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The rationale for a safe asset and fiscal capacity for the Eurozone

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Abstract

The only way to share common liabilities in the Eurozone is to achieve full fiscal and political union, i.e. unity of liability and control. In the pursuit of that goal, there is a need to smooth the transition, avoid unnecessary strains to macroeconomic and financial stability and lighten the burden of stabilisation policies from national sovereigns and the European Central Bank, while preserving market discipline and avoiding moral hazard. Both fiscal and monetary policy face constraints linked to the high legacy debt in some countries and the zero-lower-bound, respectively, and thus introducing Eurozone 'safe assets' and fiscal capacity at the centre would strengthen the transmission of monetary and fiscal policies. The paper introduces a standard Mundell-Fleming framework adapted to the features of a closed monetary union, with a two-country setting comprising a 'core' and a 'periphery' country, to evaluate the response of policy and the economy in case of symmetric and asymmetric demand and supply shocks in the current situation and following the introduction of safe bonds and fiscal capacity. Under the specified assumptions, it concludes that a safe asset and fiscal capacity, better if in combination, would remove the doom loop between banks and sovereigns, reduce the loss in output for both economies and improve the stabilisation properties of fiscal policy for both countries, and thus is welfare enhancing.

Keywords: Fiscal policy, Business fluctuations, Safe sovereign assets, Fiscal capacity

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The rationale for a safe asset and fiscal capacity for the Eurozone

1. Introduction

Financial and fiscal integration in the Eurozone is experiencing another setback, partly due to the surge in populism and the desire to bring sovereignty back to the national level. In this situation, market discipline appears as the only means that could be effective in preventing irresponsible policies and reducing moral hazard. Responding to symmetric and asymmetric shocks, when fiscal and monetary policies are constrained, may become problematic. Boosting the fiscal deficit as a countercyclical tool where there is no fiscal space may generate a doom-loop at the national level, put a strain on the Eurozone's fiscal framework and generate systemic risk for the whole economic area. Not using the fiscal lever where there is no fiscal space, may result in sub-optimal policies for both the country involved and the whole area, with the macroeconomic shock producing permanent damage to the economy. Moreover, it may frustrate the ambitions for more economic integration and risk sharing, combined with the appropriate level of control.

Two potential tools to address these challenges stand out, and in our view are tightly intertwined, even if not necessarily perceived that way in policymaking circles: the creation of a Eurozone 'fiscal capacity' and the creation of a Eurozone 'safe asset'. Both devices serve economic — albeit controversial — goals, which are to enhance the macroeconomic and financial stability of the Eurozone and remove some of the

burdens of stabilisation policies from the national sovereigns and the European Central Bank – given that both face constraints such as, respectively, high legacy debt and the zero-lower bound (ZLB). However, these devices come with other constraints, such as the need to secure political support for the inevitable sharing of financial risk and – in some scenarios – fiscal redistribution across member states.

Given these constraints, we strongly agree on the need to have unity of liability and control, i.e. a need for a full fiscal and political union in order to share liabilities, and on the aim to preserve market discipline and avoid moral hazard. In addition, we strongly agree that any control and common liabilities needs democratic legitimacy. Still, managing the transition towards a more integrated area, while minimising the economic costs and reducing risks, is in our view a necessary and desirable goal.

Specifically, the proximate purpose of a Eurozone 'safe asset' is to provide banks in the Eurozone with an asset, guaranteed jointly by the sovereigns, that they can use as collateral for interbank loans and ECB repos. Unlike the use of national sovereign debt for these purposes, the risk of haircuts associated with fiscal stress hitting the national government is small as this risk is 'shared' across the Eurozone, and eventually backstopped by the ECB. This would be a useful complement of the Eurozone macroeconomic policy framework, as it would strengthen the transmission of monetary policy as bank's balance sheets, with lending activities less exposed to national sovereign risk and fiscal policy, and with less exposure of national sovereigns to credit risk in their national banking systems.

The proximate purpose of a Eurozone 'fiscal capacity' is two-pronged. First, it would help national sovereigns to absorb 'idiosyncratic shocks', to the extent the capacity is allowed to allocate funding across member states according to their specific cyclical needs at any point in time. An example of such a device would be a Eurozone unemployment insurance or the provision of Eurozone conditional loans to national sovereigns. Second, it could be used to absorb 'common shocks', by adjusting the Eurozone aggregate fiscal policy stance, as required, in support of ECB monetary

policy, via for instance a Eurozone public works program. A point we want to make is that the creation of 'fiscal capacity', to the extent it is funded by the issuance of a 'single bond', inevitably entails the creation of a 'safe asset', even if initially perhaps not in a sufficient quantity to satisfy all of the demand for such an asset. Obviously, there are moral hazard risks associated with fiscal capacity at the centre, which need to be tackled upfront through the enforcement of conditionality. For instance, full compliance with the EU fiscal rules could be a minimum requirement for access to funding. Ultimately, countries must be allowed to default when a sovereign debt crisis strikes.

Unfortunately, the political support for the development of these devices is severely dented by insufficient fiscal discipline in some countries, nationalistic policies aimed at bringing back sovereignty, and the perception that these devices could impinge on market discipline and introduce 'moral hazard'. However, we believe that an appropriate process that links liabilities and control, while preserving market discipline, can overcome these hurdles. Hence, we think the debate must be kept alive. We share the concern that these devices entail 'moral hazard' in that they may weaken the incentives for addressing the sources of economic and political instability in the Eurozone, among which there is the persistence of significant balance sheet problems in the banking system. Strict conditionality, as mentioned earlier, is crucial.

2. The proposals that are around

2.1 Broad Objectives

Before the financial and sovereign debt crises that hit the Eurozone in 2008, the predominant conundrum was the lack of mechanisms to absorb 'asymmetric shocks'. It was argued that monetary policy, being conducted at the central level, could never absorb such shocks ('one size cannot fit all'), while fiscal policy, conducted at the national level, was heavily constrained by strict fiscal rules. Meanwhile, so-called 'alternative adjustment mechanisms', such as cross-border labour migration or

international risk sharing via the financial markets, were seen as underdeveloped in the Eurozone.

The upshot was that asymmetric shocks would unavoidably lead to temporary economic divergence. However, more importantly – once 'hysteresis' kicks in – it would contribute to persistent economic divergence, thus potentially undermining the cohesion of the Eurozone. The standard policy prescriptions to address this issue were: (i) reinforcing the EU 'Internal Market' for labour and capital so as to bolster the 'alternative adjustment mechanisms', (ii) pursuing product and labour market reform at the national level to rein in 'hysteresis' and (iii) speeding up fiscal consolidation so as to create buffers ('fiscal space') to allow the operation of 'automatic stabilisers' within the limits set by the fiscal rules[1].

Since the onset of the financial and sovereign debt crises in 2008, the challenges discussed above have become all but more severe. Specifically:

1. The sovereign debt crisis in the Eurozone gave birth to a 'doom loop'. It means (i) insolvencies in domestic banking systems translating into higher risks of default of the national sovereign (due to expectations of a debt-financed banking bailout), and (ii) higher risk of sovereign default in turn translating into funding and solvency problems for the domestic banking system as the interbank deposit market disappeared while the sovereign debt on the banks' balance sheets – which serves as collateral and for repos and ECB funding – lost market value. First steps towards a 'Banking Union' in the wake of the acute phase of the crisis have served to mitigate the 'doom loop' to some extent. However, the Banking Union is far from complete. For instance, a single European Deposit Insurance and a full-blown single banking resolution fund, backstopped by the joint sovereigns, are still missing.

[1] See for instance Codogno and Galli (2017).

2. Restructuring risk may become in itself a source of instability. The financial and sovereign debt crisis has given birth to a number of rescue mechanisms with the European Stability Mechanism (ESM) playing a pivotal role. The ESM is still evolving, and the latest innovation is the strengthening of the requirement that sovereign debt needs to be sustainable (and therefore restructured) before a country can apply for a rescue program of the ESM[2]. This is in some ways a welcome development in that it protects the taxpayer against undue support for investors in sovereign bonds of countries in distress. The fact that ESM conditions its help on the approval of its members of the debt sustainability of the country in need is not the ultimate source of financial risk: it is the (in)solvency of the country's debt that is the culprit. However, it also implies that as investors fear a haircut the risk of a sell-off once a country is hit by an adverse shock increases quickly. Hence, the approach chosen for ESM financial assistance may also become a de facto source of financial risk.

