



ISSN 2443-8030 (online)

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ECONOMIC BRIEF 004 | DECEMBER 2015

EUROPEAN ECONOMY

*Economic and
Financial Affairs*



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Luxembourg: Publications Office of the European Union, 2015

KC-BE-15-004-EN-N (online)
ISBN 978-92-79-48744-6 (online)
doi:10.2765/619075 (online)

KC-BE-15-004-EN-C (print)
ISBN 978-92-79-48743-9 (print)
doi:10.2765/64637 (print)

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Using financial variables to estimate the Irish output gap: do they make a difference?

By Mirzha de Manuel Aramendía and Rafal Raciborski

Summary

Potential output estimates during Ireland's pre-2007 housing boom showed narrowing output gaps and positive structural budget balances. These results helped to create a false sense of security among domestic policy makers. It took a deep economic and financial crisis to learn that Ireland had been building up huge imbalances and that its public finances had feet of clay.

The misjudgement of economic conditions and the underlying budgetary position derived from the specific nature of the boom in Ireland in the 2000s. Ireland's housing and construction boom was a credit fuelled bubble, facilitated by light-touch banking supervision, which fed sharp increases in government revenue and expenditure.

Although some indicators prompted warnings from the European Commission and others, established methods for estimating output gaps did not reveal the full extent of the imbalances growing in Ireland in the run-up to 2007. This is because such methods are geared towards tracking conventional business cycles and do not really gauge the economic and fiscal impact of a rapid increase in financial variables such as bank credit and property prices. Indeed, broadly stable inflation rates and capacity utilisation close to normal at the time pointed towards a 'soft landing' for Ireland.

In this Economic Brief, we estimate what we call the *financial output gap* in Ireland. We follow an approach proposed by Borio and others (2013) that allows us to take into account financial variables. We obtain estimates of the financial output gap that would have supported a more cautious assessment of economic conditions and in turn of the underlying fiscal position in Ireland in the years leading to the crisis. This conclusion holds using both historical data available today and data available in 2007 at the height of the Irish housing boom. At the same time, some health warnings are in order. Although the approach works well for the 2000s, it produces estimates that are less plausible when compared with conventional business cycle estimates for the late 1980s and the early 1990s.

Thanks to improvements in the EU's economic and fiscal governance rules introduced in 2011, financial variables now receive greater attention so that the build-up of credit-fuelled housing booms can now trigger relevant EU surveillance instruments.

Acknowledgements: This note benefited from comments by Nicolas Carnot, Servaas Deroose, Martin Larch, Werner Roeger and Charlotte van Hooydonk.

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Introduction

During the final years of the Irish housing boom, conventional estimates of the output gap and the structural budget balance did not foreshadow the cliffs the economy was heading to: The Irish economy was assessed to operate close to its potential and the structural budget balance was estimated to be sound and in surplus. A broader assessment of risks, including by the European Commission, raised concerns about the sustainability of the boom.¹ Yet, the assessment of risks did not translate into concrete actions, not least because EU surveillance is ultimately centred on conventional indicators of the output gap.

In this Economic Brief, we estimate the Irish output gap by applying an approach similar to the one proposed by Borio and others (2013). This approach was developed in the aftermath of the post-2007 global economic and financial crises, which laid bare the extent to which financial developments can impact the real economy, leading to the accumulation of massive imbalances which then unwind in an abrupt and disruptive manner. The approach is used for illustrative purposes only. It is purely statistical and offers little insight in terms of the underlying economic relationships at play. Nevertheless, it provides a useful idea of the importance played by financial variables in driving macro-economic imbalances and, in turn, the underlying fiscal position in Ireland in the 2000s.

We argue that taking into account financial variables would have supported a more cautious assessment of the cyclical and fiscal conditions in Ireland in the 2000s. This information could have helped to inform better economic policies in Ireland, by exposing the size of the housing bubble and its implications for public finances. While better indicators do not automatically translate into better policy decisions, they improve transparency and accountability in policy making.

