometric methods may be used to find adequate estimates. In this case it is important to note that the estimate for $\bar{Y}$ is consistent with a definition of potential output in which inflation is stabilised. In fact, in the long run, if $Y = \bar{Y}$ and $\vartheta = 0$, then inflation π is stable being simply equal to π^e.

The second type of formulation of the Phillips curve, expressed very simply, has the following expression:

$$\pi_t = \beta\pi_t^e + \varkappa(Y_t - Y_t^n).$$

In this equation, known as the 'neokeynesian Phillips curve', the constant $0 < \beta < 1$ is a factor measuring the effect of revisions of inflation expectations on actual inflation, whereas $\varkappa$ depends on the specification of the equations of the model underlying this formulation. The neokeynesian Phillips curve is based on rational expectations, where $\pi_t^e = E_t\{\pi_{t+1}\}$.

While apparently there are some similarities with the equation above, namely the fact that inflation π arises when GDP is above potential, both equations have substantial differences, beyond the absence of supply shocks ϑ. First, this last equation is based on a dynamic general equilibrium model with microeconomic fundamentals. Firms take optimal decisions taking into account a monopolistic competition environment, as well as restrictions regarding the frequency of price adjustments. In this context, talking about imbalance situations, such as 'excess demand', makes no sense. All markets are in equilibrium at each moment. In parallel, while the above equation has taken different forms, with different autoregressive structures and cost-push shocks, the underlying structural models in this second type of formulation are, in turn, very restrictive, calling for microeconomic fundamentals.

Second, the concept of potential output Y^n moves away from the most traditional formulation becoming conditional on a more restrictive definition of 'natural output'. This concept corresponds to the output level prevailing in the economy in the absence of nominal frictions.[4] Therefore, the output gap is close to zero in the absence of nominal stickiness in the general equilibrium model.

Finally, the equation is only based on expectations about future developments in the output gap. To understand this characteristic note that the previous expression can be rewritten as follows:

$$\pi_t = \varkappa \sum_{i=0}^{\infty} \beta^i E_t(Y_{t+i} - Y_{t+i}^n).$$

In this expression, it is clear that inflation depends only on the contemporaneous output gaps (where $i = 0$) and future output gaps ($i > 0$), where these are discounted with the factor β. Past inflation does not exercise any influence on current inflation.

It is important to emphasise that this very simple formulation is based on a relationship between pro-cyclical marginal costs and output gaps. When output rises above the natural, the demand for factors triggers a rise in both costs and inflation, against a background in which firms set final prices above their marginal costs (which also hover around a benchmark value). Alternative definitions of marginal costs lead to alternative specifications of the neokeynesian Phillips curve, remaining valid that the current inflation rate depends on contemporaneous and future marginal costs. In these alternative formulations it is possible to assign some role to past inflation. In this case it is considered that a fraction of firms in the economy makes decisions based on adaptive expectations. This equation is commonly known as 'hybrid' neokeynesian Phillips curve, which contains a term associated with past inflation (for the case of Spain, see, for example, Galí and López-Salido, 2000). Specifications using the growth rate of wages and the unemployment rate are also available in literature (Galí, 2011).

The empirical validity of the existing versions of the Phillips curve remains a topical theme, calling for discussion by the scientific community. Havik *et al.* (2014) presents both more traditional and more recent versions.

Box 3 | Okun's law

In 1962, A. Okun published a seminal article suggesting that instead of trying to quantify the potential output level directly, by measuring the impact of various production factors, the information contained in unemployment could be used in its place (Okun, 1962). More precisely, the gap between the unemployment rate and an unobserved benchmark value serves as a proxy for the level of underutilised resources in the economy. This relationship progressively became known as 'Okun's law', and is still discussed and assessed empirically in economic literature (see, for example, Ball, Leigh and Loungani, 2013, or Lafourcade *et al.*, 2016).

In its simplest formulation, Okun's law is as follows:

$$(U_t - \bar{U}_t) = -\eta\,(Y_t - \bar{Y}_t).$$

The actual and benchmark unemployment rates are given by U and $\bar{U}$, respectively, and consequently $(U - \bar{U}) > 0$ gives the level of idle resources. In turn, the constant $\eta > 0$ implies a negative relationship with the output gap $(Y - \bar{Y})$. Using usual terminology compatible with Okun's law, 'excess aggregate demand' may be measured as positive output gaps or unemployment rates below the benchmark values. This formulation also allows the more traditional Phillips curve to contain the output gap or the unemployment gap (Box 2).

Okun emphasises that potential output is not simply the maximum level of production possible and that benchmark unemployment is not the level at which all workers have jobs. These levels must not involve an increase in inflationary pressures.

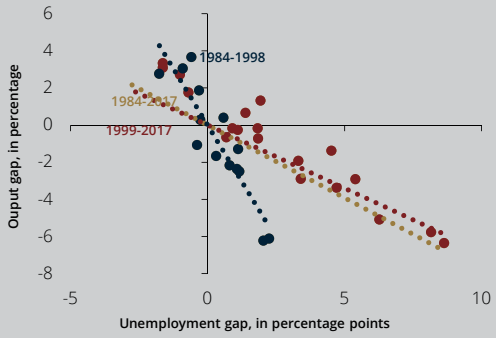
Chart C.3.1. presents the results for Portugal, using unemployment and output gaps. The unemployment gap was computed using the benchmark values calculated with the method suggested by Centeno *et al.* (2009). The output gap uses these estimates, as well as the Cobb-Douglas production function method presented by Almeida and Félix (2006). The Chart presents data for the period from 1984 to 2017, as well as for two sub-periods from 1984 to 1998 and from 1999 to 2017. The results suggest that firstly there indeed seems to be a negative relationship between the unemployment gap and the output gap. This result does not seem surprising considering that workers help increase production, unlike the unemployed (Mankiw, 2003). Secondly, this simplified illustration suggests that the slope of the linear relationship observed in the chart has decreased over time, indicating that in the most recent period, the change in unemployment is associated with smaller changes in GDP. Thirdly, there is high dispersion around the linear relationship, which suggests that this formulation may not be the most appropriate for describing the unemployment/production dichotomy in Portugal over this period of time.

The formulation presented above can be rewritten in terms of changes, if for example the benchmark unemployment rate and the economy's potential growth are taken as constants (Ball *et al.*, 2013). Chart C.3.2 presents the results for this option. The results confirm the two earlier conclusions (the negative relationship between unemployment and production and the reduction of the curve's slope), but in this version the dispersion around the linear trend is larger, suggesting that important changes have taken place in the potential output levels and in the benchmark unemployment rate. Although these conclusions are based on very simple formulations, they confirm some of the results that may be found in empirical literature. Using data for a fairly broad set of countries, including Portugal, Lafourcade *et al.* (2016) conclude that the negative correlation

between unemployment and output is a relatively robust macroeconomic result, present in various time periods, countries or econometric schemes for identifying business cycles. The reduction in the curve's slope in the most recent period was emphasised by Maria (2016).