3. Monetary policy continues to edge at the brink of a de facto zero lower bound (ZLB). It is true that the European Central Bank has been running a massive asset purchase program, which has helped to push the implied effective or 'shadow' policy rate into negative territory, but there are limits to that policy as well – be it technical or political. We would argue that this limit has probably been reached as well – i.e. with the asset purchase

[2] The Euro Summit on 14 December 2018 endorsed the terms of reference on the reform of the European Stability Mechanism and asked the Eurogroup to prepare the necessary amendments to the ESM Treaty by June 2019. In the terms sheet, there is an explicit reference to the need "to improve the existing framework for promoting debt sustainability in the euro area. […] We also reaffirm the principle that financial assistance should only be granted to countries whose debt is sustainable and whose repayment capacity is confirmed. This will be assessed by the Commission in liaison with the ECB, and the ESM". The principle is "reaffirmed" as some argue it is already explicit in the preamble of the current ESM Treaty: "(12) In accordance with IMF practice, in exceptional cases an adequate and proportionate form of private sector involvement shall be considered in cases where stability support is provided accompanied by conditionality in the form of a macro-economic adjustment programme".

program completed there is only very limited monetary policy space left. This renders the Eurozone very vulnerable to symmetric shocks. We have moved from 'one size does not fit all' to 'one size fits nobody'.

2.2 Proposals for a safe asset

The general purpose of a 'safe asset' for the Eurozone is to create a security that banks could buy to serve as collateral for interbank loans and repos and ECB funding, instead of national sovereign bonds. The advantage would be that it breaks the 'banks-sovereign doom loop', i.e. the vicious circle of a sovereign under stress prompting haircuts on sovereign bonds on banks' balance sheets, thereby raising their funding cost and interest rates on loans, driving the economy into a recession, causing more fiscal stress, and so on.

By no means do we have the ambition to provide a detailed and exhaustive literature overview on the safe asset, but instead we want to characterise what we consider the main proposals regarding their mechanics and governance implications. We distinguish two main classes:

1. *ESBies.* These bonds would be issued at the centre against national sovereign bonds purchased in the secondary market according to the 'capital key' of the ECB (i.e. broadly in proportion to the national GDP and population size of each member state). On the specifics:

    a. The purchases would typically be capped at 60% of national GDP, in line with the Maastricht debt criteria. Hence, a member state wishing to issue debt over and above 60% of GDP would pay a risk premium, keeping market discipline intact.

    b. ESBies are less risky than the underlying sovereign bonds owing to diversification (generally not all sovereigns would go bust at once). Also, it is proposed to create junior and mezzanine bonds alongside the ESBies, which would absorb most, if not all of the losses, at

default of the underlying sovereign debt. As a result, ESBies would be automatically rated triple-A.

c. ESBies would be traded in the bond market and could be purchased by banks to serve as collateral and for repos. These purchases could be encouraged for instance by exempting ESBies from risk weighting to assess banks' capital requirements.

2. *E-Bonds.* These bonds would be issued by an existing or newly created triple-A issuer at the centre with a joint guarantee from the sovereigns[3]:

a. Unlike ESBies, the money raised in the market would not be used to purchase national sovereign bonds in the secondary market but instead to provide 'soft' loans to national sovereigns. These loans would not be used to fund government deficits, but rather to replace sovereign debt in circulation as it matures, hence would be phased in gradually.

b. In most proposals, these loans would be capped at 60% of national GDP, in line with the Maastricht debt criteria. Hence, a member state wishing to issue debt over and above 60% of GDP would have to turn to the market and pay a risk premium.

c. These 'soft loans' could be issued in the form of bonds with a guarantee from the joint sovereigns, sometimes labelled 'blue bonds' (as opposed to 'red bonds' issued without such a guarantee). Otherwise, E-bonds serve the same purpose as ESBies.

A potential drawback of the E-bonds proposal is that there is a relatively long transition period in which unprotected sovereign bonds are gradually replaced with 'blue bonds' as they mature. Eurozone stability in the meantime would be vulnerable

[3] On the specifics, see Zettelmeyer and Leandro, 2018.

as the new sustainability requirements of the ESM, as noted earlier, potentially add fuel to the sovereign-banks doom loop via the threat of restructuring. For some years, the current situation would effectively not change. One proposal to address this is to exempt sovereign debt to this requirement up to an amount that corresponds to the debt cap enshrined in the Fiscal Compact[4].

Other proposals have been floated, but these can generally be seen as variants of the above devices. For instance, the European Commission has floated a proposal for 'Stability Bonds' which refers to the joint issuance of sovereign bonds at the centre with a joint guarantee, with the proceeds allocated to the member states according to the capital key (European Commission 2011). This is similar to the E-bonds proposal[5].

2.3 Proposals for fiscal capacity at the centre

The key tenet of proposals for fiscal capacity is to create a central fiscal authority, which can issue debt that in turn serves to fund new expenditure, either at the centre or at the national level. As a result, it directly affects the fiscal policy stance either at the national level or in aggregate (or both). This property distinguishes it from the safe asset proposals, which a priori do not affect the fiscal stance as they only aim to securitise in some shape or form already existing sovereign debt. Even so, fiscal capacity proposals generally entail (or at the minimum prepare the ground for) the creation of a single Eurozone 'sovereign' bond which could serve as a safe asset for banks. We distinguish three strands of proposals.

1. *Loans from the centre*. This is the least radical option – actively promoted by the European Commission – which entails the provision of loans from a newly created fiscal capacity to member states in recession, subject to conditionality (for instance they need to respect their commitments under

[4] See for this proposal Bini Smaghi and Marcussen (2018).

[5] There are also some drawbacks. Tranching would reduce liquidity, which may call for higher premia. Moreover, the convex shape of the credit curve may also imply higher average cost of borrowing.

the EU fiscal rules). The rationale is that such a fiscal capacity at the centre could borrow at better terms, i.e. lower rates than the national sovereign could and as such is welfare enhancing. This device is distinct from loans extended by the ESM, which are not meant to be used for fiscal stimulus purposes at all. ESM loans are subject to the member state concerned adopting an adjustment programme and presumably restructuring their sovereign debt. However, the funding mechanism, i.e. the issuance of bonds at the centre to finance top-down loans, is similar and so is the principle that the loans will have to be repaid in full. E-Bonds follow this approach.

2. *Public works at the centre and top-down grants*. One step further in the direction of a full 'fiscal union' concerns proposals to create an entity at the centre that can raise its own tax, for instance, a Eurozone VAT surtax, and raise capital through bonds issued against future tax proceeds. The capital thus raised could be spent on public works that transcend national interests (or much more controversially a European army) or handed out as grants (as opposed to loans) to the national sovereigns in accordance with the capital key. In principle this would not entail a redistribution of fiscal means across member states as long as the VAT base is close enough to the capital key, but it would entail fiscal stimulus (or fiscal restraint when grants and bond issuance are rolled back) for the euro area as a whole over and above national fiscal policies.

3. *Horizontal transfers*. The ultimate step towards fiscal union is to allow the fiscal entity at the centre to spend tax proceeds and capital raised in the bond market on public (welfare or other) programmes in the member states, according to their 'cyclical' needs. The most well-known example would be the creation of a Eurozone unemployment insurance, which could not only run deficits or surpluses at the centre (and hence affect the aggregate Eurozone fiscal stance) but could also run deficits in some

> member states and surpluses in others at any point in time. These deficits and surpluses would have to be purely cyclical in nature, i.e. they would cancel out both over time and across countries. Obviously for this 'neutrality' principle to hold is required that shocks in all countries are drawn from the same distribution and that the rules (for instance unemployment benefit rules), and their implementation, are identical across countries and over time[6].

