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It's Not Austerity. Or is it?

Assessing the effect of austerity on growth in Europe, 2010-15*

Matteo Fragetta[§], Roberto Tamborini⁺

Abstract

While the debate over the relationship between austerity and growth in Europe has been lively and intense, systematic and rigorous empirical analysis has remained underdeveloped. With this econometric study of a panel of European countries and the US from 2010 to 2015, we have sought to fill this gap. In particular, our study is organised as a "test" of the "it's not austerity" hypothesis, i.e. that austerity cannot be regarded as the explanatory variable of the post-crisis poor growth in Europe. To this end, we have articulated this hypothesis in four control variables of the growth-austerity relationship accounting for external competitiveness, the sovereign debt crisis, the general efficiency of the economy, and the composition effect of austerity between (less) expenditure and (more) taxation. As further control variable we have also considered one-year official forecasts of austerity. Austerity has been identified as a year-to-year increase in the structural primary balance relative to potential GDP. Upon estimating a static relationship using year-to-year changes in the variables with two methods (two-way fixed effects and Pesaran's PCCE (2006)), and a dynamic one, aimed at capturing longer-run effects, with the Arellano-Bond difference panel estimator, our main conclusion is that the "it's not austerity" hypothesis does not pass our test. The austerity coefficient is significant in all estimated relationships (except one) with the "Keynesian" theoretical sign, i.e. a negative effect on GDP growth in a range between 0.7 and 0.9 in the static specification and slightly lower in the dynamic one. On the other hand, the evidence also indicates that austerity cannot be regarded as the single negative factor impinging on growth in the panel under examination. The general efficiency of the economy has also played a role, but what emerges as the more significant co-determinant is the increase in the debt/GDP ratio, with an effect on growth comparable to austerity (or larger in some specifications). However, this fact should be reconsidered carefully, because the "excess austerity" hypothesis may be corroborated, according to which it is growth-depressing austerity which causes the debt/GDP ratio to grow, hypothesis enhanced by the finding that the real value of debt and its real interest rate are both non-significant.

Keywords: EMU, fiscal consolidation, panel time series

JEL Classification: E62, C33

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§ Department of Economics and Statistics, University of Salerno, mfragetta@unisa.it

+ Department of Economics and Management, University of Trento, Trento (Italy), roberto.tamborini@unitn.it

1 Introduction

"Austerity" was the 2010 word of the year according to the *Merriam-Webster Dictionary*, with more than 250,000 clicks on the online edition. This (un)popular word now stands for what economists call "fiscal consolidation", a policy aimed at rebalancing public finances towards zero deficit or a surplus typically in view of public debt stabilisation or reduction.¹ This policy has been, more or less willingly, pursued by the majority of governments in the advanced economies in order to consolidate public finances after the large deficits and debts accumulated in response to the Great Recession of 2008-09. Austerity has spurred controversies ever since its appearance as the "Treasury View" in the years of the Great Depression.² The fundamental issues are typically two. First, is austerity effective for its own purposes (e.g. does it succeed in rebalancing public finances and stabilising public debt)? Second, what are the economic and social costs of austerity (e.g. does it depress economic activity and create unemployment)?

The epicentre of austerity, and of controversies, has been Europe, in particular the Euro Zone (EZ), where fiscal consolidation has been enforced after 2010 under the pressure of the sovereign debt crises, and in compliance with the rules established in the Maastricht Treaty and the subsequent specifications in the Stability and Growth Pact (SGP) up to the Treaty on Stability, Coordination and Governance in the Economic and

¹ Originally, the term "austerity" was introduced in Great Britain in a broader socio-economic sense to denote the hard living conditions in the aftermath of World War II (e.g. Kynaston 2007).

² The conventional birth date of the Treasury View is 1929 in a speech delivered to the House of Commons by Winston Churchill, then Chancellor of the Exchequer in the Conservative government. Opposing the programmes of public works aimed at creating new employment put forward by the Liberals and supported by Keynes, Churchill invoked the "orthodox Treasury View" arguing that increasing public expenditure would simply displace an equal amount of private expenditure with no net effect on economic activity. It seems that inspiration had come from an article published by Hawtrey in 1925, "Public Expenditure and the Demand for Labour", though it is unclear how this article came to be endorsed by the Treasury as its own view (see <http://uneasymoney.com/2013/04/10/hawtrey-and-the-treasury-view/>). For fiscal austerity in historical perspective see the fine essay by Blyth (2013).

Monetary Union ("Fiscal Compact") of 2012. Beyond accounting for two thirds of the EU countries and 73% of GDP, the critical role of the EZ relates to some facts that should be borne in mind, and that will be further examined below. First, according to different possible definitions and measures of fiscal consolidation, the EZ stands out as the Western world area where austerity has been enacted earlier, faster and harder (see section 3). Second, whereas public deficits in the EZ have by and large been brought under control (from 6.4% of GDP in 2009 to 2.1% in 2015), public debts have been escalating (from 78.3% to 92.9% of GDP over the same period)³. Third, after the US financial crisis went global and "real" in 2008-09, the EZ also became the epicentre of the "Europeanisation" of the crisis marked by double-dip recession, prolonged stagnation, higher unemployment, in the context of the contagion from private to public debt crises (see Figure 1 and Figure 2). The debate over the role of austerity in this dismal scenario has then raged.⁴

The "it's austerity" view mainly hinges on the point that, beyond a threshold, "excess austerity" (De Grauwe and Ji 2013), by depressing economic activity and growth, also self-defeats stabilisation of public finances and debts. In the "it's not austerity" narrative the main argument is that *some* countries have performed *worse* than others owing to *their own conditioning factors*. Among these, four are more often invoked. 1) *Structural inefficiencies*: seeming austerity victims are countries plagued with long-lasting inefficiencies that inhibit growth; an oft alleged evidence is that these countries also experienced low growth before austerity. 2) *Lack of external competitiveness*: even admitting that austerity may, in the short run, reduce domestic demand, seeming austerity victims are countries with large external imbalances due to endemic competitiveness losses; typically, persistent appreciation of the real effective exchange rate on the basis of unit labour costs. 3) *Excess indebtedness*: seeming austerity victims are countries with higher public debt, usually associated with higher interest rates and involved in, or on the brink of, debt crises. 4) *Composition of consolidation* between cutting expenditures or raising taxes: seeming austerity victims are countries with disproportionate resort to taxation.

³ Eurostat, database AMECO

⁴ Among the numerous accounts of the debate see e.g. Buti and Pench (2012), Corsetti G. (ed., 2012), Buti and Carnot (2013), Tamborini (2015).

While casual observations and simple correlations between austerity and growth are abundant, rigorous econometric analyses are relatively underdeveloped (Mauro and Zilinsky 2015). And where they have been developed, as in the neighbouring research on the so-called "fiscal multipliers", results remain controversial (e.g. Favero et al. 2011, Hebous 2011, Gechert et al. 2015). If one lesson can be drawn from this literature, it is that the effects of fiscal policy on economic activity depend on a wide array of historical, economic, institutional and contingent factors.

Thus an appealing argument of the "it's not austerity" hypothesis, in which we are particularly interested here, is that austerity is unlikely to be *the* single cause of the poor post-crisis performance of the EZ. Indeed, economies are too complex entities to be subject to monocausal explanations. More in particular, the available data do show quite an amount of heterogeneity across countries within and outside the EZ, both in their exposition to austerity and in a number of *other possibly conditioning factors*. Against this background, we abstain from pursuing a would-be general conclusion about "the" relationship between austerity and growth. The focus of our study is on the explanatory power of austerity on growth in the EZ and the other EU countries (OEU) after the Great Recession from 2010 to 2015, controlling for the conditioning factors mentioned above, with the US considered as an outside comparable counterparty.

We have set time and space limits to our investigation by purpose. The time window of austerity has been chosen according to the indicator we have adopted – the government's structural primary balance as a ratio to potential GDP currently used by the European Commission in the Excessive Deficit Procedure (see below, section 3) – and in line with other studies using different indicators (e.g. Alesina et al. 2015, Tamborini 2015, House et al. 2017). The EZ represents a unique "field experiment" of a large number of countries where some key conditioning factors of fiscal policy are common and exogenous, namely fiscal targets and rules, monetary policy, the exchange rate with the rest of the world. Further, the strong macroeconomic interdependences within the EZ capture another likely important conditioning factor of fiscal policy in open economies. Pooling EZ and non-EZ countries together helps identify the specific role of the EZ institutions, while enlarging the scope of macroeconomic interdependencies. The US have been included for similar reasons, as they have different policy institutions from

the EU as a whole, but represent significant macroeconomic linkages with the rest of the outside world (likewise House et al. 2017). Empirical research has also shown that the effects of fiscal policy are time-varying in relation for instance to the business cycle, locally or world-wide, or to the monetary policy regime. Our limited and well-defined time window may reduce the presence of significant "regime shifts" in general economic conditions, with predominant low growth, low inflation, policy interest rates at the zero lower bound. Alas, time and space boundaries have a cost in terms of observations, and hence the feasibility and reliability of econometric tests, that we have sought to manage at best. Hopefully, the boundaries we have set are sufficiently well tailored (not too large, not too small) in order for our conclusions to be meaningful for policy making *in the present context of the EU and the EZ in particular*.

In consideration of the unresolved issues in the ongoing debate, the econometric analysis that we present in this paper can be thought of as a test of the "it's not austerity" hypothesis, where the null is that the conditioning factors wipe out any significance of austerity. A critical preliminary consideration is that short-run (business cycle) and longer-run (growth capacity) perspectives are often mixed up in the debate about austerity. As a matter of fact, fiscal policy may have both short-run and long-run effects on economic activity, and there may be connections between cyclical (non)stabilisation and growth capacity (Zagler and Dürnecker 2003, DeLong and Summers 2012, De Grauwe 2015). Moreover, austerity usually is, and it has been pursued in the EZ, as a medium-term policy (Alesina et al. 2015). Therefore we have tested both a short-run (year-to-year changes) specification and a longer-run, dynamic specification.

Methodologically, we have adopted a panel time series approach, in particular the Pooled Common Correlated Effects estimator (PCCE) developed by Pesaran (2006)⁵. This estimator presents several valuable features in relation to our research question and available dataset.⁶ First, country heterogeneity can be accounted for by considering country-unit

⁵ The Common Correlated Effects (CCE) estimator could also in principle be implemented, allowing for a full parameter heterogeneity setup. However, given our short sample in the time series dimension, we restrict our attention only to the pooled version of the estimator.

⁶ See also Chudik et al. (2011), Kapetanios et al., (2011) and Pesaran and Tosetti, (2011).

effects (i.e. the effect of any time-invariant regressors for each country) and time-unit effects (i.e. the effect of any time-variant regressors which is common to all countries). Second, several macro-panel data present evidence of non-stationarity in their time series component (Phillips and Moon 2000). This feature is likely to arise in our dataset, and it needs to be accounted for in order to avoid bias and/or inefficiency. Third, in the context of a cross-country analysis where units feature strong economic interlinkages, it is likely to detect cross-sectional correlation or dependence among regression error terms. Further properties will be presented in detail in section 4.

Our main finding, robust to the wide range of controls and checks that will be analysed in due time, is that the null can be rejected, i.e. austerity has in fact played a significant role in determining post-crisis (poor) growth across Europe. Nonetheless, the evidence also indicates that austerity has not been the single determinant of growth in the panel under consideration, with the more significant co-determinant factor being the rise in the public debt-to-GDP ratio.

The remainder of the paper is structured as follows. Section 2 provides an overview of the debate on fiscal austerity in Europe, pointing out the open issues and motivation for rigorous empirical analysis. Section 3 addresses the problems challenging the empirical analysis of austerity. Section 4 presents the data, the econometric model and the estimation strategy. Section 5 reports and discusses the results. Finally, section 6 concludes.