In the formulation of Okun's law presented above, the two gaps are zero in the same period. This exclusive link requires that other elements that underlie the level of potential output and respective comparisons with the benchmark values (hours worked, participation rate, or productivity) are ignored. Regardless of these gaps, the link suggested by Okun requires acceptance of the fact that they are essentially related to the number of unemployed as a percentage of the labour force. If potential output is calculated for example using a production function, other contributions may arise naturally (Prachowny, 1993). It is normal to include autoregressive terms in Okun's law, lags in the explanatory variables and possibly certain terms associated with expectations (see, for example, Lafourcade *et al.*, 2016).

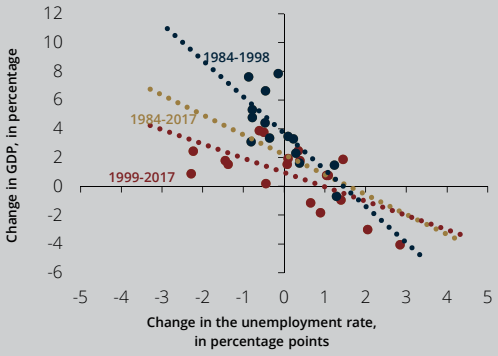
Chart C.3.1 • Okun's law based on output and unemployment gaps



Source: Banco de Portugal.

Notes: Each dot represents a year. The linear trends were depicted assuming a zero intercept.

Chart C.3.2 • Okun's law based on the change in output and unemployment



Sources: Banco de Portugal and Statistics Portugal.

Note: Each dot represents a year.

Potential output and factors of production

This section presents various estimates for potential output for Portugal and for the euro area, as well as information on the factors of production and other aspects affecting their assessment. This assessment provides important context for framing economic policy measures.

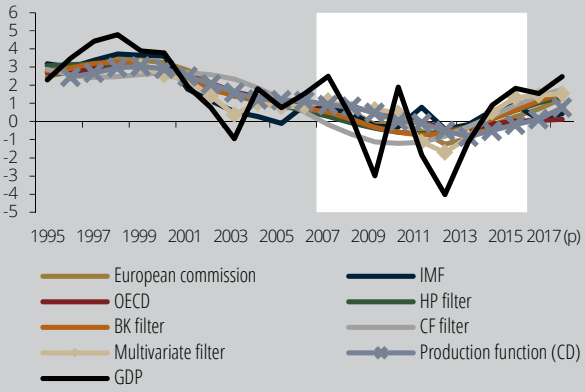
Potential output estimates

Considering some of the estimation methods described above, Chart 2 illustrates the potential growth concept, defined as the annual change in potential output, for the Portuguese economy. This chart presents estimates for the period from 1995 to 2017, calculated by the European Commission, IMF and OECD, as well as an update of the estimate presented in Maria (2016) for a multivariate filter and the estimates presented in Almeida and Félix (2006) for the univariate filters and the Cobb-Douglas production function.

Firstly, all the methods used indicate a deceleration of potential output from the start of the sample period, leading to negative rates of change. In particular, the last recession that affected the Portuguese economy involved a reduction in potential output. In the most recent period, however, potential output grew again. The Portuguese economy will grow above its potential growth in 2017 according to the set of estimates considered. Potential growth is now between 0% and 2%, which is clearly below the estimate for the start of the sample period (between 2% and 4%).

Chart 3 presents various output gap estimates implicit in the different estimation methods. In the most recent period, the various estimates presented suggest an approximation of the GDP level to potential output, with the negative gap of the last few years progressively narrowing.

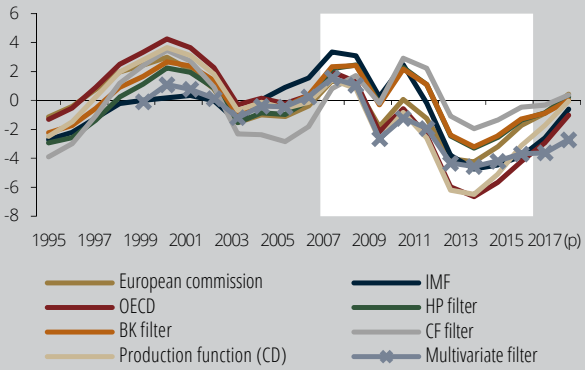
Chart 2 • GDP and potential output growth rates in Portugal | In percentage



Sources: Banco de Portugal, European Commission, Statistics Portugal, IMF and OECD.

Notes: (p) – projected. Potential output growth rates correspond to changes in the levels of each estimate. Each growth rate is identified by the publisher, e.g. European Commission, or by the method used by the Banco de Portugal, e.g. HP filter. White areas signal years in which at least one of the estimates contemplates a decrease in potential output. The Hodrick and Prescott (HP), Baxter and King (BK) and Christiano and Fitzgerald (CF) filters, as well as calculations based on the Cobb-Douglas (CD) production function follow the methodology presented in Almeida and Félix (2006). The multivariate filter follows the methodology described in Maria (2017). The estimates are based on the most recent data. For the year 2017 these values correspond to the projections of Banco de Portugal presented in this *Economic Bulletin*.

Chart 3 • Output gaps in Portugal | In percentage



Sources: Banco de Portugal, European Commission, Statistics Portugal, IMF and OECD.

Notes: (p) – projected. The output gap corresponds to the difference between GDP and each of the potential output estimates. Output gaps are identified by the publisher, e.g. European Commission, or by the method used by the Banco de Portugal, e.g. HP filter. White areas signal years in which at least one of the estimates contemplates a decrease in potential output. The Hodrick and Prescott (HP), Baxter and King (BK) and Christiano and Fitzgerald (CF) filters, as well as calculations based on the Cobb-Douglas (CD) production function follow the methodology presented in Almeida and Félix (2006). The multivariate filter follows the methodology described in Maria (2017). The estimates are based on the most recent data. For the year 2017 these values correspond to the projections of Banco de Portugal presented in this *Economic Bulletin*.

Charts 4 and 5 present estimates for the euro area. In this case, only the European Commission, IMF and OECD estimates are used. Compared to the Portuguese economy, the most striking difference is the lack of a decline in potential output. In turn, both the gap and the growth rates are more stable, with the deceleration of potential output less pronounced than in Portugal.

Empirical evidence for certain factors affecting potential output

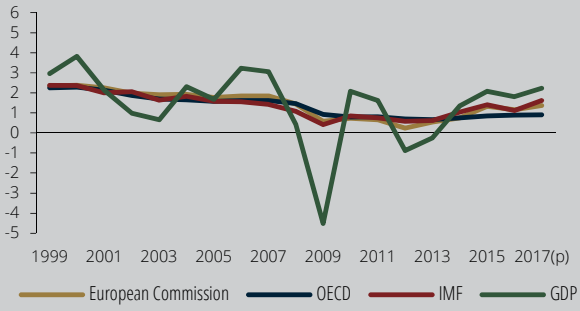
Labour and the capital stock are two key production resources which account for a large proportion of potential output. The labour input combines various elements, including demographics, average hours worked per worker, or the benchmark unemployment rate (see Box 1 for a usage in the context of a Cobb-Douglas production function). As is clearly evident, not all the factors affecting potential output may be changed by policy measures with the same ease or speed.