Each of these devices has more or less far-reaching consequences for Eurozone governance. A safe asset without fiscal capacity at the centre will not influence the aggregate fiscal stance and macroeconomic policy mix, and since for new deficit spending the member state has to turn to the market, the incentives for fiscal discipline would not change much. As a result, while tighter surveillance of national fiscal policy may be welcome in its own right, there is little in these devises that would require even more fiscal surveillance. On the other hand, a change in financial regulation would be required to encourage the use of safe bonds by banks instead of national sovereigns, such as the still hotly debated introduction of risk weighting. More generally, financial risk stemming from the banking system would be reduced, thus facilitating financial surveillance by the single supervisor and national supervisors. Finally, the transmission of monetary policy would be facilitated.

By contrast, the creation of fiscal capacity, according to more conservative views would invite a Trojan horse of centralised fiscal policy, with all the risks of fiscal dominance this might entail. This is much less the case if all fiscal capacity could do is extending loans to stopgap national sovereigns, funded by centrally issued debt. However, fiscal capacity that can accord debt-funded grants to member states is subject to credit risk and hence could be susceptible to exerting pressure on the European Central Bank to keep policy rates low (fiscal dominance). If the central entity

[6] This, by the way, raises a huge political problem as, in some circumstances, high-unemployment countries would have to pay benefits to low-unemployment countries even though the unemployment gap remains wide.

enjoys taxing power, it could also be susceptible to squeezing national tax bases. Therefore, it could be argued that a fiscal capacity of that kind would need to be subject to democratic control at the Eurozone level. This is, arguably even more, the case if the fiscal capacity has the power to redistribute fiscal resources across member states. Barring such democratic control, strict conditionality for access to loans extended by the fiscal capacity would be crucial.

3. Assessing the proposed devices: an analytical framework

To assess the macroeconomic stabilisation properties of the proposed devices, we make use of a standard Mundell-Fleming model, adapted to the features of a closed monetary union (a single supra-national monetary policy with multiple national fiscal policies). We adopt a two-country setting comprising a 'core' country and a 'periphery' country [7]. The 'periphery' country differs from the 'core' country in only one aspect, which is its smaller fiscal policy space, due for instance to a higher public debt burden accumulated in the past and a comparatively poor reputation in the financial markets, reflected in a higher sensitivity of sovereign bond yields to fiscal expansions. Otherwise, we assume the two economies to be identical.

Alongside the two national sovereigns, we include a supra-national entity (dubbed 'fiscal capacity') which can issue a single bond with a guarantee from the national sovereigns. It can earmark the money raised to either purchase existing sovereign bonds in the secondary market, or issue new loans (over and above existing debt) to the national sovereigns. In the former case, the single bond solely serves as a 'safe asset' for banks to replace existing sovereign debt on their balance sheet, whereas in

[7] The model developed in this section is based on a two-country version of the single-country model developed by Buti *et al* (2002) which has similarities with the model developed in Buti et al (2003), except that we assume here most model parameters to be strictly identical (symmetric) across countries.

the latter case it serves to fund a supra-national fiscal expansion (a 'fiscal capacity' proper). The money raised in the latter case is distributed to the national sovereigns according to a simple rule, for which we examine two alternatives. In the first alternative, the funds are allocated to minimise the aggregate output loss (in the wake of an adverse shock), whereas in the second alternative the allocation of funds is geared to minimising the difference in output losses between the two countries. We will show that these are mutually incompatible goals, notably when shocks are asymmetric.

3.1 The real economy

As noted, we use a standard Mundell-Fleming approach, adapted to the features of a closed monetary union[8]. The aggregate demand equations read:

$$(1) \qquad \begin{cases} y^d = -\phi_1(r - \pi^e) + \phi_2(d + f) - \phi_3(\pi - \pi^*) - \phi_4(y - y^*) + \varepsilon^d \\ y^{*d} = -\phi_1(r^* - \pi^e) + \phi_2(d^* + f^*) + \phi_3(\pi - \pi^*) + \phi_4(y - y^*) + \varepsilon^{*d} \end{cases}$$

An asterisk (*) indicates the periphery country. In each country aggregate demand, y^d and y^{*d}, is determined by the real interest rate $r - \pi^e$ and $r^* - \pi^e$ (where π^e denotes 'expected inflation' which is assumed to be uniform across the monetary union), the primary fiscal deficit (d and d^*) and cross-border trade. The latter is a function of the inflation differential ($\pi - \pi^*$), and the relative pace of economic growth ($y - y^*$). In addition, we include the fiscal multiplier effect of transfers from the 'fiscal capacity', denoted by f and f^*. For simplicity, we assume the fiscal multipliers to be the same for national and supra-national fiscal expansions (or contractions). Finally, ε^d and ε^{*d} are demand shocks.

Aggregate supply y^s and y^{*s} is determined via an inverted Phillips-curve type of equation, including the inflation 'surprises' $\pi - \pi^e$ and $\pi^* - \pi^e$ and supply shocks ε^s and ε^{*s}:

[8] See note 2.

$$(2) \qquad \begin{cases} y^s = (\pi - \pi^e)/\omega + \varepsilon^s \\ y^{*s} = (\pi^* - \pi^e)/\omega + \varepsilon^{*s} \end{cases}$$

The parameter ω captures the slope of the Phillips-curve. All variables are defined as deviations from a not specified steady state and, accordingly, expected inflation is assumed to be nil $\pi^e = 0$ and all shocks are normally distributed around nil.

The interest rates r and r^* can be seen as the rate charged on bank loans, which we assume to carry a risk premium over and above the monetary policy rate i, induced by fiscal developments. Specifically, as sovereign debt serves as collateral for interbank loans and repos, a deterioration in the fiscal position will raise the funding cost for banks (who are facing a bigger haircut on their collateral) which will be passed through into higher interest rates on domestic loans. The degree to which this mechanism is at play depends on the initial balance sheet situation of banks and the sovereign: if banks carry a lot of non-performing loans and/or their initial sovereign debt portfolios are sizeable relative to their capital, the impact of a deterioration of the fiscal position on domestic interest rates will be stronger. This aims to capture the 'doom loop' that hit the periphery more so than the core and may further increase with the new requirement that sovereign debt needs to be sustainable (and therefore restructured) before a country can apply for a rescue programme of the ESM[9].

[9] The penalty on bank lending rates applies to the periphery but not to the core. However, bank lending rates may be due to a number of factors not related to the sovereign-banks doom loop described in the paper. Other channels may transfer the rising sovereign risk to bank credit risk, such as the government guarantees on the banking sector. Appropriate policies, i.e. bank resolution framework, supervision, etc., may mute the effects of these channels. Moreover, for the banks there may be a tradeoff between increasing banking rates and reducing bank loans, i.e. improving the quality of their bank portfolio. Although these two effects may have different impacts on the economy, to maintain the exercise simple we assume that bank loan spreads can also represent other possible transmission mechanisms.

Given that we consider the 'core' country to have a fiscally prudent history and the 'periphery' country a profligate one, we assume only the 'periphery' country's bank lending rate carries a risk premium[10], so:

$$(3) \qquad \begin{cases} r = i \\ r^* = i + \eta d^* \end{cases}$$

The variables f and f^* do not enter equations (3) since these do not add to the market debt of the national sovereigns (as these are grants or loans from fiscal capacity in exchange for IOUs), they will not lead to haircuts on banks' collateral.

The primary fiscal deficits d and d^* are partly endogenous on the account of 'automatic stabilisers' (e.g. variations in tax proceeds or social security outlays as a function of cyclical economic activity), so:

$$(4) \qquad \begin{cases} d = -\tau y + g \\ d^* = -\tau y^* + g^* \end{cases}$$

where g and g^* denote the stance of the 'structural' or 'discretionary' (as opposed to the 'cyclical' or 'induced') component of the fiscal deficit in each country and τ roughly corresponds to the tax burden, or size of the government sector relative to aggregate output, in each country.

[10] In the model, the penalty on the bank lending rate is only applied for national fiscal expansions, which is the identifying assumption and thus crucial to derive the result that centralised expansions are more desirable. Admittedly, there is the possibility that centralised expansions are financed via common debt and thus the high-risk countries are compensated by low-risk countries. However, if the safe asset is de facto backstopped by the ECB, fiscal expansions at the centre would carry no risk other the risk of inflation and tighter monetary policy in the future. Without a backstop, indeed, there is sovereign risk that is henceforth shared between the core and the periphery, and therefore yields in the core would end up higher than baseline. The experience of the Outright Monetary Transactionss (OMT) seems to suggest that the 'insurance' offered to the periphery did not translate into higher rates at the core. Moreover, if the whole point of a safe asset is that it enjoys a central bank backstop, then the yield curve may steepen after fiscal expansion at the centre. However, this would not be different from the baseline case, and thus we have not included it in the model.