2 The debate on fiscal austerity and growth

To begin with, a confusion surrounding the quarrel about austerity and growth should be dispelled. Confusion is between long-run and short-run analysis. Critics of austerity argue that it is mainly responsible for the extent and persistence of low or negative growth *after the Great Recession of 2008-09*. Their concern is with the pro-cyclical effects of austerity, i.e. the kind of facts depicted in Figure 1 and Figure 2, namely the "decoupling" of the GDP and unemployment paths of the EZ from the other areas since 2011, after austerity programmes started. Recovery appears to be weaker,

slower, with a persistent negative wedge.⁷ The austerity defenders instead focus on the long-run growth capacity of the economy, which in their view is either unaffected, or even enhanced, by austerity as a means to keep public finances in order over time. As a matter of fact, it is well known that fiscal policy actions may have both short-run and long-run effects, and there may be connections between cyclical (non)stabilisation and growth capacity (Zagler and Dürnecker 2003, DeLong and Summers 2012, De Grauwe 2015). In the EZ, austerity has been pursued as a medium-term strategy, so that the two perspectives cannot be disjoined: *given the Great Recession shock*, has austerity amplified or absorbed the shock? Therefore, to what extent is it responsible for the subsequent economic performance of the countries under austerity therapy?

These questions are critical for at least two reasons. The first is that a negative impact of austerity on economic activity, even a "short-run" one, may jeopardise the achievement of the ultimate goals of fiscal consolidation and debt sustainability. The second is that the social costs of a slump induced by austerity, beyond being a problem by themselves, may weaken the political will necessary to pursue the consolidation programme.

Form this point of view, the austerity-growth nexus is intertwined to the theory and evidence of the so-called "fiscal multipliers", i.e. the impact of (changes in) fiscal policy variables on economic activity. With the demise of active fiscal policy during the long spell of the Great Moderation, at the outbreak of the world crisis research in this field was frozen at the point of the Keynesians *vs.* Monetarists debate of the Seventies, with only few noticeable updates on the front opposite to the Keynesian view, namely that multipliers are small (one half or less) or zero, implying that deficit spending has a negligible positive effect, if any, on economic activity, whereas fiscal consolidation is neutral or may even have a positive effect.

The rapid but ineffective fall of interest rates to zero and the exhaustion of conventional monetary policy, prompted the fast resumption of expansionary fiscal policy worldwide and spurred the empirical research on its effectiveness via estimation of fiscal multipliers. Through the rainfall of widely different results, a revised and moderate support to the Keynesian

⁷ Other oft mentioned indicators of the EZ operating below capacity are the large and persistent output gaps coupled with the steady fall of the inflation rate towards zero.

view emerged (e.g. Blanchard et al. 2010, Coenen et al. 2010). Likewise, an empirical assessment of the European Economic Recovery Plan of fiscal stimulus engineered by the EC in 2009-10 found "multipliers greater than one", with sizeable, though short-lived, effects on GDP growth, conditional on accommodative monetary policy (Coenen et al. 2012)

Against this background, the debate and policy attitude in the EU after the Great Recession and the consequent deterioration of public finances⁸ have gone through various phases. In the early phase of launch and enforcement of austerity by institutional agencies, the message was that austerity would be neutral on, or even beneficial to, the recovery growth path of the EU economies.

There should be little question that European economies share the need to reduce public deficits and debts from levels that, as confirmed by a growing strand of empirical literature [...] are likely to be harmful for growth in the medium term [...] (Buti and Pench 2012, p. 1)

Some argue that budget consolidation and fostering growth appear contradictory to one another [...] As consolidated public finances enhance the trust of financial markets in each respective country, budget discipline is a key prerequisite for economic success and should not be perceived as a hurdle to growth (OECD 2012, p. 5)

The strand of literature mentioned in the first quotation is the one generated by the well-known Reinhart and Rogoff (2010) finding of a critical debt-to-GDP threshold of about 90% beyond which it becomes detrimental to growth. Whereas this literature is essentially empirical with little investigation into the causes of the relationship between debt and growth, the so-called "trust channel" mentioned in the second quotation provides one explanation. This explanation encompasses various theoretical links between the state of public finances and the economy created by optimising forward looking agents representative of the private sector. Overall, these theories stand in sharp contrast with the traditional Keynesian wisdom that austerity has a net negative impact on economic activity.⁹

The prototypical agent is the "Ricardian consumer" in the path-breaking paper by Barro (1974). Since *sustainable* public debt at any point in time has to be matched by the discounted value of future budget *surpluses*, the

⁸ As will be seen later, deterioration in the EU and in the EZ in particular was less dramatic than elsewhere, and it was mostly due to bank bailouts, concentrated in a few countries, rather than to pure deficit spending.

⁹ To some extent, these theories are also alternative to the traditional neoclassical ones based on the "crowding-in" of private expenditure via interest rate due to the reduction of the borrowing requirement of the government (Bernheim 1989).

Ricardian consumer anticipates the ensuing loss of permanent income and cuts consumption accordingly. An immediate, large and credible cut of public debt (i.e. a front-loaded consolidation) reduces or prevents the fall of present consumption. This consumer channel lies at the core of the influential literature on "expansionary" or "non-Keynesian" consolidations prompted by the empirical studies on some successful episodes by Giavazzi and Pagano (1990, 1996), Alesina and Perotti (1995, 1997). Recent New Keynesian developments of business cycle models have introduced, besides the Ricardian consumer, investors in public debt whose trust in its sustainability determines the interest rate that governs private expenditure (e.g. Corsetti et al. 2010, 2012). This "sovereign risk channel" is more complex and gives more nuanced results, depending in particular on the concomitant monetary policy stance. High public debt exacerbates macroeconomic shocks, while front loaded consolidation *may* have expansionary effects under specific conditions.

In a second phase, marked by double-dip recession, persistence of stagnation, and further deterioration of debt-GDP ratios in the EU with epicentre in the EZ, the pendulum has swung towards the negative effects of austerity. One of the key contributions to the swing has been the paper by Blanchard and Leigh (2013), providing evidence that the wrong forecasts of moderate or negligible effects of austerity were based on the underestimation of fiscal multipliers. For instance, the empirical study by Beetsma et al. (2014) shows a *negative* effect of unanticipated consolidation actions on consumers' confidence. However, the confidence effect is sensitive to contour conditions, among which the taxation *vs.* expenditure composition. A simulative application by Berti et al. (2013) to the EZ consolidation effort confirms the same picture, where the ensuing negative effect on output makes the debt/GDP ratio *increase*, as was indeed observed, though the authors deemed this effect to be short-lived.¹⁰

¹⁰ It should be noted, however, that as Tamborini (2013) shows, if the problem is the contribution of austerity to the reduction of the debt/GDP ratio, the critical condition, given one unit of increase in the primary budget/GDP ratio, is $\phi d_{t-1} < 1$, where ϕ is the absolute value of fiscal multiplier and d_{t-1} is the outstanding debt/GDP ratio. This condition is violated when $1/d_{t-1} < \phi$, which means that even a "not-so-large" multiplier may work perversely if combined with a large initial debt.

This second wave of research added novel, important insights dismantling earlier confidence in the discovery of "the" multiplier as an invariant structural parameter underpinning general statements and prescriptions about fiscal policy. Multipliers are "state-dependent", that is quite sensitive, over time and across countries, to a wide range of contour conditions.

First, multipliers are larger in recessions than in expansions, which implies that fiscal consolidations in recessions have a deeper contractionary impact than in expansions (Auerbach and Gorodnichenko 2012a, 2012b, 2013; Gechert et al. 2015, Batini et al. 2012). Second, multipliers are sensitive to other conditioning factors, namely 1) the structure of the economy (e.g. the extent of "frictions" in the labour, goods, and financial markets: Galì et al. 2007, Fernandez-Villaverde 2010, Eggertsson and Krugman 2012), 2) the concomitant monetary policy stance and exchange rate regime (Eggertsson 2011, Christiano et al. 2011), 3) the presence of interdependence spillovers when consolidation is undertaken simultaneously by more than one country (Berti et al. 2013, in't Veld 2013). Overall, credit constraints, interest rates at the zero lower bound, fixed exchange rates, large interdependencies are all factors, present in the post-crisis EZ, that may explain the amplified negative impact of EZ-wide austerity (see e.g. House et al. 2017 in a DSGE simulative study comparable to our econometric one). Favero et al. (2011) have probed into the role of these factors providing an appropriate econometric methodology to test their effects, and concluding that "the question 'what is the fiscal policy multiplier' is an ill posed one. There is no unconditional fiscal policy multiplier" (Favero et al. 2011, p. 2).

Concomitantly, the role of country-specific conditioning factors has also been invoked to argue that such factors, not austerity *per se*, are responsible for the negative economic performance of *some* EZ countries.¹¹ One is *structural inefficiencies*: seeming austerity victims are countries plagued with structural inefficiencies an oft alleged evidence is that these countries also experienced low growth before the crisis. Another, related, factor is *lack of competitiveness*: even admitting that austerity may, in the short run, reduce domestic demand, seeming austerity victims are countries with

¹¹ Buti and Carnot (2013) and Buti and Pench (2012) provide the articulation of these arguments.

large external imbalances due to endemic competitiveness losses (typically, persistent appreciation of the real effective exchange rate on the basis of unit labour costs). Then there comes *excess indebtedness*: seeming austerity victims are countries with higher public debt, usually associated with higher interest rates and involved in, or on the brink of, debt crises. Finally, a further important factor is the *composition of consolidation* between cutting expenditures or raising taxes: seeming austerity victims are countries with disproportionate resort to taxation. Though some countries in the EZ do present these negative features more than others, they have not been object of accurate scrutiny in order to test how far these conditioning factors go in the explanation of post-crisis economic performances *vis-à-vis* austerity.

3 Gauging austerity

A basic problem in the empirical analysis of austerity is its correct and appropriate measurement. As a matter of fact, a number of different measures are possible and available in the literature depending on the purpose of analysis. To begin with, four different actors are involved with different viewpoints and stakes: the government, the recipients of fiscal decisions, the investors in public debt, external agencies. Each actor may assess, or perceive, whether fiscal policy is austere or not in different ways, and it is not difficult to imagine situations in which assessments are even of opposite sign. Gauging austerity faces three main problems: the "ex-ante *vs.* ex-post problem", the "identification problem", and the "denominator bias".

A simple example may clarify the issues involved in the ex-ante *vs.* ex-post problem. Suppose the government cuts some current expenditure. "Ex ante" this is intended to be an austerity policy. How it affects the economy, however, depends on how the recipients of current expenditure are actually affected. Suppose that some automatic stabilizers are in place such that other components of current expenditure are increasing: overall, total expenditure indicates little or no change and, consequently, ex-post austerity results smaller than ex-ante probably with negligible effect on the economy. Two conflicting criteria are present: 1) governments are responsible for what they can control directly, hence the indicator should be ex-ante as much as possible; 2) the assessment of fiscal policy should necessarily go through its effects on the economy, which largely depends on

the actual evolution of relevant fiscal variables. What the external observer should look at? It depends on the purpose of analysis. If the purpose is tracking the government's policy choices and innovations, the ex-ante criterion is more prominent. If the purpose is assessing the impact of fiscal variables on the economy, as in most of the research on austerity, the ex-post criterion becomes more appropriate.

Consider the early EMU official indicator for the Excessive Deficit Procedure: the total budget/GDP ratio. This complies with the second criterion, but it ill serves the first. The well-known reason is that the total budget includes items that are not under government direct control, at least in the short run, namely interest payments on debt and automatic stabilisers embedded in pre-existing laws. A first alternative is to exclude interest payments and consider the primary budget. The advantage of this measure is also that, in the ex-post perspective, it has a precise role in national accounting, namely the public sector's contribution to the formation of national disposable income. Hence, austerity, i.e. a larger primary surplus or smaller primary deficit, entails a net reduction in the formation of national disposable income.

Then, even though the ex-post criterion may be preferable for our specific research question, the identification problem is encountered. In fact, the components of the primary budget can be classified into two broad categories: those that are somehow related to "the dependent variable", namely GDP or its changes over time, and those that are not. The former can in turn be distinguished between the automatic stabilisers (e.g. unemployment subsidies) and discretionary counter-cyclical measures (e.g. one-off changes in tax rates). Those unrelated to the business cycle are instead the result of discretionary *and* "structural" interventions in the sense that they are taken in view of other policy objectives and are, at least ex-ante, meant to be permanent (e.g. a change in the pension transfers). The components related to the business cycle create a "reverse causality" loop that interferes with the correct identification and estimation of the impact of austerity on GDP, as can easily be seen by means of the following simple two-equation model of the rate of change, in log-difference, in the primary budget b_t and in GDP y_t in any year t over the previous year.