The evolution of the population is one of the most structural aspects of economies. Charts 6 and 7 present the evolution of the population aged between 15 and 64 years and between 15 and 74 years, respectively. In Portugal, the demographic trend has been one of a rising population up to the end of the first decade of this century, followed by a decrease. These developments have been accompanied by growth in the share of the population between 65 and 74 years, which intensified after the recent international financial crisis. This greater share is one of the key standouts when compared to the euro area, along with changes in the Portuguese population being more pronounced.

The population's ageing trend partly results from the sharp decrease in fertility in the 1970s and 1980s, as shown by the synthetic fertility index (Chart 8). Currently Portugal has one of the lowest rates of this index among the euro area countries (Banco de Portugal, 2015b). Regarding net migration, available estimates suggest this was positive from 1999 to 2010, in contrast to the persistently negative levels thereafter, as shown in Chart 9. The population has therefore evolved adversely in Portugal, both in absolute terms and in comparison to the euro area, affecting growth in the labour input.

There are other components in the labour input that also influence the estimation of potential output, although their capacity for promoting growth over the long term is limited. Chart 10 shows developments in the participation rate, measured as the ratio between the labour force and the population aged between 15 and 64. Overall the trend was upwards, stabilising

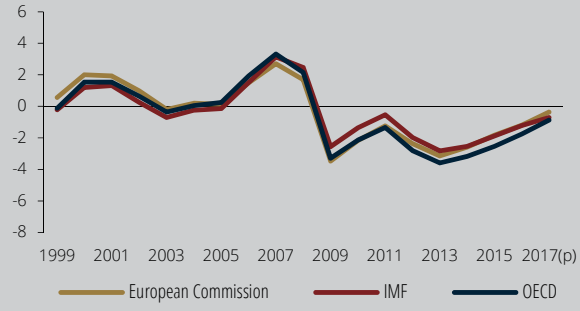
Chart 4 • GDP and potential output growth rates in the euro area | In percentage



Sources: European Commission (AMECO), IMF and OECD (Banco de Portugal calculations).

Notes: (p) – projected. The potential output growth rates correspond to changes in the levels os each available estimate.

Chart 5 • Output gaps in the euro area | In percentage



Sources: European Commission (AMECO), IMF and OECD.

Notes: (p) – projected. The output gap corresponds to the difference between GDP and each of the estimates available for potential output.

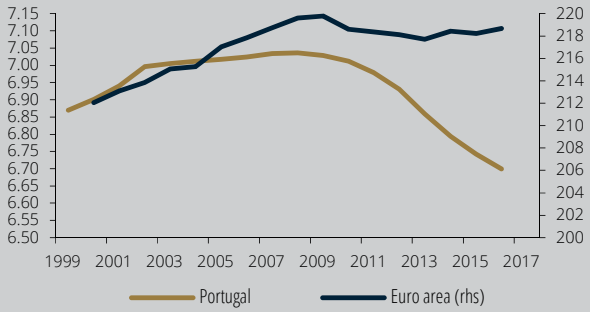
somewhat in the second half of the sample period. The upward movement was essentially driven by the increasing participation of women in the labour market, which offset a relative stabilisation in the participation of men. The aggregate participation level is above that of the euro area, although the differential is narrowing, reflecting in both cases the effect of the participation of women.

The labour supply underlying potential output is also affected by the benchmark unemployment rate. The results presented in Chart 11 suggest that this rate increased from the start of the sample period, although the extent depends on the methodology used. This increase compares to a relative stabilisation in the estimates for the euro area. The last part of this Special issue discusses the uncertainty in estimating potential output and its components.

The average hours actually worked in the Portuguese economy have decreased slightly since 1995 (Chart 12). The average number of hours worked in Portugal has been systematically above that of the euro area, where the downward trend has been more pronounced. Hourly labour factor productivity, calculated as the ratio between GDP and total hours actually worked in the economy, has had a different evolution (Chart 13). Despite increased productivity in the Portuguese economy, it is substantially below that of the euro area. The percentage change in hourly productivity of the labour input between 1995 and 2016 is similar, reaching around 25% in both cases.

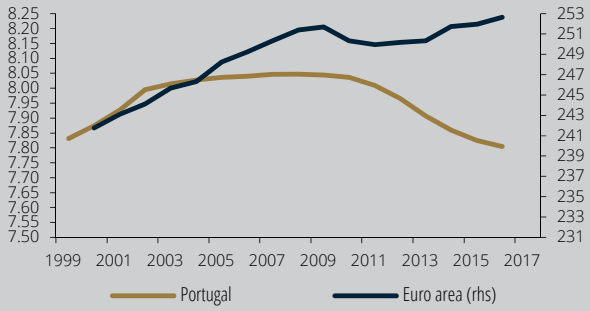
The weak performance of hourly productivity in Portugal is the result of several factors, including the average education level, which remains below that of the euro area, despite the increase

Chart 6 • Working age population (15-64 years) | Millions of people



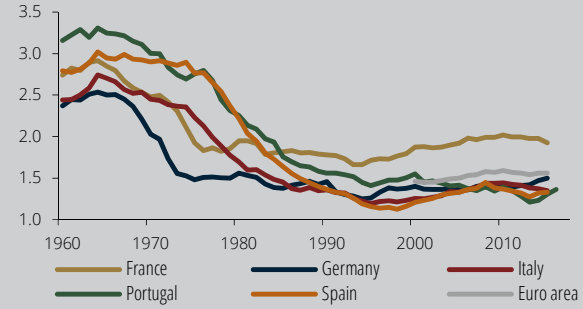
Source: Eurostat.

Chart 7 • Working age population (15-74 years) | Millions of people



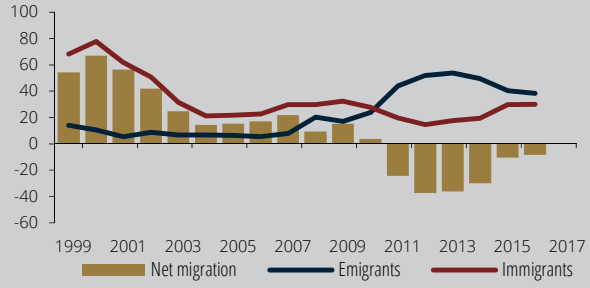
Source: Eurostat.

Chart 8 • Total fertility rate | Mean number of children born alive



Sources: Eurostat, Human Fertility Database and Statistics Portugal.