The model is perfectly symmetric across the countries with regard to all parameters, with one exception, which is that $\eta > 0$, to capture the banks-sovereign 'doom loop' in the periphery. However, as discussed in more detail in section 4, once a 'safe asset' is introduced and has replaced the national sovereign bonds as collateral for banks this asymmetry will disappear and hence $\eta = 0$.

Reduced form equations for output and inflation may be derived from equations (1) – (4) assuming that $y^d = y^s = y$, $y^{*d} = y^{*s} = y^*$. We assume, for convenience, that $\pi^e = 0$. The math remains quite cumbersome (see Annex 2), so we resort to shorthand notation (signs of first derivatives indicated above variables):

(5) $$y = y\overset{- + ? + + + + + -}{(i, g, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s})}$$

(6) $$y^* = y^*\overset{- + ? + + + + - +}{(i, g, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s})}$$

(7) $$\pi = \pi\overset{- + ? + + + + - -}{(i, g, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s})}$$

(8) $$\pi^* = \pi^*\overset{- + ? + + + + - -}{(i, g, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s})}$$

From these reduced-form equations, the following can be inferred:

1. Fiscal expansions in the 'core' boost output and inflation in both countries. This is a priori not clear for fiscal expansions in the 'periphery'. Only if in the 'periphery' the negative feedback via costlier bank lending falls short of the standard multiplier effect of fiscal policy will the net impact be positive. This requires that $\eta < \phi_2/\phi_1$, a condition that is satisfied by mainstream empirical estimates (in our numerical examples we assume

that $\eta = 0.2$, $\phi_1 = 1$ and $\phi_2 = 0.5$)[11]. Even so, the overall output impact of fiscal expansions in the periphery is muted by the bank lending channel.

2. Fiscal expansions conducted by the 'fiscal capacity' are unambiguously positive for output and inflation in both countries as this does not impinge on the bank lending channel. Similarly, monetary policy easing is unambiguously positive for output and inflation in both countries, and so are (positive) demand shocks (and vice versa for adverse demand shocks).

3. For supply shocks, the impact is more diverse than for demand shocks. Domestic supply shocks have an unambiguously positive impact on domestic output and a negative impact on domestic inflation. However, positive supply shocks abroad have a negative impact on output at home due to a loss of competitiveness. Supply shocks have an unambiguously negative impact on inflation at home and abroad.

The monetary and discretionary fiscal policy variables in our model (i, g, g^*, f, f^*) are endogenously determined via a set of policy reaction functions. However, rather than postulating these reaction functions (e.g. a Taylor rule for monetary policy) we will derive these from welfare loss minimising behaviour by the relevant actors (the central bank, the national governments and the 'fiscal capacity'). We will now turn to each of these policy instruments separately.

3.2 Monetary policy

The central monetary authority is assumed to minimise the welfare loss $L_{\bar{\pi}}$ associated with aggregate inflation $\bar{\pi}$ measured against targeted inflation (assumed to be nil). Monetary policy may be subject to 'inertia', i.e. the monetary authority tolerates some

[11] See for instance Baldacci and Kumar (2010) for the impact of the fiscal deficit on sovereign yields and Hervé et al (2010) for the fiscal and monetary policy multipliers.

deviation from targeted inflation in order to avoid socially costly swings in the interest rate:

$$(9) \qquad \begin{cases} \min_{i} L_{\bar{\pi}} = \frac{1}{2}\bar{\pi}^2 + \alpha\frac{1}{2}i^2 \\ \bar{\pi} = \frac{1}{2}\pi + \frac{1}{2}\pi^* \end{cases}$$

where α measures the welfare cost of interest rate volatility relative to that of missing the inflation target. The monetary policy reaction function then reads (see Annex 2):

$$(10) \qquad \overset{+\ ?\ +\ +\ +\ +\ -\ ?}{i = i\left(g, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\right)}$$

The signs of the impact responses of monetary policy are unambiguous and straightforward, except in the cases of fiscal expansion in the periphery and a supply shock in the periphery. The reason for the former is again that a priori it cannot be ruled out that a fiscal expansion in the 'periphery' is contractionary due to the predominance of the bank lending channel, although again this is not what empirical estimates suggest (see above). For supply shocks in the 'periphery', the reason is similar: a supply shock, via the automatic fiscal stabilisers, could, in theory, improve the fiscal situation, reduce the cost of credit, and thus trigger a tightening of monetary policy.

3.3 National fiscal policies

The national governments in both countries are assumed to minimise the welfare loss L_g or L_{g^*} associated with variations in their output gap (the deviation of output from its steady state equilibrium). Akin to monetary policy, fiscal policy is subject to inertia due to adjustment costs associated with a change in policy:

$$(11) \qquad \begin{cases} \min_{g} L_y = \frac{1}{2}y^2 + \beta\frac{1}{2}g^2 \\ \min_{g^*} L_{y^*} = \frac{1}{2}y^{*2} + \beta\frac{1}{2}g^{*2} \end{cases}$$

where β represents the cost of changing the budget relative to excess demand or supply. Minimisation of these welfare losses yields reaction functions for fiscal policy in both countries, which in short-hand notation read (see Annex 2):

$$(12) \qquad g = g\overset{+\ ?\ -\ -\ -\ -\ +}{\left(i, g^*, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\right)}$$

$$(13) \qquad g^* = g^*\overset{+\ -\ -\ -\ -\ -\ +\ -}{\left(i, g, f, f^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\right)}$$

Similar to the earlier policy reaction functions, there is ambiguity with regard to the impact of fiscal expansion in the periphery, and for the same reasons as discussed above (possible predominance of the bank lending channel of fiscal policy). Otherwise, the impulse responses are straightforward in light of the earlier discussion, with again supply shocks abroad triggering fiscal expansions at home to offset the loss of competitiveness.

3.4 The 'fiscal capacity'

While the welfare loss functions as formulated for monetary and national fiscal policies are relatively straightforward, it is not a priori clear what objectives the 'fiscal capacity' should pursue. In very general terms, its goal could be to 'promote the stability of the monetary union', but stability has at least two dimensions:

1. 'Stability' could refer to the need to stem the cyclical fluctuations in the aggregate output of the monetary union as a whole. The 'fiscal capacity's role would then be to support monetary policy in the pursuit of its aggregate inflation goal. As such it would ease some of the burdens of monetary policy and help to establish a more balanced (fiscal-monetary) policy mix for the monetary union as a whole. This could be desirable if monetary policy is over-stretched (as some would argue is currently the case in EMU), i.e. its effectiveness is constrained by the zero-lower bound.

2. However, 'stability' could also refer to the 'cohesion' of the monetary union: too much cyclical divergence between the members of the monetary union potentially undermines its cohesion and the role of the 'fiscal capacity' would be to minimise this divergence. As such, the 'fiscal capacity', rather than relieving pressure on monetary policy, would then support or ease the burden for national fiscal policies. This could be particularly welcome where fiscal policy in the 'periphery' is constrained by the banks-sovereign 'doom loop'.

If we take the first objective as our guide, the welfare-loss function the 'fiscal capacity' aims to minimise would read:

$$(14) \quad \begin{cases} \min_{f,f^*} L_{\bar{y}} = \frac{1}{2}\bar{y}^2 + \gamma\frac{1}{2}(f^2 + f^{*2}) \\ \bar{y} = \frac{1}{2}y + \frac{1}{2}y^* \end{cases}$$

where the parameter γ captures the adjustment costs associated with supra-national fiscal policy relative to cyclical fluctuations in the aggregate output gap. The adjustments cost could stem from the political capital that is 'consumed' whenever the 'fiscal capacity' intervenes as there will probably always be latent – if not overt – political opposition. This gives rise to the following reaction functions (see Annex 2):

$$(15) \quad f = f\overset{+\ -\ -\ ?\ -\ -\ +\ -}{\left(i, f^*, g, g^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\right)}$$

$$(16) \quad f^* = f^*\overset{+\ -\ -\ ?\ -\ -\ +\ -}{\left(i, f, g, g^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\right)}$$

We see here the same ambiguities with regard to the impact of fiscal expansions in the 'periphery' and for the same reason. Interestingly, there is a potential asymmetry about the impact of supply shocks. Positive supply shocks in the 'core' would trigger a fiscal expansion at the supra-national level (assuming there is 'fiscal capacity' to begin with) to offset the loss in competitiveness in the 'periphery' that is not neutral for the monetary union as a whole due to its demand spillover effects via the bank

lending channel. The same reasoning holds for the negative signs on supply shocks in the 'periphery' in equations (15) and (16).

