1.1. Potential output in Portugal and in the euro area: Where do we stand?

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1. Motivation

The economic outlook and growth assessment of a particular country require an overview of potential output estimates. Being Portugal a small country integrated in a large monetary union, with important linkages in terms of labour, capital and technology, it is natural to ask: how does the Portuguese economy compare with the euro area?

Both the *level* and *growth rate* of potential output provide valuable information to assess past, current and future developments, and contribute to design adequate policies. In the short-run, for instance, the difference between Gross Domestic Product (GDP) and potential output levels — the output gap — can provide information about inflationary pressures and reveal the ability (or inability) of the economy to expand without price acceleration. A possible interpretation for this link lies in excess demand paving its way in rigid markets. As the economy evolves towards its long run path, in the absence of additional exogenous disturbances, the output gap should close, and the growth rate of GDP should be equal to the growth rate of potential output.

Higher labour and capital productivity are desirable objectives of any society, as a way to increase potential output and social well-being. In addition to the quantity and quality of inputs, potential output also depends on the talent to efficiently combine these inputs, which is greatly influenced by the role of institutions. The ability of labour and product markets to efficiently allocate resources, with proper incentive mechanisms, and a competitive environment that prevents undesirable economic rents help workers and firms to achieve higher productivity levels. Comparing potential output developments, input markets, or institutional designs in Portugal and in the euro area may help policy-makers to identify areas which justify alternative settings, with a view to maximize social well-being.

This Section offers model-based potential output estimates for Portugal and the euro area, following Duarte *et al.* (2019). Observed data is decomposed into trends and cycles by mixing dynamic equations for price and wage inflation with a version of Okun's law and a production function featuring capital, labour and total factor productivity (TFP). A distinctive characteristic of this exercise lies in the assumption that the TFP trend component is an unobserved variable, to be jointly estimated with the remaining unknowns, and thus conditional on the model structure, including on inflation developments. Expectations take an adaptive form. The models are estimated independently for Portugal and the euro area with Bayesian techniques.[1]

The main conclusions are threefold. Firstly, results confirm that Portuguese potential output has been decelerating compared with the dynamism of the 1980s and the 1990s, when the unemployment rate below (above) which wage inflation rises (decreases), i.e., the *Non-Accelerating Wage Rate of Unemployment* (NAWRU), remained broadly stable around 5.5%. There is also a confirmation that the financial and sovereign debt crisis of 2010 had long-lasting effects. Current estimates for 2017 place the growth rate of potential output slightly above 1.0% and on an increasing path, which is comparable with mid-2000s' estimates, while the NAWRU is around 8.5% and on a decreasing path.

Secondly, the Portuguese potential output is diverging from euro area estimates since 2003. This evidence adds to the well-known divergence in actual GDP, which reflects both trend and cyclical components, and suggests that structural reforms are needed in order to match the euro area economic performance.

Finally, output gap estimates are typically more volatile in Portugal than in the euro area throughout the entire sample. More recently, we observe a more negative and persistent output gap in Portugal, consistent with larger labour market slack and a relative decrease in wage differentials. In contrast, we detect a relative stability of price differentials during the same period. Results suggest relative inflation expectations as an explanation but further work is needed to shed more light on why nominal developments in product markets did not follow those in labour markets, *i.e.* why the pass through to output prices did not occur.

1 The main theoretical reference behind the model is Szörfi and Tóth (2018). Almeida *et al.* (2009) and Centeno *et al.* (2009) present alternative estimates and an overview on the Portuguese potential output before 2008.

2. Data

The dataset is quarterly and relies on official national accounts data regarding employment, hours worked, compensation of employees, real GDP and the GDP deflator, and on Labour Force Survey data for working-age population, labour force and the unemployment rate. Price inflation is measured by the annualised growth rate of the GDP deflator and wage inflation refers to the annualised growth rate of compensation per hour worked.

Portuguese data covers the 1980Q1–2018Q2 period. These series where retrieved from Statistics Portugal and Banco de Portugal databases, the latter including the capital stock and historical data prior to 1995.

Euro area data also covers the 1980Q1–2018Q2 period. These series were retrieved from Eurostat, with the exception of the capital stock, which was collected from the macro-economic database of the European Commission (AMECO). Observed data were backdated with the Area-wide model database (Fagan *et al.*, 2001) or with AMECO growth rates, when the former is not available. When only annual data exists, we use spline interpolation methods.