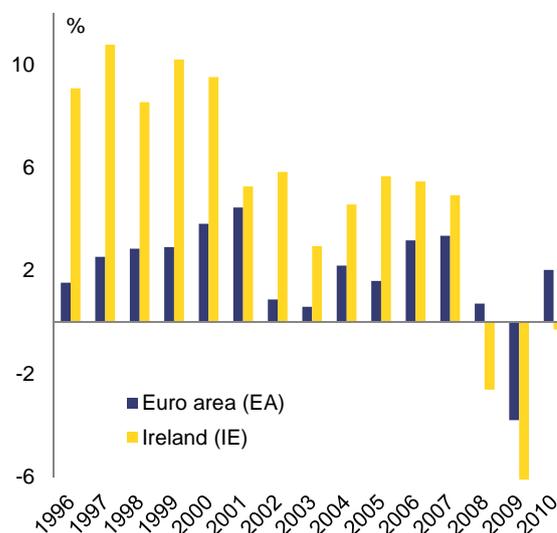
Before turning onto the output gap estimations, we first consider the relevant changes in the patterns of economic activity in Ireland and their consequences for public finances.

From export-led to construction-led

The Irish economy experienced very strong growth in the 1990s driven by its competitive position and a process of convergence with its European neighbours (Graph 1). From 1995 to 2000, real GDP grew by 9.6% yearly on average with net exports

accounting for 2.2 percentage points of this figure. However, the dynamics of the Irish economy changed sharply from 2000. GDP grew at robust but lower rates and wage developments in the non-tradable sector dented the country's competitiveness.

Graph 1: Growth in GDP at constant market prices



Note: Euro area composition varied during the period.
Source: European Commission

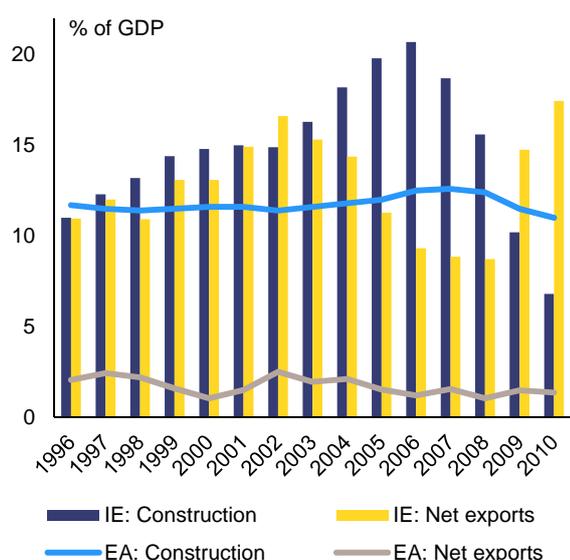
From 2000 to 2007, yearly GDP growth was 5% on average with net exports contributing far less than before. As construction activity picked-up, the real effective exchange rate appreciated by 38%.²

The boom in construction in the 2000s was fuelled by very strong credit growth and a sense of unlimited potential following the previous period of economic expansion.³ From the late 1990s, households could aspire to purchase property with more ease, given higher disposable incomes and easier access to mortgage finance. This grew to unsustainable levels, amidst very low interest rates and light-touch bank supervision. Strong capital inflows effectively de-linked national investment from national savings, while markets mispriced country-specific risks within the euro area. In addition, the natural demographic expansion in Ireland was coupled with strong inward migration, with immigrants often coming to work in the construction sector.

During this boom, the productive capacity of the economy shifted from the tradable to the non-tradable sector (Graph 2). In the mid-2000s, the shift became more pronounced until the bubble burst in 2008. The number of people employed in construction multiplied by three from 1995 to 2007, reaching 13.5% of total employment — 5.2 percentage points above the EU-15 average.

Residential property prices increased by 30% from 2005 to 2007 fuelling a financial acceleration mechanism whereby higher collateral values lead to higher credit growth and higher credit growth further fuels house price increases.⁴ Moreover, higher salaries to buy ever more expensive housing eroded Ireland's competitiveness vis-à-vis trading partners. However, broadly stable inflation rates and normal rates of capacity utilisation did not signal any form of conventional overheating and supported the hypothesis of a soft landing.

