The Fiscal Mix in the Euro-Area Crisis
- Dimensions and a Model-Based Assessment of Effects

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The fiscal mix in the euro-area crisis
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PRELIMINARY

Abstract

There is a consensus that fiscal policy has played an active role in shaping euro-area macroeconomic developments in recent years. The problem is, there is little consensus how. The current paper contributes to the debate in three ways: first, it provides the facts. Namely, it documents the evolution of the fiscal mix in the euro area since 2007 both across countries and across a broad set of fiscal instruments. Second, it highlights in a model-free way how important the counterfactual is for assessing the fiscal stance. In particular, the paper documents that – compared to past behavior – fiscal policy in the euro area was not particularly pro-cyclical in the early phase of the financial crisis. Compared to the U.S. response in recent years, instead, it provided less tax-based relief. Third, and last, we build a two-country model of a currency union to provide a model-based assessment of how the fiscal mix, across instruments and time may have affected the “Core” countries and the “Periphery” of the euro area. The model suggests that the policy mix in the crisis may have been a key driver of rising government debt, while contributing to stabilize output and inflation.

Keywords: Fiscal policy mix, consolidation, currency union.
risk premium, sovereign risk

JEL-Codes: E32, E62, E52

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1 Introduction

There is a broad consensus that fiscal policy has played an active role in shaping euro-area developments in recent years. There is much less of a consensus, however, on how fiscal policy behaved (whether it was accommodative or not, for example) and what the macroeconomic effects of the policies were. We believe that there is both a lack of information and a lack of clarity as to how the counterfactual assumptions shape the assessment. This paper aims to contribute to the debate on these fronts.

The paper, first, provides the facts about the euro area’s fiscal mix. It, then, puts the fiscal mix into the context of economic theory. Last, the paper provides a model-based quantitative assessment of the effects that the fiscal mix had on economic activity in the euro area. The finding is that, compared to pre-crisis fiscal behavior, the fiscal mix in the euro area was accommodative throughout the crisis and remains so. This fiscal stance has helped stabilize economic activity and inflation, yet it came at the cost of a sharp run-up in public debt, particularly in the euro-area “Periphery.”

The paper, first, documents three phases of the fiscal mix in the euro-area “Core” and the “Periphery:” a stimulus phase (2008-2010), a consolidation phase (late 2010-2013) and a stabilisation phase (from 2014 onward). Starting from 2007, we compute individual spending instruments (government consumption, government investment, and public transfers as shares of GDP), together with a detailed breakdown of effective average tax rates by economic function (consumption, labor income and capital income taxes). The stimulus phase was common to most countries in the euro area and characterized by a mix of tax cuts and spending increases. The consolidation phase, instead, saw fiscal policies diverge sharply. Amid rising debt and (perceived) sovereign risk, the Periphery embarked on a broad-based consolidation effort that affected all the fiscal instruments, with the notable exception of transfers. The Core, instead, never withdrew the spending stimulus provided in the early phase of the crisis.

\[1\] For the remainder of the paper, the “Periphery” of the euro area consists of Cyprus, Greece, Ireland, Italy, Portugal, and Spain. The “Core” is formed by the remaining countries of the euro area. These labels do not contain judgement of any sort.

\[2\] We wish to emphasize that the data set that comes with the current paper allows a much more detailed breakdown of the evolution of the fiscal instruments for any country of the euro area (EA18). It also allows distinguishing fiscal forecasts and ex post realizations.
In the rest of the paper we argue that this mix has important implications.

Second, we use a simple textbook New-Keynesian model augmented by a sovereign risk channel to review the literature on fiscal policy transmission. The literature emphasizes two things: that the fiscal mix is of central importance for the business cycle and that the macro-economic impact of that mix heavily depends, in particular, on the monetary stance and the (perceived) fiscal sustainability risks. In the euro-area context two conclusions can be highlighted. On the one hand, the conditions for large fiscal multipliers seem not have been in place in the early phase of the crisis, rendering the early stimulus fiscally costly. The reason is that spending multipliers tend to be large when monetary policy is constrained; compare Christiano et al. (2011). Yet monetary policy in the euro area appears to have become constrained only from around mid 2012 onward (compare also Swanson and Williams (2014)), that is, well after the stimulus phase ended. This suggests the possibility that fiscal policy in the stimulus phase has contributed to the very run-up in public debt that markets became worried about in 2010 and that gave rise to a sharp increase in sovereign risk spreads. On the other hand, the changes in the area-wide fiscal mix afterward are consistent with the implications that one would derive from a model of sovereign risk in a currency union (for example, Corsetti et al., 2014). Namely, that the fiscal mix in a currency union supports output in the union as a whole if those countries facing high sovereign risk retrench whereas the remaining countries have an accommodative fiscal stance.

Third, and last, we provide an assessment of how the fiscal mix, across instruments, blocks, and time may have affected the “Core” countries and the “Periphery” of the euro area. Toward this end, we build a two-country model of a currency union with sovereign risk, extending the work of Corsetti et al. (2014). We calibrate the model to match salient features of the euro-area macroeconomic developments since the onset of the crisis. The counterfactuals that we run confirm our earlier conjectures: the policy mix in the crisis has contributed to stabilizing output and inflation in the area as a whole and the two blocks, if at the cost of notably raising government debt – particularly so in the Periphery.

There is an extensive literature concerned with fiscal policy transmission. Among the papers that have examined fiscal policy in the euro area specifically, the paper closest to ours is
It provides an empirical assessment of the deficit reduction plans of 2009-2014 for eight euro-area countries (including Portugal, Spain, Ireland and Italy) based on the narrative approach developed in Alesina et al. (2014b). The authors conclude that fiscal austerity in 2009-2014 was not the main driver of weak economic activity as long as austerity was primarily spending-based. By and large, we share their main conclusion: the fiscal mix in the euro area remained expansionary throughout the crisis years. Our study differs from theirs in three dimensions. First, we provide fiscal developments for all countries in the euro area (EA 18) and examine the area-wide fiscal mix jointly. Second, our analysis builds on disaggregated data at the instrument level. Third, we resort to a full-fledged business cycle model for the counterfactual analysis. Similar to us, Coenen et al. (2013), Cwik and Wieland (2011), and in ’t Veld (2013) also propose DSGE model based evaluation of fiscal policy developments in the euro area. They focus, however, either only on the stimulus or the consolidation phase, but not on the overall mix. A central tenet of the current paper, instead, is that developments later in the crisis years cannot be discussed independent of decisions made earlier.

The rest of the paper proceeds as follows. Next, we show that fiscal policy has been more active in the crisis years than pre-crisis. Thereafter, in Section 3 we document the euro-area fiscal mix since the onset of the crisis in detail, and the broader macroeconomic context. Section 4 puts this mix into the context of the literature on fiscal policy transmission. Section 5 presents the quantitative results from model-based counterfactuals. A final section concludes.

2 Fiscal policy in the Euro area before and after the crisis

The financial crisis that started in 2008 marked a deep break in the way fiscal policy was managed in all developed countries, and the euro area makes no exception as this section shows. Euro-area fiscal policy has become more active in the crisis years than it used to be. Towards showing this, Figure 6 presents the evolution of the change in the GDP ratio of the cyclically-adjusted primary balance (“CAPB”). The CAPB cleans the fiscal balance on two dimensions. First, it uses the primary balance, thus abstracting from interest payments on
debt. Second, it is cyclically adjusted with a view to removing the effect of the response of automatic stabilizers on the primary balance. The CAPB, thus, often is used as a summary measure of discretionary fiscal policy. Each panel of the figure shows the change of the euro-area’s cyclically-adjusted primary balance on the y-axis, and how it was associated with the euro-area’s output gap of the previous year (x-axis). The panel on the left shows the \textit{pre-crisis years} 2001 through 2007. This includes the 2001 growth slowdown. The panel on the right shows the \textit{crisis years} 2008 to 2015 and forecasts through 2017. The bottom-left quadrant of each panel marks a fiscal loosening amid a negative output gap (fiscal policy becoming more “counter-cyclical”). The top-left quadrant marks a fiscal tightening amid a negative output gap (fiscal policy becoming more “pro-cyclical”).