Equation (1) determines the change in GDP under the hypothesis that it is equal to a constant (trend growth), up to a change in the primary balance and exogenous shocks:

$$(1) \quad \Delta y_t = \alpha_0 + \alpha_1 \Delta b_t + u_{yt}$$

where α_1 measures the impact of the primary balance and u_{yt} represents an exogenous shock. Note that $\alpha_1 < 0$ is the key hypothesis concerning the effect of austerity on growth. The equation can then be re-formulated in terms of deviation from trend, or growth gap, $\Delta \hat{y}_t = (\Delta y_t - \alpha_0)$.

Equation (2) determines the change in the primary budget as a result of the three components mentioned above (see e.g. Perotti 2011):

$$(2) \quad \Delta b_t = \alpha_2 \Delta \hat{y}_t + u^c_{bt} + u^s_{bt}$$

where α_2 measures the cyclical elasticity of the budget consisting of the automatic component, u^c_{bt} the discretionary counter-cyclical component, and u^s_{bt} the discretionary structural one. The hypothesis concerning the sign of the cyclical elasticity is $\alpha_2 > 0$. Note that this component is activated only by deviations of GDP from trend. The discretionary counter-cyclical component, being unsystematic, cannot be expressed in form of a structural reaction function; it may be thought of as a binary variable, $u^c_{bt} = 0$ if $\Delta \hat{y}_t = 0$, $u^c_{bt} \neq 0$ otherwise.

The information contained in equation (2) cannot be ignored when estimating equation (1), which would otherwise yield a distorted value of α_1 . The correct procedure would be first to solve simultaneously for the two-equation system, with the following result

$$(3) \quad \Delta \hat{y}_t = (\alpha_1(u^c_{bt} + u^s_{bt}) + u_{yt})k$$

$$(4) \quad \Delta b_t = (\alpha_2 u_{yt} + u^c_{bt} + u^s_{bt})k$$

where $k = (1 - \alpha_1 \alpha_2)^{-1}$

The solution to the identification problem, indicated by equation (3), is therefore the use of the sole discretionary changes in the primary budget $u^b_t = u^c_{bt} + u^s_{bt}$ where austerity is identified by a positive sign. Since however u^c_{bt} may be correlated to GDP, albeit unsystematically, a stricter identification criterion is given by the sole structural component u^s_{bt} . This is in fact the latest fiscal indicator used by the European Commission (EC) under the name of "structural primary balance", after a debate involving

Alesina and Ardagna (2009), IMF (2010), Perotti (2011).¹² Note that, according to the ex-post criterion, the real dosage of austerity injected into the economy is given by equation (4). If the sign hypotheses hold, then $k < 1$, and, as said in the initial example, ex-post austerity will be less than the ex-ante one. Likewise, the impact of ex-ante austerity on growth is measured by the *joint* coefficient $\alpha_1 k$, which in absolute value results *lower* than α_1 . However, as long as $u_{yt} = 0$, the system ex-post yields the correct relationship $\Delta \hat{y}_t / \Delta b_t = \alpha_1$. In sum, the use of ex-ante austerity may over-estimate the actual austerity suffered by the economy, while it may under-estimate its impact on growth, the more so the stronger is the cyclical elasticity of the budget.¹³

The third problem, the denominator bias, arises when the fiscal variables are expressed as ratios to GDP. This is quite common in applied research, and is used in the fiscal regulations of the EMU. The problem is easy to explain. Let us define b'_t the log of the primary-budget/GDP ratio; hence the year change of the ratio is $\Delta b'_t = \Delta b_t - \Delta y_t$. Clearly, given Δb_t , a recession biases the indicator towards austerity and vice versa an expansion. On the other hand, it may be argued that, as a matter of fact, the same Δb_t is "heavier" when GDP is declining than when it is rising.

An additional problem, less considered in the literature, occurs at the modelling level. The budget/GDP ratio is not the same variable as the primitive one, and hence one should not just plug it into the estimation equations carelessly. Let us first examine the budget equation (2). Here the rescaling of the budget in terms of GDP on both sides of the equation is neutral, once we also rescale $u'_{bt} \equiv (u^c_{bt} + u^s_{bt}) - \Delta y_t$

$$(5) \quad \Delta b'_t = \alpha_2(\Delta y_t - \alpha_0) + u'_{bt}$$

By contrast, equation (1) describes how the economy reacts to changes in the primary budget, and this is likely to be the result of how economic agents react to changes in the public expenditures they receive and the taxation they pay, not to their GDP ratios. Hence in this case the rescaling

¹² Identifying the u^c_{bt} component requires direct information on governments' decisions contained in official documents, or the so-called "narrative method" introduced by Romer and Romer (1990) in monetary policy analysis.

¹³ Technically, in order to extract the value of α_1 from the coefficient $k\alpha_1$ in equation (3), one needs an independent measure of α_2 . Consider the following simple numerical example: $\alpha_0 = 2\%$, $\alpha_1 = -0.6$, $\alpha_2 = 0.3$, $k = 0.847$, $u_{yt} = 0$, $u_{bt} = 1\%$. The fiscal shock multiplier is -0.51 , i.e. lower than the structural parameter α_1 . Yet the final result is $\Delta \hat{y}_t = -0.51\%$, $\Delta b_t = 0.84\%$, so that $\Delta \hat{y}_t / \Delta b_t = -0.6$.

of the budget variable in terms of GDP amounts to respecifying the equation as follows:

$$(6) \quad \Delta y_t = \alpha_0 + \alpha_1(\Delta b'_t + \Delta y_t) + u_{yt}$$

The solution of the two-equation system is now the following:

$$(7) \quad \Delta \hat{y}_t = -\alpha'_0 + (\alpha_1 u'_{bt} + u_{yt})k'$$

$$(8) \quad \Delta b'_t = \alpha'_0 + (\alpha_2 u_{yt} + (1-\alpha_1)u'_b)k'$$

where $\alpha'_0 = \alpha_0 \alpha_1 \alpha_2 k'$, $k' = (1 - \alpha_1(1+\alpha_2))^{-1}$. The noteworthy implications (under the sign hypotheses of the coefficients α) are the following:

- the intercept of the GDP equation biases the growth gap upwards (the equation cannot be used to measure the deviation of GDP from trend correctly)
- the coefficient of ex-ante austerity on growth is biased downwards ($\alpha_1 k' < \alpha_1$)
- the ex-post budget is biased downwards by the spurious term α'_0 proportional to the growth trend.¹⁴

Less serious distortions arise if the primary budget is measured as a ratio of trend or potential GDP as in the EC procedure. In this case, $\Delta b'_t = \Delta b_t - \alpha_0$. The result now is:

$$(9) \quad \Delta \hat{y}_t = -\alpha'_0 + (\alpha_1 u'_{bt} + u_{yt})k$$

$$(10) \quad \Delta b'_t = \alpha'_0 + (\alpha_2 u_{yt} + u'_b)k$$

Apart from the two intercepts, that present distortions similar to the previous ones, the key coefficients of ex-ante austerity on growth and on the ex-post budget are the same as in the primitive equations (3) and (4).

In the light of these considerations we have chosen as fiscal indicator the structural primary balance as per cent of potential GDP (STPB) elaborated by Eurostat since 2010, the year when the EC started to use it in the official Excess Deficits Procedures.¹⁵ This official status of the STPB is another important reason for its adoption in this study: EMU members are required to implement the fiscal consolidation policies that are necessary to keep the STPB in balance or slight surplus. Therefore, beyond any other

¹⁴ Consider again the numerical example in fn. 13 with $u'_{bt} = 1\%$. The fiscal shock multiplier now is -0.34 , and the system yields $\Delta \hat{y}_t = -0.13\%$, $\Delta b'_t = 0.7\%$. With ex-ante austerity of the same magnitude, both the growth gap and the ex-post austerity result smaller. The ex-post relationship $\Delta \hat{y}_t / \Delta b_t = -0.19$ severely underestimates the structural coefficient $\alpha_1 = -0.6$ as well as the shock multiplier.

¹⁵ Potential GDP is not a constant like α_0 . However this is in principle of minor importance here, though a residual problem may be due the fact that estimations of potential GDP have some correlation with actual GDP.

consideration, the relevant issue for the EMU is the relationship of *this* indicator with growth.

To begin with, we provide a preliminary overview of the evolution of the STPB from 2010 to 2015. The data clearly show that for the large majority of countries 2010-15 was indeed an austerity period following the wide fiscal deficits generated by the Great Recession of 2008-09: 64% of the observations are positive changes in the STPB, i.e. budget restrictions. This evidence is in line with other studies using other indicators (e.g. Tamborini 2015, Alesina et al. 2015, Mauro and Zilinsky 2015). For convenience we present average values for 5 subgroups of our country dataset: the Euro Zone (EZ) in the composition of the 17 members present for at least five of the six years of data period (i.e. Estonia (2011) is included, whereas Latvia (2014) and Lithuania (2015) are excluded), the 5 EZ countries with larger fiscal imbalances and debt crises, also known as the "Periphery" (EZ5: Greece, Ireland, Italy, Portugal, Spain), the 7 EZ early accession countries with more stable fiscal conditions, also known as the "Core" (EZ7: Austria, Belgium, Finland, France, Germany, Luxembourg, Netherlands), the other EU countries (OEU: Bulgaria, Czech Republic, Denmark, Hungary, Latvia, Lithuania, Poland, Romania, Sweden, United Kingdom), and finally the United States.¹⁶

Looking at the year changes in STPB in Figure 3, the forerunner of austerity was the EZ5 group, with a consolidation of 2.4 points of GDP in 2010. Afterwards, almost all countries and groups performed a sequence of further increments of their STPB with a similar pattern of intensity, peaking in 2012 and then declining. With reference to the debate on the timing of consolidation (e.g. Buti and Carnot 2013, ECB 2014), we can see rather clear evidence of "front-loaded" austerity, especially in the EZ5 group. As a result, Figure 4 shows a general consolidation trend in the levels of STPB, but also the well-known fact that the US stand out for keeping a large and persistent deficit differential with respect to the EU countries. These entered in the surplus territory between 2011 and 2012.

¹⁶ The STPB for all countries is provided by Eurostat, database AMECO, except the US, for which we have used the OECD Outlook dataset "General government underlying primary balance" as % of GDP, cyclically adjusted and net of one-off measures. Unfortunately, Eurostat and OECD use different methodologies.

Typically, fiscal consolidation is a medium-term policy, and as such it ought to be assessed. To this end, it is useful to consider the cumulated changes in the STPB (equivalent to the difference between its level in 2015 and 2009, the peak year of the Great Recession): 20 countries had a cumulated adjustment positive and larger than 1%, for 4 it was around zero (less than $\pm 0.5\%$), and 4 ended with a net negative figure. Top consolidators have been Greece (14.9%), Ireland (10.5%), Romania (8.3%), Cyprus (8.3%), Portugal (8.1%).

It is generally argued that consolidation is a means to restoring fiscal balances after large imbalances. This was the case in our time window, given the fiscal consequences of the Great Recession. Comparing the cumulated adjustments of the STPBs in 2010-15 *vis-à-vis* their cumulated imbalances in 2008-09, it is interesting to note that only 5 countries broke even (less than $\pm 0.6\%$). In 17 countries the consolidation overshot the initial deterioration leaving a net surplus. Greece by far exceeds the others with a net 9.3%, followed by Lithuania and Romania with 5%. The remaining 6 countries ended with a net deficit. In Figure 5 the reader can see these data for our subgroups. On average, all recorded a net over-adjustment of the STPB; yet the peculiar role of the EZ5 countries emerges once again. With respect to the others, these had a worse deterioration of the STPB in 2008-09 as well as a much larger over-adjustment in 2010-15. On the opposite front one can see the EZ7 group.

Given its importance in the debate, we also provide the taxation *vs.* expenditure composition of STPB changes.¹⁷ At the country level, we have 40% of episodes of consolidation with tax increase and 39% with expenditure cut (of course they are not mutually exclusive). Interestingly, we also have 23% of episodes with tax increase greater than the STPB increase, denoting an underlying increase in expenditure. In the medium-term perspective 2010-15, net increases in taxation contributed to consolidation in 18 countries, while net cuts in expenditures contributed in 15 countries. Figure 6 shows the net consolidation *vis à vis* its components for our subgroups. Overall, all groups, except EZ7, combined tax increases with expenditure cuts. Contrary to widespread belief, the more virtuous group – according to the composition argument – was EZ5, with expenditure cuts exceeding tax increases; the least virtuous was EZ7, with expenditure allowed to grow and forcing taxation to grow more.