Graph 2: Net exports and construction



Note: Construction gross fixed capital formation.
Source: European Commission

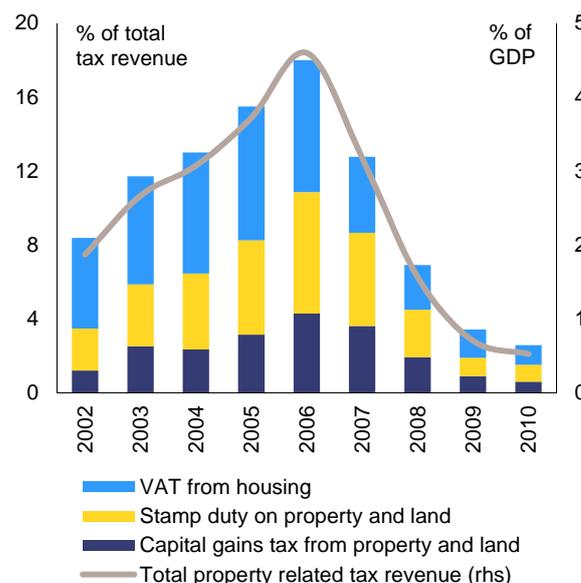
Impact of the bubble on public finances

An asset price bubble in the property sector affects government revenue through various channels. More construction activity increases public revenue from taxing value added, and boosts company profits and salaries in the sector. Growing property prices, particularly when combined with abundant mortgage finance, result in more purchases and sales of properties, and higher revenue from taxing these transactions. In addition, higher house prices increase government revenue from property and wealth taxes, and set off further private consumption. Unfortunately, however, most of these additional revenues disappear when property prices return to fundamental values.

From another perspective, changes in the composition of output also affect government revenue. Construction investment and household

consumption typically generate more tax revenue than export-oriented industrial production. Hence, a steep reallocation of resources towards the non-tradable sector can generate both a higher current account deficit and higher government revenue (Bénétrix and Lane 2011 and 2012). However, lost ground in international export markets can be difficult to recover. When the bubble bursts, the government is deprived of significant sources of revenue.

Graph 3: Tax revenue linked to construction in Ireland

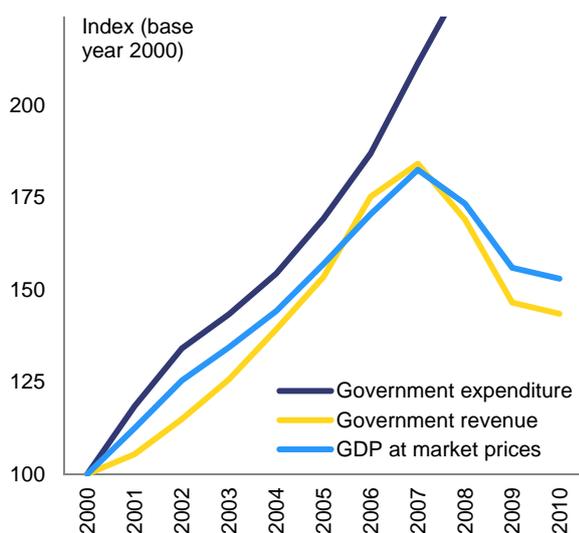


Source: European Commission (2011, p. 16) "The Economic Adjustment Programme for Ireland".