Chart 9 • Net migration in Portugal | Thousands of people

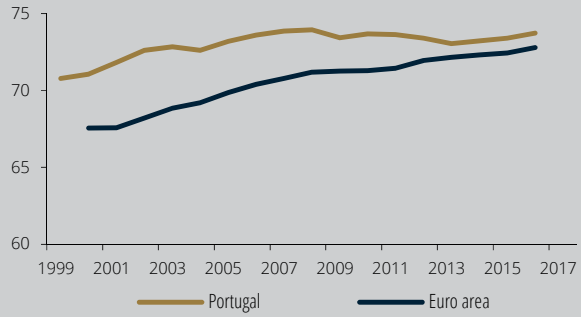


Sources: Eurostat and Statistics Portugal.

from the start of the century (Chart 14). In Portugal, the proportion of the population aged between 15 and 64 who have completed at least upper secondary education increased from 21% to 47% between 2000 and 2016, which compares to an increase from 59% to 70% in the euro area. The education level is frequently linked to the concept of human capital, which is one of the key components driving the pace of economic activity growth. The increase in human capital, both in quantity and in quality, is linked to productivity gains, with unlimited developments in quality over the long term. These gains may be a factor counterbalancing the negative effects of the demographic developments (Banco de Portugal, 2015b).

Another important factor is the low level of capital per worker, associated in particular with low levels of investment in the Portuguese economy. Developments in the capital-per-worker ratio, shown in Chart 15, are particularly worrying (Banco de Portugal, 2017b). According to data published by AMECO, this ratio has been falling since 2014, which interrupts the prior trend of convergence to euro area levels. In 2016, Portugal had one of the lowest capital-to-labour ratios in the euro area. Low levels of capital per worker place Portugal in a segment of the world

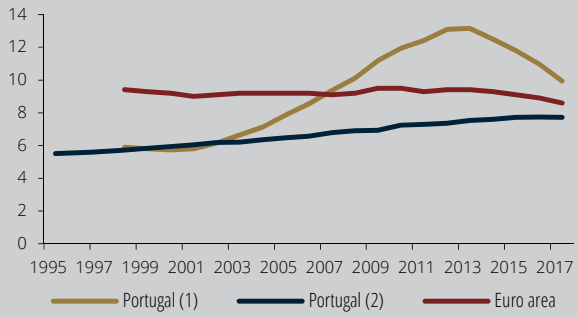
Chart 10 • Participation rate | In percentage



Source: Eurostat.

Note: The participation rate is calculated as the ratio between labour force and working-age population.

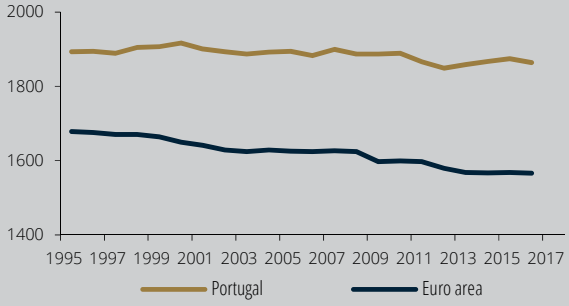
Chart 11 • Reference unemployment rate | In percentage



Sources: Banco de Portugal and European Commission (AMECO).

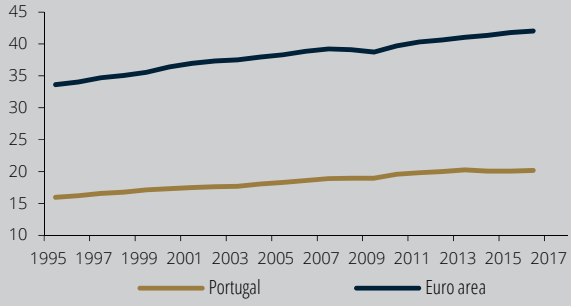
Notes: The series 'Portugal (1)' and 'Euro area' were taken from AMECO and refer to the NAWRU. The series denoted as 'Portugal (2)' is calculated using the methodology proposed by Centeno, Novo and Maria (2009) and corresponds to the NAIRU.

Chart 12 • Average hours worked | Average number of hours worked per year



Source: Eurostat.

Chart 13 • Output per hour worked | Euros, 2010 prices



Source: Eurostat.

production frontier which does not grow significantly as a result of technological progress.[5]

Chart 16 presents a breakdown of potential output's rate of change in the Portuguese economy over the period from 1996 to 2017. The results suggest very unfavourable developments in the labour input, which is in line with the empirical evidence shown previously. After positive contributions at the start of the sample period, the labour input is widely identified as being behind the deceleration and subsequent decline in potential output. In the latter case, the contributions of other inputs are no longer sufficient to push potential output into expansion. Potential output's rate of change was lowered by around 1 p.p. in several years. Demographic developments, including the fall in the working-age population, have been a dominant factor.

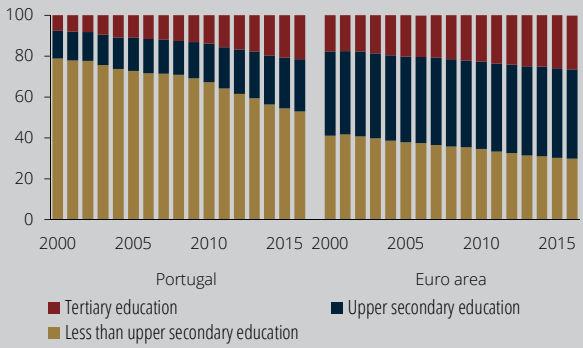
The results obtained in Chart 16 also provide confirmation that the developments in the investment rate are a further cause for concern. Up to 2003-04, about 1 p.p. of potential output growth was provided by developments in the capital stock. In the following period, this contribution gradually shifted down to zero and thereafter turned negative. A reduction in the capital stock suggests that the current investment is insufficient to offset the depreciation of the installed capital.

In contrast, total factor productivity has made an important positive contribution, accelerating gradually in the most recent period, after a period of weak growth. In 2017, potential output growth derived through this method includes a contribution from total factor productivity close to 0.5 p.p. This contribution incorporates several factors, including the positive impact of the increase in the average number of years of schooling that has taken place.

The results obtained based on the production function proposed in Almeida and Félix (2006) suggest a qualitative assessment similar to that presented in Chart 16. The most notable difference refers to the benchmark unemployment rate, as presented in Chart 11. Using this rate results in less negative contributions from the labour input in 2009-13, followed by more unfavourable contributions up to 2017. According to this calculation method, the contribution from total factor productivity came to 0.8 p.p. in 2017.

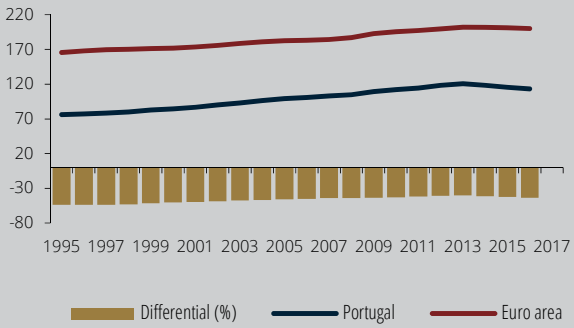
In the case of the euro area, there is some deceleration in potential output but its level does not decline, as both the capital stock and the total factor productivity continued to have significant contributions (Chart 17).