The panel on the right suggests the three different phases of fiscal policy alluded to above: a \textit{stimulus phase} in the early part of the financial crisis, when the fiscal stance (as measured by the CAPB) became more counter-cyclical than pre-crisis. This phase gave rise to a \textit{consolidation phase} that started in late 2010. In that phase, debt sustainability concerns started to prevail, and the fiscal stance as measured here became increasingly pro-cyclical. Finally, the fiscal policy stance stabilized since 2014, with little change in the CAPB projected going forward. The next section provides the macroeconomic background in the context of which

Figure 1: \textbf{Euro area fiscal stance, before and after the crisis.} Source: IMF-WEO and AMECO. The change in cyclically-adjusted primary balance is expressed in percentage of nominal potential GDP.
the different phases arose.

Overall, comparing the two panels of Figure 6 highlights a marked change in euro-area fiscal policy in the crisis. The panel on the left suggests little use of countercyclical discretionary fiscal policy \textit{pre-crisis}. At best it was mildly \textit{procyclical}. The panel on the right, instead, suggests a much more active discretionary fiscal policy stance in the crisis years, with strong countercyclical elements during the stimulus phase. In the next chapter we will document the dimensions of that activism. Toward the end of the paper, then, we will ask what effect this activism had on the macroeconomy and public finances.

3 The euro-area macroeconomy and the fiscal mix in the crisis

This section documents the main developments in core and periphery countries since the beginning of the financial crisis, and compares them with the aggregate euro area developments. In the first subsection, we focus on the evolution of GDP and the sovereign spreads (Section 3.1). Thereafter, we discuss the fiscal mix. Wherever suitable, the series that we present are weighted averages of the country-level data. Throughout this section, the green shading corresponds to the stimulus phase identified in Section 2, the white shading corresponds to the consolidation phase, and the blue shading corresponds to the stabilisation phase.

3.1 The euro area macro-economy since 2008

Since the end of 2008, euro-area economic activity experienced unusual volatility (see left panel of Figure 2). Initially, the recessionary developments were rather synchronized across the core and periphery. Starting from the end of 2009, though, economic developments in the periphery started to lag substantially behind the recovery in the core. Only from mid-2013 we observe a third phase of gradual convergence of growth rates, still currently on-going. The evolution of real GDP in the aggregate euro zone is broadly mirrored by the dynamics of core consumer price inflation (see the right panel of Figure 2). Sustained disinflation is observed in both regions since mid-2013, the disinflation being strongest in the peripheral countries. Figure 3 shows headline HICP inflation rates (left-hand side), and the same headline rates
adjusted for the mechanical effects of tax measures. Only some – but by no means all – of the acceleration of headline inflation in the periphery over the years 2010/13 can be attributed to the direct effect of tax measures.

**Private investment and consumption**

Figure 4 reports the evolution of private investment and private consumption in percent of actual GDP for each of the blocks. The euro-area crisis was marked by a precipitous fall in private investment. This fall was particularly severe in the periphery, with an overall
contraction from the 2007 level of about 7 percentage points of GDP, more than three times
the maximum drop observed in core countries. It is also noteworthy that investment stabilized
in the Core from 2010 onward, whereas investment in the Periphery continued its slide. The
dynamics of consumption, in contrast, has been more stable. Private consumption showed
less volatility in both regions and in the aggregate euro-area, with the changes in the GDP
ratio attributable mostly to the dynamics of the denominator.

Private investment

Private consumption

![Graph showing private investment and consumption](image)

Figure 4: Percent of GDP; Source: Eurostat - National accounts

**Public debt and sovereign risk**

The level of the public debt-to-GDP ratio increased substantially throughout the crisis, with
the public debt-to-GDP share in 2015 exceeding 120% of GDP in the Periphery (see Figure 5), while in core countries it rose to a much smaller degree. Figure 6 decomposes this increase
in public debt mechanically into different factors: the primary deficit, the differential between
interest rates and nominal GDP growth rates and the other factors not included in the deficit.
The latter mostly refers to transfers to the financial system (and in some cases positive
privatisation receipts). Differently to the common view, transfers to the financial system
explain a bigger share of debt accumulation in core rather than periphery countries, mostly
due to the bank capital injections in Germany in 2008-2009 and in Belgium in 2013-2014.
In periphery countries, debt increased mostly on account of sustained primary deficits and
interest payments, the latter due to the increased risk premia, which gradually passed through
to interest payments.
Figure 5: Percent of GDP; source: ECB and Eurostat.

As Figure 7 (taken from Corsetti et al. (2014)) documents, the increase in public debt ratios in the periphery was accompanied not only by an increase in sovereign CDS spreads but also a surge in non-financial corporate spreads. This subsided only after the European Central Bank’s announcement of outright monetary transactions (OMT).

Monetary Policy
Fiscal and monetary policy interact in numerous ways. In particular, the transmission of fiscal policy measures depends heavily on the monetary reaction to those measures. Similarly, the monetary transmission mechanism can be affected by fiscal imbalances. Going into the

**Figure 7:** 5-year CDS spreads in low-spread and high-spread euro area countries, as well as for nonfinancial corporations headquartered there. Low-spread euro area includes Austria (number of firms in our sample: 1), Finland (4), France (29), Germany (21), and Netherlands (8). High-spread euro area includes Italy (4), Portugal (2), and Spain (6). The same relative weights are adopted for the sovereign and corporate index series. For example, of the 63 firms in the low-spread euro area sample, 29 are headquartered in France. As a result, in the sovereign low-spread euro area series, France has a weight of 29/63. Source: Bloomberg.

**Figure 8:** **Forward rates on AAA government paper.** Based on estimates of Svensson-type model of the yield curve for AAA-rated government paper. Plotted is the observation closest to the middle of the first month of a given quarter. The vertical dashed line marks the date ECB president Draghi’s July 26, 2012 “whatever-it-takes speech.” Panel on the left: forward rate curves, maximum maturity 5 years. Panel on the right: number of quarters (including current quarter) for which the instantaneous forward rate is smaller or equal to 25 basis points annualized. Source: ECB Statistical data warehouse.
financial crisis, the European Central Bank implemented a number of “non-standard” monetary policy measures. Instead of reporting on these in detail, Figure 8 shows the resulting forward rates as implied by a Svensson-type model of the yield curve. The figure shows a gradual downward movement of the forward curve. We take the resulting curves as a rough indication of monetary policy expectations, having in mind all the due caveats (not least having in mind that this neglects movements in the term premiums). In the early years of the crisis, the estimated forward curves not only do not touch values close to zero, but they also remain rather steep. One interpretation of this is that markets expected monetary policy to react to shocks and not to hold rates fixed for some time. Only at the beginning of 2012 do the forward curves fall below 25 basis points (a rough measure of the central bank policy rate nearing the ZLB), and then only for four quarters initially (that is, the current quarter and the next three). It takes until ECB president Draghi’s July 2012 “whatever-it-takes” speech whereafter the spot rate reaches zero and the forward curve flattens for an extended period. From mid 2012 onward, the policy rates were expected to stay below 25 bps (annualized) for around 7 quarters on average.

3.2 The fiscal mix

Economic theory (reviewed in Section 4) tells us that the fiscal mix is of central importance for the business cycle, particularly in circumstances where monetary and/or fiscal policy in the currency union or parts of it are constrained. Next, we therefore review the nature and composition of the fiscal mix in the euro area. The development of the fiscal mix throughout the crisis is presented through the use of six fiscal instruments: on the revenue side, we look at the ex-post estimates of labour taxes, indirect taxes and taxes on capital income; on the spending side, we decompose spending net of interest (primary spending) into government consumption, public transfers and government investment. We focus on these instruments, rather than on fiscal balances, because they can better represent the way the fiscal policy mix interacted with macroeconomic developments.