If, however, we take the second objective as our guide, the 'fiscal capacity' may be expected to minimise the welfare loss stemming from deviations of these fluctuations from one country against the other:

$$(17) \quad \{ \begin{array}{c} \min_{f,f^*} L_{\bar{\bar{y}}} = \frac{1}{2}\bar{\bar{y}}^2 + \gamma\frac{1}{2}(f^2 + f^{*2}) \\ \bar{\bar{y}} = \frac{1}{2}y - \frac{1}{2}y^* \end{array}$$

where $\bar{\bar{y}}$ gauges the (standard) deviation of output fluctuations from the mean, as opposed to the mean of these fluctuations themselves ($\bar{y}$). This gives rise to the following policy reaction functions (see Annex 2):

$$(18) \quad f = f\big(i, f^*, g, g^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\big) \quad (-\ +\ -\ +\ -\ +\ -\ +)$$

$$(19) \quad f^* = f^*\big(i, f, g, g^*, \varepsilon^d, \varepsilon^{*d}, \varepsilon^s, \varepsilon^{*s}\big) \quad (+\ +\ +\ -\ +\ -\ +\ -)$$

Interestingly, we now find opposing effects of monetary policy, with a monetary contraction producing a fiscal contraction by the fiscal capacity in the 'core' and expansion by the fiscal capacity in the 'periphery'. This occurs because a monetary contraction fuels the banks-sovereign doom loop in the 'periphery', and therefore fiscal support in the 'periphery' and fiscal contraction in the 'core' is called for to stem cyclical divergence. More generally, fiscal policy at the supra-national level tends to go in opposite directions in one country relative to the other, for a given shock to stem cyclical divergence.

We think this is an important result from our analysis at this point. It goes to show that fiscal transfers from one country to the other are inevitable if 'fiscal capacity' pursues goals other than just the stabilisation of the aggregate business cycle or, as we will show in section 4, if the banks-sovereigns 'doom loop' is active. However, if 'fiscal capacity' is geared towards stabilising aggregate output (regardless of cross-country

divergence), such transfers are highly unlikely. We will turn this again in the next section.

A final observation is in order about the assumed symmetry of the inflation proneness between the periphery versus the core. Before the financial crisis, inflation in the periphery persistently outpaced that in the core. Some of this may be attributable to asymmetric demand and supply shocks associated with the creation of the single currency, such as the removal of exchange rate risk on international capital flows. The latter has been an essential driver of the real estate booms and the associated reallocation of resources to construction activity in parts of the periphery, which in turn may have contributed to an inflation differential between the two blocks. However, there may have been parametric divergences as well, due to supply rigidities in the periphery and differences in inflation expectations, which can be represented by reformulating equations (2) as:

$$\text{(2a)} \quad \begin{cases} y^s = (\pi - \pi^e)/\omega + \varepsilon^s \\ y^{*s} = (\pi^* - \pi^{e*})/\omega^* + \varepsilon^{*s} \end{cases}$$

where $\omega^* > \omega$ and $\pi^{e*} - \pi^e = f(\pi^* - \pi)$. This implies that – all else equal -- demand stimulus in the periphery would turn out more inflationary than in the core. This would have two effects, one being a loss in international market share of the periphery to the core (the competitiveness channel) and the other one being a loss of domestic demand in the core relative to the periphery due to a widening of the real interest rate differential (the real interest rate channel). In our view the net effect of these two channels on the levels of economic activity in the two blocks (as opposed to the split between net exports and domestic absorption in each block), to the extent this is attributable to parametric divergence, is likely to be small and will be ignored for the sake of tractability.

4. Assessing the proposed devices: results

Given that we have identified the relevant policy reaction functions it is possible to solve the model for each of the five policy instruments (i, g, g^*, f, f^*). This solution represents a 'Nash equilibrium', i.e. an uncoordinated equilibrium in which all actors pursue their goals independently. Independence in this case has a specific formal meaning, which is that each actor pursues his own welfare loss minimisation goals without considering ex ante how the other actors might respond.

4.1 Numerical calibration of the model

Despite its relative simplicity, the model is still excessively complex to derive the Nash equilibria analytically so that we will resort to numerical solutions. The assumed baseline values for the parameters are listed in Table 1. These values are based on the mainstream literature but are by no means written in stone and are open to discussion. However, we do believe their order of magnitude is broadly correct. We will here briefly discuss the rationales for our picks.

Table 1: Numerical calibration of the model [a]

Parameter	Value	Source
τ	0.5	Girouard and André (2005)
ω	0.25	Ball et al (2013), Llaudes (2005)
η	0.2	Baldacci and Kumar (2010)
ϕ_1	1.0	Clements at al (2001)
ϕ_2	0.5	Baum et al (2012), Barrell et al (2012)
ϕ_3	0.5	Bayoumi et al (2011), ECB (2013)
ϕ_4	0.5	Bayoumi et al (2011), ECB (2013)

a. See the explanation in the main text.

For the responsiveness of the primary fiscal deficit to variations in economic activity gauged by the parameter τ estimates are available in Girouard and André (2005). The average estimate for the Eurozone countries in their sample is 0.48. The difference in their estimates for the averages for the core (0.51) and periphery (0.46) is negligible (the core countries in their sample are Austria, Belgium, Finland, France and the Netherlands, and the periphery countries in their sample are Ireland, Italy, Portugal and Spain). Accordingly, we assume that $\tau = 0.5$.

The parameter gauging the slope of the Phillips curve ω is based on two studies that estimate, respectively, the semi-elasticity of inflation with regard to the unemployment rate and the semi-elasticity of the unemployment rate relative to real output. Specifically:

1. Ball *et al* (2013) provide estimates for the former for a series of advanced economies, including nine Eurozone countries for which they on average estimate -0.45. The variation across countries of this estimate is quite limited, and in fact, the averages for the core countries (Belgium, Finland, France, Germany, Netherlands) and periphery countries (Ireland, Italy, Portugal, Spain) in the sample are also -0.45.

2. Conveniently, Llaudes (2005) provides estimates for the latter including for the same set of Eurozone countries covered by Ball et all (2013). Their average estimate for the Eurozone countries is -0.54, with their average estimate for the core at -0.58 and the periphery at -0.49. These are probably not statistically different.

Based on these estimates, we assume that $\omega = 0.25$ (very close to the multiple of the above two estimates -0.45 x -0.54 = 0.24).

Clements et al. (2001) estimated interest rate multipliers, which for the euro area as a whole are -1.1 after six quarters, -1.1 after eight quarters, and -0.8 after twelve quarters. There are some noticeable differences between countries, but these do not seem to be

systematic concerning whether a country is core or periphery[12]. Given this, it looks reasonable to assume that $\phi_1 = 1$.

Baldacci and Kumar (2010) show that an increase in the fiscal deficit by one percentage point raises the sovereign yield by 20 basis points on average for a sample of advanced and emerging market countries. This impact can be larger if the initial fiscal position of a country is 'poor' (high debt and deficit), up to 60 basis points. However, since this sample includes countries with extremely vulnerable fiscal situations, such as Venezuela, Bolivia and Brazil, we will take the baseline estimate in Baldaci and Kumar (2010) as our guide, hence assume that $\eta = 0.2$.