By extending our database to a period prior to the euro area creation, we enrich the analysis with a larger time span and avoid focusing on a sample highly conditioned by the financial and sovereign debt crisis and its long-lasting effects. Additionally, to reduce end-of-period biases, estimates take into account an extension of the sample with projections up to 2021 for Portugal (taken from Banco de Portugal) and up to 2020 for the euro area (taken from AMECO).

3. Model

The analysis in this Section is based on a multivariate filter featuring a production function with unobserved components, such as potential output and the NAWRU. The model decomposes some key observable variables into trend and cyclical components, both of which are unobserved—notably real GDP is decomposed into potential output and the output gap and the unemployment rate into the NAWRU and the unemployment gap.

The unobserved components model uses the production function as a central organizing element—such that developments in potential output can be interpreted in light of changes in production factors and their productivity—which introduces more economic structure

compared to statistical filtering approaches. The growth rate of potential output $\Delta\bar{y}_t$ is given by

$$\Delta\bar{y}_t = \Delta\overline{tfp}_t + \iota\Delta\bar{l}_t + (1-\iota)\Delta\bar{k}_t, \tag{1}$$

where $\Delta\overline{tfp}_t$ is defined as the growth rate of trend TFP, $\Delta\bar{l}_t$ is the change in the trend component of total hours worked, and $\Delta\bar{k}_t$ is the change in observed capital. Further details are available in Duarte *et al.* (2019).

The production function structure allows us to decompose potential output growth into TFP, capital and labour contributions (the latter being further decomposed into the contributions from the labour force, measured in hours, and the unemployment rate). A distinctive characteristic of the model lies on the assumption that TFP is another unobserved variable, to be jointly estimated with the remaining unknowns, as in Szörfi and Tóth (2018). In our model the growth rate of the trend component of TFP is informed by the change in the HP-filtered Solow residual—the residual from the production function after accounting for actual labour and capital data—and is subject to shocks. Changes in trend unemployment (NAWRU) and trend labour force are also informed by low-frequency movements of observed data and are subject to shocks.[2]

In addition to the Cobb-Douglas production function, the model also includes simple theoretical economic relationships, namely a dynamic version of Okun's law and equations linking output gaps and labour input gaps to nominal developments. Okun's law links the output gap to the unemployment gap, meaning that the latter—a proxy for the level of underutilised resources in the economy—is inversely related with the output gap.

The wage equation assumes that (labour-productivity adjusted) wage growth is conditional on price inflation expectations and on both the labour force gap and the unemployment gap. It should be mentioned that Okun (1962) identified trend unemployment rate as being compatible with "full employment", meaning that the unemployment level would be low enough to result in as much production as possible without generating inflationary pressures. The model also includes a price equation, which determines that price inflation responds to inflation expectations and the output gap. We assume that changes in both wage and price expectations are conditional on past developments and exogenous disturbances.

2 Changes in the NAWRU are informed by the variation in the HP-filtered gap between long and short-term unemployment, while changes in trend labour force are informed by the variation of the HP-filtered labour force.

The long-run equilibrium of the model has several appealing characteristics, namely (i) price and wage inflation are constant, (ii) output and labour market gaps are nil, with actual and potential output growing at the same rate, and (iii) real wages grow in line with labour productivity.

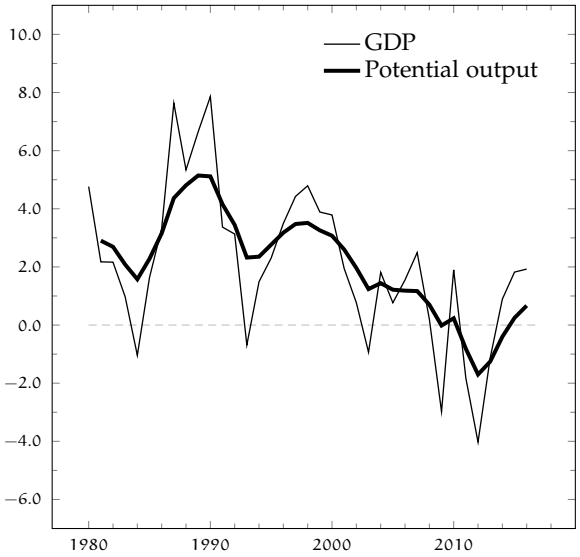
4. Results

Figure 1a illustrates the annual change in Portuguese potential output. After a slowdown in the run up to the financial and sovereign crisis of 2010 and a pronounced decline in 2012, model-based estimates point to a recovery of potential output, reaching growth rates around 1.0% in 2017, relatively close to mid-2000s' estimates, yet still considerably below those of the beginning of the sample. These features are relatively common across different models and international institutions' estimates.[3]