In the following charts, the euro-area developments are shown as a black solid line. For
comparison, we also plot the evolution of the same fiscal instruments for the US (as red dashed line). For better readability, the US series have been adjusted (by adding or subtracting a constant) such that the 2006 level of the US series coincides with the levels for the euro area.

During the stimulus phase (characterised by the adoption of the European Economic Recovery Plan (EERP) at the end of 2008) fiscal policy was loosened throughout both blocks. On the revenue side, this was reflected in the contraction of all effective tax rates, both in Core and Periphery countries (see Figures 9 for the entire euro area and 10 for Core and Periphery). The consolidation phase started in late 2010 coinciding with the build-up of (perceived) sustainability risks and the related increase in sovereign spreads (compare Figure 7). Only from about 2014 onwards, projections for all fiscal instruments point toward a stabilisation.

Figure 9: Fiscal instruments euro area (EA18, solid line) and US (red dashed line). Data are based on EC AMECO database, Autumn 2014, and US NIPA. A vertical dotted line at that point marks the start of out-of-sample forecasts.
Revenues

Figures 9-11 highlight the following three elements of the euro-area, core and periphery tax policy mix since 2008:

1. Indirect taxes at the area-wide level fell early on in the crisis. Only around 2012/13 they have recovered and later exceeded their pre-crisis level. The Periphery accounts for the largest share of these developments. Non-policy factors seem to have played a dominant role in the stimulus phase of the crisis.

2. Labor taxes in both Core and Periphery have risen above pre-crisis levels. This contrasts strongly with the US labor taxes over the same period.

3. The drop in capital income taxes observed in the stimulus phase was due to both policy and non-policy factors, and again was weaker than in the US.

Going more in detail, aggregate euro area indirect tax rates and capital income tax rates show a substantial drop in the first phase, and then a strong recovery during the consolidation phase (see Figure 9). At the end of the last, stabilization phase, indirect taxes in the euro area are projected to be about half a percentage point above their 2007 (pre-crisis) levels, while capital income taxes remain below the pre-crisis levels. The volatility in indirect taxes is mostly due to the developments in the Periphery, while capital income taxes show similar drops in both regions (and thus in the euro area as a whole), as shown in Figure 10. Tax rates appear to have been considerably more accommodative in the US.

Labor taxes in the euro area have been stable throughout the stimulus phase, to rise by about one and a half percentage points throughout the consolidation phase, before stabilizing at that higher level from 2014 onward. The size and timing of the adjustment in labor taxes is remarkably similar in Core and Periphery. This similar pattern, however, fits into very different starting conditions in the two regions, with labor taxes in the Periphery in 2007 being eight percentage points lower than in the Core.

Changes in effective tax rates can be the result of discretionary changes in legislation (changes in effective tax rates due to “policy factors”) or they can be the result of changes in the state of the economy (due to progressivity or tax evasion, or loss carry-forward, for example; changes
Figure 10: **Fiscal instruments in the Core (dashed line) and Periphery (solid line).** Data are based on EC AMECO, Autumn 2014. A vertical dotted line at that point marks the start of out-of-sample forecasts.

due to “non-policy factors”). Figure 11 shows how much of a given change in effective current tax rates (calculated summing revenues and bases of indirect, labor, and capital income taxes) mechanically can be attributed to policy factors and to non-policy factors. From 2010 onwards, the AMECO database reports discretionary measures on current revenues, in revenue units. For the figure, any change in effective tax rates attributable to this (keeping the base fixed) is labelled a change due to policy-factors (shown as a red bar). The residual is labeled a change due to non-policy factors (yellow bar). The results are striking. First, the revenue-generating discretionary changes to effective current tax rates were larger in the Periphery (and much larger in 2012) than in the Core. Second, the non-policy factors helped the consolidation effort in Core countries, while they constituted a substantial headwinds on the consolidation in the Periphery. The non-policy factors that held back the consolidation in the Periphery include among other things tax evasion; compare, for example, [Commission (2014)].
Figure 11: **Evolution of the effective current tax rate, decomposition in policy and non-policy factors.** Revenue as a percent of GDP - Source: AMECO and authors’ calculations.

**Expenditures**

Next, when looking at the evolution of the public sector’s expenditure in the euro area, we can draw the following conclusions:

1. Euro-area government spending (as share of GDP, see Figures 9 and 10) rose in the stimulus phase. Only half of the increase was removed in the consolidation phase. The Core did not consolidate government consumption expenditures at all. The Periphery, instead, consolidated sharply. Developments in the Periphery mirror those for the US.

2. Euro area government investment activity contracted sharply in the consolidation phase (by about a percentage point). This development resembles the US experience. The Periphery accounts for almost all of this, though. Here government investment fell by almost 2 percentage points of GDP during the consolidation phase.

3. The contraction of government consumption and investment in the periphery was partly offset by the increase in transfers, which continued to rise through the consolidation phase.

Transfers (as a fraction of potential GDP) in the euro area rose by about a percentage point in the stimulus phase, see the bottom-left panel of Figure 9. This rise was due primarily to an increase in transfers in the periphery (bottom left panel of 10). There, transfers rose further still in the consolidation phase, to a level that was about three percentage points higher than
prior to the crisis. Transfers in the Core stabilized, in contrast.

It is important to contrast the evolution of transfers with that of other expenditure components in the Core and in the Periphery. While in the stimulus phase the government consumption expenditures evolved rather uniformly across the blocks, the consolidation phase shows a sharp divergence (see the center panel in the bottom row of Figure 10). The Core’s government consumption expenditures did not reverse at all (staying about one percentage point above the pre-crisis level through the end of the forecast horizon in 2016), whereas the Periphery’s spending level contracted sharply: from peak to trough by two percentage points of GDP. Half of that consolidation effort, however, simply reflects the removal of prior stimulus. Note that the developments in the Periphery themselves are quite similar to the development of US government consumption.

Government investment in the euro area has been reduced by about a full percentage point of potential GDP in the consolidation phase (bottom-right panel of Figure 9). This is the outcome of a combination of a mild, trend-like fall in the Core and a sharp contraction in the consolidation phase in the Periphery (bottom-right panel in Figure 10). The Periphery governments’ investment activity increased mildly in the stimulus phase but then fell by 2014 to a level that was almost two percentage points (of potential GDP) lower than pre-crisis.

4 The fiscal mix in light of economic theory

This section puts the euro-area fiscal mix into the context of economic theory. What will become apparent is that one needs an integrated assessment of all the dimensions of the fiscal mix and its timing, and the macroeconomic environment, in order to assess how fiscal policy has shaped the euro-area macroeconomy. The theory suggests two things, in particular: that the fiscal mix is of central importance for the business cycle and that the macro-economic impact of that mix heavily depends on two dimensions that have changed in the euro area over the course of the crisis: the monetary stance and the (perceived) fiscal sustainability risks in the euro area’s periphery (compare Section 3.1). Section 5 will provide a quantitative assessment of the macro-economic effects of the fiscal mix in the euro area using a rather
complex business-cycle model that incorporates the considerations discussed here. A short summary of the discussion in the current section can be found in Table 1. Readers who are familiar with the literature or are interested primarily in the quantitative results should feel free to jump directly to Section 5.