For the fiscal multiplier $\phi_2$there is a wide range estimates available in the literature, with their size depending inter alia on the openness of the economy, due to import leakages. Baum et al (2012) estimate for the G7 (minus Italy) multipliers in the range of 0.7 to 1.3 for changes in public expenditure and in the range of 0 to 0.4 for tax revenues. Barrell et al (2012) for eighteen OECD countries (including EMU countries) estimate multipliers for government consumption of 0.53 in the core (Austria, Belgium, Finland, France, Germany, Netherlands) and 0.66 in the periphery (Greece, Ireland, Italy, Portugal, Spain). For social benefits, they estimate 0.26 for the core, and 0.17 for the periphery. Their tax multipliers are small overall, of the order of 0.1-0.2. So, it would seem that ϕ_2 should be in the range of nil to 0.5, but since our fiscal multiplier is before subtraction of trade leakages (which are modelled separately, see below), we adopt a value at the upper end of this range, i.e. $\phi_2 = 0.5$.

Estimates for the parameters that capture cross-border trade, ϕ_3 for absorption and ϕ_4 for competitiveness, are available in Bayoumi et al (2011). They provide separate estimates for the Eurozone prior to the creation of the single currency and after its creation, suggesting that the impact of competitiveness has increased. Specifically, their estimate for the price elasticity of intra Eurozone exports is around -1 before and

[12] After eight quarters the multiplier is 1.1 for the core and -1.0 for the periphery, with slightly larger but still modest differences for shorter and longer time horizons.

-1.5 after the adoption of the euro. Their estimate of the foreign demand elasticity of exports is around 1.5 (both before and after the adoption of the euro). However, since these elasticities are estimated through export equations, we need to multiply them by the share of intra-area exports in GDP. According to the ECB (2013), these shares average around 40% in the core and 30% in the periphery. We will ignore this difference and multiply the elasticities of Bayoumi et al (2011) by 0.35, which yields (rounded to the first decimal) $\phi_3 = \phi_4 = 0.5$.

Finally, for the inertia coefficients in the welfare loss functions α, β and γ, we have adopted a value of 0.1, which means that the fiscal and monetary authorities value the cost of deviating from their policy goal ten times as much as the cost of changing their policy instrument variable(s). This is an arbitrary choice, but alternative experiments with our model (not reported here) indicate that significantly higher values of the inertia coefficients do not alter the thrust of the results.

The shocks in our experiments are fixed at, respectively, $\varepsilon^d = \varepsilon^{*d} = -5\%$ (symmetric demand shock), $\varepsilon^d = -\varepsilon^{*d} = 5\%$ (asymmetric demand shock), $\varepsilon^s = -\varepsilon^{*s} = 5\%$ (symmetric supply shock) and $\varepsilon^s = -\varepsilon^{*s} = 5\%$ (asymmetric supply shock). To facilitate the discussion the results for each of these sets of shocks are presented in graphical form in Annex 1.

4.2 The current situation

In the current situation, the 'doom loop' is still intact, so we keep the baseline value $\eta = 0.2$. Obviously, there is no 'fiscal capacity' and hence we assume that $f = f^* = 0$. From the impulses responses shown in Charts (1a) and (1b) the following can be inferred:

1. After a symmetric demand shock, fiscal stimulus in the 'periphery' falls short of that in the 'core', the former being held back by the need to contain the widening yield spread. If the demand shock is asymmetric, the 'core' tightens fiscal policy more than the 'periphery' eases it, as may be expected

given the need to contain the rise in the yield spread. Not surprisingly, output stabilisation works out better in the 'core' than in the periphery.

2. After a symmetric supply shock inflation kicks in materially and hence monetary policy is tightened. This is not the case when the supply shock is asymmetric due to the offsetting forces on inflation in the two economies. Either way, fiscal policy in the core responds more strongly than in the periphery for the same reason as above.

The upshot is that the asymmetric response of the cost of credit to fiscal developments hampers a fiscal response in the 'periphery', which implies an asymmetry also in the impulse response of output. Hence, regardless of the type of shock, the 'periphery' is always worse off in the current situation.

4.3 A safe asset

The introduction of the safe asset removes the doom loop, and hence we assume that $\eta = 0$. With that, the impulse responses of both countries become perfectly symmetric, as is confirmed in Charts (2a) and (2b):

1. After a symmetric demand shock, fiscal stimulus is now indeed symmetric, while the yield spread on bank loans disappears. Importantly, the output loss is smaller for both economies relative to the present situation, indicating that the introduction is a win-win from a macroeconomic stabilisation point of view.

2. After an asymmetric demand shock, the safe asset allows the periphery to ease fiscal policy more and hence to contain the output loss more relative to the current situation. The yield spread on bank loans narrows relative to the current situation, and inflation is somewhat higher.

3. The safe asset creates some space for the periphery to expand its fiscal policy more than in the baseline also in the case of a symmetric supply

shock. The output imbalance diminishes as a result. However, the safe asset is of little significance for the impulse responses to asymmetric supply shocks.

Overall, the introduction of a safe asset improves the stabilisation properties of fiscal policy, from which both countries benefit, especially in the case of symmetric demand shocks.

4.4 Fiscal capacity aimed at macro-stabilisation

We now introduce fiscal capacity able to provide (additional) fiscal impetus, geared towards stabilisation of the aggregate business cycle. We compute the Nash equilibria for cases both without and with the creation of a 'safe asset' to replace sovereign bonds on banks' balance sheets. The main findings are that (see Charts 3a and 3b):

1. The output losses after a symmetric demand shock are smaller relative to the current situation for both countries. Fiscal capacity at the centre provides additional stimulus to both countries, while fiscal stimulus of the national sovereign falls in the 'periphery' (to limit the widening of the yield spread). However, when also a safe asset is introduced, fiscal stimulus in the periphery partly shifts back from the fiscal capacity to the national sovereign, though overall stimulus increases.

2. In the case of supply shocks, be they symmetric or asymmetric, the fiscal capacity is relatively ineffective, even in combination with a safe asset. This is obviously due to the nature of the shocks (demand stimulus is of no help when supply shrinks). When the supply shocks are asymmetric, demand stimulus at the supra-national level aimed at the aggregate output has no impact at all.

Overall, fiscal capacity aimed at the aggregate cycle (on its own but even more so in combination with a safe asset) provides a relatively powerful stabilisation mechanism in the case of demand shocks but is by comparison of little help in the case of supply shocks, especially when these are asymmetric.

4.5 Fiscal capacity aimed at minimisation of cyclical divergence

In our final set of impulse responses, we look at the case where the fiscal capacity minimises cyclical divergence. Cyclical divergence is absent when shocks are symmetric, and the doom loop neutralised, so in that case, we a priori do not expect the fiscal capacity to be able to make any significant contribution to achieving stabilisation policy goals. Only when the shocks are asymmetric and/or the doom loop operates would this be different. These priors are confirmed by the impulse responses reported in Charts (4a) and (4b):

1. When the demand shock is symmetric, the fiscal capacity makes some difference as it helps to offset the asymmetric output response to the shock resulting from the doom loop. However, addressing the doom loop itself – through the introduction of a safe asset – is much more powerful.

2. When the demand shock is asymmetric, the introduction of fiscal capacity shifts the onus of the overall fiscal expansion from the core to the periphery, with the fiscal capacity running a surplus in the core, which implies a transfer from the core to finance the fiscal capacity's deficit in the periphery. With a safe asset introduced alongside the fiscal capacity also, the periphery sovereign can expand its fiscal policy (relative to baseline) as well.

3. Our conclusion with regard to supply shocks in the previous section – that the fiscal capacity adds little value in that case also holds when the fiscal capacity is aimed at minimising cyclical divergence. Demand stimulus to offset supply shocks is just not a good idea.

The upshot is that combining of safe asset and fiscal capacity aimed at minimising cyclical divergence form a powerful way to address asymmetric demand shocks, but it also implies a cross-country fiscal transfer as the fiscal capacity runs a surplus in the core and a deficit in the periphery.

5. Conclusions

Addressing structural weaknesses and building up countercyclical fiscal balances is a requirement for all countries in the Eurozone. Any sharing of risk or liability is not going to happen without countries' giving up sovereignty (i.e. unity of liability and control). Without giving up sovereignty completely, the moral hazard needs to be addressed by strict enforcement of the fiscal rules and allowing countries to default.