Chart 14 • Educational attainment level | Share in total, in percentage



Source: Eurostat.

Chart 15 • Capital stock per worker | Thousand euros, 2010 prices



Sources: European Commission (AMECO) and Eurostat.

Uncertainty and instability in the quantification of potential output

Despite potential output being used for the purposes of economic analysis and to assist policy decisions, quantifying it involves various sources of uncertainty and a considerable level of instability. This Special issue began by clarifying that the very definition of potential output is not simple, unique or consensual. Unlike GDP, there are no official, standardised estimates calculated by the different statistical offices that may be compared worldwide. Its analysis thus requires particular caution.[6] The estimation of potential output and the stable separation of what should be classified as a gap, or the business cycle, would allow the economy's fundamental characteristics to be correctly measured. This stable separation can be particularly difficult however, whether it relates to methodologies with simple solutions or those which are relatively more complex.

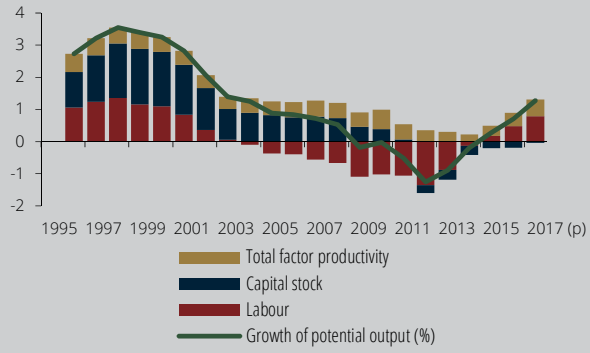
Two fundamental sources of uncertainty

There are two fundamental kinds of uncertainty, described for example in European Central Bank (2000), in the quantification of potential output: uncertainty surrounding the model and uncertainty surrounding the point estimate.

As mentioned above, the model may be based on univariate or multivariate formulations; it may derive from a production function, or a merely statistical process. The different treatment of expectations may be one of the factors influencing the results. Adaptive expectations and rational expectations are two common formulations in literature. For the Portuguese case, for example, Centeno *et al.* (2009) use adaptive expectations (for the United States, see Gordon, 2013), while Maria (2016) uses a combination of the two (for the United States, euro area and Japan, see Carabenciov *et al.*, 2008).

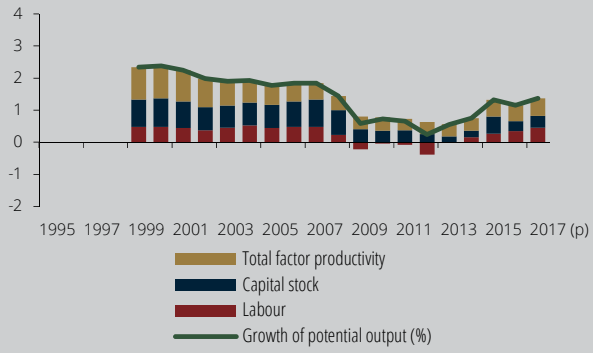
In general, even if there were a consensual definition of potential output, the choice of the most appropriate model could be problematic. If we compute potential output only based on the information held in GDP, note that each filter produces an alternative result. The same happens in the multivariate formulations, which may relate to different macroeconomic restrictions. The coexistence of positive and negative

Chart 16 • Growth accounting for Portugal
| Contributions to the growth rate of potential output
in percentage points



Source: European Commission (AMECO).
Note: (p) – projected.

Chart 17 • Growth accounting for the euro area
| Contributions to the growth rate of potential output
in percentage points



Source: European Commission (AMECO).
Note: (p) – projected.

gaps in certain years, depending on the model used, clearly shows that the results should be interpreted with caution (Chart 3). The assessment of the economy's cyclical position is therefore complex, and should always be based on different nominal and real indicators, in order to assess whether the results of the different models are reasonable. Indicators based on surveys, such as the productive capacity utilisation rate or firms' resource utilisation data, may be used for this purpose.

A second type of fundamental uncertainty arises from the point estimate itself within the model chosen. Thus, even if consensus were reached over the model to be used, the estimates could still be very inaccurate. If there is a set of alternative values, which are similarly probable, the point estimate is not easily distinguishable from other values; however, the reading and interpretation may be very distinct. For example, a positive output gap estimated very inaccurately may be statistically indistinct from a zero or even negative gap. This problem is particularly concerning if the economy is subject to structural changes, which may have very profound effects on the definition of the model's parameters and latent variables. Note that, in general, these variables inherit the missing elements in the model in some way.

Other contraints on potential output quantification

A very important aspect to take into account when estimating potential output, with various consequences, relates to the time horizon used for the estimation. For example, if the introduction of the euro is considered to be a structural change to the functioning of the Portuguese economy, interfering with the formulation underlying potential output, then the sample would have to be restricted as appropriate. However, if the dataset used severely limits the number of observations, which may be very influenced by the recent international financial crisis, it is highly likely that the impact on potential output is also significant.

Estimation of potential output in different sample periods may have significant consequences, even when only one calculation method is used. This is clear from the results obtained for the Portuguese economy when estimates based on the Hodrick-Prescott filter are used, for example. Merely including more observations for GDP creates significant point revisions, not only for the current values of potential output but also for the past values (Box 4). A source of uncertainty in this filter lies in the definition of the most appropriate smoothing profile.

Point estimate revisions are also significant in the case of the results published over time by certain international institutions, such as the European Commission (Box 4). Anderton *et al.* (2012) presents results for unemployment gap revisions, using estimates from the European Commission, OECD and IMF.

End-of-sample bias is another aspect widely mentioned in the empirical literature, to be taken into consideration when quantifying potential output, whether using univariate or multivariate methods. Often the dataset is extended with projections for the relevant variables to reduce this bias and thereby to calculate estimates that are closer to the latent variables. Failure to predict the disruptions taking place over that projection horizon limits the scope of this solution however. These aspects illustrate the difficulty in quantifying the growth and principally the potential output level in real time, i.e. only taking into account the data available up to the present time.

A third aspect relates to the historical revision of the databases used. The impact of these revisions is difficult to measure, although it is very significant in models that use a broader dataset, which as a result are more liable to undergo alterations.

Finally, the dataset used must be scrutinised carefully. The variables used may for example have significant measurement errors, or may not be the most appropriate. The dataset may be excessively limited, and so the results may be affected by the omission of variables.

The use of variables with measurement errors may raise doubts about the quality of the potential output estimates. In this context, the

Cobb-Douglas production function offers a very intuitive example (Box 1). By capturing the part of production that is not associated with the direct use of the labour and capital factors, total factor productivity accommodates multiple effects, including alternative definitions for the production factors, measurement errors in these variables, distortions associated with imperfect competition, or various externalities. If there are returns to scale, for example, the impact on production associated with variations in the labour input is no longer equal to the wage share. The capital stock is another variable typically subject to measurement problems. As well as choosing the most appropriate measure for determining production, it may be very important to distinguish between quantity and quality effects of capital.[7]

It is not always easy to identify, correct or assess the importance of the omission of variables. Del Negro, Hasegawa and Schorfheide (2016) mention, for example, that forecasts from general equilibrium models with financial frictions are only superior in periods of financial distress.

