

Part III

Impact of macroeconomic developments on fiscal outcomes

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KEY FINDINGS

This part provides new empirical evidence on the impact of macroeconomic developments on fiscal outcomes.

Macroeconomic developments can have an impact on fiscal outcomes via three main channels.

- **Growth effects:** Macroeconomic developments can have an effect on fiscal outcomes via actual and/or potential growth. For instance, evidence shows that high public debt can weigh on actual growth and high private debt can slow down potential growth.
- **Discretionary fiscal policy effects:** They can induce policymakers to implement discretionary policy measures. For example, in the wake of a housing boom, governments may decide to change property taxation or increase spending in the wake of additional revenues.
- **Revenue windfalls/shortfalls:** They can have a direct impact on revenue windfalls and shortfalls. Revenue windfalls (shortfalls) are unexpected gains (losses) in revenues that are not the result of GDP growth or discretionary fiscal policy. They stem, for instance, from developments in asset or housing markets and related transaction, property or wealth taxes that are decoupled from GDP growth.

Our empirical findings show that macroeconomic developments can have a significant impact on revenue windfalls.

- Results from panel regressions for a sample of EU Member States over the past 20 years show that macroeconomic developments have a significant impact on revenue windfalls and shortfalls.
- In particular, we find that for the EU on average, an increase in household debt results in higher revenue windfalls. A higher trade balance, for instance a decrease in imports with regard to exports, leads to revenue shortfalls.
- Results also show that temporary windfall revenues often trigger permanent increases in spending or decreases in tax rates.

Taking account of macroeconomic developments can lead to a better understanding of the fiscal effort.

- Findings from panel estimates show that developments in trade balance and household debt have had a sizable impact on revenue windfalls (shortfalls) over the past 20 years. These developments have been reflected in the fiscal effort as measured by the change in the structural balance, as it captures the revenue windfalls/shortfalls.
- The analysis also supports the increased reliance on the expenditure benchmark in measurement of the fiscal effort. The expenditure benchmark is less affected by macroeconomic factors than the structural budget balance, since it does not rely on revenue windfalls and shortfalls, respectively.

1. INTRODUCTION

The financial and sovereign debt crisis drew attention to the fact that large fluctuations in government revenues beyond those explained by fluctuations in GDP may have a major impact on fiscal outturns and public finance prospects. Before the crisis, several EU Member States had experienced a build-up of macroeconomic imbalances, including in the external sector, property prices and private debt. While building up, these imbalances generated large windfall revenues, which governments spent in the absence of governance instruments detecting their temporary nature. As imbalances and the associated windfall revenues reversed, they amplified the effect of the cyclical downturn itself on fiscal outcomes. Reversing excessive expenditure growth (and tax cuts) that were based on windfall revenues proved difficult in the downturn, leading to large and persistent fiscal imbalances and protracted adverse impacts on growth and employment caused by fiscal consolidation.

Those effects of macroeconomic and financial sector developments on fiscal outcomes are not limited to the financial crisis and its aftermath. Large revenue windfalls and shortfalls occur every year in Member States, and trigger debates on the appropriate fiscal response ⁽¹²⁷⁾.

Over time, fiscal surveillance has relied on a range of indicators to gauge the fiscal stance, the fiscal outlook and fiscal risks. The set of core indicators in the EU fiscal surveillance framework has over time been expanded to account for temporary factors, in particular cyclical developments and one-off policy effects, in order to better measure the underlying fiscal trends and risks. Cyclically-adjusted fiscal indicators, such as the cyclically-adjusted budget balance (CAB) and the structural balance (SB) are central elements in the EU fiscal framework.

Still, regular patterns in budgetary elasticities are not explicitly considered when assessing the fiscal position. Cyclically-adjusted fiscal indicators are frequently substantially affected by unplanned or unexpected revenue windfalls and shortfalls that are not the result of (discretionary)

fiscal policy and do not reflect real GDP developments. They result in particular from changes in tax bases and effective tax rates that relate to macro-financial developments. Tax base effects beyond GDP stem from factors such as financial transactions (property), stock variables (wealth, property prices) or capital inflows. In addition, impacts on effective tax rates may result from price developments in the context of nominal tax brackets ⁽¹²⁸⁾. If the link between macro-financial developments and revenue windfalls and shortfalls that are not fully captured by surveillance instruments such as the structural balance can be better understood, this will provide insights into their likely permanent or temporary nature.

Information on fiscal risks associated with macroeconomic and financial developments may provide a better understanding of the underlying fiscal position and fiscal effort. The aftermath of the crisis saw the introduction of the Macroeconomic Imbalance Procedure (MIP), with the aim of complementing the existing economic surveillance framework and monitoring, preventing and correcting the build-up of imbalances. A large number of variables aimed at capturing macroeconomic imbalances are regularly screened in the context of MIP surveillance to identify possible risks to macroeconomic stability at large. Macroeconomic imbalances were also recognised as, at least, an important imperfect predictor not only of macroeconomic, but also fiscal, perspectives. More recently, the Commission has emphasised the use of the expenditure benchmark in budgetary surveillance, which helps to identify whether government expenditure developments are in line with underlying economic activity over the longer run. It strengthens the ability of the fiscal framework to deal with these revenue windfalls/shortfalls. This Chapter analyses the extent to which fluctuations in budgetary elasticities resulting from macroeconomic developments can be better captured, in order to improve the understanding of

⁽¹²⁷⁾Graph A.1. in the Annex shows the occurrence of (unexpected) windfall revenues over time in Member States.

⁽¹²⁸⁾In addition, macroeconomic imbalances may also substantially affect potential output, in terms of both level and composition (through sectoral reallocations, over- or under-investment and hysteresis effects), as well as potential output measurement leading to *ex-post* potential output revisions. Both indirectly affect cyclically-adjusted fiscal indicators (Box III.2.1).

the underlying fiscal positions and fiscal effort.

Since the financial crisis, a few studies have further investigated the link between macroeconomic developments and cyclically-adjusted fiscal indicators. Those studies suggest that the assessment of the fiscal position, fiscal stance and fiscal risks should more explicitly consider budgetary fluctuations linked to macroeconomic and financial developments in addition to the output gap. More broadly, the existing literature looks at either the impact of macroeconomic developments that are potentially associated with external macroeconomic factors (e.g. current account developments) *or* that of the financial cycle (often associated with internal macroeconomic factors, e.g. housing prices developments) on public finance indicators. However, no comprehensive analysis exists that covers the impact of a broad range of macroeconomic developments together ⁽¹²⁹⁾.

This Part elaborates on the literature by combining the different elements in an empirical analysis adding a novel feature, that of netting out the impact of discretionary revenue measures. To demonstrate how consideration of macroeconomic developments can improve the understanding of the underlying fiscal outcomes (i.e. the fiscal effort and the fiscal position), we capture their estimated effects based on a panel analysis, and illustrate the extent to which it has affected fiscal outcomes in Member States since 2000.

To that end, we proceed in two steps. A first step is to estimate the sensitivity of fiscal outcomes to macroeconomic developments on top of those linked to the economic cycle. This part of the analysis investigates the extent to which macroeconomic developments may be drivers of revenue windfalls and shortfalls. The focus on

revenues, together with the netting out of discretionary policy measures, gives a clean measure of the direct fiscal impact of macroeconomic developments that is not polluted by policy reactions, and reduces estimation challenges due to endogenous effects of fiscal policy on macroeconomic variables ⁽¹³⁰⁾. In a second step, the findings of that empirical analysis are used to illustrate the potential impact over time of macroeconomic developments on fiscal indicators.

The structure is as follows. Chapter 2 discusses the empirical literature and presents the conceptual framework more in detail. Chapter 3 presents the regression analysis and results of the effects of macroeconomic developments on revenue windfalls and shortfalls. Based on those findings of the regression analysis, Chapter 4 shows the extent to which the consideration of macroeconomic developments can help improve understanding of the underlying fiscal position.

⁽¹²⁹⁾Note that the ‘twin-deficit hypothesis’ literature on external and fiscal imbalances is beyond the scope of this study. As explained by e.g. Corsetti and Mueller (2006) and Afonso et al. (2018), the twin-deficit hypothesis suggests that the government and current account balance move in the same direction. Chinn and Ito (2019) also suggest a causal link going from fiscal tightening to external surpluses, consistent with a ‘twin-surplus hypothesis’. The effect that this chapter aims to capture goes in the opposite direction, with revenues improving as the current account balance deteriorates. Section 2.2. discusses how endogeneity concerns that may arise from this hypothesis are addressed.

⁽¹³⁰⁾Morris and Schuknecht (2007) note that the impact of discretionary tax changes makes it extremely difficult to estimate budget elasticities (to changes in asset prices) in a reliable way using econometric estimation. They suggest that ideally, these effects should be netted out, but notes that no such estimates of the revenue impacts of policy changes were available in a consistent data series across countries and time.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Cyclically-adjusted fiscal indicators, such as the structural balance (SB), are used to assess the underlying fiscal position. The structural balance is a central element in the EU fiscal framework though its centrality has been attenuated by increased reliance on expenditure benchmarks. Changes in those cyclically-adjusted fiscal indicators that are not the result of discretionary fiscal policy may reflect in particular changes and revisions of potential output and changes in the revenue to GDP ratio (windfalls/shortfalls). The latter can be due to revenues not directly linked to GDP but to other macroeconomic developments such as financial transactions (property), stock variables (wealth, property) or imports (since, ceteris paribus, an increase in imports does not affect GDP but does raise indirect taxes) ⁽¹³¹⁾. Graph III.2.1 shows the channels through which macroeconomic developments may affect fiscal outcomes (both public revenue and expenditure), and breaks down the cyclical effects (associated with the automatic stabilisers), the discretionary fiscal policies (that depend on many factors) and the cyclically-adjusted expenditure and revenue net of discretionary policies (our focus). The section below provides a discussion of the empirical literature on the effect of those macroeconomic variables on fiscal indicators, with a focus on the effect on revenues.