¹⁷ These data are not available for the US.

We wish to complete our preliminary analysis of the STPB with a comparison with two other fiscal indicators largely used in the relevant literature: the cyclically adjusted primary balance (CAPB) and the actual primary balance (PB). The former is an alternative ex-ante indicator, the other is an ex-post indicator as discussed above. For consistent comparison, both are calculated in terms of potential GDP. Country yearly data (not reported here) show a certain amount of variability across the three indicators. Generally, STPB follows a smoother path than CAPB and PB, which is the most variable. A pattern broadly emerges whereby the differences between STPB and CAPB are rather small (as confirmed by other studies using the narrative approach to calculate the STPB, e.g. Alesina et al. 2015) with the exception of the US,¹⁸ whereas those between STPB and PB are more sizeable though unsystematic. As can be seen in Figure 7, in all subgroups but EZ5 there is a tendency of PB to exceed STPB. In other words, in the medium run and on average ex-post austerity has been stronger than the ex-ante one. This is at first sight in contrast with what equation (10) predicts, given $k < 1$. However, the model itself suggests that the observed result may be due a combination of poor automatic stabilisation, and/or other one-off discretionary *budget cuts* that have not been reckoned as structural. If this is true, it means that discretionary fiscal decisions have not been dictated by counter-cyclical reasons but mainly by pressures for consolidation.¹⁹

4 Empirical methodology and data

In order to address econometrically the issue of the relationship between austerity and growth in Europe in the light of the issues discussed in the previous sections, we have adopted a panel time series approach that will be illustrated below. Our panel dataset contains yearly data over the period

¹⁸ This however may be due to the different data sources: see fn. 16.

¹⁹ An instance may be Lithuania, which alone accounts for 20.5 points of excess of PB over STPB in the OEU group owing to extraordinary consolidation measures in 2010, 2012 and 2013. By contrast, Greece stands out in the EZ5 with its PB 7.3 points below STPB mostly due to bank rescue operations only partially reabsorbed. Ireland, too, had very large swings in its PB with respect to STPB caused by bank bailouts, which however were almost rebalanced over the the whole time period leaving a sizeable 2 points of PB in excess of STPB. Without Greece, the EZ5 group, too, had its PB slightly above STPB.

2011–2015 on 26 members of the EU²⁰, and the US. The US is included as the main representative country of the rest of the Transatlantic area, and may also account for the extra-EU component of the business cycle. We have thus 27 countries and 162 observations. As already explained, this methodological choice has been dictated by the aim to take spillovers and interdependencies into account exploiting the cross-country dimension. Our limited and well-defined time and space window on Europe may reduce the presence of significant "regime shifts" in general economic conditions or of excess heterogeneity in contour factors that plague the robustness of empirical findings in this field. On the other hand, the not-so-large number of observations exerts its own limitations on the scope and quality of estimations, and to cope with this we have run a number of tests that will be presented in due time.

We have estimated two specifications of the relationship of interest, a static, or *short-run* one, and a dynamic, or *longer-run*, one. The former aims to capture the year-to-year relationship between austerity and GDP growth as follows:

$$(11) \quad \Delta GDP_{it} = \beta_1 \Delta STPB_{it} + \gamma x_{it} + u_{it}, \quad i = 1, \dots, N; \quad t = 1, \dots, T$$

where the dependent variable is the year rate of change of real GDP, $STPB_{it}$ is the structural primary balance as defined in section 3, x_{it} is a vector of k control variables, u_{it} is the error term,²¹ i is the cross-sectional unit, and t is the time index. Austerity is measured by a positive change (more surplus/less deficit) in the structural primary balance $\Delta STPB_{it} > 0$.

The dynamic specification aims to capture the effect of austerity on the GDP path over time in consideration of the fact that austerity has consistently been implemented for a number of years. To this end, we have estimated a dynamic formulation of equation (11), with an autoregressive distributed lag structure (ARDL), adding first lag of dependent and independent variables:

$$(12) \quad \Delta GDP_{it} = \beta_1 \Delta STPB_{it} + \beta_2 \Delta STPB_{it-1} + \gamma_1 x_{it} + \gamma_2 x_{it-1} + \delta \Delta GDP_{it-1} + u_{it},$$

²⁰ Estonia has been excluded because of data availability on long term interest rate.

²¹Different assumptions can be made about the structure of u_{it} , which can be characterized by the different degree of heterogeneity introduced. In the empirical methodology section we will discuss several potential such structure motivated by economic considerations.

where γ_1 and γ_2 represent vector of parameters on the corresponding contemporaneous and lagged controls considered in the static specifications.

Our controls consist of a set of potential conditioning variables of the (negative) effect of austerity on growth meant to isolate and identify the “it’s not austerity” hypothesis, according to the literature previously discussed.²²

- “*It’s competitiveness*”, for which we have used the change in the real effective exchange rate $\Delta REER_{it}$, as an indicator of gains/losses of external competitiveness of the economy ($\Delta REER > 0$ denotes real appreciation, i.e. loss of external competitiveness)
- “*It’s sovereign debt*”, for which we have used alternatively: (a) the change in the debt/GDP ratio $\Delta DEBT_{it}$; (b) the change in the real value of outstanding $\Delta DEBT_L_{it}$; (c) the change in the long-term real interest rate on government bonds ΔRIR_{it} . (a) is the most widely used indicator of sustainability or riskiness of public debt, but being divided by GDP, it may suffer from the denominator bias discussed in section 3. Alternatively, we have employed (b) as a direct measure of the entity of debt. (c) is yet another alternative proxy for the role of the sovereign debt, since the interest rate on bonds is supposed to be driven by sovereign risk and to affect directly the economy; it also controls indirectly for the ECB common monetary stance filtered through the market assessment of sovereign risk.
- “*It’s the economy*”, i.e. long-term structural factors determining low growth, for which we introduce the 2000-07 average growth rate of each country AVG_GROWTH_i .
- “*It’s taxes*”, i.e. the disproportionate use of taxation in austerity measures, for which, separately, we will show respecifications of the models where the structural primary balance has been split into the two components of variation in expenditure ΔG_{it} and tax revenue ΔT_{it} .

To estimate the static relationship in equation 11, we have started with one of the most common panel model, where it is assumed that the error has the following specification:

$$(13) \quad u_{it} = \alpha_i + \lambda_t + \varepsilon_{it}$$

It is commonly defined in the literature as the two-way fixed effect model (2FE). The fixed effect α_i is aimed at capturing unobserved time invariant

²² See in particular Mauro and Zilinsly (2015) who employ a similar set of controls.

component which might be specific to each country, while λ_t can be thought of as a flexible (nonlinear) time trend, a common factor/shock affecting all units by the same amount (Fuertes and Smith 2016). Note that with a first difference specification the fixed effects cancel out.

This modelling strategy is part of a more general setting, broadly defined as the first generation of panel, where little attention was paid (apart from time and country effects) to the issue of correlation between variables in different units/country due to inter-economy linkages (such as the economic and financial integration process, for example). Forms of cross-correlation between variables, defined by the literature as cross sectional dependence (CSD), can be due to spatial spillovers, as for example shown by Bailey et al. (2016) for house prices in different regions. Another important source of CDS is represented by unobserved time-varying heterogeneity due to unobserved shocks which might potentially hit all countries differently. Our results section will begin with testing whether our variables of interest are characterized by CSD, by means of the Pesaran (2004) test.

More formally, in this case the error can be assumed to have the following multifactor representation:

$$(14) \quad u_{it} = \alpha_i + \lambda_t + \delta_i f_t + \varepsilon_{it}$$

$$(15) \quad x_{it} = \pi_i + \theta_i g_t + \rho_1 f_{1t} + \dots + \rho_n f_{nt} + v_{it}, \quad f_{nt} \subset f_t.$$

In equation (14), α_i and λ_t have the same interpretation as in equation (13), while f_t represents a set of common persistent (weak and strong) factors with factor loadings that can differ across countries, given the different factor loadings ρ . Equation (15) accounts for the possibility of endogeneity for the determinants of growth, which apart from idiosyncratic factors g_t might be driven by a subset of the factors f_t also affecting the dependent variable ΔGDP_{it} .

Various solutions have been proposed in order to solve endogeneity due to time varying unobserved common factors affecting all countries differently. Bai (2009), proposes a principal component strategy to approximate such common factors. Pesaran (2006) with his common correlated effects (CCE) estimators shows that adding cross sectional averages of the dependent and independent variables to the regression equation allows to approximate a limited number of strong factors affecting all countries and an infinite number of weak factors affecting a subset of countries. Such empirical implementation is very flexible in dealing with business cycle dynamics, whether they come from idiosyncrasies of a small number of economies, or

global shock. Idiosyncrasies in business cycle affecting a subset of the countries (e.g. spatial spillovers) can be dealt with an infinite number of weak factors (Chudik et al. 2011), while global shocks affecting all countries can be accounted for with the presence of strong factors. Several works such as Kapetanios et al. (2011) and Pesaran and Tosetti (2011), among others, have shown by means of econometric theory and simulations that the CCE estimator is able to accommodate endogeneity due to potential time varying unobserved heterogeneity due to global shocks and/or omitted variables with different impact on the different countries in the sample. Moreover, results are robust to non-stationarity in the variables and non-stationarity of the common factors (regardless of the presence of cointegration).

The CCE estimator can be implemented assuming homogeneity of the slope coefficients specifying a pooled CCE (PCCE), or allowing for heterogeneous slope parameters for each country and therefore introducing further heterogeneity. Given the limited number of observations, we choose the CCE estimator for the only pooled version, where parameter homogeneity for slope parameters across countries is assumed. The CCE estimator has also been developed for modelling dynamic relationship, however, each additional regressor, including lags, requires the estimation of n (countries) additional parameters. For the same reason, in order to analyse potential dynamic properties of our relationship of interest which allow us to infer on long-run multipliers, the only 2FE model is estimated using the Arellano-Bond (1991) general method of moments estimator, adopting an autoregressive distributed lag (ARDL) specification of order 1.

5 Results

To begin with, as conjectured on the basis of economic considerations, according to Pesaran's (2004) CD test shown in Table 1, which strongly rejects the null hypothesis of no cross-sectional dependence, results point at a clear-cut evidence of cross-sectional dependence for all variables.

Then we first present results on the short-run relationship between GDP growth and austerity, with the 2FE model, and, to corroborate our results, with the more flexible PCCE estimator. We will then show results for the dynamic specification, which allows us to give a first tentative answer to

the longer-run effects of austerity. Finally, in order to take into account for the possibility that austerity might be anticipated by economic agents, defined by the literature as fiscal foresight, we show that our results remain robust to proxies representing agents expectations of fiscal stance and potential immediate reaction to anticipated fiscal plans (for a more detailed illustration of fiscal foresights, see Leeper et al. 2013).

5.1 Short-run analysis

The first set of results concern the short-run effects of austerity on growth. Table 2 reports estimates based on the 2FE method. Columns (1) to (3) distinguish the three different variables used to proxy the role of the sovereign debt crisis. The table also reports the standardised estimated coefficients, which makes it possible to compare the relative magnitude of the impact of the explanatory variables. Since we are unable to reject the null of no autocorrelation on the second lag (first order autocorrelation is expected for differenced data) with the Arellano-Bond test, we utilise cluster robust standard errors, which control for heteroskedasticity and within cluster (countries in our case) autocorrelation.²³ Although not explicitly developed to account for all possible forms of cross-sectional dependencies, the CD test shows reassuring results, where the null of cross-sectional independence is accepted for all specification.²⁴

The evidence can be summarised as follows.

- Austerity has exerted a highly significant negative effect on yearly growth *vis-à-vis* all the conditioning factors. Absolute coefficients indicate that 1% of increase in the STPB has reduced GDP growth in a

²³ Cluster robust standard errors do not require a model for the autocorrelated errors, but that the number of clusters goes to infinity. Utilizing cluster robust standard errors, Bertrand, Duflo, and Mullainathan (2004) show via simulation that with a critical value equal to 1.96 and 20 clusters the rejection rate was equal to 0.058. Cameron, Gelbach and Miller (2008) show with a different model that the rejection rate was equal to 0.081. Given the highly statistical significance of our parameter estimates (and the fact that we have 27 or 26 cluster, depending on the specification), we are quite confident in inferential. For further details, see Cameron and Miller (2015).