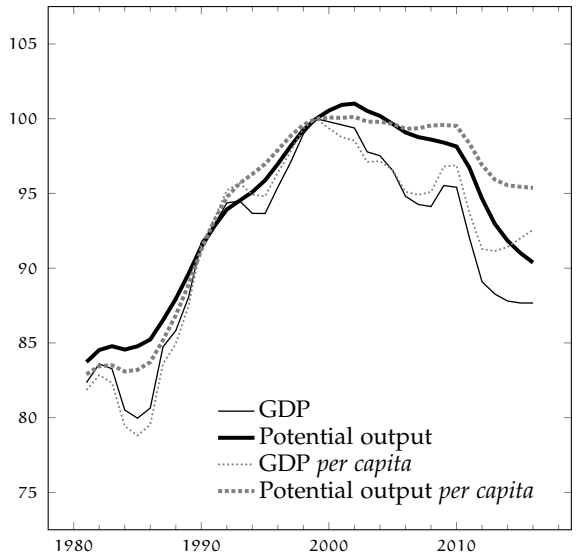
One key factor behind the potential output slowdown throughout the whole sample period is related with the evolution of the capital stock, with a contribution that gradually decreased to below zero, suggesting that investment rates have been insufficient to offset the depreciation of installed capital. Recent developments suggest a slow-moving recovery in the capital stock, mainly spurred by business investment, while public and housing investment are lagging behind. Another structural factor of concern in recent years, and most likely in the years to come, are the demographic developments, namely the decrease in working-age population. In the end of the sample, potential growth is supported by favourable TFP developments, which outweigh negative contributions from both capital and labour.

How do Portuguese developments compare with the euro area? The most striking difference between the two economies is that potential output did not decrease in the euro area—despite some deceleration in growth rates—mainly due to significant contributions from both capital and TFP throughout most of the sample period. Moreover, estimates suggest that potential output growth rates in the euro area are more stable, although the NAWRU has also recorded a slight upward trend. In 2017, the growth rate of euro area potential output stands at 1.6% and the NAWRU at 9.2%. The NAWRU is systematically lower in Portugal than in the euro area over the sample, with the exception of the crisis period. Nevertheless, the

3 See Banco de Portugal (2017).



(a) Growth rates in Portugal | In percentage



(b) Cumulated growth differentials between Portugal and the euro area | Index (1999=100)

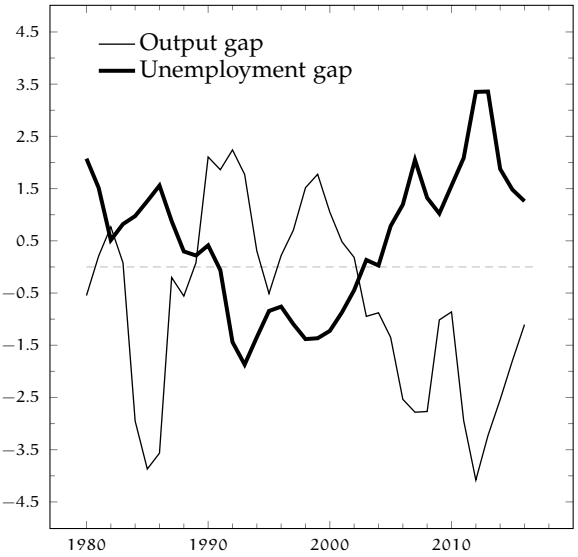
Figure 1: GDP and potential output

Source: Eurostat, Banco de Portugal, Statistics Portugal, Area-wide database and authors' calculations.

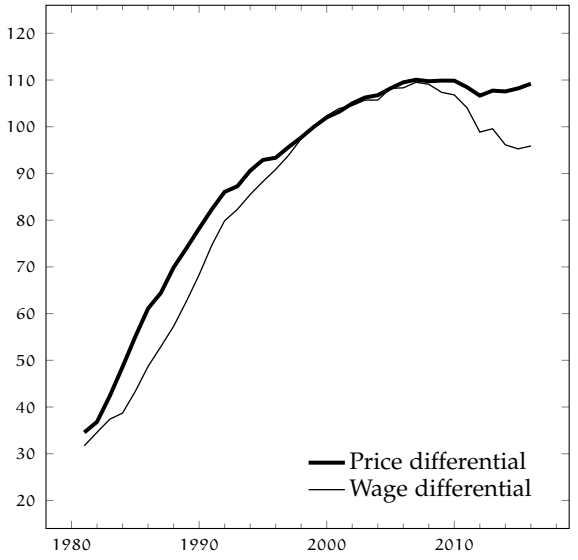
differences have narrowed considerably compared to the beginning of the sample.[4]

Figure 1b depicts cumulated growth differentials between Portugal and the euro area. The line in the Figure is upward (downward) slop-

4 Note that the level of potential output is influenced by the *level* of the NAWRU, while the growth rate is determined by the *change* in the NAWRU.