The importance of structural transformations

Over the last two decades, economic growth in Portugal and in the euro area has slowed. This trend intensified in the recent financial and sovereign debt crisis, in particular, due to its duration and severity, raising doubts over the growth outlook for the medium to long term.

While the recent recovery in the Portuguese economy has been clear, its long-term growth continues to raise concerns. According to the European Commission's latest projections,[8] the Portuguese economy's potential growth is close to 1% until 2070. On average, Portugal will grow 0.4 p.p. below the projection for the euro area as a whole. This low growth in potential output in Portugal is affected by the protracted deceleration in investment, with a persistent impact on developments in the capital stock, as well as by the decline in the working-age population.

The estimates for potential output's growth rate suggest that the recent pace of growth in the Portuguese economy includes a cyclical component that will tend to fade over the long term. Its relative contribution to actual growth suggests that a policy mix should be adopted to help make this rate of expansion last longer. As structural reforms might interfere in the determination of the economy's aggregate supply, they are often mentioned by the euro area's monetary authorities.[9] These reforms also play an important role within the European Semester, where specific measures are recommended for each Member State, with the aim of creating more jobs and stimulating economic growth.

There are various channels through which structural reforms may have an effect on economic growth.[10] From an aggregate production function viewpoint, policy measures may affect growth through changes to the benchmark levels for the production factors, which determine potential output, or through efficiency gains in their combination. Labour market reforms which aim to increase labour supply through a greater participation rate include for example measures addressing vulnerable groups like unskilled workers, the long-term unemployed or the inactive, such as the discouraged workers.

Measures that aim to increase incentives to investment and that attract, in particular, foreign direct investment may result in a higher capital-to-worker ratio, helping place Portugal in a more dynamic segment of the world production frontier.

A volatile and uncertain fiscal framework, a slow and inefficient legal system and an education system that is inadequate for the technological transformations in progress discourage investment, and are seen as considerable obstacles to economic growth.

Policy measures in the areas of competition, institutions and public infrastructure, among others, may also lead to efficiency gains for the production factors. These gains may result both from

a more efficient combination of the production factors, and from their reallocation to more productive firms and sectors. In turn, technological innovation may affect products or production processes. In this context, the efficiency level in the labour and product markets is a key factor.

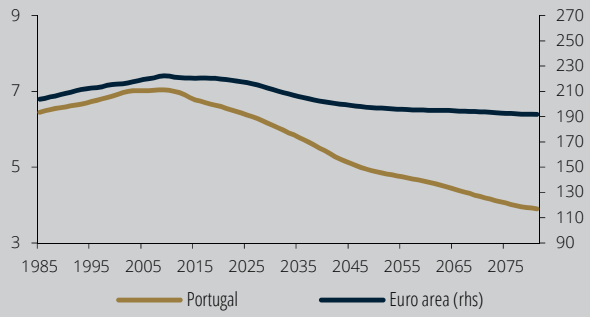
Structural reforms become particularly important when the expected contribution from the labour input applies a particularly negative pressure on growth prospects. Charts 18 and 19 present the expected evolution of the working-age population (aged 15 to 64 years) and the participation rate in the labour market, both for Portugal and for the euro area.

According to the demographic projections from Eurostat and the European Commission for Portugal, using the parameters of the production function presented previously, the decrease in the working-age population contributes to an average decline close to -0.5 p.p. in the Portuguese economy's annual potential growth between 2020 and 2080, which compares to -0.1 p.p. for the euro area.[11]

Even though structural reforms need to be implemented, measuring their impact is not direct or immediate, and some difficulties may exist in measuring their success over time. In the literature there are several studies, based on theoretical and empirical models, which find favourable effects on the economy's production, on consumption, on investment, or on employment (Almeida, Castro and Félix, 2010; Gomes *et al.*, 2011; Varga and in't Velt, 2014 and IMF, 2015).[12] However, these reforms tend to take time to produce results, and may even be linked to adverse effects in the short term. These kinds of adjustment costs may be greater or particularly harmful in recessive episodes, particularly if they involve reallocations of the labour input when the waiting time for finding a new job is increasing. Likewise, excessive indebtedness levels or financial constraints may also increase these adjustment costs, as they restrict the capacity for smoothing consumption during any unforeseen events, amongst other effects.

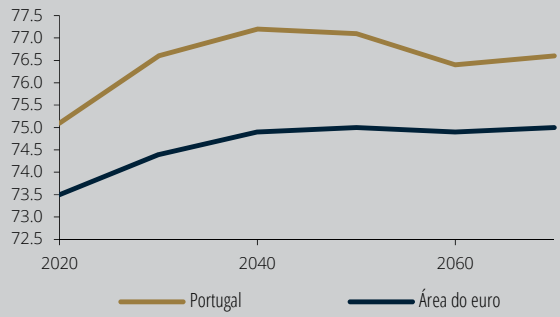
The benefits of structural reforms are very dependent on the overall institutional framework. Indeed, labour market reforms may be more effective if the product market also functions efficiently. In this way, there may be scale effects from a wide-ranging reform package, particularly if it is implemented in an appropriate sequence.

Chart 18 • Working-age population (15-64) | Millions



Source: Eurostat.

Chart 19 • Participation rate (15-64) | In percentage



Source: European Commission (Ageing Report, 2017).

Note: The participation rate is calculated as the ratio between labour force and working-age population.

Box 4 | Potential output revisions

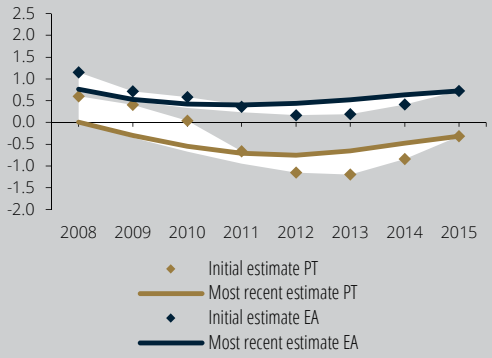
Potential output's level and rate of growth are subject to particular uncertainty. This Box focuses on the difficulties associated with the estimation of contemporaneous values and the dependence on the dataset available.

In general, an estimate of potential output in real time may differ substantially from an estimate made thereafter under the same methodology, only due to the inclusion of new data that become available in the interim. To illustrate the magnitude of these revisions, Charts C.4.1 to C.4.4 show sequential estimates of potential growth and the output gap released by the European Commission[13] and those that would result from the simple use of a Hodrick-Prescott filter (HP).[14]

Comparison between the initial and most recent estimates shows that the potential growth and the output gap are revised considerably in certain years. Furthermore, the revisions tend to be more significant in the output gap, as a result of the cumulative effect of the revisions on rates of change. The differences between the maximum and minimum values of the estimates for each year, represented by the white area, also confirm the degree of uncertainty, as the revisions do not always approximate to the most recent value. This is especially visible in the European Commission's estimates for Portugal, where consecutive revisions are often observed moving in opposite directions.