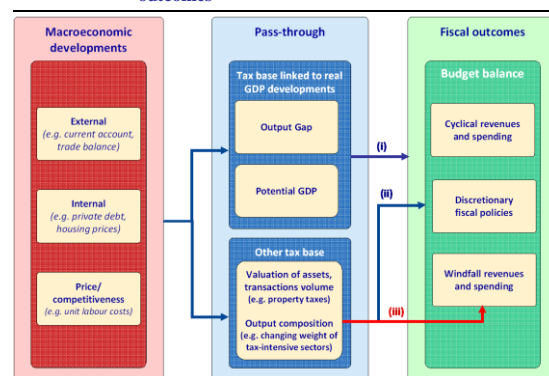
2.1. LITERATURE REVIEW

The literature on the effects of macroeconomic developments on fiscal outcomes can be broadly categorised into three groups: external, internal and price factors. As regards external macroeconomic developments, imports are a tax base for indirect revenues and the import share of GDP can fluctuate substantially. The effect on cyclically-adjusted government revenues of the fluctuation of this tax base that is not closely linked to GDP is represented by channel (ii) and (iii) if this triggers a policy reaction in Graph III.2.1. Typically, a deteriorating current account balance improves indirect tax revenues, since net capital inflows finance a higher level of domestic absorption (thus imports). Dobrescu and Salman (2011) and Lendvai et al. (2011) highlight

⁽¹³¹⁾ Such as customs duty, excise duty, anti-dumping duty and value added tax.

the effects of current account movements and positions that are not captured by conventional (even cyclically-adjusted) fiscal indicators ⁽¹³²⁾. Lendvai et al. (2011) find that the government revenue ratio increases significantly during boom years (i.e. the tax elasticity to GDP is above 1), and look at the effects on revenue components. They find that the revenue ratio increase is primarily driven by indirect taxes (as imports increase more than GDP). The ratio of direct taxes

Graph III.2.1: Effect of macroeconomic developments on fiscal outcomes



Note: Spending shortfalls may also occur, but they can be hardly distinguished from discretionary policies and are therefore not the focus of the analysis.

to GDP follows a similar path, but fluctuations are less pronounced. Social contributions are constant as a share of GDP during the boom phase, and tend to increase in the post-boom phase ⁽¹³³⁾. Conversely, an increase in exports would generally lead to shortfalls (as a % of GDP), since such increase is reflected in GDP (denominator of the revenue ratio) and since the tax take on exports is generally lower than on other parts of GDP (diminishing the numerator of the revenue ratio) ⁽¹³⁴⁾. In addition, external financial flows may also

⁽¹³²⁾ Lendvai et al. (2011) adjust cyclically-adjusted balances for absorption booms and show that standard approaches used to adjust budget balances for the cycle could miss part of the temporary revenues accruing during absorption booms when the current account deteriorates sharply.

⁽¹³³⁾ Note that a breakdown of trade balances in exports and imports may provide additional information on drivers of tax windfalls, because imports and exports are not equally tax-rich. Therefore, a constant trade balance with different levels of imports and exports can have different fiscal effects via different budgetary elasticities.

⁽¹³⁴⁾ An exception is revenues derived from exports of government-owned resources, on which the revenues may be higher than on the other parts of GDP. In this case, exports may lead to windfalls.

Table III.2.1: Summary of the expected impact of macroeconomic developments on fiscal outcomes

	External macroeconomic developments (current account (CA), trade balance, exports and imports)	Internal macroeconomic developments (febt/credit/asset prices)	Prices, wages and competitiveness (CPI/ULC)
Revenue and components (PIT, CIT, VAT, SSC, nTax)	The government revenue to GDP ratio increases significantly during boom years. In particular, the CA deficit improves indirect tax revenues (Dobrescu and Salman 2011, Lendvai et al. 2011). Direct taxes follow a similar but less pronounced path. Social contributions to GDP are constant during the boom phase, and increase in the post-boom phase (Lendvai et al. 2011).	Asset price booms raise revenues from asset-related taxes and lead to generalised revenue growth (wealth effects of increasing asset values) (Eschenbach and Schuknecht 2004, Girouard and Price 2004). Asset prices affect transaction taxes and corporate taxes, while their effects on direct household taxes and indirect taxes tend to be smaller (Morris and Schuknecht 2007) (2).	An increase in inflation rates might have positive consequences for tax revenues. Inflation's effects tend to be positive for personal income taxes and social security contributions, and negative for corporate income taxes (Heinemann 2001). RULC increases imply a rise in SSC and PIT to GDP ratios (ceteris paribus). However, prolonged wage increases above productivity developments may lead to losses of competitiveness, with countervailing effects on public revenues, as exemplified by periphery euro area countries in the 2000s (Osbat et al. 2012) (1).
Expenditures	The public expenditure to GDP ratio tends to decline significantly during absorption booms. However, in the late phase of the absorption boom, the expenditure ratio stabilises, suggesting a shift to a pro-cyclical policy stance (Lendvai et al. 2011).	<p>Boom-bust phases tend to exacerbate already existing pro-cyclical policy biases, as well as political-economy biases, toward higher spending (Jaeger and Schuknecht 2007) (2).</p> <p>Political-economy factors can accentuate this pattern especially if booms fall into election periods (Buti and van den Noord 2003).</p> <p>During a bust phase, financial instability may force governments to provide bank support measures, further increasing spending (Eschenbach and Schuknecht 2004).</p>	Public expenditure-to-GDP may decline due to denominator effects and nominal expenditure control frameworks. Inflation can affect means-tested benefits, if eligibility for them or their level are not fully indexed to inflation. Wage increases in the private sector can trigger rises in public sector wages and thus expenditure (Fernández-de-Córdoba et al. 2012).
Debt	During the absorption boom, the dynamism of nominal GDP and reduction in the government deficit lead to a decline in the debt ratio. This decline is more than reversed in the post-boom phase (Lendvai et al. 2011).	Pro-cyclical policy biases accentuated by boom-bust phases could cause a deficit and debt bias where fiscal accounts improve only slightly in periods of asset price boom, and deteriorate strongly in the subsequent downturn. Over time this pattern may imply debt increases (Eschenbach and Schuknecht 2004). Excessive asset prices volatility itself can harm output (Zandi 1999), contributing to increase debt ratios.	Higher inflation first implies (ceteris paribus) a decrease in the debt-to-GDP ratio, which can then be reversed due to interest rate rises, or if inflation undermines competitiveness (especially in a monetary union).

(1) Osbat et al. (2012).

(2) Examples are Ireland and Spain just before the 2008 financial crisis (Pierluigi and Sondermann, 2018).

contribute to asset prices fluctuations, with government revenue effects as described below.

Internal macroeconomic developments can also shape public finances. These developments include asset prices and financial stock and transaction variables that affect property, wealth and financial transaction taxes. Those tax bases are not directly associated with real GDP developments and may thus affect cyclically-adjusted revenues, triggering revenue windfalls or shortfalls (channel (ii) and (iii) if this triggers a policy reaction in Graph III.2.1). Liu et al. (2015) provide an overview of the literature on the effects

of internal macroeconomic developments on taxes, noting that most studies focus on housing and equity prices. In particular, asset price booms may not only (temporarily) raise revenues from asset-related taxes, but also lead to generalised revenue growth, due to the wealth effect of increasing asset values on consumption (Eschenbach and Schuknecht 2002 ⁽¹³⁵⁾, Eschenbach and Schuknecht 2004 and Girouard and Price 2004). Looking at revenue components, asset price developments seem to affect transaction taxes and corporate taxes, while their effects on direct

⁽¹³⁵⁾Liu et al. (2015) incorporate the impact of asset price cycles in the calculation of structural fiscal balances.

household taxes and indirect taxes tend to be smaller. The magnitude and nature (contemporaneous or lagged) of the effects differ across countries due to heterogeneity in the respective tax structures, with differences in the size of the tax base related to housing transactions or housing wealth, as well as in the lag structure of taxation (Morris and Schuknecht 2007). The heterogeneity makes empirical estimates challenging ⁽¹³⁶⁾.

Price and wage inflation have various effects on public finances. *Ceteris paribus*, an increase in inflation might have positive consequences for tax revenues (as a % of GDP) ⁽¹³⁷⁾, although with opposite effects across tax components and depending on the design of taxes ⁽¹³⁸⁾. Wage increases trigger rises in SSC and PIT ratios to GDP (*ceteris paribus*), also due to income earners being pushed into higher tax brackets in a progressive tax system. However, wage increases may also adversely affect CIT as production cost rises put pressure on corporate profits. Depending on the extent to which profit margins –and thereby CIT– are squeezed by higher wage costs, the resulting direct effect on windfall revenues could be positive or negative. Any revenue windfalls effects may well be of temporary nature, depending on the degree to which competitiveness is affected by prolonged wage increases above productivity.

⁽¹³⁶⁾ See also Claessens et al. (2011), Bénétrix and Lane (2013). Credit growth and household debt indicators are relatively easily comparable across countries and highly correlated to house prices and equity prices, and so can consist of good proxies for internal macroeconomic developments. Bénétrix and Lane (2015) show how fiscal variables covary with the financial cycle, which they capture by the credit growth and current account balance.

⁽¹³⁷⁾ Heinemann (2001), based on an econometric panel analysis on a sample of OECD countries over 1972–1996.

⁽¹³⁸⁾ With progressive income tax and an imperfect indexation of brackets, for instance, inflation increases real tax revenues, at policy unchanged (Oates 1988). However, inflation may reduce real tax revenues for taxes with considerable lag between the taxable event and the moment the tax is paid (Olivera 1967, Tanzi 1977). Alesina and Perotti (1995) find that inflation tends to have positive effects on individual income taxes and social security contributions, and negative effects for corporate income taxation. In addition, inflation is expected to be neutral for proportional taxes without a significant collection lag, such as VAT. For social security contributions, two opposite effects are at play: as social security contributions are often paid as a flat rate of income up to a maximum value, inflation may dampen government revenues by reducing the real levels.

Concerning expenditures, the ratio of total government expenditure to GDP tends to decline significantly during the first years of absorption booms (i.e. phases of buoyant domestic demand), but then stabilises, suggesting a shift to a procyclical policy stance (Lendvai et al. 2011). During the early years of the boom, government spending increases in line with its historical trend, and the boom in nominal GDP brings the expenditure ratio down. In the late phase of the absorption boom, the expenditure ratio raises, as nominal spending growth is adjusted upward to match buoyant government revenue. Jaeger and Schuknecht (2007) also find that boom-bust phases tend to exacerbate already existing procyclical policy biases toward higher spending. During a boom phase, revenue windfalls from large asset price increases tend to result in expansionary expenditure policies that erode the positive effects on the budget, due to perceived larger room for discretionary spending. Political-economy factors can accentuate procyclical policy biases further, especially if booms fall in election periods (Buti and van den Noord 2003). Higher inflation also tends to reduce public expenditure ratios in the short run, with potential adverse effects in the longer run ⁽¹³⁹⁾.

Macroeconomic developments also contribute to public debt ratio developments. During an absorption boom, high nominal GDP growth together with the reduction in the government deficit typically lead to a sharp decline in the debt ratio. However, that decline is generally reversed in the post-boom phase (Lendvai et al. 2011). If higher inflation undermines competitiveness in a monetary union or fixed exchange rate regime, downward price and wage adjustment eventually reverses the favourable public finance dynamics.