(a) Differentials in output and unemployment gaps | In percentage points



(b) Cumulated price and wage differentials | Index (1999=100)

Figure 2: Differentials in real and nominal developments in product and labour markets

Source: Eurostat, Banco de Portugal, Statistics Portugal, Area-wide database and authors' calculations.

ing if Portugal is growing more (less) than the euro area and, thus, growth differentials are positive (negative). This figure illustrates that while actual GDP was growing above the euro area during most years in the first part of the sample, Portugal registered persistently lower

growth rates during the last two decades, *i.e.* a divergent process.[5] With regard to potential growth, we find a similar diverging path, which is however less pronounced and highly influenced by the last economic crisis. This implies that the sovereign and debt crisis had both a trend and a cyclical impact.

The main messages remain broadly unchanged when we look at differentials per capita. Although there is some convergence towards the euro area in the most recent period, namely in the case of actual GDP, this reflects the fact that population has been decreasing in Portugal, which is a demographic trend that will eventually take its toll on future growth.

Figure 2a presents the differentials in output and unemployment gap estimates between Portugal and the euro area. The volatile output gap differentials are dominated by the volatility of the Portuguese output gaps (which also tend to be larger). During the last fifteen years, we find consistently lower (and negative) output gaps in Portugal than in the euro area, although the differential has been narrowing in the recent past. In line with Okun's law, periods characterized by a relatively lower output gap are mirrored by higher unemployment gaps, and *vice-versa*. In fact, we find a negative unemployment gap differential in the 1990s and then a reversion to a more pronounced positive differential since the early 2000s.

Figure 2b depicts the evolution of cumulative price and wage inflation differentials. Price and wage inflation were significantly higher in Portugal than in the euro area in the first part of the sample, which explains the positive slopes of the lines in the graph. While both economies went through strong disinflationary processes, the reduction in Portuguese inflation was more significant, narrowing the differential between both economies in the run up to the euro.

The high output gap volatility, together with the acute disinflation that characterized the first two decades of the sample, turn it difficult to reconcile inflation gaps towards the euro area with developments in the output and labour markets. However, in the more recent period, where inflation differentials have narrowed, the persistently negative output gap differential should translate into negative price inflation differentials relative to the euro area. Notwithstanding, price inflation in Portugal remained relatively aligned with the euro area. On the contrary, the consistently higher labour market slack translated into nominal wage adjustments, namely lower wage inflation in Portugal. In other words, there has been a real exchange rate depreciation *vis-à-vis* the monetary union using wage but not price

5 See, for example, Banco de Portugal (2018).

differentials.[6] This result suggests that the pass-through from wages to prices did not take place in relative terms, or has been at least incomplete. In light of the model this can be explained by relative expected inflation, *i.e.* agents expect a higher price acceleration in Portugal.

5. Caveats

Model specification and results are conditional on several working assumptions. Firstly, the models with euro area and Portuguese data are estimated independently. This implies that international linkages and spillovers are ignored. Secondly, the model lacks a nominal anchor. This implies that inflation targets within the monetary union are ignored. Thirdly, results are also conditional on the law of motion of unobserved variables, for instance on alternative orders of integration for the NAWRU. Choosing between an integration order of 1 or 2 changes the NAWRU's level and volatility, particularly in the Portuguese case. Finally, changes in the sample period have important effects in estimates of some unobserved variable, namely the NAWRU.

6. Final remarks

This Section suggests that the economic divergence that Portugal has been witnessing over the last two decades has both a trend and a cyclical component. The trend component is particularly worrisome given that potential output estimates highlight structural features, which are quite telling about future developments. The results reinforce the case for structural reforms if policy-makers desire to resume a sustainable economic convergence.

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6 The real exchange rate depreciation is also visible with unit labour costs. The relative stability of price inflation also holds with the Harmonized Index of Consumer Prices, with or without energy prices, and the private consumption deflator.

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