For the exposition of selected channels, we resort to a textbook version of the New Keynesian business-cycle model, an exposition of which can be found, for example, in Galí (2008). This model forms the backbone of the (much larger) model of Section 5. The key property of New Keynesian models is that due to nominal rigidities economic activity is demand-determined. The textbook model consists of a closed economy. Households consume, work in the labor market and save into nominal bonds, the rate of return on which ($R_t$ in the following) the central bank controls. For the exposition in this section, we simplify the fiscal sector such that there are only four fiscal instruments: a distortionary labor tax, $T^L_t$, a distortionary consumption tax $T^C_t$, a lump-sum tax $T^g_t$ that is used to stabilize the debt level, and government consumption expenditures $g_t$. Taxes and spending can vary over time. Production uses labor only. That is, we abstract in particular from physical capital as well as private or government investment. GDP, $y_t$, therefore will be given by the sum of private and government consumption only.

Letting $E_t$ mark expectations, and after imposing goods-market clearing, the household’s consumption-saving problem gives rise to the following so-called intertemporal IS-equation

\[
y_t - g_t = E_t[y_{t+1} - g_{t+1}] + E_t[T^C_{t+1} - T^C_t] - [(R_t + \Delta_t) - E_t[\pi_{t+1}]]. \tag{1}
\]

The first term reflects the households’ desire to smooth consumption over time. The second term reflects that consumption taxes change the effective cost of consuming at different points in time. For example, all else equal, if the household expects consumption taxes to be higher in the future than today, the household will want to consume more today than tomorrow. The final term is the ex-ante real rate of interest that the household faces ($\pi_t$ is the inflation rate). The higher that real rate is, the more the household will want to save today rather than consume. The higher the real rate, the lower, therefore, is aggregate demand. This makes
Stylised facts from Section 3.2 Theory discussed in Section 4 likely macroeconomic implications

<table>
<thead>
<tr>
<th>Revenue side</th>
<th>core and periphery</th>
<th>Stimulus expansionary at cost of higher debt; expectations of trajectory of indirect taxes supported consumption in stimulus phase, at cost of stronger contraction in consolidation phase.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drop in indirect effective tax rates</strong> during the stimulus, fully offset during consolidation phase (offset correctly anticipated).</td>
<td>Most of these developments took place in the periphery. There, strong increase in statutory VAT rate in the consolidation phase.</td>
<td>Recessionary. Periphery’s rise runs counter to fiscal devaluation, as labour taxes rose in the middle of a consolidation in indirect taxes.</td>
</tr>
<tr>
<td><strong>Steady rise in labor taxes</strong> above pre-crisis levels.</td>
<td>Both in core and periphery.</td>
<td></td>
</tr>
<tr>
<td><strong>Strong drop in effective capital taxes</strong>. Mostly driven by non-policy factors (negative profits), but also cuts to top rates.</td>
<td>Particularly strong in periphery.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenditure side</th>
<th>core and periphery</th>
<th>Expansionary in the stimulus phase (not self-financing ⇒ increase in debt ⇒ sovereign risk?). Consolidation contractionary for periphery; sovereign risk renders recessionary impact smaller. After 2012 (at the ZLB), core’s continued stimulus supports activity in the periphery.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government consumption</strong> rises in stimulus phase. Half of this increase consolidated thereafter.</td>
<td>Core and periphery provide stimulus. Permanent in core. Euro-area consolidation, thus, due only to periphery, which consolidates to levels below pre-crisis.</td>
<td></td>
</tr>
<tr>
<td><strong>Government investment</strong> contracts sharply in consolidation phase.</td>
<td>Contraction centered on periphery. There, contraction of two percent of potential GDP. Much smaller, trend-like fall in core.</td>
<td></td>
</tr>
<tr>
<td><strong>Transfers</strong> increase</td>
<td>Mostly in periphery. Transfers stable in core after stimulus phase, which saw a continuing increase during the consolidation phase.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Summary table – fiscal mix
the real rate a central element in the transmission of fiscal policy. $\Delta_t$ is an interest-rate spread that can arise, for example, if sovereign risk spills over to private-sector interest rates, giving rise to the sovereign-risk channel of Corsetti et al. (2013). Note that through setting the nominal interest rate accordingly, in principle, the central bank can absorb the effect of sovereign risk on the macroeconomy.

The second equation is the so-called New Keynesian Phillips curve

\begin{equation}
\pi_t = E_t[\pi_{t+1}] + \kappa \cdot \left[ \nu y_t + T_c^c + T_L^L \right], \quad \kappa > 0, \nu > 1.
\end{equation}

It reflects the firms’ pricing decisions. Firms will raise their prices (thus creating inflation), whenever their marginal costs of production rise today, or are expected to rise in the future (as reflected in higher future inflation). In the textbook version of the model, marginal costs of production are given by the wage that firms pay. This wage, in turn, will be affected both by economic activity (the higher employment is, the higher the wage) and by taxes. The reason for the latter is the following. The higher the labor tax rate is the lower the worker’s take-home pay. That is, the less the worker will be inclined to work and the higher a wage the firm has to pay. The marginal costs for the firms will, thus, rise with the labor tax. Similarly, the marginal costs for the firms will rise with the consumption tax.

4.1 Area-wide fiscal policy

Let us focus first on the transmission of area-wide fiscal policy. In “normal times,” one would expect the central bank to counter inflationary developments. That is, as inflation rises, the central bank would be expected to raise the nominal rate of interest, $R_t$, sufficiently strongly to raise the real rate of interest $R_t - E_t\pi_{t+1}$. This, in turn, will lead households to save more, cutting back consumption. This causes aggregate demand to fall, thus dampening inflationary pressures.

In the textbook model, reductions in consumption taxes or labor taxes are disinflationary. If

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4Government spending $g_t$ will typically also have a further indirect effect on costs through the wealth effect. This effect tends to be quantitatively small, however, so we neglect it in the exposition here. For the exposition, we also abstract from discounting in the Phillips curve.
the central bank reacts as in “normal times,” it will cut interest rates, leading to a rise in aggregate demand. In other words, theory suggests that such tax cuts are expansionary in normal times. An increase in government spending is expansionary as well. At the same time, the additional demand leads to higher inflation and, thus, to higher real rates which *crowd out* private consumption. In normal times, the spending multiplier, therefore, is positive, but less than one, see Woodford (2011). At the same time, the theory suggests that such expansions (due to the multiplier being less than one) are not self-financing. For the euro area, this means that likely the fiscal developments in the stimulus phase were expansionary, but have raised the government debt level.

All of this contrasts sharply with a situation in which the monetary authority does not react as in “normal times.” Imagine, for example, that the central bank were to keep interest rates constant amid the fiscal impulse; for example, because it is constrained by a lower bound on interest rates. We will call this the zero lower-bound (ZLB) scenario. For government spending, Christiano et al. (2011) and Woodford (2011) stress that government spending multipliers can then be much larger than in “normal times.” If interest rates \( R_t \) remain fixed, the inflationary impact of government spending reduces the real rate of interest \( R_t - E_t \pi_{t+1} \) falls if inflation expectations rise but interest rates do not). Rather than crowding out private-sector consumption more fiscal spending *crowds in* private consumption in such a situation.

For the transmission of tax changes as well, the monetary stance is of central importance. Eggertsson (2011), for example, stresses that in a ZLB scenario, changes in tax rates may have the exact opposite effect on economic activity than in normal times. Tax increases are inflationary. In normal times, the monetary response crowds out demand. If interest rates remain fixed, however, the increase in inflation is *expansionary*, for it reduces the real rate of interest.