The European Commission (2009) estimated that government revenue windfalls, linked to the rapid expansion in credit and asset price booms, may have equalled 0.9% of GDP in 2006 in the euro area as a whole. However, in countries affected by property bubbles, revenue windfalls were significantly higher. In Spain, 75% of the increase in tax revenue from 1995 to 2006 was estimated to be transitory due to its link with the property bubble (Martinez-Mongay et al. 2007). In Ireland, government revenue increased by 84% in nominal terms between 2000 and 2007 but remained constant at 36% of nominal GDP. Over the next three years, revenue collapsed by 22% while GDP only contracted by 16% in nominal terms. Graph 3 illustrates the extent of the surge and collapse in revenue linked to construction and its weight in overall tax revenue, which went from 18% in 2006 to 3% in 2010. Using estimates of the fundamental level of construction and tax receipts, Addison-Smyth and McQuinn (2009) show a "property windfall component" of EUR 2.4 billion or 1.1% of Irish GDP in 2006, from stamp duty and value added tax alone.

Fiscal policy can worsen the situation by behaving pro-cyclically; that is, by contributing to the ballooning of the bubble — hence increasing the size of the crash and reducing the fiscal space available during the following economic contraction. In Ireland, government expenditure increased at a higher speed than GDP from 2000 (Graph 4), as spending caps were abandoned.

Graph 4: Public expenditure and revenue in Ireland



Note: Expenditure and revenue of general government. Source: European Commission

The surge in revenue was such that the government achieved surpluses despite targeting small deficits. The government also altered the tax system, in a manner that made it more reliant on construction (Čech 2006). It notably introduced changes to personal income tax that reduced the tax base, limiting the capacity of the tax system to generate sufficient revenue after the bubble (Kanda 2010). In addition, taxes on property, rental income and capital gains were not structured to play an active counter-cyclical role. Instead, tax incentives encouraged further investment into real estate (Nyberg 2011).

Output gap and financial variables

The estimates of potential output and output gap play an important role in economic policy-making, including in EU economic surveillance. Potential output can be broadly defined as the level of output that appears to be sustainable over the medium term in view of an economy's fundamentals and isolating the volatility embedded in the business cycle. The output gap is the difference between actual and potential output. A negative output gap indicates that resources are underutilised while a positive gap

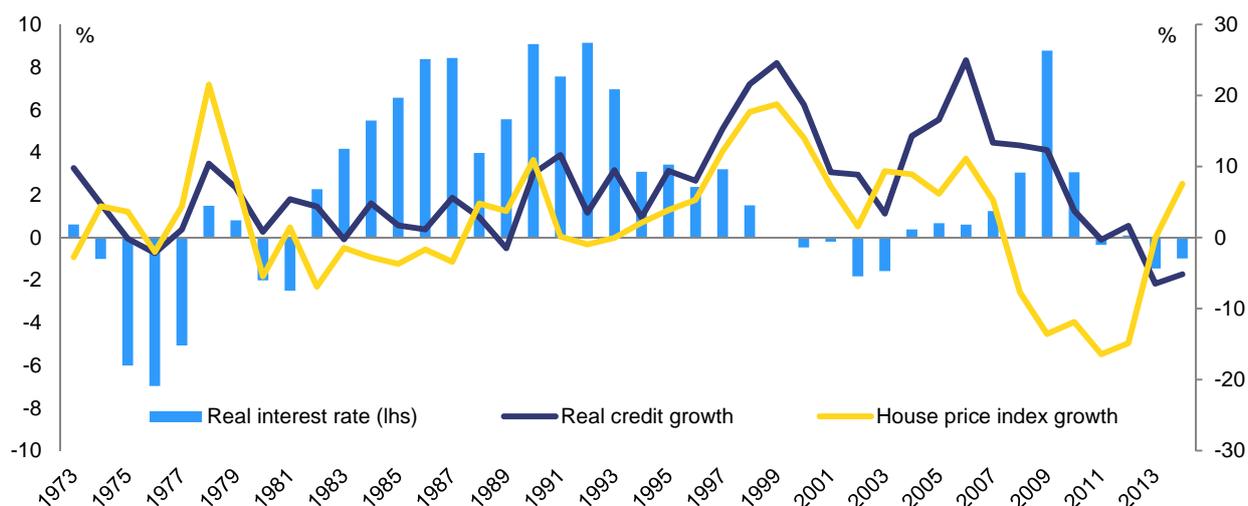
means that an economy risks overheating. The output gap is also used in budgetary surveillance to estimate the structural budget balance, where an estimation of the cyclical component of the balance is subtracted from the headline deficit figure. The estimation of this cyclical component also depends on budget elasticities, which summarise the response of the budget balance to changes in the level of economic output.⁵

In the run-up to the 2007-2010 crises, real-time estimates of potential output in Ireland produced slightly negative output gaps and positive structural balances. In later years, revised estimates showed that output gaps had been underestimated in real-time and confirmed that Ireland had been growing well above potential and that the underlying fiscal position was less sound than assumed.