²⁴ In a recent work, Pesaran (2015) shows that the CD test is best viewed as a test of weak cross sectional dependence. He also adds that for estimation and inference, it is the strong cross sectional dependence of the errors to create problems.

range between 0.7% to 0.9%. Standardised coefficient are however significantly lower.

- Among the conditioning factors, sovereign debt pressure is also significant, though not in all specifications. This seems best captured by the increase in the debt/GDP ratio or more marginally by the increase in the RIR. Notably, 1% larger debt/GDP ratio accounts for 0.18% of GDP loss, but in standardised terms, this effect is relatively larger than that of austerity.
- Previous growth is always significant, indicating the presence of long-run structural factors, but with a marginal effect of about one half of austerity.²⁵
- Losses in external competitiveness seem instead irrelevant.²⁶

In Table 3, along with time and fixed effects, we introduce further heterogeneity, following Pesaran's PCCE (2006). As explained in section 4, in this framework we assume that the dependent and independent variables are driven by a finite number of unobserved common processes (weak and strong factors), which can have a different impact across countries (time dummies are also aimed at capturing unobserved time varying processes but they only capture the common effect through time across countries). In the PCCE specifications, we adopt Huber/White standard errors which only control for potential heteroskedasticity, given that there is no evidence of second order autocorrelation.²⁷

²⁵ This finding does not exclude well-known exceptions, such as Greece, Ireland, Spain, which grew faster before the crisis, or Germany, which was in slow motion before the crisis.

²⁶ The overall picture is similar to Mauro and Zilinsky (2015), except that we find austerity to be strongly significant across all specifications and controls whereas they find mixed evidence. In particular they point out that dropping Greece affects significance. We do not agree, however, that Greece, or any other extreme case should be excluded on the grounds of robustness checks. Quite the contrary. The overall effect of austerity on growth cannot be assessed independently of the way in which this policy has been implemented in each and all countries. One important reason being that the EZ is highly integrated with sizeable macroeconomic spillovers across countries (in't Veld 2013, Berti et al. 2015). The effects on Greece do matter in connection with all the others; the results of the PCCE method that we present below take into account the presence of these connections.

²⁷ Keeping fixed the number of cross sectional means but changing variables and corresponding cross sectional means to obtain approximation of the factors does not affect the results, which are available on request.

Introducing these factors actually modifies the results in terms of significance of the explanatory variables. Given that the PCCE has been developed to control also for spatial spillovers effects, these in fact cannot be ignored, and these estimates should be regarded as more reliable.²⁸ Now austerity and the sovereign debt/GDP ratio stand out as the sole significant variables, with the austerity effect slightly upgraded and the debt effect downgraded in standardised terms. The past growth rate, the REER and the RIR are never significant.

As a first preliminary conclusion, we may say that stronger austerity doses combined with increasing sovereign debt relative to GDP emerge as the most significant determinants of negative effects on yearly growth rates. This is a notable finding for two reasons. One is that rising debt may indeed be a conditioning factor of the worse growth performance that we have observed in countries engaged in stronger austerity measures. The other relates to the policy puzzle raised by the critics of austerity (see section 2): austerity is generally deemed necessary when debt is growing relative to GDP, but this may turn out to be a self-defeating policy if it harms growth, so that the debt/GDP ratio raises. Therefore, the denominator bias inbuilt into the debt/GDP ratio suggests some caution concerning the significance of this variable. Caution which is enhanced by the finding that the real value of debt and its real interest rate are both non-significant.

We now present the results of the estimated models where the austerity variable has been replaced by its decomposition in the change (decrease) in total expenditure ΔG_{it} and (increase) in total revenue ΔT_{it} . As said above, this reformulation is a way to test the argument that the negative effect of austerity on growth arises as a consequence of rising taxation instead of cutting expenditure. As to the econometric technique, Table 4 is analogous to Table 2, and Table 5 to Table 3.

The evidence is in line with the previous findings under both estimation techniques. In particular:

²⁸ In part this might be due to the higher number of parameters required to estimate with the PCCE estimator.

- both arms of austerity have concurred to the overall negative effect on growth with the expected "Keynesian" signs *vis-à-vis* all controls, with no evidence of "non-Keynesian" effects of e.g. expenditure cuts
- the relative order of magnitude is instead sensitive to the estimation method; with 2FE (Table 4) the taxation effect is in the order of magnitude of one-to-one and about twice larger than the expenditure, whereas with the PCCE method (Table 5) the two effects are almost equal in the order of magnitude of 0.2
- among the conditioning factors, sovereign debt and long-term growth remain the more significant candidates, but the former loses significance with the PCCE method

5.2 Introducing dynamics: A look at longer-run effects

In this section we gauge the effects of growth determinants over a longer-time horizon by means of equation (12). In general, it can be shown that in the unrestricted ARDL (1,1) model, long-run "multipliers" can be computed as nonlinear combinations of the estimated coefficients (i.e. steady-state solutions), where the delta method is used to compute the corresponding standard errors. Considering, for example austerity, the long-run multiplier would be equal to

$$\frac{\beta_1 + \beta_2}{1 - \delta}$$

(for further details see Fuertes and Smith 2016).

We have adopted the Arellano-Bond (AB) difference panel estimator (1991), which is based on the Generalized Method of Moments (Hansen 1982). The choice of the AB estimator is due to the dynamic bias problem that arises in a fixed effect context, where correlation between the lagged dependent variable and the error over time arises (i.e. endogeneity, see Nickel 1981). We have used the more efficient two-step procedure correcting for possible downward small sample bias using the Windmeijer (2005) correction of standard errors.²⁹ Given the overidentifying restrictions

²⁹ Via simulation, Windmeijer (2005) finds that in difference-GMM regressions two-step efficient GMM produces lower bias and standard errors. Reporting his correction for standard errors in the two-step procedure appear moderately superior to one step robust estimation

imposed in our specifications, where we have more instruments than regressors, we have checked the validity of exogeneity assumptions by means of the Hansen and Sargan test. More specifically, lagged level values of the variables are used as instrument for the specification in differences (equation 1). As in the static case, we assume that all the unobserved heterogeneity is captured by the country time invariant fixed effect and by the common cross-country time variant shocks and declare the only lagged dependent variable as endogenous. Note that due to differenced data estimation and the use of a lagged value, the effective sample is now 2012-2015. Interestingly, it is possible to show that OLS estimate (with time dummy) of equation (12) implies a positive correlation between the endogenous lagged dependent variable and the error, inflating its coefficient estimate, while FE estimation (or 2FE as in our case) implies a negative correlation between the lagged dependent variable and the error, since it does not solve the Nickel problem producing a deflated value on the lagged dependent variable. A credible estimate of the true value on the lagged dependent variable should lie between the bounds defined by OLS and 2FE (See Roodman, 2006 for further details). Table 6 shows OLS and 2FE estimate of the lagged dependent variable. We will use these bounds as an additional diagnostic check of the GMM specifications that will follow.

Table 7 presents the estimation results, where the reported coefficients of the explanatory variables are the long-run ones as explained above. Our remarks are the following.

- All estimates retain the sign of previous estimates. The lagged dependent variable estimates obtained with the two-step GMM is in the credible range shown in table 6 except for the specification with ΔRIR_{it} ³⁰
- Lagged GDP is always statistically significant denoting, as expected in the aftermath of the Great Recession, a relatively high persistence, in the range between 0.5 and 0.7; note that this order of magnitude amplifies the long-run coefficients of the explanatory variables.
- Austerity enacted over time still presents negative long-run multipliers,

³⁰ Moreover, a very close estimate of the lagged dependent variable of the GMM to the OLS estimate might reveal the possibility of a weak instrument. This problem appears not to arise in our specification.

slightly lower than the short-run ones; yet in this specification austerity loses significance. Two reasons may be put forward: one is that austerity has been front-loaded and then injected at a decreasing pace; the other lies in the different evolution of austerity in different countries (see section 3, and Figure 4 and Figure 5).

- The debt-to-GDP ratio remains the only significant variable related to the sovereign debt crisis as in the static model.
- The REER is now statistically significant, and with relatively large coefficients, suggesting that it is the *persistence* of deterioration of external competitiveness that may have played a role. However, it should be recalled that in the period under consideration the "Peripheral" countries obtained a sustained recovery of external competitiveness *vis-à-vis* the "Core" (i.e. real depreciation, $\Delta REER < 0$) giving, therefore, a *positive* impulse to growth that may have offset the negative impulse due to austerity.

As in the static case, we also present the results of the estimated model where the austerity variable $\Delta STPBit$ has been replaced by its decomposition in the change (decrease) in total expenditure ΔGit and (increase) in total revenue ΔT_{it} . As can be seen in Table 8,

- all coefficients retain the previous sign
- expenditure presents significant and sizeable (in the range of 1 or more) long-run coefficients, whereas taxation coefficients have almost the same size but lack significance
- since, as shown in section 3, austerity has been obtained by way of expenditure cuts no less than by way of tax increases (see Figure 6), this evidence suggests that the former have been the main driver of the negative effect of austerity over time
- the REER and debt-to-GDP ratio confirm their significance in the long-run.

5.3 Controlling for expectations

The most recent literature argues that in measuring the effect of fiscal policy on other macroeconomic aggregates, most researchers do not take into account the effects on the same aggregates due to potential news anticipating future fiscal actions as previously discussed. In order to control for potential news anticipating fiscal action, we have re-estimated our previous models

adding, as a further control, the difference between the Commission's forecast of the Cyclically-Adjusted Primary Balance $CAPB_{it-1|t}$ of each country released at time $t-1$ for t (average of the spring and autumn forecasts).³¹ The rationale behind this strategy is that the contemporaneous $\Delta STPB$ should be exogenous to potential news appearing the previous year for the current year and potentially conditioning economic agents in their decisions³². Hence, this forecast variable is computed as

$$FOREC_{it} = CAPB_{it-1|t} - STPB_{it-1}$$

For space reasons (the other results are available on request) we consider only the specification with the debt-to-GDP ratio, which appears to offer the most reliable estimates. Estimates are presented with the two-way FE, PCCE, and AB GMM difference panel estimator, for both the single austerity indicator $\Delta STPB$ (Table 9), and its decomposition into expenditure ΔG and taxation ΔT (Table 10).

With regard to the forecast variable, it is worth noting that it always displays the same correct theoretical sign as the actual $\Delta STPB_{it}$. This suggests a good anticipatory power of the forecasts. Nonetheless, forecasts are always statistically insignificant, whereas all austerity indicators retain expected sign and significance with all estimators. This evidence allows us to conclude that the growth-austerity relationship based on the observed austerity indicators emerged from our investigation is robust to the anticipatory effect of (official) forecasts. Interestingly, long run coefficients obtained with the dynamic specification in column three, shows that the only spending has statistical significance.

6 Conclusions

Whereas the debate over the relationship between austerity and growth in Europe has grown lively and intense, systematic and rigours empirical analysis has remained underdeveloped. An exception can be seen in the vast literature on fiscal multipliers, but this field of investigation has often been

³¹ We use the CAPB as a proxy because the first forecast of the Structural Budget Balance released by the Commission has been released in 2013 for 2014

³² For a similar strategy in a multivariate context see Auerbach and Gorodnichenko (2012a).

pursued for its own sake, and, in general, it may be, at most, complementary to direct research on the austerity-growth problem.

With our econometric study of a panel of European countries and the US from 2010 to 2015, we have sought to fill this gap, while taking stock of the main issues emerged in the theoretical and policy debate. In particular, we have focused on the argument that austerity cannot be regarded as the explanatory variable of the post-crisis poor growth in Europe, whereas a number of other conditioning factors, specific to different countries, have played a key role. We have dubbed this argument as the "it's not austerity" hypothesis, and we have organised our study as a "test" of this hypothesis against the alternative "it's austerity" hypothesis. To this end, we have articulated the "it's not austerity" hypothesis in four control variables of the growth-austerity relationship: the REER for external competitiveness, the public debt-to-GDP ratio (or the absolute real value of debt, or the RIR) for the sovereign debt crisis, the average growth rate of the previous ten years for the general efficiency of the economy, the expenditure and taxation components of austerity for its composition effect. As further control variable we have also considered one-year official forecasts of austerity. Austerity has been identified as a year-to-year increase in the structural primary balance relative to potential GDP (the budget indicator in use by the European Commission).