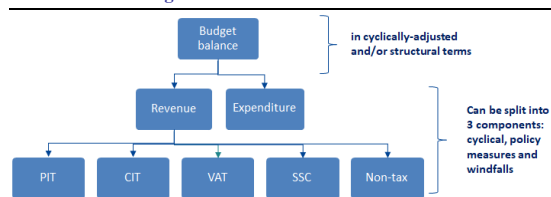
⁽¹³⁹⁾ With imperfect indexation of eligibility for means-tested benefits (and of their level), inflation automatically decreases expenditure ratios. In addition, government expenditure limits are often set in nominal terms, so higher-than-expected inflation may decrease spending in real terms, absent discretionary measures. However, in the long run, private sector wage increases affect public sector wages with a lag, at least in OECD countries (Fernández-de-Córdoba et al. 2012), possibly triggering increases in public expenditure. In particular, during booms, governments expand employment and wages, while in downturns, lack of tax revenues can force the government to cut back the wage bill – the latter occurring with rigidities (Afonso and Gomes 2014).

2.2. CONCEPTUAL FRAMEWORK

To assess how macroeconomic developments can affect cyclically-adjusted fiscal outcomes, we focus on government revenues. Empirical studies generally find weak significance for the effects of macroeconomic developments apart from cyclical factors on budget balance measures, whether cyclically adjusted or not. By focusing on effects on revenues, rather than budget balance measures, we address the countervailing effect of discretionary expenditures increasing (resp. decreasing) when revenue windfalls (resp. shortfalls) occur. While public expenditure is subject to budgeting processes and control, budgetary outcomes for expenditure are more subject to government decisions (except expenditure linked to automatic stabilisers), including decisions not to correct budget overruns⁽¹⁴⁰⁾.

Graph III.2.2 illustrates the breakdown for the empirical analysis. Rather than looking at budget balance measures, we focus on revenues and further disaggregate revenues into the different revenue components (personal income tax, corporate income tax, indirect taxes (VAT)⁽¹⁴¹⁾, social security contributions and non-tax revenues), all cyclically-adjusted, as % of GDP.

Graph III.2.2: Breakdown of the cyclically-adjusted components of budget balance



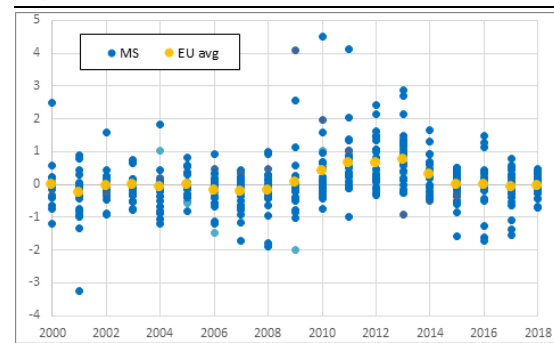
To better identify the impact of macroeconomic developments on revenues, we also correct revenues for the impact of policy measures. The aim is to focus on the windfall revenues that correspond to the direct effects of macroeconomic developments, netting out fiscal policy reactions

⁽¹⁴⁰⁾ It is also more difficult to make a distinction between policy and macroeconomic effects for expenditures, partly due to data availability. Discretionary tax measure and discretionary fiscal measure databases cover the years 2000-2015 and 2009-2018 respectively. Unlike the former, the latter covers both revenue and expenditure policy decisions.

⁽¹⁴¹⁾ Throughout the text, tables and graphs indirect taxes are referred to as VAT.

(both one-offs and permanent) in addition to the business cycle effects. To do so, we adjust the annual cyclically-adjusted revenue data for the impact of discretionary revenue measures in each Member State using the Commission services database on discretionary tax measures as well as internal estimates of discretionary revenue measures. Endogeneity concerns stemming from the effects of fiscal policy on macroeconomic variables, as discussed by Bénétrix and Lane (2013), may be also attenuated⁽¹⁴²⁾. Discretionary measures can be potentially large, and are quite heterogeneous across Member States (Graph III.2.3).

Graph III.2.3: Discretionary revenue measures in the EU



Note: DRM after 2008 are completed with DTM before 2008. If DRM are indicated as zero, they are replaced by DTM (in particular between 2008 and 2010).

Source: Own calculations based on AMECO, discretionary tax measure database and internal estimates for discretionary fiscal measures.

The analysis focuses on short-term direct effects of macroeconomic developments on cyclically-adjusted revenues. The complex longer-term developments of macroeconomic developments and their interactions are not part of this study. For instance, a prolonged rise in unit labour costs may

⁽¹⁴²⁾ Endogeneity concerns should be seen in the context of the 'twin-deficit hypothesis' that suggests that a larger fiscal deficit, through its effect on national saving, leads to an expanded current account deficit. If the twin-deficit hypothesis holds, both budget balance and current account balance (or trade balance) would be jointly determined and move in the same direction. The tax elasticity effect that we investigate, on the contrary, suggests that the budget deficit improves as the current account deteriorates. By netting out the effect of government expenditure and of discretionary revenue policy measures from our LHS variable of interest, the potential for endogenous effects is much reduced when compared to studies in the literature. What remains is the disposable income effect of windfall revenues which stem from e.g. the tax take on increased consumption of imports. This effect is of secondary order but may imply minor endogeneity issues. Correcting for Nickel bias and applying instrumental variables estimates confirm that these effects are minor in our setting.

trigger an increase in revenues in the short term but could have negative effects through competitiveness losses in the longer term. This would lead to a decline in exports and a shift to the non-tradeable sector, and eventually declining investment and asset prices and a possible rise in risk premia. While we do not capture those dynamics and interactions in the medium and longer term, we do capture their direct impacts on fiscal outcomes at the time they occur, by incorporating dependent variables reflecting these effects.

As the current analysis is based on *ex-post* cyclically-adjusted fiscal data, any measurement ‘errors’ of the potential output in real time are not captured. This can lead to underestimation of the effects of macroeconomic developments on cyclically-adjusted revenues compared to an analysis using real time data. Indeed, the measurement of cyclically-adjusted revenues depends on the measurement of the output gap. Therefore, for a given change in the revenue ratio triggered by a given macroeconomic development, the measurement of the change in cyclically-adjusted revenue may depend on whether a change in real GDP is considered a change in either potential output or the output gap. In the years before the 2008-2009 economic and financial crisis, with buoyant economies triggered by imbalances, part of the fluctuations of real GDP had been considered as changes in potential GDP in real time – but then revised *ex post* as changes in output gap. The cyclically-adjusted revenues associated with those developments would therefore be lower when measured *ex post*, compared to when they would have been measured in real time, as part of the revenues are assigned *ex post* to cyclical fluctuations and netted out from cyclically-adjusted revenues ⁽¹⁴³⁾.

After looking at the direct effects of macroeconomic developments on aggregate windfall revenues, we estimate the effects on revenue components (personal income tax, corporate income tax, VAT, social security contributions and non-tax revenues), also cyclically-adjusted and corrected from the

impact of policy measures. This disaggregation allows deeper understanding of the effects on revenues, and may underpin the robustness of the findings.

Second, based on those regressions, we illustrate the potential impact of macroeconomic developments on the fiscal efforts for every country in the panel. This helps better understand the underlying fiscal efforts, since the revenue windfalls (shortfalls) triggered by macroeconomic developments affect the (estimated) fiscal effort as measured by the change in the structural balance (which captures the windfalls/shortfalls), whereas they are not directly linked to fiscal measures taken. This helps better understand the underlying budgetary positions and fiscal risks, since reversal of macroeconomic variables to their equilibrium values would trigger revenue shortfalls (windfalls).

The country-specific results should be considered indicative. National tax systems have many country-specificities that may not be reflected in a panel analysis, since tax bases, rates and lags differ. As a result, the impact of macroeconomic developments may differ substantially. Yet, this methodology requires panel data, and due to data limitations, we cannot estimate the country-specific impact coefficients. We therefore rely on common impact coefficients across EU Member States. Tests for a range of country groupings (not shown in this report) find that the coefficients reflecting the revenue impacts of macroeconomic developments are relatively similar across the range of different country groupings. Finally, estimating the potential revenue effects of a reversal of macroeconomic variables to their ‘equilibrium’ levels requires assumptions on the latter, which are uncertain.

⁽¹⁴³⁾ Borio et al. (2014, 2016) develop a potential output measure that takes account of the financial cycle. They find that a finance-neutral output gap measure helps correct the flattering effect of financial booms on the fiscal accounts.

Box III.2.1: Breaking down the effects of macroeconomic developments on cyclically-adjusted revenues

The effect of a development in a macroeconomic variable x on the cyclically-adjusted ratio-to-GDP of public revenues $\frac{Rev^*}{Y^*}$ (with Rev^* the cyclically-adjusted revenue and Y^* the potential output) can be written ⁽¹⁾:

$$\begin{aligned} \frac{\partial \left(\frac{Rev^*}{Y^*} \right)}{\partial x} &= \frac{\partial}{\partial x} \sum_i \left(\frac{Taxrate_i \cdot Taxbase_i^*}{Y^*} \right) = \sum_i \frac{\partial}{\partial x} Taxrate_i \cdot \left(\frac{Taxbase_i^*}{Y^*} \right) \\ &= \sum_i \frac{\partial Taxrate_i}{\partial x} \cdot \left(\frac{Taxbase_i^*}{Y^*} \right) + \sum_i Taxrate_i \cdot \left(\frac{1}{Y^*} \left\{ \frac{\partial Taxbase_i^*}{\partial x} - \frac{\partial Y^*}{\partial x} \cdot \frac{Taxbase_i^*}{Y^*} \right\} \right) \\ &= \underbrace{\frac{1}{Y^*} \cdot \sum_i Taxrate_i \cdot \frac{\partial Taxbase_i^*}{\partial x}}_{\text{Effects on the tax base and effective rates (I)}} - \underbrace{\frac{1}{Y^*} \cdot \sum_i Taxrate_i \cdot \frac{Taxbase_i^*}{Y^*} \cdot \frac{\partial Y^*}{\partial x}}_{\text{Effects via potential GDP (II)}} + \underbrace{\sum_i \left(\frac{Taxbase_i^*}{Y^*} \right) \cdot \frac{\partial Taxrate_i}{\partial x}}_{\text{Discretionary revenue measures (III)}} \end{aligned}$$

where $Taxbase_i^*$ represents different components of the cyclically-adjusted tax base, for all tax payers (i.e. all tax bases broken down by tax brackets/rates). Tax bases are cyclically-adjusted, which nets out cyclical effects linked to the output gap. $Taxrate_i$ represents the tax rate applied to the corresponding tax base. Sums are made over all different tax bases.

The effects of macroeconomic developments on the tax bases include (I) both immediate and lagged effects, and (ii) structural effects due to e.g. level shifts in (asset) prices and changes to the economic structure ⁽²⁾, and temporary effects. When estimating the impact coefficient of the macroeconomic indicators on fiscal outcomes, we are agnostic on whether they are temporary or structural as we aim to measure the immediate and direct effect of changes in non-GDP related tax bases. To the extent that the structural shifts in tax bases are reflected in the macroeconomic indicators that we cover, we capture their effects on revenues. If changes to the tax bases affect revenues only with a lag, we may fail to capture their effect due to differences in tax structures and lags across Member States. Since the effects on revenue beyond 1 year should also have the same sign as the change in the respective tax base, failure to capture lagged effects on revenue accruals implies an underestimation of the coefficient. Moreover, to the extent that macroeconomic developments indirectly affect real GDP (e.g. if a collapse in property prices triggers declining GDP through demand effects as consumption and investment fall due to wealth and balance sheet effects) we do not capture it as it is reflected in the cyclical adjustment of GDP. We focus on short-term effects of macroeconomic developments that do not directly affect real GDP, and therefore on the direct effects beyond GDP only.