Taking into account the above, the paper makes a very simple point: it is welfare enhancing, i.e. good from an economic point of view, to have a mechanism to absorb negative symmetric and asymmetric shocks smoothly, both for the Eurozone periphery and the core. The vulnerability implicit in high debt-to-GDP and the ZLB tends to magnify shocks, and the extra stress disproportionally falls on the periphery. The responsible conduct of policies, while desirable, would still not protect the periphery from being hit disproportionately by shocks. In countries outside of the Eurozone, monetary policy and the exchange rate provide a buffer to absorb shocks. Within the Eurozone, countries gave up these tools (and on top of that there is the ZLB that constrains everybody).

Therefore, purely from an economic point of view, it would be desirable to have a safe asset and fiscal capacity to absorb these shocks. The alternative would be to allow these shocks to fully play out so that they act as a discouragement for misguided policies. However, over time this would undermine social cohesion, and thus the political support for integration. A safe asset and fiscal capacity can only come with strict conditionality and with a democratically legitimate transfer of sovereignty to the centre, but without it, the situation would remain sub-optimal from an economic point of view and would leave the Eurozone exposed to unnecessary stress.

Specifically, our modelling exercise shows that the current situation leaves peripheral countries exposed to symmetric and asymmetric demand shocks. In the case of supply shocks, fiscal policy in the core responds more strongly than in the periphery. Hence, regardless of the type of shock, the 'periphery' is always worse off. The introduction

of the safe asset removes the doom loop, and impulse responses of both countries become perfectly symmetric, while the spread on bank lending rates disappears. The output loss reduced for both economies and the stabilisation properties of fiscal policy improve for both countries, especially in the case of symmetric demand shocks. Moreover, the safe asset creates some space for the periphery to expand its fiscal policy more than in the baseline.

The introduction of fiscal capacity aimed at stabilisation of the aggregate business cycle can provide additional fiscal impetus to both counties. With also a safe asset, fiscal stimulus in the periphery partly shifts back from the fiscal capacity to the national sovereign. Fiscal capacity aimed at the aggregate cycle, on its own but even more so in combination with a safe asset, provides a relatively powerful stabilisation mechanism in the case of demand shocks but is by comparison of little help in the case of supply shocks, especially when these are asymmetric.

When fiscal capacity aims at minimising cyclical divergence, it helps to minimise output losses in both countries in case of asymmetric demand shocks. In combination with a safe asset introduced alongside fiscal capacity, the periphery sovereign can expand its fiscal policy (relative to baseline) as well, and fiscal capacity becomes a powerful way to address asymmetric demand shocks, but it also implies cross-country fiscal transfers.

Fiscal capacity adds little value in case of supply shocks, and it would not be a good idea to use it for that purpose. All results remain robust to different calibrations of the model.

We repeat that, while the economic rationale for a safe asset and fiscal capacity in the Eurozone emerges clear from our analysis, their introduction needs to be accompanied by a proper democratically legitimate process that leads to centralised control, without weakening the signalling role of financial market discipline or increasing 'moral hazard'.

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Appendix 1: Shock Responses

Table 1a: The current situation (policy variables)

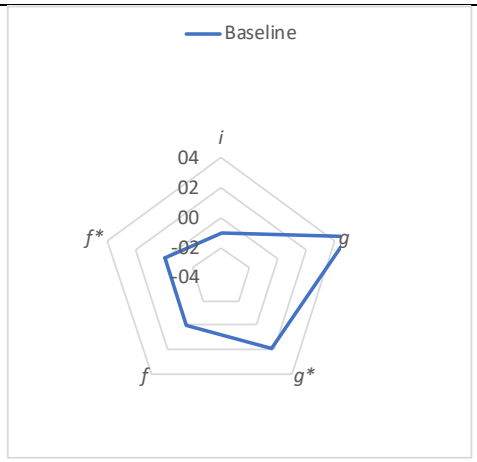
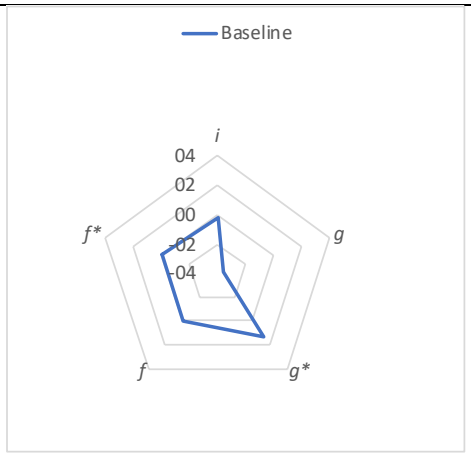
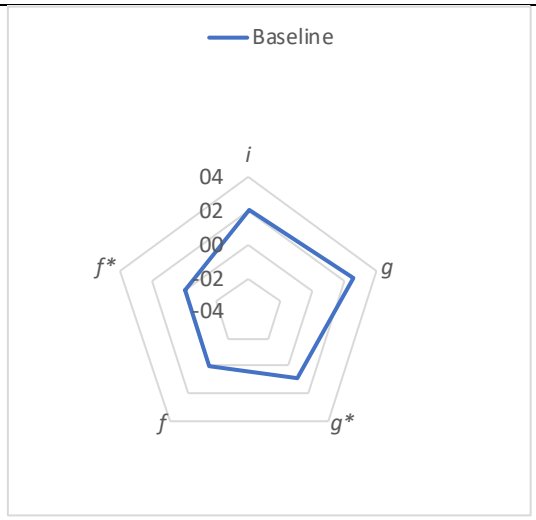
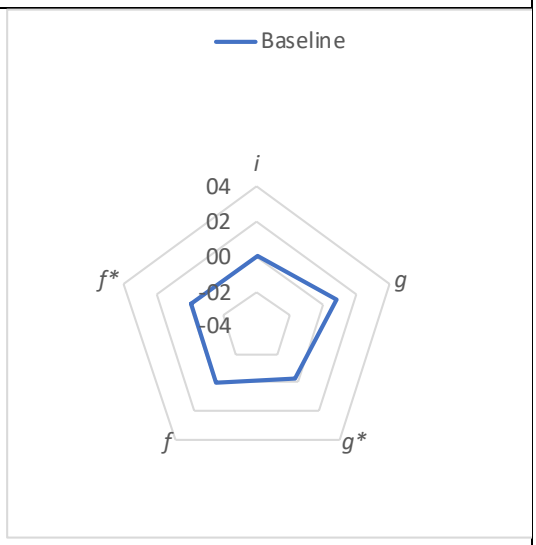
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 1b: The current situation (economy)

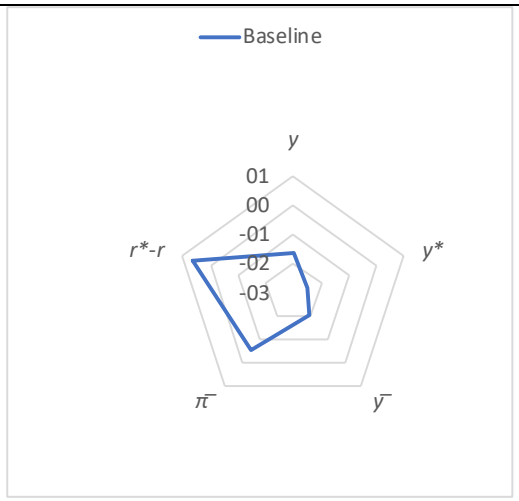
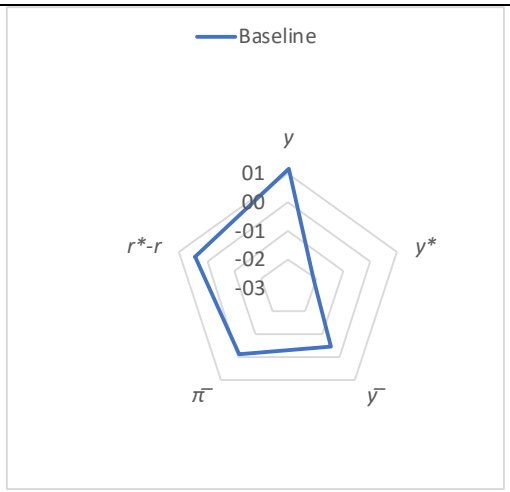
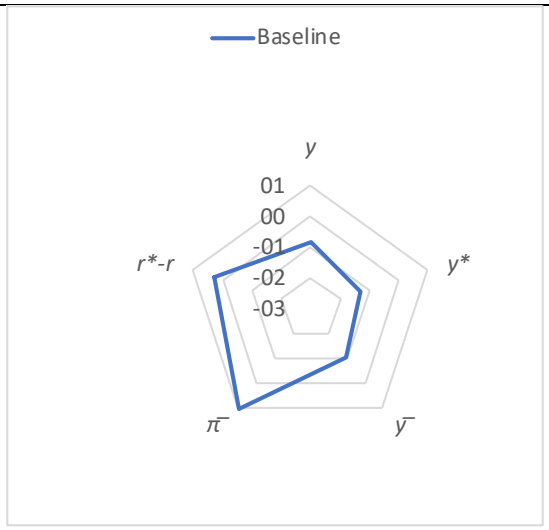
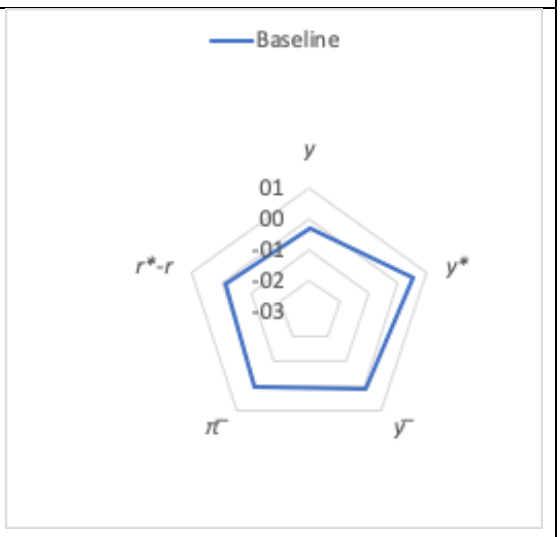
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 2a: Safe asset (policy variables)