Figure 9 documents that government consumption and investment expenditures combined rose in the euro area during the stimulus phase, but then started falling somewhat pre-crisis levels. The theory suggests that the spending impulse may not have been timed to

\footnote{If a considerable share of households were liquidity-constrained, instead, spending multipliers could be larger than unity (Gali et al., 2007). Still, they would need to be unrealistically large to make spending increases self-financing in normal times.}
have the largest possible multiplier. Indeed, Figure 8 shows that up until July 2012 the ECB’s main refinancing rate (one measure of the monetary stance) remained at or above 1 percent per annum, reaching levels close to zero only in November 2013 and so did interest rate expectations; confer Figure 8. In line with this, Swanson and Williams (2014) show that medium-term risk-free yields in the euro area, as measured by yields on German bunds continued to react to news until late 2012 and so were essentially unconstrained. Thus, the expansion in spending may have happened when multipliers were small, with commensurate effects on the government debt level, while little spending stimulus was forthcoming when multipliers could have been expected to be larger and the associated fiscal costs much smaller. This matters, for an increase in debt can raise fiscal sustainability risks (the $\Delta_t$ term in equation 1). In normal times, the central bank can absorb sovereign risk spreads. At the ZLB, it cannot as easily. Fiscal sustainability risks then change the fiscal calculus, as is stressed by Corsetti et al. (2013). Namely, they show that once higher debt levels induce sovereign risk spreads to rise and government spending is not self-financing, spending cuts are less recessionary. Spending cuts reduce the deficit, which in turn causes risk spreads (the $\Delta_t$) faced by the government and the private sector to fall, crowding in private-sector demand. This is important for the euro-area context because the fiscal consolidation in the periphery occurred precisely in such an environment of heightened perceptions of sovereign risk.

It is also important to note that “unconventional fiscal policy” can ensure that the lower-bound constraint on monetary policy is undone; see Correia et al. (2013). For this to work, the fiscal mix across instruments and time matters. This can be seen in IS-equation 1: A path of consumption taxes that rises over time ($[E_t T_{t+1}^C - T^C_t] > 0$) has the same effect on economic activity through the intertemporal IS equation, equation 1, as a reduction in real interest rates ($R_t - E_t [\pi_{t+1}] < 0$). Any effect on inflation can, then, be curbed by a movement of labor taxes in the opposite direction, see equation 2. While, indeed, fiscal forecasts for indirect taxes projected an increasing path from the end of the stimulus phase onward (not shown), the mix does not conform with the unconventional fiscal policy: labor taxes rose in the middle of what was a phase of consolidation of indirect taxes.

The textbook model shown above does not have a role for transfers. In practice, however,
these continued to rise over the euro area crisis years. The literature holds that transfers are expansionary if some households are liquidity-constrained, see Oh and Reis (2012), and again particularly so when monetary policy is constrained, see Giambattista and Pennings (2012).

The reason is that an increase in transfers typically moves resources from households with a lower marginal propensity to spend out of income to households that have a higher marginal propensity to spend. Of course, the downside of such increases in transfers, as with any of the fiscal measures discussed so far is that they may not be self-financing, thus contributing to rising government debt levels and increasing the need for contractionary fiscal consolidation in future years. Drautzburg and Uhlig (2015) stress that fiscal multipliers can be affected adversely in a quite dramatic fashion by the need for later distortionary financing of the ensuing deficits.

4.2 Country-specific fiscal policy

The discussion so far has abstracted from the country dimension. Section 3.1 and Figure 10 have highlighted, however, that both the state of the economy and fiscal policies started to diverge across core and periphery with the onset of the consolidation phase. The key element in a currency union is the assessment of spill-over effects across countries.

On the tax side, foremost to mention is the concept of a “fiscal devaluation” in a currency union. This entails raising competitiveness by cutting labor taxes and financing these cuts by raising value-added taxes (thus curtailing domestic demand but raising exports), compare Farhi et al. (forthcoming), for example. A fiscal devaluation in the Periphery in the consolidation phase does not receive much support from the numbers we showed in Figure 10. Rather, the opposite movement seems to have been in place. Labor taxes in the Periphery did not fall (either in absolute terms or relative to the Core). And, while indirect tax rates in the Periphery have risen in the consolidation phase they did so only from their atypically low levels reached at the end of the stimulus phase.

The international dimension matters as well on the spending side; see Corsetti et al. (2014) or Blanchard et al. (2014). Domestic government spending generates domestic demand and so tends to be inflationary at home. Spending in one block of the currency union thus tends
to cause a rise in area-wide inflation. In normal times (when the currency union’s monetary authority is unconstrained), this triggers a higher real rate of interest in the union as a whole (through the monetary response), which in turn causes negative demand spillovers to the other block of the union. The literature has pointed out, though, that matters can differ sharply in a ZLB phase, especially if that phase is persistent. Then, higher inflation crowds in the spending block’s private consumption demand. The trade channel will mean that some of that increased demand falls on the block that did not increase spending. In other words, in a ZLB scenario spending spillovers may switch from being negative (beggar-thy-neighbour) to positive. Corsetti et al. (2014) refine this argument further. In a model that forms the basis for the one used in Section 5 they argue that the country-distribution of government spending is particularly important in a ZLB phase when one region of the union is fiscally stressed, while the other is not. They show that a cut in government spending in fiscally stressed countries of a currency union (which reduces the sovereign risk-premium there) and a simultaneous fiscal expansion in countries with fiscal space can be expansionary for the area as a whole.

5 How did the fiscal mix affect the macroeconomy?

This section resorts to a larger New Keynesian model of the business cycle in order to assess the macroeconomic implications of the fiscal mix. The model is an extended version of Corsetti et al. (2014). The model economy consists of a currency union with two blocks: the Core and the Periphery and features the channels of fiscal policy transmission and the state dependence discussed in the previous section. Readers who are interested to learn more about the structure of the model may consult the box below. For the other readers, it suffices to explain the fiscal sector of the economy, to which we turn next.
**Description of the model.** Figure 12 provides a flow-chart presentation of the monetary union model. It is comprised of two blocks, HOME and FOREIGN, later associated with the Core and the Periphery. The flowchart zooms in on one of the blocks (HOME). The blocks differ in terms of size, macroeconomic and fiscal shocks, but otherwise are identical. The union-wide central bank sets the risk-free rate of interest at which savers in HOME and FOREIGN can deposit funds with a union-wide financial intermediary. In doing this, the central bank responds to area-wide inflation, the area-wide output gap, and the area-wide credit spread (with a view to absorbing the effect of rising spreads if possible); compare Cúrdia and Woodford (2010) for why this is good central bank policy. The central bank, though, can become constrained by the zero lower bound on interest rates, in which case it can no longer absorb the risk spread.

The model features three types of households in each block: savers, borrowers, and liquidity-constrained households. Savers deposit funds with union-wide financial intermediaries and buy government bonds. Borrowers borrow funds from the intermediaries, at a borrowing cost that is subject to a country-specific spread. This spread on private-sector lending, in turn, is linked to the borrowing costs of the sovereign. This is the *sovereign risk channel* of Corsetti et al. (2013). Sovereign risk is assumed to increase in the level of sovereign debt. Through the sovereign risk channel, higher government debt has the potential to reduce consumption demand. Saver and borrower households participate in financial markets. The third type of household, instead, is liquidity constrained and lives pay-check to pay-check. Liquidity-constrained households always consume their entire labor earnings plus any lump-sum transfers that they receive. For them, Ricardian equivalence does not apply – fiscal transfers matter directly for their consumption demand.

All households have preferences for bundles of differentiated goods from HOME and FOREIGN, but they exhibit home bias. Physical capital once produced is not mobile internationally. The production of domestic fixed investment uses both domestic and foreign goods as inputs, but is biased towards using the domestic ones. Labor is not internationally mobile. Prices of individual goods are rigid, so that output is demand-determined. Nominal wages are rigid as well.

Fiscal policy is country-specific. The governments in HOME and FOREIGN conduct fiscal policy according to the set of fiscal rules described in Section 5.1.