Upon estimating a static relationship using year-to-year changes in the variables with two methods (two-way fixed effects and Pesaran's PCCE), and a dynamic one, aimed at capturing longer-run effects, with the Arellano-Bond difference panel estimator, our main conclusion is that the "it's not austerity" hypothesis does not pass our test. The austerity coefficient is significant in all estimated relationships (except one) with the "Keynesian" theoretical sign, i.e. a negative effect on GDP growth in a range between 0.7 and 0.9 in the static specification and slightly lower in the dynamic one. As to the austerity components, the negative effects of expenditure cuts seem more significant than tax increases. On the other hand, the evidence also indicates that austerity cannot be regarded as the single negative factor impinging on growth in the panel under examination. The general efficiency of the economy has also played a role, but what emerges as the more significant co-determinant is the increase in the debt/GDP ratio, with an effect on growth comparable to austerity (or larger

in some specifications). However, this fact should be reconsidered carefully, because there is also evidence that debt over GDP has grown in all countries *despite* austerity, so that the "excess austerity" hypothesis may be corroborated, according to which it is growth-depressing austerity which causes the debt/GDP ratio to grow, hypothesis enhanced by the finding that the real value of debt and its real interest rate are both non-significant.

References

- [1] Alesina A., Ardagna S. (2009), "Large Changes in Fiscal Policy: Taxes Versus Spending", NBER Working Paper n. 15438; in J. R. Brown (ed.), *Tax Policy and the Economy*, vol. 24, Cambridge Mass., NBER.
- [2] Alesina A., Barbiero O., Favero C. A., Giavazzi F., Paradisi M. (2015), "Austerity in 2009-13", NBER Working Paper, n. 20827.
- [3] Alesina A., Perotti R. (1995), "Fiscal Expansions and Adjustments in OECD Economies", *Economic Policy*, vol. 21, pp. 207-247.
- [4] Alesina A., Perotti R. (1997), "Fiscal Adjustment in OECD Countries: Composition and Macroeconomic Effects", IMF Staff Papers, n. 42.
- [5] Arellano, M., Bond, S. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies*, 58, pp. 277-97.
- [6] Auerbach A.J., Gorodnichenko Y. (2012a), Measuring the Output Responses to Fiscal Policy, *American Economic Journal, Economic Policy*, 4(2), 1-27.
- [7] Auerbach A.J., Gorodnichenko Y. (2012b), Fiscal Multipliers in Recession and Expansion, in National Bureau of Economic Research, *Fiscal Policy after the Financial Crisis*, 63-98.
- [8] Auerbach A.J., Gorodnichenko, Y. (2013), Output Spillovers from Fiscal Policy, *American Economic Review*, 103(3), 141-46.
- [9] Bai, J., Kao, C., Ng, S., (2009), "Panel cointegration with global stochastic trends", *Journal of Econometrics* 149, pp. 82-99
- [10] Bailey, N., Holly S., Pesaran M. H. (2016), "A Two Stage Approach to Spatio-Temporal Analysis with Strong and Weak Cross-Sectional Dependence", *Journal of Applied Econometrics*, 31(1) 249-280.
- [11] Barro R. J. (1974), "Are Government Bonds Net Wealth?", *Journal of Political Economy*, vol.82, pp. 723-748.
- [12] Batini N., Callegari G., Melina G. (2012), "Successful Austerity in the United States, Europe and Japan", IMF Working Paper, n. 190.
- [13] Beetsma R., Cimadomo J., Furtuna O., Giuliodori M. (2014), "The Confidence Effects of Fiscal Consolidations", CEPR Discussion Paper Series, n. 10205.
- [14] Bernheim D. G. (1989), "A Neoclassical Perspective on Budget Deficits", *Journal of Economic Perspectives*, vol. 3, pp. 55-72.

- [15] Berti K., de Castro F., de Salto M. (2013), "Effects of Fiscal Consolidation Envisaged in the 2013 Stability and Convergence Programmes on Public Debt Dynamics in EU Member States", *European Economy, Economic Papers*, n. 504.
- [16] Bertrand, M., Duflo, E. Mullainathan, S. (2004), "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119(1), pp. 249-275.
- [17] Blanchard O. J., Dell'Araccia G., Mauro P. (2010), "Rethinking Macroeconomic Policy", IMF Staff Position Note, n. 3.
- [18] Blanchard O. J., Leigh D. (2013), "Growth Forecast Errors and Fiscal Multipliers", *American Economic Review, Papers and Proceedings*, vol. 103, pp.117-120.
- [19] Blyth M. (2013), *Austerity. History of a Dangerous Idea*, Oxford: Oxford University Press.
- [20] Buti M., Carnot N. (2013), "The Debate on Fiscal Policy in Europe: Beyond the Austerity Myth", *ECFIN Economic Brief*, n. 20.
- [21] Buti M., Pench L. (2012), "Fiscal Austerity and Policy Credibility", *Vox EU*, April 20.
- [22] Cameron, A. C., Gelbach, J. G., Miller, D. L. (2008), "Bootstrap-Based Improvements for Inference with Clustered Errors." *Review of Economics and Statistics*, 90(3), pp. 414-427.
- [23] Cameron, A. C, Miller, D.L., (2015) "A practitioner's guide to cluster-robust inference", *The Journal of Human Resources*, 50 (2), pp. 317–373.
- [24] Christiano L. J., Eichenbaum M., Rebelo S. (2011), "When is the Government Spending Multiplier Large?", *Journal of Political Economy*, vol. 119, pp. 78-121.
- [25] Chudik, A., Pesaran, M. H., Tosetti, E. (2011), "Weak and strong cross section dependence and estimation of large panels", *The Econometrics Journal*, 14 (1), C45–C90.
- [26] Coenen G., Erceg C., Freedman C., Furceri D., Kumhof M., Lalonde R., Laxton D., Lindé J., Mourougane A., Muir D., Mursula S., de Resende C., Roberts J., Roeger W., Snudden S., Trabandt M., in't Veld J. (2010), "Effects of Fiscal Stimulus in Structural Models", IMF Working Paper, n. 73.
- [27] Coenen G., Straub R., Trabandt M. (2012), "Gauging the Effects of Fiscal Stimulus Packages in the Euro Area", ECB Working Paper Series, n. 1483.
- [28] Corsetti G. (ed., 2012), *Austerity: Too Much of a Good Thing?*, London, CEPR.
- [29] Corsetti G., Kuester K., Meier A., Mueller G. (2010), "Debt Consolidation and Fiscal Stabilization in Deep Recessions", *American Economic Review*, 100, pp.41-45.
- [30] Corsetti G., Meier A., Mueller G. (2012), "What Determines Government Spending Multipliers?", *Economic Policy*, vol. 27, pp. 521-565.
- [31] De Grauwe P. (2015), "Secular Stagnation in the Eurozone", *Vox EU*, January 30.

- [32] De Grauwe P., Ji Y. (2013), "More evidence that financial markets imposed excessive austerity in the eurozone", CEPS Commentary, February 5.
- [33] DeLong, B, Summers, L. (2012). Fiscal Policy in a Depressed Economy. Mimeo.
- [34] ECB (2014), "Fiscal Multipliers and Timing of Consolidation", *Monthly Bulletin*, April.
- [35] Eggertsson G. B. (2011), "What Fiscal Policy is Effective at Zero Interest Rates?", *NBER Macroeconomics Annual 2011*, Cambridge Mass.: MIT Press.
- [36] Eggertsson G. B., Krugman P. R. (2012), "Debt, Deleveraging and the Liquidity Trap: A Fisher-Minsky-Koo Approach", *Quarterly Journal of Economics*, vol. 127, pp.1469-1513.
- [37] Favero C. A., Giavazzi F., Peregó J. (2011), "Country Heterogeneity and the International Evidence on the Effects of Fiscal Policy", CEPR Discussion Paper Series, n. 8517.
- [38] Fernandez-Villaverde (2010), "Fiscal Policy in a Model With Financial Frictions", *American Economic Review, Papers and Proceedings*, vol. 100, pp. 35-40.
- [39] Galí J., Lopez-Salido, Valles (2007), "Understanding the Effects of Government Spending on Consumption", *Journal of European Economic Association*, vol. 5, pp. 227-270.
- [40] Gechert S., Hughes Hallet A., Rannenberg A. (2015), "Fiscal Multipliers in Downturns and the Effects of Eurozone Consolidation", *CEPR Policy Insight*, n. 79.
- [41] Giavazzi F., Pagano M. (1990), "Can Severe Fiscal Contractions Be Expansionary?", in Blanchard O, Fisher S. (eds.), *NBER Macroeconomics Annual 1990*, Cambridge Mass.: MIT Press. pp. 75-111.
- [42] Giavazzi F., Pagano M. (1996), "Non Keynesian Effects of Fiscal Policy Changes: International Evidence and Swedish Experience", *Swedish Economic Policy Review*, 3, pp. 67-103.
- [43] Hansen, L. (1982), "Large sample properties of generalized method of moments estimators", *Econometrica*, 50(3), pp. 1029-54.
- [44] Hebous S. (2011), "The Effects of Discretionary Fiscal Policy on Macroeconomic Aggregates: A Reappraisal", *Journal of Economic Surveys*, vol.25, pp. 674-707.
- [45] House C. L., Proebsting C., Tesar L. L. (2017), "Austerity in the Aftermath of the Great Recession", NBER Working Paper n. 23147.
- [46] IMF (2010), "Will It Hurt? Macroeconomic effects of Fiscal Consolidations", Chapter 3 of *The World Economic Outlook*, Washington, October.
- [47] in't Veld, J. (2013), "Fiscal Consolidations and Spillovers in the Euro Area Periphery and Core", *European Economy, Economic Papers*, n. 1506.
- [48] Kapetanios, G., Pesaran, M. H., Yagamata T. (2011), "Panels with nonstationary multifactor error structures", *Journal of Econometrics*, 160, pp. 326-348.
- [49] Kynaston D. (2007), *Austerity Britain 1945-1951*, London, Bloomsbury.

- [50] Leeper, E. M., Walker, T. B., Yang, S. C. S. (2013), “Fiscal Foresight and Information Flows”, *Econometrica*, 81(3), pp. 1115–1145.
- [51] Mauro P., Zilinsky J. (2015), ”Fiscal Tightening and Economic Growth”, Petersen Institute for International Economics, *Policy Brief*, n. 15.
- [52] OECD (2012), *Restoring Public Finances. 2012 Update*, Public Governance Committee.
- [53] Perotti R. (2011) ”The Austerity Myth. Gain Without Pain?”, NBER Working Paper n. 17571.
- [54] Pesaran, M. H. (2004), “General Diagnostic Tests for Cross Section Dependence in Panels”, University of Cambridge, mimeo.
- [55] Pesaran, M. H. (2006), “Estimation and inference in large heterogeneous panels with a multifactor error structure”, *Econometrica* 74 (4), pp. 967–1012.
- [56] Pesaran M. H. (2015), “Testing weak cross-sectional dependence in large panels”, *Econometric Reviews*, 34, 1089–1117.
- [57] Pesaran, M.H., Tosetti, E. (2011), “Large Panels with Common Factors and Spatial Correlations”, *Journal of Econometrics*, 161(2), pp. 182-202.
- [58] Reinhart, C.M., Rogoff, K.S. (2010). ”Growth in Time of Debt”. *American Economic Review: Papers and Proceedings*, vol. 100, 573-578.
- [59] Romer C., Romer D. (1990), ”New Evidence on the Monetary Transmission Mechanism”, *Brookings Paper on Economic Activity*, n.1, pp.149-214.
- [60] Roodman, D. (2006), “How to do xtabond2: An introduction to “difference” and “system” GMM in Stata”, Working Paper 103, Center for Global Development, Washington, DC.
- [61] Smith, R., Fuertes, A.M. (2010), “Panel Time-Series”, London: Centre for Microdata Methods and Practice. Institute for Fiscal Studies.
- [62] Tamborini, R. (2013), ”The New Fiscal Rules For the EMU. Threats From Heterogeneity and Interdependence”, *The European Journal of Comparative Economics*, 10, 315-336.
- [63] Tamborini R. (2015), ”Transatlantic austerity, 2010-13. A comparative assessment”, in Paganetto L. (ed.), *Anaemic Europe - How to Achieve Dynamism and Mass Flourishing*, Wien, Springer, pp. 123-161.
- [64] Windmeijer, F. (2005), “A finite sample correction for the variance of linear efficient two-step GMM estimators”, *Journal of Econometrics*, 126, pp. 25–51.
- [65] Zagler M., Dürnecker G. (2003), ”Fiscal Policy and Economic Growth”, *Journal of Economic Surveys*, vol. 17, pp. 397-418