For this Economic Brief, we have estimated what we call a financial output gap in Ireland. We follow an approach similar to the one developed by Borio and others in 2013. It is based on the premise that financial variables contain complementary information about the cyclical component of output. This approach attempts to capture the effects asset price booms can have on the real economy and in turn on public finances. These effects can include weakened financial and supply constraints, for instance through mortgage finance and the misallocation of resources, for instance towards the construction sector.

Within a simple statistical framework to detrend macroeconomic series, known as the Hodrick-Prescott (HP) filter, Borio and others (2013) introduce a range of financial variables (Graph 5), assuming that they explain the division between the cyclical and the non-cyclical component of output. We use this simple approach for illustrative purposes: to provide qualitative indications of how incorporating financial information could change our assessment of the prevailing economic conditions in Ireland and, in turn, of the actual strength of the underlying budgetary position.⁶

We compare the estimates based on our extended HP filter (the model is described in the annex) with those produced by two conventional approaches: (a) a standard HP filter and (b) the production function approach used in EU fiscal surveillance.⁷ Both the standard and the extended HP filters are purely statistical approaches that do not embed any description of the supply-side structure of the economy, in contrast with the production function used in EU fiscal surveillance.⁸

Graph 5: Financial variables used to estimate the output gap

Notes: Real interest rate is the headline European Central Bank rate deflated by consumer prices (Source: European Commission). Real credit growth refers to the growth in credit deflated by consumer prices (Source: Bank for International Settlements). The house price index is a synthetic indicator that captures house price developments (Source: Organisation for Economic Cooperation and Development).

Using Borio's approach, today's estimates of Irish potential output during the boom years produce large positive output gaps. These estimates, based on data available in February 2015, remain large from 2000 onwards, unlike those obtained from the other two methods, which only pick up later on, towards the end of the housing boom (Graph 6). In particular, in 2007, the final year of the Irish construction boom, the financial output gap peaked above 10% as compared to close to 5% using the EU's commonly agreed method. In sum, the financial output gap appears to capture the impact of the construction boom and financial variables in the run-up to the crisis.⁹

Since it is easy to second-guess with hindsight, we redo these estimations using data available at the time. Concretely, we use real GDP and financial data available at the height of the Irish housing boom in autumn 2007 (Graph 7). These "real-time" estimates would also have yielded large positive financial output gaps in the order of 4% of GDP, in contrast with estimates close to zero from the two conventional methods. These results show that taking into account the possible effect of the financial cycle not only makes a difference in hindsight: They would also have supported a more cautious assessment of the cycle and the structural fiscal position in real-time. Using a back-of-the-envelope calculation, a 4% of GDP difference in the output gap estimate reduces the structural budget balance by around 2% of GDP, turning the structural surpluses estimated for Ireland at the time — that is, in autumn 2007 — into structural deficits¹⁰

At the same time, some health warnings are in order. Since the extended HP-filter with financial variables and the two conventional methods generate very different patterns for output gaps over the sample period (1973-2014), it is worth trying to explain where these differences come from. Our estimates using Borio's approach are mainly driven by real interest rates and house prices. They describe a lower frequency *financial cycle*, with two periods of positive output gaps and two periods of negative output gaps over the whole sample period. By way of contrast, the production function approach identifies four episodes with positive output gaps. These four episodes are more strongly aligned with conventional business cycle indicators such as capacity utilisation rates.