The appendix to the paper contains a detailed exposition of the model and discusses the parameter choices that we make.
Area-wide central bank.
- sets area-wide risk-free rate in banking system
- responds to area-wide inflation, output gap, and risk spreads

Area-wide competitive banking system

HOME government.
- Taxes and transfers
- gov’t consumption
- gov’t investment

HOME households.
Three types of households:
- Borrowers, borrow at country-specific spread
- Savers, invest in
  - deposits (at risk-free rate)
  - domestic gov’t bonds
  - Liquidity-constrained
  - excluded from asset markets

Households work at domestic firms (wages rigid)
Households consume HOME and FOREIGN produced goods
(home bias, imperfect substitutes)

HOME firm sector.
Produces HOME good
(sell subject to nominal rigidities)
using domestic labor and domestic
physical capital (gov’t and private)

Firms in HOME and FOREIGN are owned in equal measure by HOME
and FOREIGN borrowers and savers (that is, area-wide ownership). No
trade in firms (simplifying assumption)

Import FOREIGN goods for investment

Sovereign risk channel. Domestic gov’t debt affects domestic borrowing costs

HOME and FOREIGN goods for gov’t investment

HOME and FOREIGN goods for gov’t consumption

Some international insurance through very infrequent change of location

FOREIGN hh’s borrowing and deposits

Imports FOREIGN goods for consumption
HOME and FOREIGN goods for gov’t investment

Figure 12: Flowchart. Illustrates the structure of the model. Green squares: area-wide elements. Blue squares: country-specific elements. Yellow squares: sovereign risk channel. The model is symmetric. The same country-specific elements and sovereign risk channel pertain to FOREIGN as well (though depending on the FOREIGN state of the economy, of course).
5.1 Fiscal rules

In absence of shocks, we wish the fiscal sector to normally react to macroeconomic developments in a way that is consistent with pre-crisis fiscal behavior in the euro-area. Toward this end, and as is customary in the literature, we model fiscal policy as a set of fiscal rules. The form and parameterisation of the rules is identical in HOME and FOREIGN. Nevertheless, fiscal policy is country-specific because the fiscal instruments can deviate from the rule, and they react to country-level developments. The fiscal rules take the form

\[ x_t = \rho_x x_{t-1} + \theta_{x,B} \hat{b}_t^g + \theta_{x,Y} \hat{y}_t + \epsilon_t^x. \]

Here, \( x_t \in \{ \tau^c_t, \tau^L_t, \tau^K_t, \hat{g}_t, \hat{i}_t^g, \hat{T}_t^g/P_t \} \) is one of six fiscal instruments, namely, the tax rate on consumption (indirect tax), tax rate on labor income, the tax rate on capital income, real government consumption, real government investment, and government transfers. Hats over a variable mark percentage deviations from the balanced growth path. The tax rates are expressed in terms of deviation from the steady state, which is taken to be the euro-area average of 2007. The spending instruments are expressed in terms of the percent deviation from the balanced growth path. The instruments are persistent through parameter \( \rho_x \), and they respond to deviations of real debt \( b_t^g \) from the Maastricht treaty target level and deviations of output \( y_t \) from the balanced growth path. Next to the systematic behavior embedded in the rules, there can be unanticipated “fiscal shocks,” \( \epsilon_t^x \), which corresponds to the unsystematic component of fiscal policy that is not anticipated by economic agents. The rules for different instruments \( x \) will have different parameters \( \rho_x, \theta_{x,B}^v, \) and \( \theta_{x,Y} \).

It is beyond the scope of the current paper to estimate fiscal rules in the context of the current model. Rather, we rely on estimates in the literature to parameterise these rules. Our main point of reference is [Coenen et al. (2013)], from which we take the functional forms of the rules and the parametrisation of all but one. Their estimates are for the euro area as a whole, derived from estimating the ECB’s New-Area-Wide-Model with a fiscal sector on a sample from 1985Q1 to 2010Q2. Their estimates are thus, largely based on “normal times” and ignore the euro area’s fiscal consolidation phase, in particular. In any case, their estimates
appear quite similar to those reported by Forni et al. (2009), whose sample runs to 2005Q4, and so is firmly pre-crisis. The rules are parameterised as shown in Table 2.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Parameter values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption tax rate, $\tau_c^C$</td>
<td>$\rho_c = 0.91$, $\theta_{x,B} = 0$, $\theta_{x,Y} = 0$</td>
<td>Coenen et al. (2013)</td>
</tr>
<tr>
<td>Labor tax rate, $\tau_L^L$</td>
<td>$\rho_L = 0.75$, $\theta_{x,B} = 0.05$, $\theta_{x,Y} = -0.04$</td>
<td>Coenen et al. (2013)</td>
</tr>
<tr>
<td>Capital tax rate, $\tau_K^K$</td>
<td>$\rho_K = 0.95$, $\theta_{x,B} = 0.0025$, $\theta_{x,Y} = -0.0025$</td>
<td>Forni et al. (2009)</td>
</tr>
<tr>
<td>Expenditures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government consumption, $\tilde{g}_t$</td>
<td>$\rho = 0.77$, $\theta_{x,B} = -0.02$, $\theta_{x,Y} = 0.06$</td>
<td>Coenen et al. (2013)</td>
</tr>
<tr>
<td>Government investment, $\tilde{i}_t^I$</td>
<td>$\rho = 0.7$, $\theta_{x,B} = -0.18$, $\theta_{x,Y} = 0.55$</td>
<td>Coenen et al. (2013)</td>
</tr>
<tr>
<td>Lump-sum transfers, $\tau_t^L$</td>
<td>$\rho = 0.7$, $\theta_{x,B} = -1$, $\theta_{x,Y} = -1$</td>
<td>Coenen et al. (2013)</td>
</tr>
</tbody>
</table>

Table 2: Parameterisation of the fiscal rules. (1): The estimates by Forni et al. (2009) are very similar ($\rho_{x,c} = 0.96$, $\theta_{x,c,B} = 0.003$ after imposing $\theta_{x,c,Y} = 0$). (2): Coenen et al. (2013) model separately taxes on wages, and worker’s and employer’s social security contributions. We account only for one class of labor-income taxes. Our parametrisation is an average of their groups’ responses. Forni et al. (2009), estimate $\rho_{x,L} = 0.91$, $\theta_{x,L,B} = 0.01$ and impose $\theta_{x,L,Y} = 0$. (3): Coenen et al. (2013) assume that capital taxes remain fixed throughout, which seems unreasonable to us. Hence we use the Forni et al. estimates. (4): consistent with the estimates in Forni et al. (2009), who abstract from feedback and set $\theta_{c,G} = 0$, $\theta_{c,Y} = 0$. (5): We treat government investment as a perfect substitute to private-sector investment. This follows Coenen et al. (2013), who report little evidence of complementarities. (6): Coenen et al. (2013) distinguish lump-sum transfers from lump-sum taxes. The distinction being that the latter only burden the Ricardian households. Instead, we only have one lump-sum tax/transfer instrument. Our parametrisation reflects this.

The set of parameterised pre-crisis rules combined is debt-stabilising. For all expenditure items, the fiscal rules incorporate a contribution to debt consolidation (negative parameters $\theta_{x,B}^B$). The expenditure items react to output, as well. Government consumption and investment expenditures are cut if output falls short of trend. Transfers, instead, increase. On the revenue side, only labor taxes contribute notably to debt stabilisation. The labor and capital tax rules are mildly pro-cyclical: tax rates rise in recessions. The consumption tax rate is acyclical.

We describe the construction of the baseline economy next.

5.2 Constructing the baseline

The simulations are obtained through an iterated perfect foresight solution of the non-linear model. We solve the model under perfect foresight. Then, we move two quarters ahead, taking the previous two simulation quarters (this quarter and next) as given. We allow for economic
shocks and unanticipated changes in the fiscal instruments and simulate anew. Again, we move two quarters forward, until we reach 2014Q4. First, we describe the evolution of the baseline economy. Then we describe counterfactuals. In these, we take from the baseline economy the evolution of non-fiscal shocks and of monetary policy (shocks and ZLB episodes, respectively), as well as the form and parametrisation of the fiscal rule, but change the shocks that affect the fiscal policies.