The effects of macroeconomic developments on potential GDP and measurement of potential GDP (II) can be large, particularly in the medium term, as exemplified by adjustment dynamics and hysteresis effects triggered by corrections of macroeconomic imbalances in the aftermath of the financial crisis.

We capture the ‘true’ short-term effects by using *ex-post* (revised) potential output data (the term ‘true’ is relative, as further revisions of potential output are still possible, in particular towards the end of the sample). The effect of macroeconomic developments on potential output is indeed often underestimated in

⁽¹⁾ The GDP-ratio of each component (i.e. personal income tax, corporate income tax, VAT, social security contributions and non-tax revenues) can be expressed in the same manner.

⁽²⁾ For instance, large capital inflows can trigger real currency appreciation and increase real wages, which can lead to competitiveness losses for the tradable sectors and a rise in demand for services, implying a shift towards non-tradable sectors.

(Continued on the next page)

Box (continued)

real time. This concerns both real effects related to unsustainable changes in the real economy (such as excess production capacity in construction or financial sectors), and measurement issues, since estimated potential GDP behaves rather pro-cyclically and increases in booming economies including when reflecting rising imbalances. Borio et al. (2014, 2016) have for instance studied the effect of the financial cycle on (potential) GDP and found that the cyclical correction done when compiling the output gap and potential output does not factor in the financial cycle. This can trigger ‘myopic’ fiscal policy, notably by incentivising governments to commit to expenditure over the long run. Schematically, in year t_0 (real time), for year t , with $Y_{0,t}^*$ the potential output estimated/forecast at year t_0 for year t , and Y_t^* the revised measure for potential output, these effects can be re-written as:

$$\text{Effects via potential GDP (II)} = -\frac{1}{Y_t^*} \left\{ \sum_i \text{Taxrate}_i \cdot \frac{\text{Taxbase}_i^*}{Y_t^*} \cdot \frac{\partial Y_{0,t}^*}{\partial x} + \sum_i \text{Taxrate}_i \cdot \frac{\text{Taxbase}_i^*}{Y_t^*} \cdot \left(\frac{\partial (Y_t^* - Y_{0,t}^*)}{\partial x} \right) \right\}$$

$(Y_t^* - Y_{0,t}^*)$ represents measurement errors of potential output in real time, due to underestimation of the effects of macroeconomic factors (such as the financial cycle). Let us illustrate the magnitude of the measurement error during the great crisis. When comparing the potential GDP growth forecast in 2011, estimated in the Commission spring 2010 forecast (considered as a ‘real time’ estimate), with the one calculated in the Commission spring 2019 forecast (considered as ‘*ex post*’ and true estimate), we can find large differences. There was more than +3% measurement difference for countries such as Greece, Poland, Romania and Slovakia; more than -3% for countries such as Latvia and Portugal, around +0.9% for Italy and +0.4% for Germany. Correction of the fiscal indicators for these potential output effects is beyond the scope of this analysis.

Discretionary revenue measures (III) are represented by changes in tax rates (at given tax bases) ⁽³⁾. In practice, it is difficult to assess whether a measure is a direct response to macroeconomic developments ⁽⁴⁾, or due to other factors (e.g. political programme, longer-term policy objectives). In this study, we also aim to estimate the direct policy response to macroeconomic developments.

⁽³⁾ To simplify, a measure that affects the tax base would here be considered as a change in tax rate - e.g. tax rate changed for zero, or increased from zero, to be applied on the corresponding tax base.

⁽⁴⁾ An example is when a government adjusts tax rates applied to housing construction, in response to developments in housing prices.

3. EFFECTS OF MACROECONOMIC DEVELOPMENTS ON FISCAL INDICATORS

We want to estimate the effect of macroeconomic developments on fiscal outcome, based on panel data for the EU. We specify dynamic panel regressions, including both country- and year- fixed effects ⁽¹⁴⁴⁾. By taking first differences, we also avoid some complex issues linked to the identification of equilibrium values for macroeconomic variables, and address issues of fixed effects and non-stationarity of the series ⁽¹⁴⁵⁾.

$$w_{i,c,t} = \alpha + \rho w_{i,c,t-1} + \beta \Delta M_t + \gamma X_t + \delta_c + \delta_t + \varepsilon_{i,c,t} \quad (1)$$

where $w_{i,c,t}$ are revenue windfalls (shortfalls if negative), δ_c and δ_t are respectively the country- and time-fixed effects, ρ measures the inherent persistence of our fiscal variables, β is the effect of the changes in macroeconomic variables M_t and γ is the effect of other explanatory variables. Revenue windfalls is our main variable of interest (Box III.3.1). We also estimate similar models for components of revenue windfalls (shortfalls) as well as for changes in structural balances. For the SB, this gives:

$$\Delta SB_{i,c,t} = \alpha + \rho \Delta SB_{i,c,t-1} + \beta \Delta M_t + \gamma X_t + \delta_c + \delta_t + \varepsilon_{i,c,t} \quad (2)$$

where all variables are expressed in % of GDP ⁽¹⁴⁶⁾.

To disentangle the direct effect of macroeconomic developments on fiscal outcomes from policy decisions, we subtract for the windfall indicators the effect of new measures decided in each of the Member States. Those are reported in the discretionary tax measure database covering the years 2000-2015, and

internal estimates of discretionary fiscal measures over 2009-2018. Unlike the former, the latter covers both revenue and expenditure policy decisions. In their overlapping period, they correlate well in a majority of cases ⁽¹⁴⁷⁾, despite having been documented through two different workflows. The data for both discretionary tax measure and discretionary fiscal measures may be subject to some misclassifications or omissions, and have not been revised *ex post* on realised outcomes of measures. Considering AMECO data (available as from 2010, and benefitting from *ex-post* adjustment to effectively implemented measures) instead of the internal estimates of discretionary fiscal measures, does not change the overall results of the study ⁽¹⁴⁸⁾. Revenues stemming from EU transfers are also subtracted from aggregate public revenues as well as from non-tax revenues.

3.1. DATA AND MODEL SELECTION

Overall, our sample covers 28 EU Member States over more than 15 years. Panels are unbalanced but cover on average 22 years per Member State for the structural and cyclically-adjusted variables, 15 years for revenue windfalls.

We confront our fiscal indicators with the relevant macroeconomic variables used in the literature ⁽¹⁴⁹⁾. The broader selection helps ensure

⁽¹⁴⁴⁾Econometric tests show that year-fixed effects are always jointly significantly different from zero. Autocorrelation of the explained variable is not always significantly different from zero but is kept throughout for consistency. Country-fixed effects might be discarded, as our explained variable is a first difference, unless we take account of heterogeneous long-term trends across countries. However, our LSDV estimators control for them, as the LSDV corrects for the Nickell bias, following Kiviet (1995) and Bruno (2005).

⁽¹⁴⁵⁾Unit root tests suggest that, while our independent and explanatory variables are not stationary in levels, their first differences are.

⁽¹⁴⁶⁾Potential GDP for the change in structural balance.

⁽¹⁴⁷⁾Correlation is above 60% for more than 80% of the Member States on aggregate and above 64% of the cases by revenue components.

⁽¹⁴⁸⁾Another source for DRM from 2010 is the AMECO database. To use it, AMECO data from 2010 is merged with the data of the discretionary tax measure database before 2010. When using AMECO data from 2010, the discretionary fiscal measure database shares are used for the revenue breakdowns into components. Using AMECO data does not change the overall results, and the results shown are those using the discretionary tax measure and discretionary fiscal measure databases.

⁽¹⁴⁹⁾Standard baseline explanatory variables of the fiscal reaction functions indicator are also included in the regression model but a priori not expected to affect windfall revenues. As a baseline, we consider the usual explanatory variables in this literature, including political economy ones (election years), the economic cycle, population structure and ageing, budget constraints (debt level, interest rate, EDP procedure, fiscal objectives achievement). The political economy variables are relevant for fiscal outcomes that can be affected by policy. While these variables would not be expected to affect windfall revenues, they can be expected to affect budget balance

Box III.3.1: Windfall revenues and components

At aggregate level, the headline budget balance (B) is the difference between public revenue (R) and expenditure (G). Correcting the headline balance for the business cycle yields the cyclically-adjusted balance:

$$CAB_t = \frac{B_t}{Y_t} - \varepsilon OG_t$$

with Y the nominal GDP, OG the output gap and ε the fiscal semi-elasticity.

Further correcting for one-off policy measures (oo) yields the structural balance, a key pillar of the EU fiscal framework:

$$SB_t = CAB_t - oo_t = \frac{B_t}{Y_t} - \varepsilon OG_t - oo_t$$

These two concepts can be restricted to revenues. We define windfalls as the change in revenues, not explained by economic growth (either structural or cyclical) or by discretionary revenue measures (including one-offs):

$$W_t = R_t - DRM_t - R_{t-1}(1 + g_t + (\eta_R - 1)\Delta OG_t)$$

with η_R the elasticity of revenue to output and g_t the growth rate of nominal GDP.

In share of GDP, windfalls can be directly related to the change in cyclically-adjusted revenues: (see Mourre et al. (2019) for the link between η_R and ε_R)

$$w_t = \Delta \frac{R_t}{Y_t} - \frac{DRM_t}{Y_t} - \underbrace{\frac{R_{t-1}}{Y_t}(\eta - 1)}_{\sim \varepsilon_R} \Delta OG_t \approx \Delta CAR_t - drm_t$$

On the expenditure side, spending windfalls could in theory be considered as well. However, the discretionary part of public spending is de facto almost impossible to isolate. In this study, we therefore focus mainly on the revenue side.

We investigate the effect of macroeconomic developments on windfall revenues in particular. Further breaking revenue down into its components, we can isolate five revenue categories (personal income tax, corporate income tax, direct taxes, social security contributions, and non-tax revenues). We calculate the corresponding five cyclically-adjusted revenue components, and the corresponding windfalls which are consistent with aggregate CAB, SB or windfalls.

that there is no ‘bias’ when screening the variables. As discussed in Chapter 2, we consider three types of indicators, respectively linked to external and internal macroeconomic factors as well as competitiveness (Table III.2.1). Having identified a large set of macroeconomic variables that may potentially affect tax bases, we aim to select a limited number among those variables in our regressions. They may be mutually correlated

especially within these categories. To avoid multicollinearity in our regression, we constrain the model to include one explanatory variable per category.