The performance of the models is particularly affected during sharp cyclical shifts, when revisions tend to be very considerable. The period analysed includes very sharp revisions for Portugal,

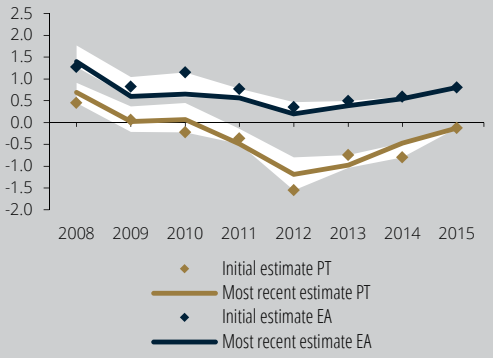
Chart C.4.1 • Potential growth: HP filter | In percentage



Sources: Banco de Portugal and Eurostat.

Notes: PT – Portugal; EA – Euro area. Annual estimates based on quarterly data. HP filter with a smoothing parameter of 7680, applied to quarterly data. The initial sample used to calculate the value for 2007 covers data from 1995-2008. This sample was extended sequentially by observations of 4 quarters up to 2016. The initial estimate of the HP filter for year t is based on a sample from 1995 to t+1. The most recent estimate is obtained using the complete sample of observed data (1995-2016). The white area represents the range between the minimum and maximum estimates for each year.

Chart C.4.2 • Potential growth: European Commission | In percentage



Source: European Commission.

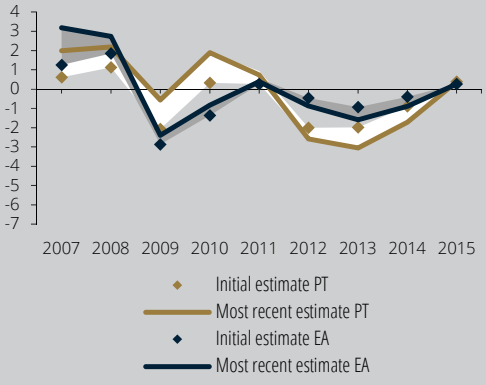
Notes: PT – Portugal; EA – Euro area. The European Commission estimates correspond to the spring forecasts published between 2008-2016. The initial estimate corresponds to the spring forecasts of t+1, when the GDP of period t is already observed. The most recent estimate corresponds to the spring 2016 forecasts. The white area represents the range between the minimum and maximum estimates for each year.

given the persistence and severity of the recent recession. Although the euro area has not been immune to the recent international financial crisis, the revisions for this aggregate are comparatively smaller.

On average, while the interval of estimates for potential growth over the period from 2008 to 2015 does not differ significantly when the estimates obtained through the HP filter are compared to those of the European Commission, this is not the case with the output gap. Taking the example of 2011, the output gap estimates produced by these two methodologies vary between -3.2% (European Commission) and 0.9% (HP filter). These results are particularly important when trying to establish the existence of any 'excess demand' (Box 2). In the case of the HP filter, potential output's deviations from the actual values tend to be relatively less persistent. For example, it may be observed that the output gap is consistently negative from 2009, according to the European Commission's estimates, while the HP filter estimates positive gaps for the years 2010, 2011 and 2015. A smoothing parameter of 7680 was used in this analysis, following Almeida and Félix (2006). In relative terms, these estimates reflect a smaller cyclical amplitude both for Portugal and for the euro area compared to the European Commission results. A smoothing parameter of 1600, which is more common in the literature, would result in less persistent business cycles, with a smaller amplitude, and a greater volatility of potential output, which would move more closely in line with actual GDP, impacting the revisions in the output gap.

The revisions of the estimates produced by the HP filter focus in particular on the end of the sample period (Charts C.4.5 and C.4.6), with the lengthening of the sample only resulting in

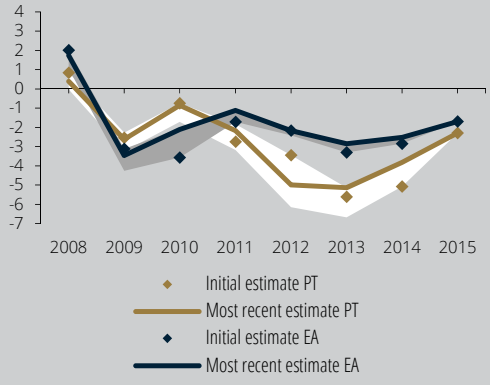
Chart C.4.3 • Output gap: HP filter | In percentage



Sources: Banco de Portugal and Eurostat.

Notes: PT – Portugal; EA – Euro area. Annual estimates based on quarterly data. HP filter with a smoothing parameter of 7680, applied to quarterly data. The initial sample to calculate the value for 2007 covers data from 1995 to 2008. This sample was extended sequentially by observations of 4 quarters up to 2016. The initial estimate of the HP filter for year t is based on a sample from 1995 to t+1. The most recent estimate is obtained using the complete sample of observed data (1995-2016). The shaded area represents the range between the minimum and maximum estimates for each year.

Chart C.4.4 • Output gap: European Commission | In percentage



Source: European Commission.

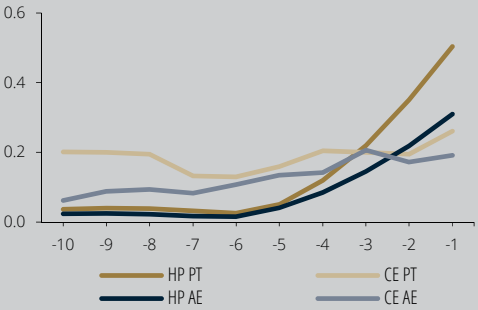
Notes: PT – Portugal; EA – Euro area. The European Commission estimates correspond to the spring forecasts published between 2008-2016. The initial estimate corresponds to the spring forecasts of t+1, when the GDP of period t is already observed. The most recent estimate corresponds to the spring 2016 forecasts. The shaded area represents the range between the minimum and maximum estimates for each year.

substantial changes to the estimates of the later years.[15] In this exercise, the revisions at the end of the sample are significant, even when only the data observed for the extension period are used.

The European Commission's estimates for remoter years are also revised considerably when new observations are added. These estimates are also subject to revisions resulting from any methodological changes and revisions in the actual data. In the case of the HP filter, this exercise only considers revisions to the trend component, given that the actual GDP series remains unchanged for all estimates.

In sum, potential output estimates are affected by the time of their calculation. Estimates in real time are provisional, and should be used with caution when analysing and defining economic policy measures. The assessment of the business cycle and the economy's potential growth requires the largest possible dataset, potentially sectoral, avoiding limited and partial sets that may lead to perception errors.