To construct the baseline we proceed as follows. For the first two quarters of each simulation run, we set the fiscal instrument to the value prescribed by the ex-post data for that year. For the taxes, these are the tax rates. For the expenditure items, we target expenditures relative to trend output. We do this by appropriately calibrating the unexpected shocks in the fiscal rules specified in the previous section. In this way, the fiscal inputs will not be influenced much by the extent to which our baseline simulation misses on the evolution of GDP. For government consumption and investment, we use the actual data. The level of lump-sum taxes (which can be interpreted as negative fiscal transfers) in the simulation is fixed so as to result (with the fiscal mix for each block) in a long-run government debt level of 60 percent of GDP. For lump-sum taxes, we match the deviation of lump-sum taxes from the 2007 level to the deviations of those taxes from the model target. The simulations start in 2008Q1 having imposed the 2007 debt levels as initial conditions (Core: 62% of GDP, Periphery: 75% of GDP).

For the model, a choice has to be made as to how deep the recession is (whether it is driven by cyclical factors or a change in the trend, for example). Compared to a pre-crisis euro-area wide trend, euro-area output falls more than 10 percent short of the trend. We set up our baseline to roughly replicate this behavior of output, with a view to providing a lot of scope for fiscal stabilization policy and debt stabilisation concerns.

The evolution of economic activity will add to determining tax revenue, and thereby affect the evolution of government debt. The latter affects the short-run tax and spending elasticities (compare Corsetti et al. (2014)). Reproducing roughly the evolution of the euro-area economy,

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It is well-understood that, thereby, we do not necessarily introduce the same sequence of shocks relative to the rules for different counterfactuals (since \( y_t \) and \( b_{t-1} \) change. For a general audience, we find it more useful, however, to think of policy counterfactuals in terms of levels than in terms of shocks.
thus, matters. This has the following elements (compare Figure 13 and Section 3.1): a sharp contraction in output and investment at the beginning of the financial crisis and diverging developments in later years. Inflation, however, remains rather stable throughout with drops in 2010 and from 2013 onward. Toward mimicking this, we introduce a sequence of unanticipated shocks to the time discount-factor, to country-specific productivity, to markups, to monetary policy and to the marginal efficiency of investment (the latter being interpretable as a measure of financial frictions). As regards monetary policy, we assume that starting with the fall of 2012 monetary policy sets its target interest rate to the zero bound. We assume that the interest rate is expected to remain there for 7 quarters, roughly the average number of quarters that emerges from Figure 8. With each simulation, the lower bound episode is extended. Sovereign spreads are assumed to be very low at the beginning (as agents perceive no default risk), but then from early 2010 to early 2011 increase to the level indicated by the CDS spreads given for a specific debt level in Corsetti et al. (2014) at the height of the crisis. They stay at that level throughout mid 2012 and then they’re reduced by half by assumption in the simulation, roughly reproducing the evolution of spreads after ECB President Mario Draghi’s “whatever it takes” remarks. It is beyond the scope of the current paper to explore the mechanism through which this cut in spreads comes to pass. Corsetti et al. (2014).
for example, explore one such mechanism: a (contingent) pooling of debt. Other proposed mechanisms build on multiple equilibria. The spreads remain at that level for the rest of the simulation.

5.3 Does the baseline fit the euro-area developments?

Figure 14 shows the evolution of selected aspects of the baseline economy in the Core and the Periphery. These should be compared to Figure 13 and the charts in Section 3.1. Where we plot percentage deviations, we plot these relative to a balanced growth path that would prevail at the long-run tax rates. It bears noting that, necessarily, the baseline does not match the evolution shown in the data in all dimensions. Nevertheless, the baseline captures,
we would argue, some of the most important characteristics of the euro-area crisis years: a deep, protracted recession paired with initially rather stable inflation. The fall in the model’s output relative to trend (shown in the left panels on the two rows of Figure 14) mimics in terms of magnitude and timing the evolution of the data shown in Figure 13. Investment (relative to GDP) has been rather stable in the Core, whereas it has fallen precipitously in the Periphery (compare for the model’s path the second panels on each line of Figure 14 to the data shown in Figure 4). The model also matches the stability of inflation that prevailed until the end of the stabilization phase (for the model’s path see the third panels from the left on each line of Figure 14 and compare to the core inflation rate shown in the right panel of Figure 2). What the baseline misses is that the deceleration of inflation was even more rapid in the data than embedded in the baseline. That said, the model capture very well the run-up in public debt levels in both the Core and the Periphery (compare the panels on the right to Figure 5), and the differential evolution of the debt levels.

5.4 The effect of the euro area’s fiscal stance as a whole

The first counterfactual that we entertain seeks to find out how important the euro area’s fiscal mix across both the Core and the Periphery was for the evolution of the crisis. This counterfactual feeds in the same sequence of recessionary non-fiscal shocks as above. It differs from the baseline, however, in that in both the Core and the Periphery there are no discretionary changes to fiscal policy. Rather, in all years the fiscal instruments are now assumed to follow the pre-crisis fiscal behavior as embedded in the fiscal rules (with $\epsilon_f = 0$ for all periods in time and instruments in both blocks of the currency union).

Figure 15 shows how much higher output, inflation, and public debt would have been if the fiscal rules had been followed throughout the crisis. The figure shows deviations from the baseline evolution, that is, the evolution shown in Section 5.2. Negative numbers in Figure 15 mean that the value of the respective variable in the counterfactual is smaller than the value in the baseline. The main result is the following: the fiscal mix in the euro-area has stabilised output in both the Core and the Periphery. That stabilisation was substantial particularly in the early and last period of the crisis. However, the stabilisation came at the
cost of higher debt accumulation. Focusing on the right-most panel of Figure 15, it becomes apparent that the rules are much more successful at stabilising the debt level. Indeed, under the rule-based counterfactual governments are capable of stabilising their debt levels (relative to GDP) almost entirely, with a commensurate reduction in the spreads (not shown). In other words, the simulations suggest that the change in the way fiscal policy has been conducted since the beginning of the crisis (when comparing to pre-crisis fiscal rules) may have raised the debt to GDP level by 30 percent of GDP in the Periphery, and almost 10 percent in the Core. This result is far less strong in the ZLB phase.

Figure 15 suggests that the run-up in debt “bought” both output and inflation stabilisation in the crisis. The differences are relatively small in the early years of the crisis up until the time that the sovereign spread rises and the central bank goes to the zero lower bound. Stabilising the debt level – as is the case under the baseline fiscal rules – would have pushed the output
level one percent below trend output (the trend does not change in the simulations) in the Periphery for several years. In the Core, the effect is of a similar magnitude. Moreover, the simulations suggest that inflation would have fallen by more – by about half a percentage point more, making the downward drift in inflation more clearly visible. Then, starting from late 2012 onward, economic activity under the rules would have been considerably lower in both the Core and the Periphery (by a full three and six percentage points, respectively). Indeed, the model-based simulations suggest that the fiscal measures over and above the rule-based behavior in the euro may have contributed considerably to stabilising economic activity in the lower bound phase. We find that the measures have added 6 percent to GDP in the Core and 3 percent in the Periphery.

Figure 16 shows the differences in fiscal instruments in the Core and the Periphery under the counterfactual. For the Core, the main difference appears on the spending side, where both government consumption and government investment would have been lower if the rules would have been in place throughout. For the Periphery, the differences in instruments are large and mostly concentrated in the revenue side. The drop in demand in the counterfactual would reduce euro-area demand at a time when the economy is constrained by the ZLB, explaining part of the lower output under the counterfactual.