To select variables, we first test the significance of the variables of interest and their combinations, when running a large number of regressions. The results are detailed below and

variables or expenditures, or possibly revenue variables that have not been adjusted for discretionary policy measures.

illustrated in Graph III.3.1 ⁽¹⁵⁰⁾. This analysis also consists of a robustness check for our analysis, showing for which variables significance is high and not dependent on model choice.

Table III.3.1: **Macroeconomic variables considered in the analysis**

Baseline Non-policy variables	Type of macroeconomic development		
	External	Internal	Price/ competitiveness
<i>in first differences</i>	<i>in first differences</i>	<i>in first differences</i>	<i>in first differences</i>
Output gap	Current account balance Trade balance	Household debt Debt of non-financial corporations	GDP deflator Consumer price index
<i>in levels</i>	Export performance**	Financial liabilities of financial sector	Terms of trade
Public debt (lag)	Openness (X+M)/GDP	House prices adjusted for property related taxes to GDP***	Real effective exchange rate Nominal Unit Labour Cost
Policy variables			
Election year*		<i>in levels</i>	
MTO overachievement*		Household credit flow	

Note: * Dummy.

** Export performance: index of market performance of exports of goods and services on export weighted imports of goods and services, as compiled in the AMECO database.

*** The adjusted indicator is: (growth rate of housing price)*(lag of share of property-related taxes in GDP).

Based on a systematic analysis of all possible regression models with the constraint of having one variable per category, we find that revenue windfalls (shortfalls) are best explained by developments of the following macroeconomic variables as follows ⁽¹⁵¹⁾:

All external variables considered (trade balance, current account balance, openness, export performance and imports/exports) consistently significantly affect revenue windfalls (shortfalls) (Graph III.3.1, upper right quadrant). It suggests a robust effect on the tax base and revenues that is not captured by the cyclical adjustment.

Concerning variables related to internal factors, only the household debt and household savings ratios are systematically significant for revenue windfalls (shortfalls), and in some models house prices as well (Graph III.3.1, lower right quadrant). As discussed in Chapter 2, less significant effects of financial and asset indicators may be due to heterogeneity in the respective tax

structures. When we add an adjusted house price indicator, reflecting the importance of property taxes for the country concerned, we capture effects also on aggregate ⁽¹⁵²⁾.

As regards price/competitiveness indicators, the ULC, CPI and terms of trade are sometimes significant for revenue windfalls (shortfalls), and in some cases the GDP deflator as well (Graph III.3.1, lower left quadrant).

Tests for endogeneity signal no indication of reverse causality between the revenue windfalls (shortfalls) on the left-hand side and explanatory variables. Considering the complex interactions between fiscal variables, fiscal policies and macroeconomic development, studies generally suffer from identification challenges, endogeneity and reverse causality, as for instance fiscal policy decisions could directly affect trade variables. In particular, fiscal expansion could raise imports directly which in turn would raise taxes and improve fiscal outcomes, leading to biased estimators. Similarly, the output gap and unit labour costs (through public sector wages) could be affected by fiscal policy. This may be less of a concern for our main variable of interest (revenue windfalls/shortfalls) than for the budget balances and expenditure variables, as fiscal policy effects are netted out. The estimation set-up aims to deal with this issue by netting out policy impulses (having revenue windfalls/shortfalls on the left-hand side) and focusing on first differences. The degree to which revenue windfalls (shortfalls) can be expected to affect the considered macroeconomic variables is likely to be minor. This is confirmed by regressions with instrumental variables and adjusting for the Nickell bias as results are not substantially affected.

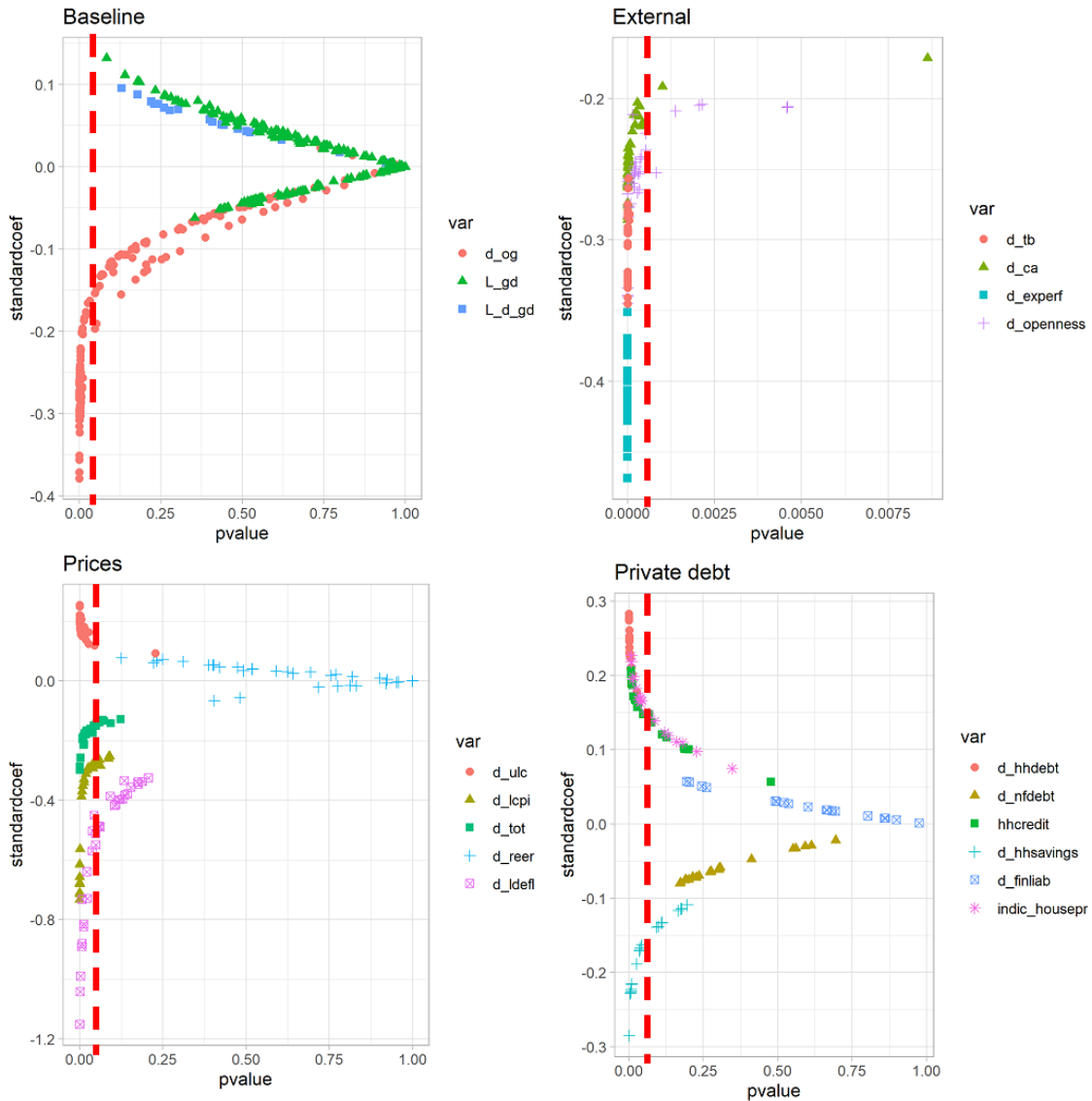
Based on that analysis, we select the trade balance and household debt as variables for the external and internal categories in the further analysis. Other variables tested, such as export performance and openness, would also have significant explanatory power. Yet, trade balance and household debt are easier to interpret. We also perform some additional statistical tests

⁽¹⁵⁰⁾In addition to the data shown, we performed less systematic tests for a wider set of macroeconomic variables.

⁽¹⁵¹⁾A Bayesian model averaging test including all macroeconomic variables of interest and running all possible regression models also confirms the results.

⁽¹⁵²⁾We add the following adjusted house price indicator: (real house price)*(share of property related taxes in GDP), taken from Taxation Trends in the European Union, 2019 edition, DG TAXUD.

Graph III.3.1: Visualisation of the estimates and their significance across variables



Note: Keeping the baseline setting (i.e. with Δ .OG and (public debt) $t-1$ in all regressions) and the variables in two out of the three macroeconomic variable categories unchanged, the various possible explanatory variables of the other category are tested. Coefficients are standardised with the ‘within standard deviation’. The variable *indic_housepr* represents the growth of housing prices, adjusted by the tax structure: (growth rate of housing price)*(lag of share of property-related taxes in GDP).
 Source: Own calculations based on AMECO data.

(multicollinearity and cointegration) to validate this selection. ⁽¹⁵³⁾ In the main analysis below, we also exclude price/competitiveness variables, because of correlation of unit labour costs and

other price variables with nominal GDP which is the denominator of all other variables. We therefore focus the analysis on trade balance and household debt. The results of the regressions are presented in the next section. ⁽¹⁵⁴⁾

⁽¹⁵³⁾The analysis also shows that for the macroeconomic variables linked to external developments, the change in the current account balance is a strong alternative explanatory variable (instead of the trade balance). The full analysis has been performed also with the current balance results. Similar outcomes are obtained as with the trade balance. The results are not shown here.

⁽¹⁵⁴⁾We also show the results of the regressions when considering the trade balance, household debt and nominal unit labour costs in the annex.

3.2. RESULTS OF THE EMPIRICAL ANALYSIS

The results for revenue windfalls (shortfalls) are remarkably robust considering a first differences set-up and important anticipated identification challenges, including differences in national tax systems, existence of and differences in tax lags (Table III.3.2).

Changes in the trade balance and household debt significantly directly affect revenue windfalls (shortfalls). We find negative effects (significant at the 1% level) on revenues from improvements in the trade balance (Table III.3.2).

Looking also at detailed results for the revenue components (Table III.3.3), we find the following results, that are highly significant and consistent with Lendvai et al. (2011):

- **An increasing share of imports to GDP raises indirect taxes.** Indeed, higher imports would increase the tax base – while real GDP may not be directly affected. More generally, fluctuations in output composition affect revenue collections by changing the weight of tax-intensive sectors in the economy: a higher reliance on imports leads to higher indirect tax collections, whereas a higher reliance on exports, which are VAT tax exempt, limits tax collections. Developments in trade balance also raise personal income taxes beyond cyclical effects (though to a smaller extent than the effects on indirect taxes). This may be linked to output composition effects: Increasing exports share in GDP may lead to lower direct taxes because the labour share in the export sectors is generally lower than the labour share of production for domestic consumption (with a higher services share) and taxation of capital/corporate profits tends to be lower than labour tax. There may be also specificities of tax systems (some taxes may be recorded as PIT)⁽¹⁵⁵⁾.
- **Similarly, we find positive effects (significant at the 1% level) of household debt on revenues** (Table III.3.2), reflecting the mechanisms by which credit growth expands the tax base beyond GDP growth with an increase in asset values, financial transactions

and (import) demand, which is consistent with Eschenbach and Schuknecht (2004).