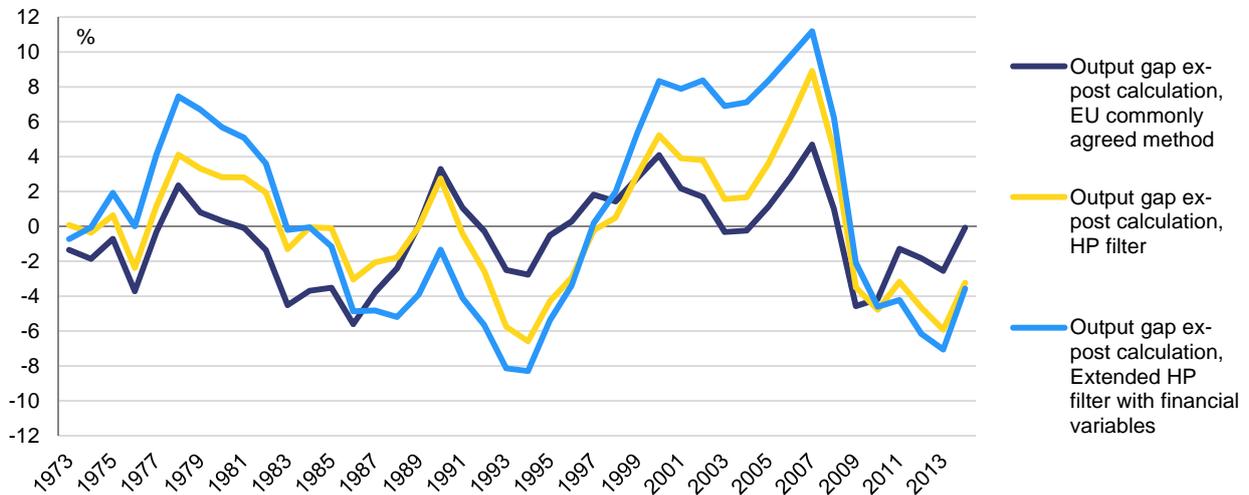
For example, in the late 1980s and early 1990s, the *financial output gap* remains negative, while the production function and standard HP filter output gaps turn positive. The persistently negative *financial output gap* is mostly driven by the high real interest rates that prevailed over that period. In line with this view was the large unemployment rate in Ireland during the 1980s. The production function approach identifies high unemployment largely as structural unemployment and also attributes the decline of the unemployment rate starting in the late 1990s mostly to structural reforms.

A complementary explanation for why the *financial output gap* yields estimates that are less aligned with the conventional business cycle in the earlier part of our sample, yet very much in line in the later part, is the regime shift that took place in financial markets

from the mid-1990s. As financial markets and financial integration were comparatively underdeveloped in the EU in the 1980s and early 1990s, the way financial variables impacted the real economy most likely differed from today's. At the

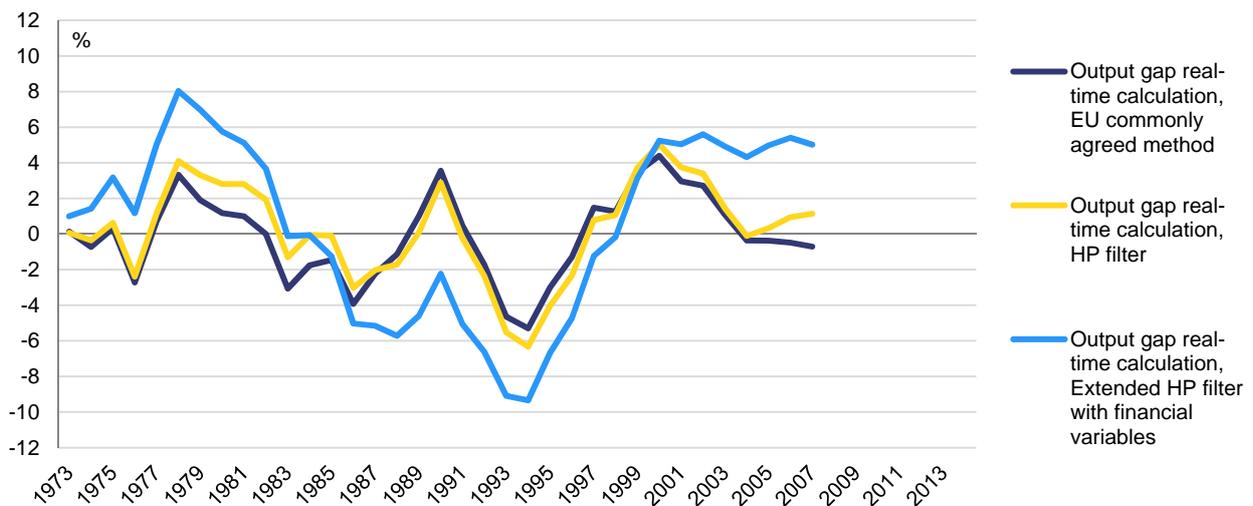
same time it should be noted that Borio's et al. approach attributes movements of financial variables to the cycle only, which constitutes a fairly strong assumption.