Figures

Figure 1. GDP at constant 2010 prices, 2008-15 (2007=100)

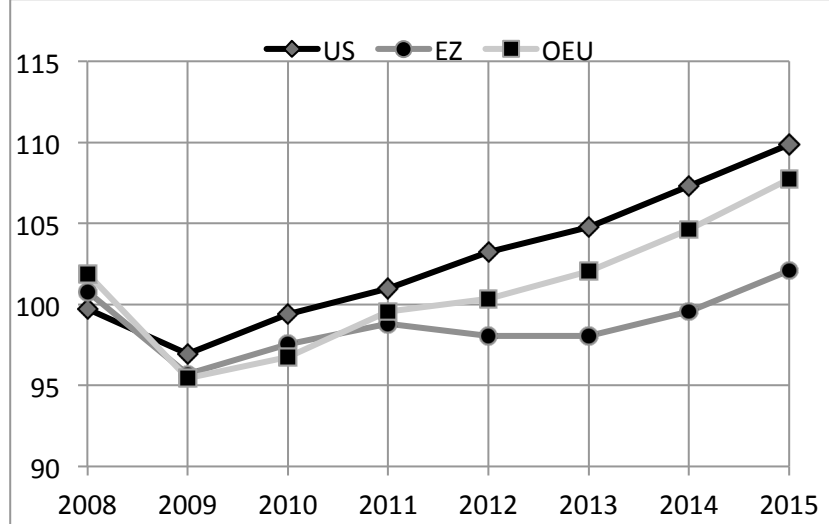


Figure 2. Rate of unemployment, total labour force, 2008-15

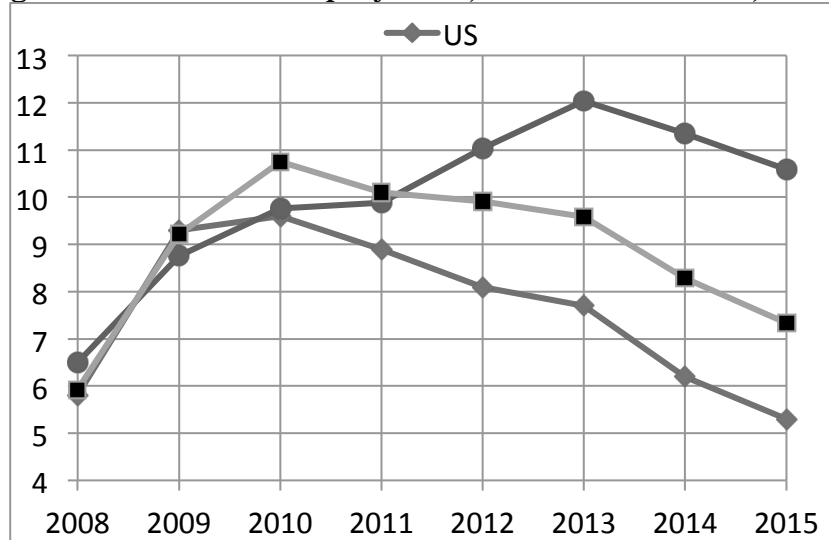


Figure 3. Year changes in the STPB 2010-15.
Average values for groups of countries

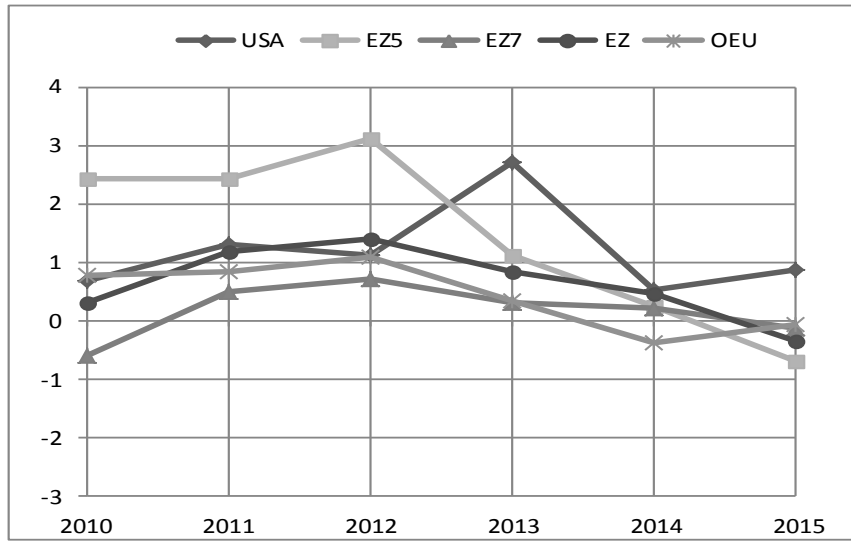


Figure 4. STPB 2010-15.
Average values for groups of countries

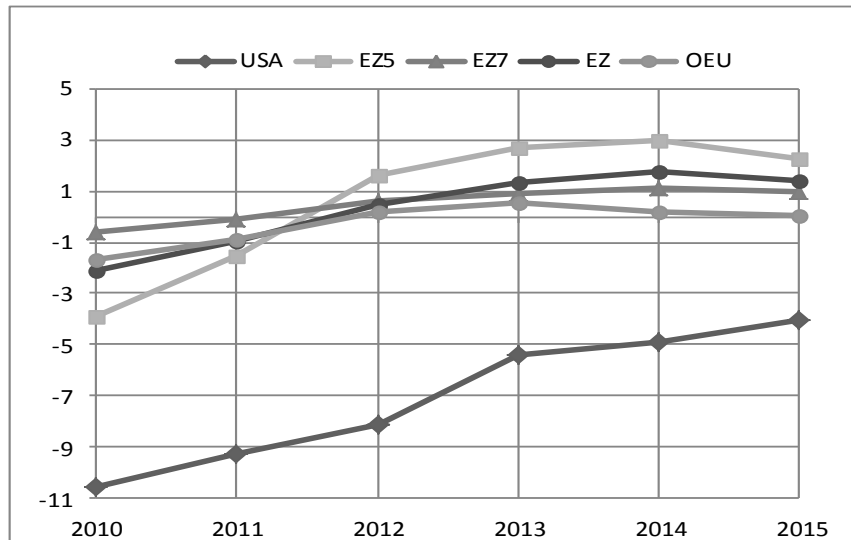


Figure 5. Cumulated changes in the STPB, 2008-09 and 2010-15. Average values for groups of countries

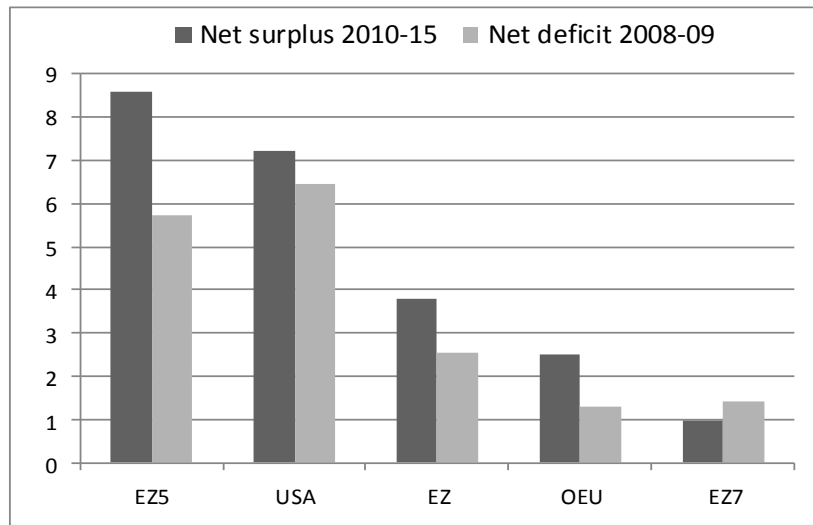
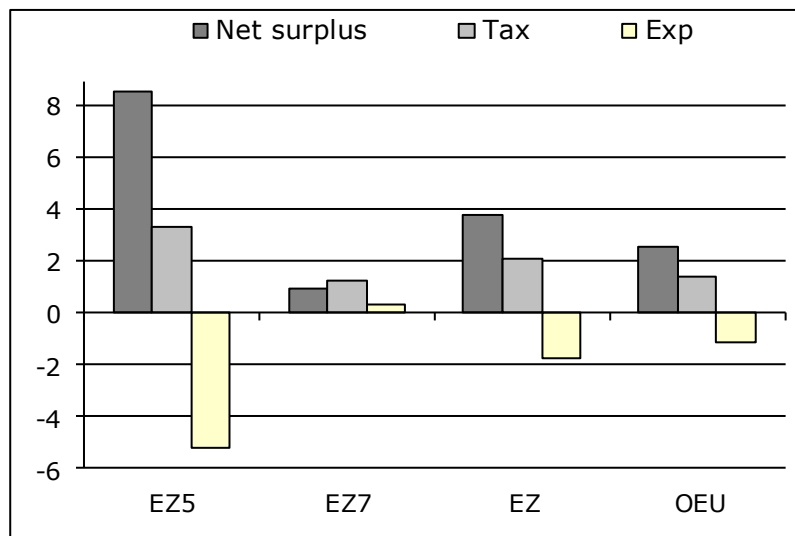
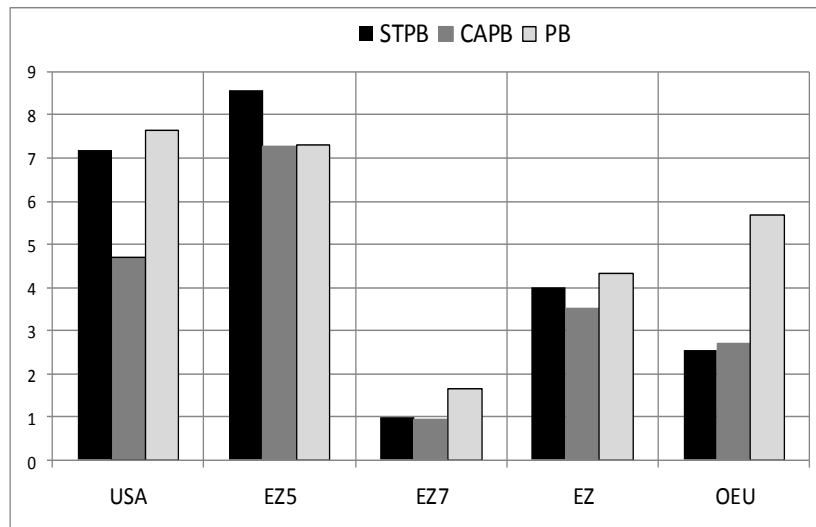


Figure 6. Cumulated changes in the STPB, structural taxation and structural expenditure. Average values for groups of countries.