Table III.3.2: Regression results for the windfall revenues and structural balance

Dependent variable	Revenue windfalls		Structural balance
	LSDVc (1)	FD-GMM (2)	LSDVc (3)
Revenue windfalls (t-1)	-0.00356 (0.0479)	0.03830 (0.0617)	
Structural balance (t-1)			-0.107*** (0.0380)
Gross debt (t-1)	0.00219 (0.00510)	0.01844 (0.0225)	0.0261*** (0.00679)
Δ Output gap (t)	-0.0760*** (0.0292)	0.10457 (0.1385)	-0.277*** (0.0370)
Δ Trade balance (t)	-0.139*** (0.0296)	-0.155*** (0.0645)	-0.0273 (0.0349)
Δ Household debt (t)	0.0704*** (0.0228)	0.1809*** (0.0599)	0.0159 (0.0319)
MTO (over-)achieved (t-1)	-0.144 (0.194)	-0.187 (0.202)	-0.642*** (0.204)
Election year (t)	-0.0245 (0.129)	-0.139 (0.137)	-0.513*** (0.160)
# countries	28	28	28
# observations	433	433	501
Wald time dummies (p-value)	0	0	0
AR (1) (p-value)		7.80e-06	
AR(2) (p-value)		0.323	
Hansen (p-value)		0.705	
# instruments		39	

Note: Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

- **Like the trade balance, household debt contributes to revenue windfalls through increases in personal income taxes and indirect taxes** (Table III.3.3). First, changes in valuation of assets and volume of transactions are not directly reflected in real GDP developments, but are affecting indirect taxes. Wealth and capital gains taxes can benefit from rising household wealth from e.g. stock and real estate markets that move in line with household debt. Asset price developments (associated with household debt) may also affect direct household taxes in a more indirect manner: if realised capital gains are taxed in corporations they may be taxed again at the household level; small, unlisted companies may pay taxes on their capital gains if the building or stocks owned by the company are sold (revalued) and taxes are then paid on the personal account of the owner⁽¹⁵⁶⁾.

⁽¹⁵⁵⁾ In addition, there could be some measurement issues (for discretionary measures or output gap).

⁽¹⁵⁶⁾ Morris and Schuknecht (2007).

Table III.3.3: Regression results for the windfall revenues components

Dependent variable	wR (1)	wPIT (2)	wCIT (3)	wVAT (4)	wSSC (5)	wNTR (6)
Dependent variable (t-1)	-0.00356 (0.0479)	0.00980 (0.0626)	-0.138** (0.0581)	-0.137** (0.0619)	0.118** (0.0584)	-0.215*** (0.0463)
Gross debt (t-1)	0.00219 (0.00510)	0.000534 (0.00300)	-0.00105 (0.00274)	0.00484* (0.00291)	-0.00115 (0.00218)	-0.000713 (0.00268)
Δ Output gap (t)	-0.0760*** (0.0292)	-0.0139 (0.0157)	-0.0137 (0.0142)	0.000246 (0.0160)	-0.0468*** (0.0122)	0.0433*** (0.0153)
Δ Trade balance (t)	-0.139*** (0.0296)	-0.0469*** (0.0147)	-0.00925 (0.0133)	-0.0800*** (0.0130)	-0.00226 (0.00950)	-0.00700 (0.0155)
Δ Household debt (t)	0.0704*** (0.0228)	0.0311*** (0.0120)	-0.0139 (0.0107)	0.0293** (0.0116)	0.0133 (0.00841)	0.0191 (0.0121)
MTO (over-)achieved (t-1)	-0.144 (0.194)	0.0581 (0.0788)	-0.191*** (0.0736)	0.0304 (0.0947)	0.117* (0.0685)	-0.0172 (0.101)
Election year (t)	-0.0245 (0.129)	0.0380 (0.0582)	-0.0478 (0.0534)	-0.0869 (0.0725)	0.0703 (0.0529)	0.0656 (0.0680)
# countries	28	28	28	28	28	28
# observations	433	318	318	335	335	433
year FE (p-value)	9.15e-06	4.05e-09	2.39e-10	0.0353	6.71e-06	0.137

Note: Estimation technique: LSDVc. Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1.

There are some further interesting findings when we compare the measured effects on the structural balance with those of the revenue windfalls (shortfalls).

Changes in the output gap significantly affect the structural balance, which corroborates the existence of procyclical discretionary policies. The measured effect of the change in output gap on the structural balance is negative and highly significant, consistent with procyclical spending or revenue policy. This procyclical policy effect is however much lower when the revenue windfalls (shortfalls) are considered as left-hand side variables, as (procyclical) revenue policy effects are removed. Some effect of the output gap remains at least in the LSDV regression for revenue windfalls (shortfalls). This may be due to the procyclical nature of the potential output measure that affects the calculation of windfall revenues⁽¹⁵⁷⁾. In addition, consistent with the findings that the structural balance is much more affected by policy variables than revenue windfalls (shortfalls), the explanatory variables that affect the policy response significantly affect the structural balance but not revenue windfalls (shortfalls) (Table III.3.2). In particular, the

dummies for election years and overachievement of the medium-term budgetary objective as well as the level of debt affect the structural balance but not the revenue windfalls (shortfalls).

Offsetting policy measures are the likely reason for the lack of significant direct effects of macroeconomic developments on the structural balance (Table III.3.2). This lack of significance is in line with findings in the literature (Bénétrix and Lane, 2013). Revenue windfalls may have been used for discretionary expenditure increases and revenue reducing measures in boom years. Regressions with cyclically-adjusted revenue and expenditure as dependent variables components confirm that there are counteracting effects explaining the aggregate results (not shown). The coefficients for cyclically-adjusted revenue and expenditure have the same sign and thus may cancel out the effect on the budget balance, except for the change in the output gap.

⁽¹⁵⁷⁾Note that calculation of the expenditure benchmark in the EU fiscal framework is based on a long-term average of potential output and thus addresses effects of some procyclicality of the potential output measure.

4. IMPLICATIONS FOR FISCAL OUTCOMES

This chapter illustrates the relevance of macroeconomic developments for a better understanding of the fiscal efforts and fiscal positions. As demonstrated above, fiscal outcomes are affected by fluctuations of macroeconomic and financial indicators beyond GDP and the economic cycle. This means that macroeconomic and financial developments potentially trigger (or mitigate) fiscal risks that are not fully considered in the cyclically-adjusted fiscal indicators used in the surveillance framework. Taking into account the revenue effects of some macroeconomic developments could help better assess the underlying budgetary position, fiscal risks and fiscal effort.

Macroeconomic developments affect Member States' fiscal effort as measured by the yearly change in the structural balance, through revenue windfalls (shortfalls). According to the EU fiscal rules, Member States target a fiscal effort measured in terms of cyclically-adjusted balance corrected for one-off measures. However, the *ex-post* attainment of the required fiscal effort may be affected by direct revenue effects of macroeconomic developments that affect tax bases that are not directly reflected in real GDP, such as changes in imports and household debt (also as proxy for property prices and transactions). For instance, at any given amount of fiscal measures undertaken by governments, if the imports decrease/increase, the resulting revenue shortfalls/windfalls adversely/positively affect the *ex-post* measured fiscal effort. In general, any increase in revenue windfalls (shortfalls) related to yearly macroeconomic developments improves (worsens) the *ex-post* measured fiscal effort, independent of the fiscal measures undertaken.

The effect of macroeconomic developments on the measured fiscal effort is estimated based on the analysis of the previous section. This effect corresponds to the (additional) revenue windfalls (or shortfalls) stemming from yearly macroeconomic developments (compared to the previous year). To estimate it, we consider the macroeconomic variables whose developments have the most significant and consistent effects on windfall revenues (i.e. trade balance and household debt) and the associated coefficients β that reflect those effects (Table III.3.2, column 1, i.e. a coefficient of -0.139 for the trade balance, and

0.0704 for the household debt) ⁽¹⁵⁸⁾. Compared to the previous year, the additional revenue windfalls (shortfalls) estimated to have been triggered by developments in trade balance and households debt write:

$$-0.139 * \Delta TB_t + 0.0704 * \Delta HHDebt_t$$

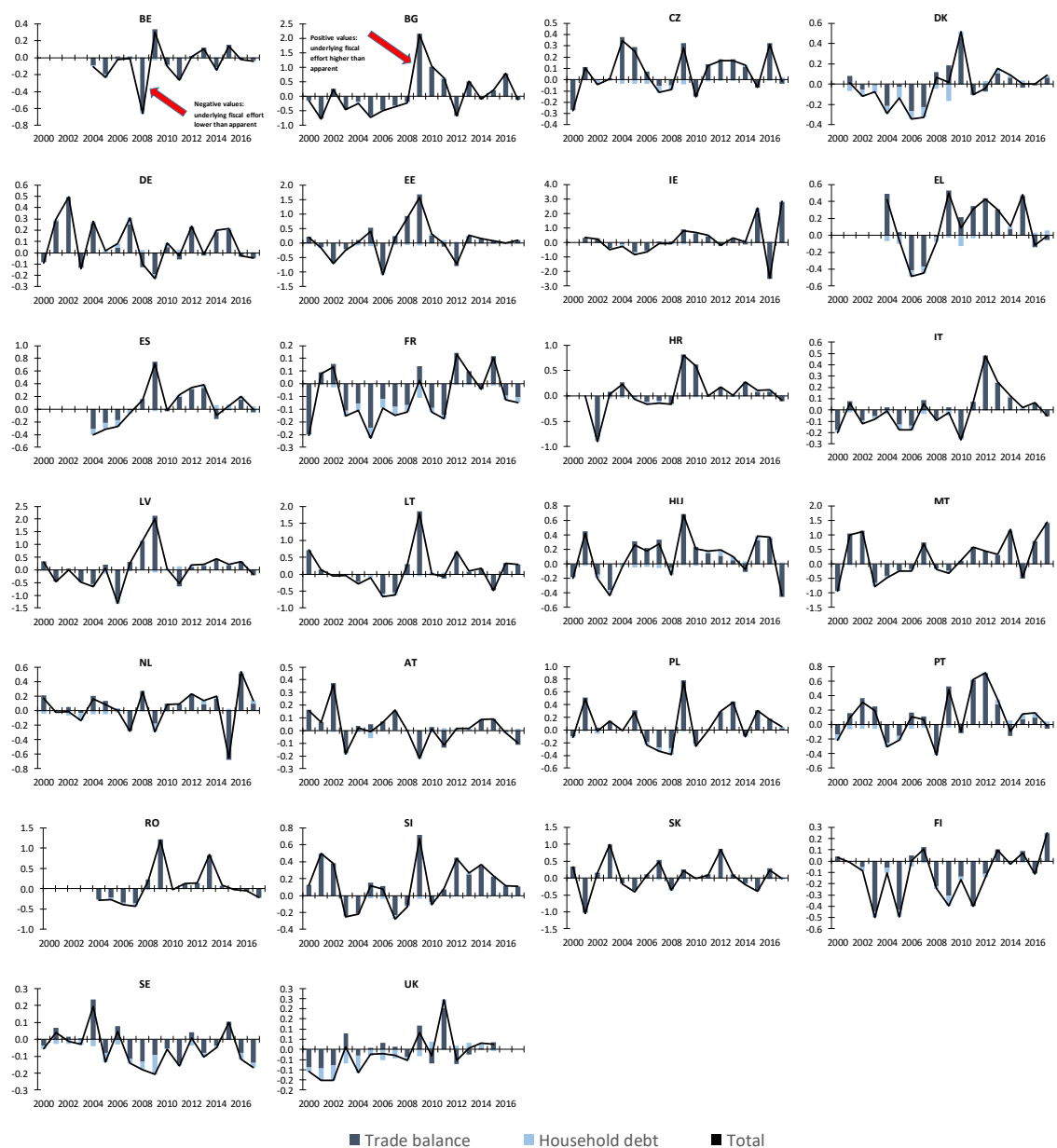
where ΔTB_t and $\Delta HHDebt_t$ are the yearly differences in trade balance and household debt.