Graph 6: Today's (2015) estimates of the output gap in Ireland



Source: European Commission. Note: Estimates based on data and forecasts available in winter 2015.

Graph 7: Real-time (2007) estimates of the output gap in Ireland



Source: European Commission. Note: Estimates based on data and forecasts available in autumn 2007.

Established methodologies and the extended HP filter with financial variables also arrive at somewhat different assessments at the beginning of 2000s, when the "dot.com" bubble burst in the United States, producing ripples that were felt in Europe, too. While this did not lead to a full blown recession in Ireland, it nevertheless reduced GDP growth to 3% in 2003, from peak growth rates of around 10% in previous years, and led to the normalisation of conventional indicators of capacity utilisation. During these same years, the country also had to deal with the restrictions put in place to contain the outbreak of foot-and-mouth disease. The

production function approach and the standard HP filter interpret this period as a closing of the output gap, while the *financial output gap* narrows only slightly, hardly reacts and still indicates positive gaps in real-time of around 5%, as it captures the continued high growth rates of house prices.

Conclusions

Despite the ballooning of construction and house prices in the 2000s, to most observers the risks for the Irish economy only became clear after the bubble had burst, with the collapse of property

prices and the banking sector. Traditional output gap calculations were positive in the first half of the decade but converged to zero at the peak of the bubble (Graph 7). Broadly stable inflation and normal rates of capacity utilisation supported the hypothesis of a soft landing in Ireland.

Instead of taking action to mitigate the bubble, in the run up to the crisis government expenditure increased at a higher speed than GDP and the tax system was made more reliant on construction. Fiscal policy behaved pro-cyclically, magnifying the crash and reducing the fiscal space available during the ensuing economic contraction.

We show that taking into account financial variables within a relatively simple statistical framework would have yielded large positive output gaps in the years leading up to the deep financial and economic crisis in Ireland. These larger financial output gaps in the 2000s would have been consistent with weaker estimates of the underlying budgetary position, implying less flattering structural budget balances in the run-up to the crisis. Conceivably, this information could have helped inform better economic policies in Ireland.

At the same time, some health warnings are in order. While performing well in the 2000s, our estimates of the financial output gap in the late 1980s and early 1990s are less plausible when compared with conventional estimates of the business cycle as financial cycles tend to have a different, lower frequency.

Overall, the case of Ireland illustrates the importance of monitoring the imbalances that can spring from developments in the financial sector and financial variables. Since 2011, the monitoring of these imbalances within EU economic governance was strengthened. It can now involve early warnings and corrective actions in the Macroeconomic Imbalances Procedure, thanks to the legislative changes introduced after the 2007-2010 crises.