A remaining part stems from reduced monetary accommodation. In the baseline we assume that the central bank reduces the policy rate by about 50 basis points for every 100 basis point increase in private-sector spreads. Since the latter rises with sovereign risk in the sample after 2012 and debt is persistent, implicitly, lowering sovereign debt also removes some monetary stimulus. In particular, under the counterfactual the Periphery has much lower sovereign debt, which in turn translates into lower spreads and thus less monetary accommodation for the Core (as most of the rise in spreads occurred in the Periphery). For the Periphery, instead, the effect that lower debt has on spreads brings less crowding out of consumption and a lower tax burden.

In sum, the model-based exercise suggests that the fiscal stance in the euro area as a whole stabilised economic activity in the crisis years. At the same time, the results also suggest that this has come at a steep cost in terms of the sovereign debt level, sending debt 30 percent of
Figure 16: **Counterfactual: rule-based policy. Fiscal instruments.** Evolution of the fiscal instruments in the counterfactual with rule-based policy. Positive numbers in the figures mean that the value of the respective variable in the counterfactual is larger than the value in the baseline. Top two rows: Periphery, bottom two rows: Core. Tax rates are in levels (0.01 on the vertical axis meaning the tax rate is one percentage point higher). Government consumption and investment are expressed in percent of GDP (a 1 on the vertical axis meaning, for example, that the government consumption GDP ratio was one percentage point higher). Transfers are expressed as a ratio of GDP as well. The scaling is the same as for taxes, though (namely a 0.01 means that the transfer/GDP ratio was a percentage point higher).
GDP higher in the Periphery and about 10 percent higher in the Core.

5.5 The effect of the Periphery’s fiscal stance alone

The previous section suggests that particularly the evolution of debt in the Periphery would have been starkly different had the pre-crisis fiscal rules been applied. This suggests to have a counterfactual involving this region only. Therefore, we now look at a counterfactual in which only the Periphery implements the rules-based debt stabilization policy throughout, but in which the Core continues to implement the same level of the fiscal instruments that we actually witnessed in the crisis years. The Periphery, instead, is assumed to follow the fiscal rules throughout, with $\epsilon_t = 0$ for all instruments and periods in the Periphery. Figure 17 shows how much lower output and inflation would have been under this counterfactual.

Figure 17: **Counterfactual: rule-based policy in the Periphery only. Output, inflation, and debt.** Evolution of output, inflation and government debt in the counterfactual with rule-based policy in the Periphery only. Positive numbers in the figures mean that the value of the respective variable in the counterfactual is larger than the value in the baseline.

The figure suggests the following conclusions, which somehow runs in contrast with the commonly-established view. Keeping the fiscal mix in the Core constant, the overall pol-
icy stance followed in the Periphery has contributed to stabilise output. This can be seen by comparing the scenario shown in this section with the dynamics in the baseline. Indeed, the policy mix followed by the Periphery in the baseline has supported Periphery’s output by about one percentage point in the entire episode, at the cost of a sharp run-up in sovereign debt by 30 percent of GDP. Most of this run-up in debt occurred through mid 2012. The increase in debt is much smaller in the ZLB period from mid 2012 onward. This has to do both with the consolidation efforts in the Periphery and the fact that the remaining demand stimulus was much more cost-effective, not least due to large positive spillovers on the Core (recall the discussion in Section 4) once euro-area monetary policy became constrained.

Moreover, the above simulations can also be used to infer the effect of Core’s fiscal stance on euro-area activity. Core’s policy is characterised, in particular, by higher government spending and higher investment spending than rule-based behavior would have envisaged. This is particularly visible in the dynamics of government consumption, which increased considerably in the stimulus phase to stabilise at the higher levels thereafter. The fact that economic activity in both blocks falls considerably stronger during the lower-bound phase in the scenario underlying Figure 15 than the one underlying Figure 17 suggests that the Core’s fiscal mix has been stabilising euro-area activity in that time as well. This is in line with Section 3 which suggested that the the fiscal stance in the Core was expansionary throughout.

5.6 Caveats

This section has sought to make the point that the fiscal mix in the euro area mattered, for the individual (block) of countries and for the area as a whole. The simulations that we showed suggested that in the recent years, after interest rates hit the ZLB, both the Periphery’s fiscal mix and the Core’s have been expansionary for the area as a whole and for the respective other block. Only the Core’s mix, however, appears to have been consistent with reasonably stable debt levels at the same time. Bank bailouts

At this point, several remarks and caveats are in order. In particular, it is important to highlight the limitations of the analysis above. First, and foremost, as regards the role of sovereign risk. The model used here allows an effect of sovereign risk on economic activity
through borrowing costs for households. What we have not modelled in any way is the interaction of fiscal policy, sovereign risk, and the funding costs of firms. This seems an important avenue for further exploration. The sequence of macroeconomic shocks that we used to initialise our baseline simulation, in particular featured sizable shocks to the marginal efficiency of investment (investment shocks). Private investment has been low in the crisis years. The effect of the shocks is to depress investment in the euro area below the level of investment seen otherwise. This makes model and data reasonably consistent in an important dimension. To the extent, however, that such shocks represent financial frictions and thus the funding costs of firms, one may reasonably argue that these frictions should be endogenous both to the value of firms (and thus to taxes) and to sovereign risk. We, instead, have assumed that they are exogenous to policy. The direction in which this biases the results ex ante may not be clear. An example may suffice: if a firm’s borrowing costs depend on the sovereign spread, which in turn depends on the debt level, fiscal consolidation in the Periphery may have been less harmful to GDP than shown here. On the other hand, if government demand provides demand at a time when there is little other demand, thus stabilising firm’s cashflow, this will go in the opposite direction, and we would understate the adverse effects of fiscal consolidation.

Several elements have been left out of the model and the discussion here. For example, we abstract from labor-market frictions other than wage rigidities. Thus, we cannot capture the effect of structural reforms on fiscal revenues and expenditures; similarly, it is likely that the unemployed were more likely to be liquidity-constrained than the employed. Thus, higher unemployment rates in the Periphery than the Core, as witnessed in reality, would likely mean that transfers in the Periphery were even more supportive of economic activity activity than we find in the current paper.

Similarly, all the results shown here were conditional on the specific set of fiscal rules used for the baseline. While these rules are representative of those shown in the literature, the specifics of the results of the counterfactuals clearly will depend on the rules. Our results, thus, are indicative of the role of the fiscal mix in the euro area crisis. They will, most likely, not remain the last word, though.
6 Conclusions

Throughout the paper we have described public-sector developments since 2007 and tried to quantify their impact on the economy through the lens of economic theory and model simulations.

We look at fiscal policy developments in the euro area across three main dimensions: instrument composition, country distribution and the time structure. We do so by computing individual spending instruments, namely government consumption, government investment, and public transfers as GDP shares, together with a detailed breakdown of effective average tax rates by economic function (consumption, labor income and capital income taxes). This approach allows us to analyse fiscal developments in the overall euro area as well as in the “Core” and “Periphery” regions separately.

The data suggest distinguishing three phases: An initial stimulus phase in 2009/10, followed by a contractionary phase in the “Periphery” in 2011-2013, and a stabilization phase that set in thereafter. Once the stimulus phase in 2009/10 is taken into account, the consolidation can be largely considered an attempt to reverse the earlier stimulus, mostly driven by spending reductions and increases in labour taxes and indirect taxes.

The simulation results suggest that the beginning of the crisis marked a change in the conduct of fiscal policy. We find that this break has contributed considerably to the run-up in debt witnessed in the euro area, while helping to stabilize output and inflation. The associated run-up in debt was particularly pronounced in the “Periphery” of the euro area.

Building on the rich database that accompanies this paper, future research could focus on the effects of real-time short-term fiscal expectations, and the role they played in determining the economic evolution during the financial and sovereign crisis. The current paper has abstracted from this dimension. Another dimension that we have abstracted from is that of a more country-specific (rather than “block-specific”) assessment of the fiscal mix. The Excel files that accompany the current paper have the country-dimension readily available for the reader and for future research.
References