Over the two past decades, this estimated effect has been significant in many Member States. Put differently, the 'underlying fiscal effort' (i.e. adjusted for the revenue windfalls/shortfalls related to macroeconomic developments) can be significantly different from the fiscal effort as measured by the change in the structural balance. Graph III.4.2 breaks down the effects of yearly developments in trade balance and household debt on the fiscal effort over the past two decades. The y-axis is reversed to facilitate the reading in terms of fiscal effort: positive values here signal increasing shortfall (or decreasing windfall) revenues, implying *ceteris paribus* that the underlying fiscal effort (i.e. adjusted for the effects of revenue windfalls/shortfalls related to macroeconomic developments) is higher. The negative values signal decreasing shortfall or increasing windfall revenues, implying *ceteris paribus* that the underlying fiscal effort (i.e. adjusted for the effects of the revenue windfalls/shortfalls related to macroeconomic developments) is lower. Results show that effects on fiscal effort come more from developments in trade balance than in household debt, and that they can be sizeable. ⁽¹⁵⁹⁾.

⁽¹⁵⁸⁾ We consider the same β for all countries, based on a panel regression with all EU countries. Tests by country group suggest that, while there are some differences between Member States, the coefficients may be close for most countries.

⁽¹⁵⁹⁾ Here as well, some caveats remain, notably as the coefficients β to estimate the effect of macroeconomic developments on fiscal effort are based on a panel regression, thus do not consider country specificities. Robustness test with estimates for country groups (not shown) however confirm that findings are robust. The 'underlying fiscal effort' (adjusted for the effects of macroeconomic developments) also does not rely on the definition of norms/equilibria for macroeconomic variables that are used in the next section to estimate the effects of macroeconomic developments on cyclically-adjusted fiscal positions.

Graph III.4.2: Revenue windfalls/shortfalls associated with developments in trade balance and household debt (EU + UK, without Luxembourg and Cyprus, % of GDP, reversed y-axis)



Notes: In total, positive values indicate increasing shortfall (or decreasing windfall) revenues triggered by macroeconomic developments, that adversely affect the fiscal effort measured in terms of cyclically-adjusted balance. The underlying fiscal effort (adjusted for changes in macroeconomic developments) is then higher than the fiscal effort measured in terms of cyclically-adjusted balance. Conversely, negative values indicate increasing windfall (or decreasing shortfall) revenues: the underlying fiscal effort (adjusted for macroeconomic developments) is then lower than the fiscal effort measured in terms of cyclically-adjusted balance.

The contributions to changes in windfall/shortfall revenues can be broken down (i) contribution to the trade balance developments and (ii) contribution of the household debt developments. Luxembourg and Cyprus are not shown due to data availability.

These findings suggest that considering windfall/shortfall revenues due to macroeconomic developments such as changes in the trade balance and household debt contribute to better understanding of the underlying fiscal effort. When analysing the yearly change in structural balance, considering the revenue windfalls and shortfalls associated with macroeconomic developments allows for better assessing fiscal effort *ex post*. For instance, in a context of an improving/deteriorating trade balance, the actual fiscal effort might be significantly larger/lower than the one measured by the change in the cyclically adjusted or structural balance. This is also why the overall assessment under the preventive arm when analysing the fiscal effort based on the changes in the structural balance, aims at carefully considering the role of windfall/shortfall revenues for the underlying fiscal effort. Similarly, better considering the revenue effects related to expected future macroeconomic developments and their implications on windfalls (shortfalls) would help better understand the underlying fiscal positions.

5. CONCLUSIONS

New evidence shows that macroeconomic developments can have a direct and sizeable effect on budgetary elasticities and therefore fiscal outcomes. Developments in macroeconomic variables –particularly the trade balance and household debt– significantly affect cyclically-adjusted government revenues. This notably reflects GDP composition effects (e.g. at constant GDP, larger imports increase revenue ratio) and tax bases effects not directly reflected in real GDP (e.g. financial transactions, wealth and property, the developments in the related tax bases being often associated with developments in household debt). A deteriorating trade balance, or rising household debt, for instance, triggers direct windfall revenues, mainly due to increased tax bases beyond GDP. This mechanically improves the structural balance.

The results suggest that systematically considering macroeconomic developments improves understanding of the underlying fiscal efforts as measured by the change in the structural balance. This is because the revenue windfalls (shortfalls) related to those developments mechanically affect the fiscal effort, as measured by the change in structural balance, whereas they are not directly linked to fiscal measures undertaken by countries. For instance, if a country simultaneously improves its fiscal position and trade balance, a smaller measured improvement in the structural balance may not necessarily imply a low ‘underlying fiscal effort’ (i.e. adjusted for the estimated revenue windfalls/shortfalls related to those macroeconomic developments). Over the past two decades, the estimated effects of macroeconomic developments on the measured fiscal effort have been sizable in many Member States, highlighting the relevance to consider them to better understand the underlying fiscal effort.

The analysis also supports the increased reliance on the expenditure benchmark in measurement of the fiscal effort. As it does not rely on revenue windfalls and shortfalls, the expenditure benchmark, introduced in the surveillance process with the six-pack reform, it is indeed less affected by macroeconomic developments than the structural budget balance.

Further work would help better distinguish temporary from structural revenue windfalls and shortfalls. This would help to get a better gauge of the underlying budgetary position to inform budgetary planning. Measurement of the direct impact of macroeconomic variables on fiscal outcomes may benefit from further work at country level, assessing in detail country tax structures and lags, to identify how macroeconomic developments are related to tax bases that are not directly linked to GDP.

REFERENCES

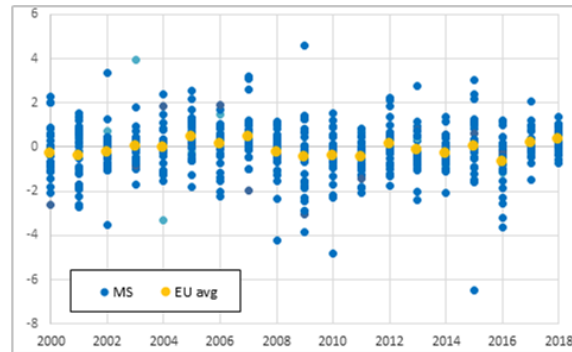
- Afonso, A., Gomes, P., 2014. Interactions between private and public sector wages. *Journal of Macroeconomics*, 39, 97–112.
- Afonso, A., Huart, F., Jalles, J., Stanek, P., 2018. Twin deficits revisited: a role for fiscal institutions? REM Working Paper, 031-2018.
- Alesina, A., Perotti, R., 1995. The political economy of budget deficits. *IMF Staff Papers*, 42(1), 1–31.
- Bénétrix, A., Lane, P., 2013. Fiscal cyclicity and EMU. *Journal of International Money and Finance*, 34, 164–176.
- Bénétrix, A., Lane, P., 2015. Financial cycles and fiscal cycles. Department of Economics, Trinity College.
- Borio, C., Disyatat, P., Juselius, M., 2014. A parsimonious approach to incorporating economic information in measures of potential output. *BIS Working Paper*, 442.
- Borio, C., Disyatat, P., Juselius, M., 2016. Rethinking potential output: embedding information about the financial cycle. *Oxford Economic Papers*, 69(3), 655–677.
- Bruno, G., 2005. Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. *Economics Letters*, 87(3), 361–366.
- Buti, M., van den Noord, P., 2004. Fiscal policy in EMU: rules, discretion and political incentives. European Commission. *European Economy. Economic Papers*, 206.
- Chinn, M., Ito, H., 2019. A requiem for ‘blame it on Beijing’: interpreting rotating global current account surpluses. *NBER Working Paper*, 26226.
- Claessens, S., Kose, M., Terrones, M., 2011. Financial cycles: what? how? when? *International seminar on macroeconomics*, 7(1), 303–344.
- Corsetti, G., Müller, G., 2006. Twin deficits: squaring theory, evidence and common sense. *Economic Policy*, 21(48), 597–638.
- De Agostini, P., Paulus, P., Tasseva, I., 2016. The effect of changes in tax-benefit policies on the income distribution in 2008-2015. *Research note 02/2015*.
- Dobrescu, M., Salman, M., 2011. Fiscal policy during absorption cycles. *IMF Working Paper*, 11-41.
- Eschenbach, F., Schuknecht, L., 2004. Budgetary risks from real estate and stock markets. *Economic Policy*, 19(39), 314–346.
- Fernández-de-Córdoba, G., Pérez, J., Torres, J., 2012. Public and private sector wages interactions in a general equilibrium model. *Public Choice*, 150(1-2), 309–326.
- Girouard, N., Price, R., 2004. Asset price cycles, ‘one-off’ factors and structural budget balances. *OECD Economics Department Working Papers*, 391.
- Heinemann, F., 2001. After the death of inflation: will fiscal drag survive? *Fiscal Studies*, 22(4), 527–546.