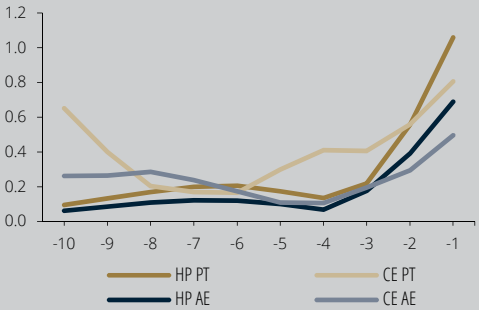
Chart C.4.5 • Mean revisions of potential output growth | In percentage points



Sources: Banco de Portugal, European Commission and Eurostat.

Notes: PT – Portugal; EA – Euro area. The figures reported are based on the mean absolute revisions for the period 1998-2015 vis-à-vis the most recent estimate (for the EC, spring 2016, in the case of the HP filter, the estimate obtained using the complete sample). The horizontal axis represents the number of years elapsed between the estimated year and the year of the publication in the case of the EC and the year of the last observation included, in the case of the HP filter. HP filter with a smoothing parameter of 7680, applied to quarterly data. The initial sample covers data from 1995-2008, which was extended sequentially by observations of 4 quarters up to 2016. The European Commission estimates correspond to the spring forecasts published between 2008-2016.

Chart C.4.6 • Mean revisions of the output gap | In percentage points



Sources: Banco de Portugal, European Commission and Eurostat.

Notes: PT – Portugal; EA – Euro area. The figures reported are based on the mean absolute revisions for the period 1998-2015 vis-à-vis the most recent estimate (for the EC, spring 2016, in the case of the HP filter, the estimate obtained using the complete sample). The horizontal axis represents the number of years elapsed between the estimated year and the year of the publication in the case of the EC and the year of the last observation included, in the case of the HP filter. HP filter with a smoothing parameter of 7680, applied to quarterly data. The initial sample covers data from 1995-2008, which was extended sequentially by observations of 4 quarters up to 2016. The European Commission estimates correspond to the spring forecasts published between 2008-2016.

Final considerations

The calculation of potential output is important for defining appropriate stabilisation policies. Despite the uncertainty inherent to the calculation of this indicator, the output gap remains important for defining monetary and fiscal policy in different economies, including in the euro area. The assessment of potential output is also relevant for the definition of policies with an impact on longer horizons. At these low frequencies, potential output growth is probably the most important variable for the determination of economic well-being in a society.

The Portuguese economy faces a set of long-term challenges that require special attention. One of these challenges relates to demographic developments, both due to the expected decline in the working-age population, and due to their ageing. The projections available suggest a persistent negative impact of these factors on potential output. In contrast, the increase in skills based on growing education levels, resulting from an education system that is adequate for the technological transformations in progress, may contribute to an increase in potential output for a prolonged period.

The increase in capital-per-worker levels is another important challenge. Correcting the high levels of indebtedness, in parallel with creating conditions that allow investment to increase, both in quantity and in quality, is essential for improving the Portuguese economy's current position. The international financial crisis left significant marks in Portugal, particularly with regard to the conditions for accessing finance, with consequences for the accumulation of capital. Although there are no estimates available that link the sharp and persistent reduction of aggregate demand to the behaviour of aggregate supply, a topic that calls for discussion by the scientific community (Yellen, 2016), investment's negative behaviour over a prolonged period will have repercussions on potential output.

An economy's capacity to increase its potential output is largely dependent on its legal and institutional framework, namely the ability to create conditions that allow the most effective allocation of available resources possible. An institutional restructuring designed to facilitate the emergence of competitive firms, as well as factor mobility between firms, may lead to a favourable creative destruction environment, increasing potential output. In contrast, the survival of firms with inferior performance, which remain active for longer periods than desirable, diverting production factors and financial resources, may hamper the economy's restructuring process and limit economic growth (European Central Bank, 2011). The increase in economies' competitiveness worldwide is one of the structural phenomena that should be taken into account when deciding on structural reforms, whether in the labour or product markets. According to available estimates for Portugal, one of the features of the recent buoyancy in economic activity was the acceleration of total factor productivity. It is vital over the medium term to design policies that support this trend.

This Special issue presented some of the main aspects associated with potential output, namely the concept, its role in economic analysis and the uncertainties inherent to its calculation. The topic will certainly continue to be the subject of debate and scrutiny in the literature and among the general public.

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Notes

1. Based on the Solow-Swan model, growth in steady state is closely related to the idea of long-term equilibrium of the economy, in which the various quantities grow at constant rates and where, consequently, key output ratios are stable (Barro and Sala-i-Martin, 1995; or Mankiw, 2003). For instance, the stock of capital increases at the same rate as GDP, whereby the capital-to-GDP ratio is constant. Inflation in the steady state is determined, for example, by the targets set by the central bank.

2. As an alternative, a production function could be considered with constant elasticity of substitution of factors, but not necessarily equal to 1, commonly referred to as CES (*Constant Elasticity of Substitution*).

3. A distinction should be made between the concept of natural output and that of 'efficient output', obtained under the assumption that the product and labour markets operate in perfect competition (see, for example, Blanchard and Galí, 2007).

4. Teles and Garcia (2016) use this definition of natural output. The authors identify a family of short-term Phillips curves that intersect a vertical long-term Phillips curve.

5. It has been suggested that this fact could be one of the reasons underlying technology's small contribution to Portugal's economic growth, in comparison to other economies (Amador and Coimbra, 2007).

6. The uncertainties over use of potential output were approached for example in Orphanides and Norden (2002) and Marcellino and Musso (2011).

7. Jorgenson and Stiroh (2000) present estimates for the United States.

8. The 2018 Ageing Report: Underlying Assumptions & Projection Methodologies.

9. See for example the speech of Mario Draghi, President of the European Central Bank (18 October 2017).

10. It is important to note that GDP is sometimes criticised as a measure of social well-being. The need to value the inclusive aspect of economic growth has been emphasised by certain institutions, due to which the policymakers should also take into consideration equity in the distribution of the benefits of structural reform (see for example, OECD 2015). According to Stiglitz, Sen and Fitoussi (2009), substantial changes to the distribution of income may affect the use of GDP, or of any other *per capita* measure, as an indicator of households' situation.

11. This calculation assumes an elasticity of 0.64 for GDP in relation to the labour input.

12. A very common exercise in general equilibrium models is to assess the effects of policies designed to increase the level of economies' competitiveness, meaning those that lead to a narrowing of the gap between the costs borne by firms in producing goods and services and the prices actually paid by the users, whether final consumers or other firms.

13. The European Commission methodology is based on a production function and is described in Havik *et al.* (2014).

14. This filter is used in the Eurosystem exercises for the computation of the cyclically-adjusted budget balance (see Bouthevillain *et al.*, 2001).

15. The magnitude and persistence of the impact of including additional information depend on the smoothing parameter chosen and therefore on the assumed duration of the business cycle.