**Figure 7. Cumulated adjustment of STPB, CAPB, PB, 2010-15.
Average values for groups of countries**



Tables

Table 1. Pesaran Cross-Sectional Dependence Tests

Variable	Test Statistic
ΔGDP	18.47 (0.000)
$\Delta STPB$	12.39 (0.000)
$\Delta REER$	14.79 (0.000)
$\Delta DEBT_{it}$	7.96 (0.000)
ΔRIR	1.14 (0.254)
$\Delta DEBT_L$	6.94 (0.000)
$FOREC$	2.75 (0.006)

Note: Pesaran (2004) shows that under the null hypothesis of no cross-sectional dependence $CD \rightarrow N(0,1)$. P-values are reported in parenthesis

Table 2. Panel estimation results with fixed effects and time dummy

Regressor	NO STANDARDIZATION			STANDARDIZATION		
	1	2	3	1	2	3
$\Delta STPB_{it}$	-0.705** (0.253)	-0.911*** (0.295)	-0.796*** (0.226)	-0.264** (0.095)	-0.341*** (0.110)	-0.298*** (0.085)
$\Delta REER_{it}$	-0.003 (0.054)	0.017 (0.060)	0.039 (0.064)	-0.008 (0.155)	0.049 (0.169)	0.111 (0.181)
$\Delta DEBT_{it}$	-0.181*** (0.020)			-0.998*** (0.112)		
$\Delta DEBT_{L_{it}}$		-0.026 (0.033)			-0.822 (1.048)	
ΔRIR_{it}			-0.187** (0.071)			-0.098** (0.037)
AVG_GROWTH_i	0.427*** (0.092)	0.477*** (0.103)	0.430*** (0.100)	0.117*** (0.025)	0.131*** (0.028)	0.118*** (0.027)
Year dummies	included	included	included	included	included	included
CD TEST	0.241	0.155	0.130	0.241	0.155	0.130
AB Test AR(2)	0.000	0.000	0.000	0.000	0.000	0.000
Number of obs.	135	135	135	135	135	135
Countries	27	27	27	27	27	27

Note: All standard errors are in parentheses (Cluster-robust standard errors which controls for potential heteroscedasticity and autocorrelation).*,**,*** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 3. Panel estimation results with the common correlated effects estimator

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	(1)	(2)	(3)	(1)	(2)	(3)
$\Delta STPB_{it}$	-0.628*** (0.187)	-0.674** (0.302)	-0.435*** (0.155)	-0.326*** (0.097)	-0.350** (0.157)	-0.226*** (0.080)
$\Delta REER_{it}$	0.013 (0.056)	-0.013 (0.060)	-0.022 (0.048)	0.019 (0.084)	-0.019 (0.089)	-0.032 (0.071)
$\Delta DEBT_{it}$	-0.092** (0.041)			-0.210** (0.093)		
$\Delta DEBT_{Lit}$	-0.007 (0.030)			-0.023 (0.096)		
ΔRIR_{it}	-0.048 (0.086)			-0.045 (0.080)		
AVG_GROWTH_i	0.319 (0.236)	0.398 (0.339)	0.393 (0.086)	0.227 (0.167)	0.283 (0.241)	0.222 (0.279)
Year dummies	included	included	included	included	included	included
CD TEST	0.119	0.983	0.114	0.119	0.983	0.114
AB Test AR(2)	0.273	0.014	0.766	0.273	0.014	0.766
Number of obs.	135	135	135	135	135	135
Countries	27	27	27	27	27	27

Note: All standard errors are in parentheses (Huber/White standard errors which controls for potential heteroscedasticity). *, **, *** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 4: Panel estimation results with fixed effects and time dummy

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	(1)	(2)	(3)	(1)	(2)	(3)
ΔG_t	0.605*** (0.142)	0.830*** (0.188)	0.735*** (0.142)	0.578*** (0.135)	0.793*** (0.180)	0.703*** (0.135)
ΔT_t	-0.974*** (0.327)	-1.178*** (0.371)	-1.034*** (0.303)	-1.004*** (0.337)	-1.214*** (0.383)	-1.066*** (0.312)
$\Delta REER_{it}$	-0.038 (0.056)	-0.020 (0.067)	0.011 (0.080)	-0.101 (0.152)	0.054 (0.181)	0.030 (0.217)
$\Delta DEBT_{it}$	-0.181*** (0.022)			-0.990*** (0.118)		
$\Delta DEBT_{Lit}$	-0.037 (0.030)			-1.071 (0.854)		
ΔRIR_{it}	-0.170** (0.075)			-0.089** (0.039)		
AVG_GROWTH_i	0.456*** (0.083)	0.520*** (0.097)	0.462*** (0.080)	0.125*** (0.023)	0.142*** (0.026)	0.127*** (0.025)
Year dummies	included	included	included	included	included	included
CD TEST	0.257	0.148	0.143	0.257	0.148	0.143
AB Test AR(2)	0.006	0.001	0.000	0.006	0.001	0.000
Number of obs.	130	130	130	130	130	130
Countries	26	26	26	26	26	26

Note: All standard errors are in parentheses (Huber/White standard errors which controls for potential heteroscedasticity). *, **, *** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 5: Panel estimation results with the common correlated effects estimator

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	(1)	(2)	(3)	(1)	(2)	(3)
ΔG_t	0.464*** (0.170)	0.404* (0.224)	0.457** (0.213)	0.250*** (0.092)	0.218* (0.121)	0.247** (0.115)
ΔT_t	-0.421*** (0.149)	-0.512** (0.245)	-0.465** (0.224)	-0.197*** (0.069)	-0.239** (0.114)	-0.217** (0.105)
$\Delta REER_{it}$	-0.054 (0.046)	-0.072 (0.067)	-0.021 (0.064)	-0.057 (0.071)	-0.094 (0.086)	-0.028 (0.083)
$\Delta DEBT_{it}$	-0.041 (0.053)			-0.095 (0.121)		
$\Delta DEBT.L_{it}$		-0.020 (0.027)			-0.061 (0.027)	
ΔRIR_{it}			-0.074 (0.103)			-0.069 (0.096)
$AVG.GROWTH_i$	0.480*** (0.158)	0.680** (0.309)	0.499** (0.188)	0.339*** (0.112)	0.480** (0.218)	0.352** (0.133)
Year dummies	included	included	included	included	included	included
CD TEST	0.112	0.114	0.150	0.112	0.114	0.150
AB Test AR(2)	0.349	0.967	0.362	0.349	0.967	0.362
Number of obs.	130	130	130	130	130	130
Countries	26	26	26	26	26	26
Countries	26	26	26	26	26	26

Note: All standard errors are in parentheses (Huber/White standard errors which controls for potential heteroscedasticity).*, **, *** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 6. OLS and 2FE estimator of the lagged dependent variable in the dynamic specification

	$\Delta STPB$			ΔG and ΔT		
	$\Delta DEBT$	$\Delta DEBT.L$	ΔRIR	$\Delta DEBT$	$\Delta DEBT.L$	ΔRIR
<i>OLS</i>	0.703*** (0.052)	0.765*** (0.053)	0.739*** (0.050)	0.741*** (0.060)	0.808*** (0.063)	0.771*** (0.060)
<i>2FE</i>	0.152 (0.108)	0.226** (0.112)	0.144 (0.102)	0.190 (0.124)	0.285*** (0.120)	0.210* (0.106)

Note: All standard errors are in parentheses (Huber/White standard errors which controls for potential heteroscedasticity).*, **, *** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 7. Dynamic two-step panel estimation A rellano-Bond differenced estimator

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	1	2	3	1	2	3
$\Delta STPB$	-0.528 (0.497)	-0.749 (0.504)	-0.283 (0.737)	-0.197 (0.186)	-0.280 (0.189)	-0.106 (0.276)
$\Delta REER$	-0.305* (0.159)	-0.373** (0.182)	-0.461* (0.230)	-0.867* (0.452)	-1.060** (0.518)	-1.310* (0.654)
$\Delta DEBT$	-0.227** (0.088)			-1.254** (0.488)		
$\Delta DEBT_L$		0.026 (0.080)			0.837 (2.561)	
ΔRIR			-0.403 (0.463)			-0.211 (0.242)
ΔGDP_{it-1}	0.572*** (0.126)	0.674*** (0.088)	0.742*** (0.080)	0.572*** (0.126)	0.674*** (0.088)	0.742*** (0.080)
Year dummies	included	included	included	included	included	included
CD TEST	0.253	0.249	0.196	0.253	0.249	0.196
SARGAN TEST	0.342	0.382	0.347	0.342	0.382	0.347
HANSEN TEST	0.299	0.585	0.448	0.299	0.585	0.448
AB Test AR(2)	0.110	0.630	0.815	0.110	0.630	0.815
Number of obs.	108	108	108	108	108	108
Countries	27	27	27	27	27	27

Note: All standard errors are in parentheses (To avoid small sample bias that occurs in the two step procedure, the Windmeijer correction is used.).*,**,*** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 8. Dynamic two-step panel estimation - Arellano-Bond differenced estimator

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	1	2	3	1	2	3
ΔG	1.039** (0.497)	1.338** (0.510)	0.969 (0.735)	0.993** (0.472)	1.279** (0.487)	0.926 (0.702)
ΔT	-0.959 (0.687)	-1.114 (0.736)	-0.830 (0.940)	-0.988 (0.708)	-1.148 (0.759)	-0.856 (0.969)
$\Delta REER$	-0.515* (0.273)	-0.590** (0.260)	-0.650* (0.354)	-1.390* (0.273)	-1.592** (0.703)	-1.755* (0.957)
$\Delta DEBT$	-0.214* (0.687)			-1.170* (0.687)		
$\Delta DEBT L$		0.017 (0.083)			0.480 (2.393)	
ΔRIR			-0.451 (0.542)			-0.237 (0.285)
ΔGDP_{it-1}	0.654*** (0.122)	0.707*** (0.109)	0.748*** (0.099)	0.654*** (0.122)	0.707*** (0.109)	0.748*** (0.099)
Year dummies	included	included	included	included	included	included
CD TEST	0.263	0.279	0.251	0.263	0.279	0.251
SARGAN TEST	0.282	0.374	0.323	0.282	0.374	0.323
HANSEN TEST	0.376	0.670	0.642	0.376	0.670	0.642
AB Test AR(2)	0.313	0.913	0.896	0.313	0.913	0.896
Number of obs.	108	108	108	108	108	108
Countries	26	26	26	26	26	26

All standard errors are in parentheses (Huber/White standard errors which controls for potential heteroscedasticity).*, **, *** denote significance at the 0.1, 0.05, 0.01 level, respectively.

Table 9: Different estimators adding expectations

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	TWO WAY FE	PCCE	GMM	TWO WAY FE	PCCE	GMM
$\Delta STPB_{it}$	-0.80*** (0.224)	-0.632*** (0.192)	-1.152 (0.690)	-0.283*** (0.079)	-0.326*** (0.103)	-0.406 (0.243)
$\Delta REER_{it}$	-0.049 (0.061)	-0.049 (0.078)	-0.473 (0.339)	-0.132 (0.146)	-0.064 (0.104)	-1.278 (0.915)
$\Delta DEBT_{it}$	-0.180*** (0.020)	-0.084** (0.041)	-0.142 (0.158)	-0.988*** (0.222)	-0.192** (0.088)	-0.781 (0.866)
$FOREC_{it-1 t}$	-0.035 (0.061)	-0.009 (0.072)	-0.337 (0.252)	-0.016 (0.031)	-0.011 (0.056)	-0.157 (0.118)
AVG_GROWTH_i	0.455*** (0.085)	0.400** (0.202)		0.125*** (0.019)	0.142** (0.140)	
Year dummies	included	included	included	included	included	included
CD TEST	0.183	0.121	0.315	0.183	0.121	0.315
AB Test AR(2)	0.002	0.468	0.374	0.002	0.468	0.374
Number of obs.	130	130	104	130	130	104
Countries	26	26	26	26	26	26
SARGAN TEST			0.344			0.344
HANSEN TEST			0.156			0.156

Note: For the different estimators, the same standard errors utilized in the previous tables are used here.

Table 10: Different estimators adding expectations

<i>Regressor</i>	NO STANDARDIZATION			STANDARDIZATION		
	TWO WAY FE	PCCE	GMM	TWO WAY FE	PCCE	GMM
ΔG_{it}	0.614*** (0.134)	0.489*** (0.168)	1.499** (0.735)	0.587*** (0.128)	0.264*** (0.091)	1.433** (0.619)
ΔT_{it}	-0.980*** (0.319)	-0.436*** (0.147)	-1.343 (0.940)	-1.010*** (0.329)	-0.202*** (0.069)	-1.385 (0.814)
$\Delta REER_{it}$	-0.034 (0.055)	-0.044 (0.055)	-0.590 (0.354)	-0.093 (0.148)	-0.058 (0.073)	-1.593 (1.054)
$\Delta DEBT_{it}$	-0.185*** (0.021)	-0.040 (0.053)	-0.148 (0.095)	-1.012*** (0.118)	-0.092 (0.122)	-0.813 (0.899)
$FOREC_{it-1 t}$	-0.025 (0.065)	-0.061 (0.056)	-0.440 (0.320)	-0.012 (0.030)	-0.074 (0.068)	-0.205 (0.149)
AVG_GROWTH_i	0.455*** (0.081)	0.470*** (0.169)		0.125*** (0.022)	0.331*** (0.119)	
Year dummies	included	included	included	included	included	included
CD TEST	0.247	0.118	0.260	0.247	0.118	0.260
AB Test AR(2)	0.001	0.308	0.631	0.007	0.308	0.631
Number of obs.	130	130	104	130	130	104
Countries	26	26	26	26	26	26
SARGAN TEST			0.253			0.253
HANSEN TEST			0.215			0.215

Note: For the different estimators, the same standard errors utilized in the previous tables are used here.