Annex: Estimated model

Our estimates based on an extended HP filter, which takes into account financial variables, are derived from the following model:

$$\begin{aligned} (1) \quad & y_t = p_t + c_t \\ (2) \quad & p_t = 2p_{t-1} - p_{t-2} + \varepsilon_t^p \\ (3) \quad & c_t = \phi c_{t-1} + \gamma^0 z_t + \gamma^1 z_{t-1} + \varepsilon_t^c \end{aligned}$$

Where y_t is output in t , p_t is potential output, c_t is output gap, ε_t^p and ε_t^c are white noise processes with zero mean and variances, V^p and V^c , respectively, and γ^0 and γ^1 are vectors of coefficients on vectors of contemporaneous (z_t) and lagged (z_{t-1}) exogenous financial variables, respectively. Equation (3) allows for the output gap to be an AR(1) process with AR coefficient ϕ . We follow Borio et al. in specifying potential output process (2) to be an integrated process of order 2. The vector of exogenous financial variables, z_t includes credit growth, house price inflation and real interest rate. In the estimation the credit growth variable is dropped due to a lack of significance. House prices are found to enter the model with no lag, while the interest rate enters with lag 1. This approach does not embed any description of the supply-side structure of the economy, in contrast with the production function used in EU fiscal surveillance.

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¹ On 24 January 2001, the Commission issued a critical opinion on the 2001-2003 stability programme and on 12 February 2001 the ECOFIN Council adopted a recommendation asking Ireland to avoid further overheating of its economy by containing public expenditure. The IMF also identified the risk of overheating and pro-cyclical policy. After 2001, the Commission noted several times that the Irish government's targets for the general government budget balance were not particularly ambitious in view of the very strong economic growth. After 2001, the European Commission also pointed to the risks of the housing boom. In its assessment of the 2005 update of the Irish stability programme, the Commission explicitly identified the very high valuation of the existing housing stock and a possible sharp downturn from the extended residential construction boom as downside risks to the economy and public finances. A year later, the Commission's assessment of the 2006 stability programme update explicitly referred to the unsustainable level of residential construction. Together with very high residential property prices, the construction boom was thought to carry the risk of a sharp downward adjustment in the Irish economy. The identification of risks linked the construction boom did not translate into concrete surveillance actions. The EU economic surveillance framework was centred on public finances, and Ireland complied with existing rules.

² Deflator: unit labour costs in the total economy - 37 trading partners. Source: European Commission (Eurostat).

³ For a more detailed account of the economic phenomena that led to the Irish crisis see European Commission (2011).

⁴ Source: Irish Central Statistical Office. Property Price Index.

⁵ For a detailed description of the cyclically adjusted budget balance and its use in EU fiscal surveillance see Larch and Turrini (2009).

⁶ Following Borio et al. (2013), in the initial estimation three financial variables were used: house price inflation, credit growth and real interest rates (Graph 5). Since credit growth turned out non-significant in the presence of house price inflation, it was subsequently dropped. The real interest rate was found significantly negative and enters the regression with a lag. Crucially, the coefficient on house price inflation was found significant and positive: the boom in construction contributed to and probably amplified the cyclical upswings and downswings of the Irish economy. The model equations and the results of the estimation are available from the authors upon request.

⁷ The full description of the production function approach used in EU fiscal surveillance is found in Havik et al. (2014). The HP filter was used previously in EU fiscal surveillance, on its own and together with the production function approach. The pure HP filter is the "back-up" method for "old" Member States and is produced in parallel with the production function method for "new" Member States.

⁸ For a review of the relative merits of the EU commonly agreed method for calculating potential output, based on a production function approach, see European Commission (2015).

⁹ There is a marked difference between the real time and the ex-post output gap estimate from conventional methods. The difference mainly reflects the fact that in real-time no-one anticipated the sharp post-2007 slowdown in economic activity. As a result actual output was assumed to be close to potential output. The same problem is less of an issue for the financial output gap as financial variables were patently above long-term trends in Ireland in the pre-crisis years. Plus, unlike national accounts data, financial statistics are not revised across different data releases.

¹⁰ The structural budget balance of Ireland was estimated to be 1.2% of GDP in the autumn 2007 Commission forecast

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