- Jaeger, A., Schuknecht, L., 2007. Boom-bust phases in asset prices and fiscal policy behavior. *Emerging Markets Finance and Trade*, 43(6), 45–66.
- Kiviet, J., 1995. On bias, inconsistency, and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics*, 68(1), 53–78.
- Lendvai, J., Moulin, L., Turrini, A., 2011. From CAB to CAAB? Correcting indicators of structural fiscal positions for current account imbalances. European Commission. *European Economy. Economic Paper*, 442.
- Liu, M., Mattina, T., Poghosyan, T., 2015. Correcting ‘beyond the cycle’: accounting for asset prices in structural fiscal balances, *IMF Working Paper*, 15-109.
- Morris, R., Schuknecht, L., 2007. Structural balances and revenue windfalls: the role of asset prices revisited. *ECB Working Paper*, 737.
- Mourre, G., Poissonnier, A., Lausegger, M., 2019. The semi-elasticities underlying the cyclically-adjusted budget balance: an update and further analysis. European Commission. *Discussion Paper* 98.
- Oates, W., 1988. On the nature and measurement of fiscal illusion: a survey. in: Brennan, G., Grewal, B., Groenewegen, P. (eds.), *Taxation and fiscal federalism: essays in honour of Russel Mathews*, Australian National University Press, 65–82.
- Olivera, J., 1967. Money, prices and fiscal lags: a note on the dynamics of inflation. *PSL Quarterly Review*, 20(82).
- Osbat, C., Jochem, A., Özyurt, S., Tello, P., Bragoudakis, Z., Micallef, B., Sideris, D., Papadopoulou, N., Ajevskis, V., Krekó, J., Gaulier, G., 2012. Competitiveness and external imbalances within the euro area. *ECB Occasional Paper Series*, 139.
- Pierluigi, B., Sondermann, D., 2018. Macroeconomic imbalances in the euro area: where do we stand? *ECB Occasional Paper*, 211.
- Schuknecht, L., Eschenbach, F., 2002. Asset prices and fiscal balances. *ECB Working Paper*, 141.
- Tanzi, V., 1977. Inflation, lags in collection, and the real value of tax revenue. *IMF Staff Papers*, 24(1), 154–167.

ANNEX

A.1 Overview of windfall revenues in the EU

Graph III.A.1: Windfall revenues by Member States (% of GDP)



Note: DRM after 2008 are completed with DTM before 2008. If DRM are indicated as zero, they are replaced by DTM (in particular between 2008 and 2010).

Source: Own calculations based on AMECO, discretionary tax measure database and internal estimates for discretionary fiscal measures.

A.2 Regression results with the price variable (ULC) included

We find similar conclusions for the effect of a change in trade balance or of household debt on windfall revenues (Table III.A.1). The conclusions are also similar for the components of revenues, except for the effect of change in household debt on non-tax revenues (Table III.A.2).

Table III.A.1: Sensitivity analysis – regression results for the windfall revenues and structural balance

Dependent variable	Revenue windfalls		Structural balance
	LSDVc	FD-GMM	LSDVc
Estimator	(1)	(2)	(3)
Dependent variable (t-1)	-0.0100 (0.0474)	-0.0175 (0.0393)	-0.120*** (0.0394)
Gross debt (t-1)	0.00436 (0.00492)	0.0104 (0.0233)	0.0237*** (0.00607)
Δ Output gap (t)	-0.0724** (0.0288)	-0.0538 (0.0587)	-0.283*** (0.0363)
Δ Trade balance (t)	-0.130*** (0.0310)	-0.132*** (0.0374)	-0.0460 (0.0376)
Δ Household debt (t)	0.0620*** (0.0232)	0.0736*** (0.0239)	0.0304 (0.0286)
Δ Unit Labour Cost (t)	0.0430** (0.0189)	0.0516*** (0.0182)	-0.0749*** (0.0272)
MTO (over-)achieved (t-1)	-0.135 (0.193)	-0.219 (0.188)	-0.658*** (0.219)
Election year (t)	-0.0373 (0.131)	-0.135 (0.134)	-0.485*** (0.132)
# countries	28	28	28
# observations	433	405	497
year FE (p-value)	8.81e-06	7.19e-11	0
AR (1) (p-value)		8.00e-06	
AR(2) (p-value)		0.341	
Hansen (p-value)		0.701	
# instruments		38	

Note: Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

In addition, we find positive effects (significant at the 5% level) of unit labour costs on revenues (Table III.A.1). Looking at detailed results for the revenue components, unit labour costs contribute to windfall revenues mainly through social security contributions and corporate income taxes (the demand effect on profits offsets the rising compensation costs for firms), while non-tax revenues tend to decrease (Table III.A.2).

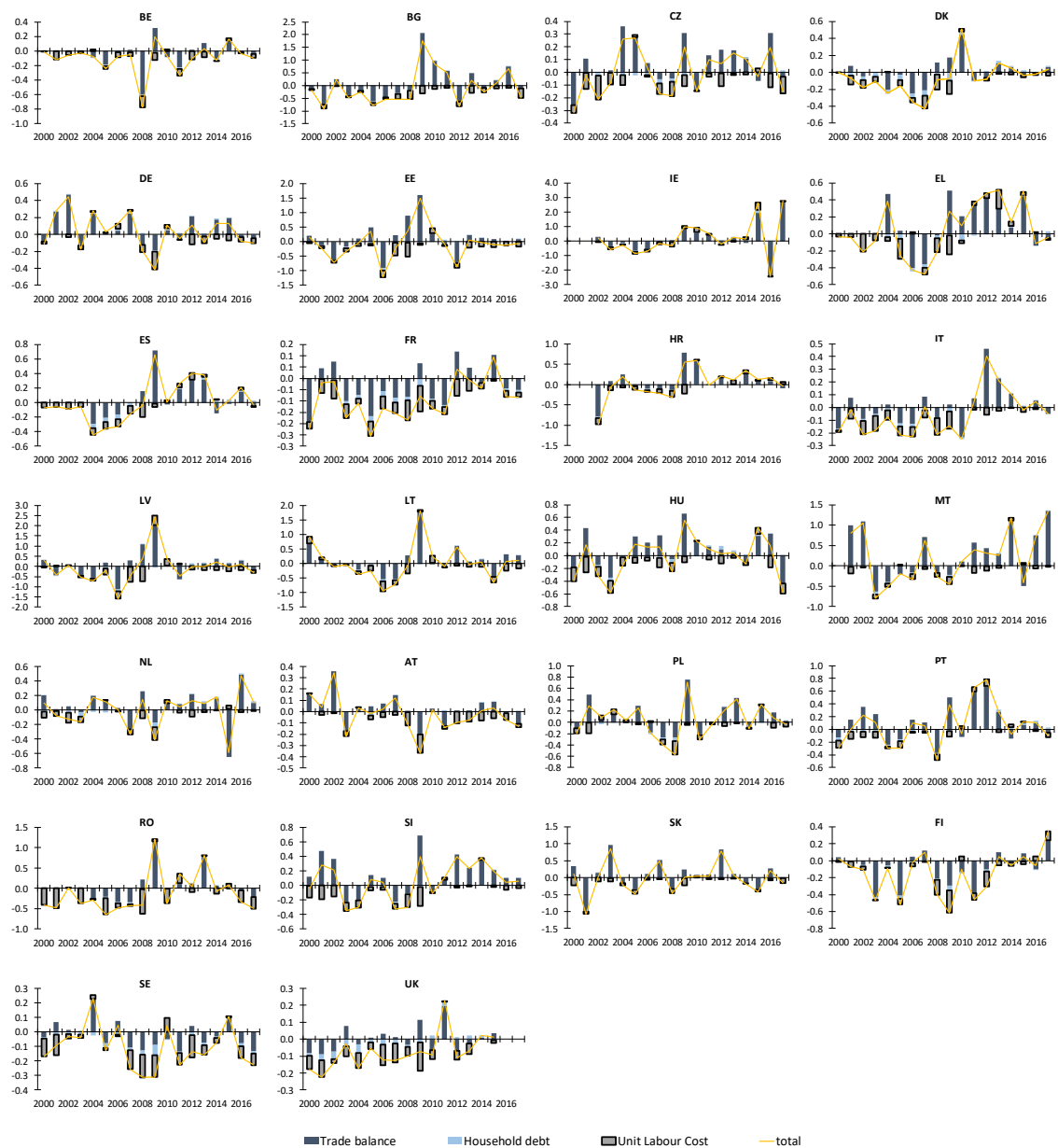
The significant negative coefficient of the unit labour costs on the structural balance may be driven by increased expenditure on public sector wages, social transfers and pensions.

Table III.A.2: Sensitivity analysis – regression results for the windfall revenues components

Dependent variable	wR	wPIT	wCIT	wVAT	wSSC	wNTR
Estimator	LSDVc	LSDVc	LSDVc	LSDVc	LSDVc	LSDVc
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (t-1)	-0.0100 (0.0474)	0.00878 (0.0636)	-0.136** (0.0583)	-0.146** (0.0614)	0.112* (0.0581)	-0.204*** (0.0462)
Gross debt (t-1)	0.00436 (0.00492)	0.000808 (0.00298)	-0.000703 (0.00270)	0.00509* (0.00293)	-0.000300 (0.00210)	-0.00195 (0.00258)
Δ Output gap (t)	-0.0724** (0.0288)	-0.0135 (0.0156)	-0.0131 (0.0140)	0.00128 (0.0160)	-0.0447*** (0.0120)	0.0412*** (0.0151)
Δ Trade balance (t)	-0.130*** (0.0310)	-0.0442*** (0.0151)	-0.00596 (0.0137)	-0.0778*** (0.0135)	0.00489 (0.00940)	-0.0120 (0.0162)
Δ Household debt (t)	0.0620*** (0.0232)	0.0280** (0.0123)	-0.0179 (0.0110)	0.0268** (0.0118)	0.00319 (0.00836)	0.0240* (0.0123)
Δ Unit Labour Cost (t)	0.0430** (0.0189)	0.0110 (0.00871)	0.0142* (0.00794)	0.00950 (0.0101)	0.0348*** (0.00716)	-0.0241** (0.00985)
MTO (over-)achieved (t-1)	-0.135 (0.193)	0.0547 (0.0788)	-0.195*** (0.0731)	0.0260 (0.0945)	0.104 (0.0657)	-0.0242 (0.101)
Election year (t)	-0.0373 (0.131)	0.0331 (0.0588)	-0.0540 (0.0534)	-0.0896 (0.0723)	0.0579 (0.0508)	0.0716 (0.0685)
# countries	28	26	26	28	28	28
# observations	433	318	318	335	335	433
year FE (p-value)	8.81e-06	3.62e-05	0	0.00259	0.0105	0.0493

Note: Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

Graph III.A.3: **Difference between the fiscal effort measured in the surveillance process and adjusted for changes in macroeconomic developments**



Notes: In total, positive values indicate increasing shortfall (or decreasing windfall) revenues triggered by macroeconomic developments, that adversely affect the fiscal effort measured in terms of cyclically-adjusted balance: the underlying fiscal effort (adjusted for changes in macroeconomic developments) is then higher than the fiscal effort measured in terms of cyclically-adjusted balance. Conversely, negative values indicate increasing windfall (or decreasing shortfall) revenues: the underlying fiscal effort (adjusted for changes in macroeconomic developments) is then lower than the fiscal effort measured in terms of cyclically-adjusted balance. Luxembourg is not shown due to data issues.

The contributions to changes in windfall/shortfall revenues can be broken down (i) contribution of the trade balance developments, (ii) contribution of the households debt developments and (iii) contribution of the unit labour cost developments. These contributions do not depend on the norms (equilibria) chosen for trade balance, households debt and unit labour cost developments.