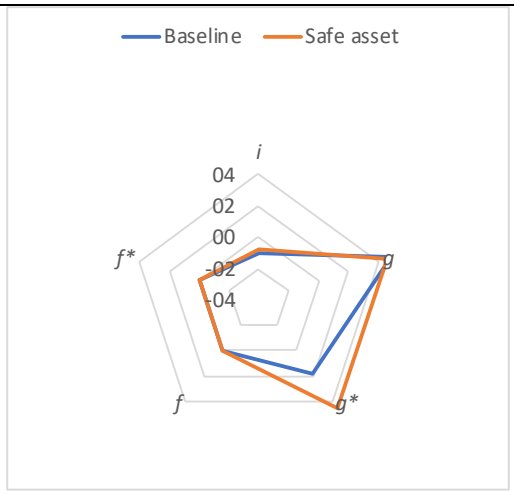
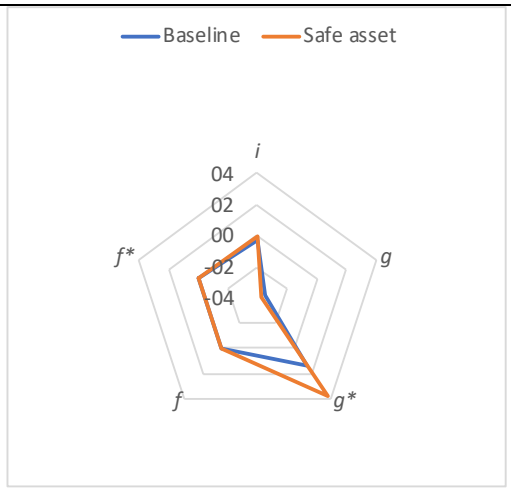
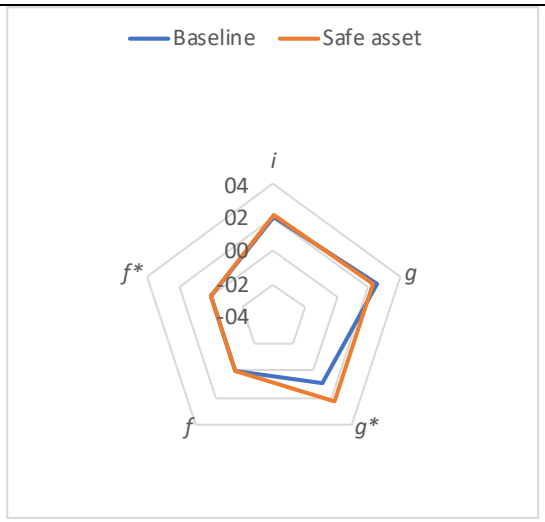
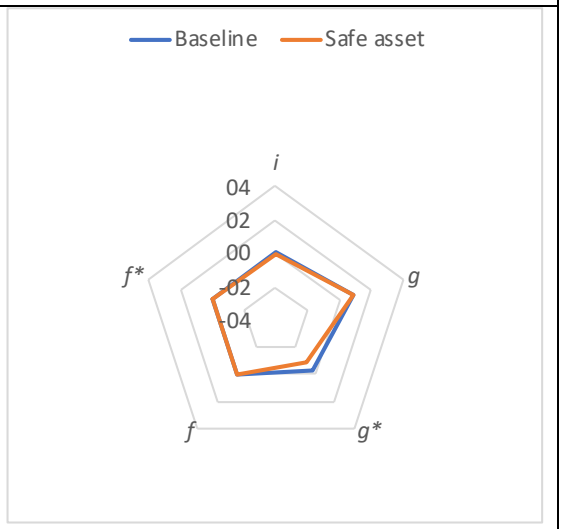
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 2b: Safe asset (economy)

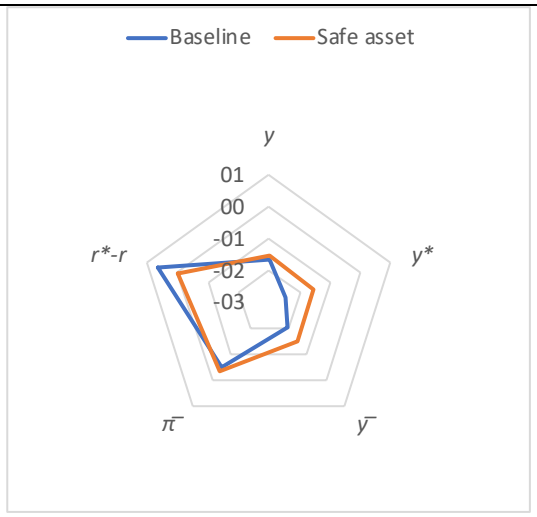
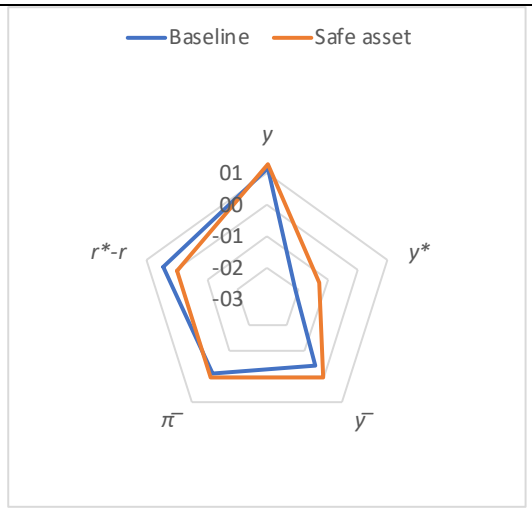
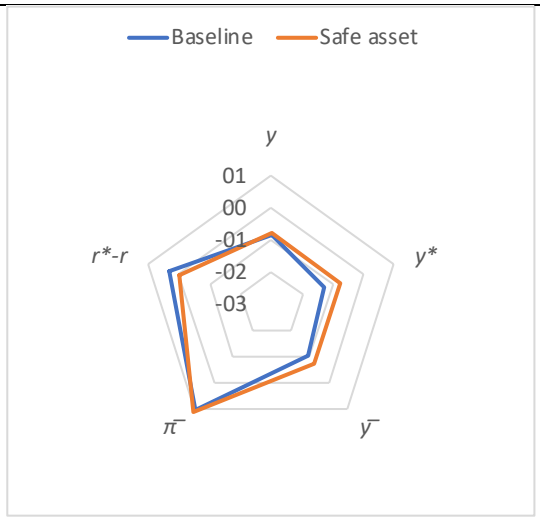
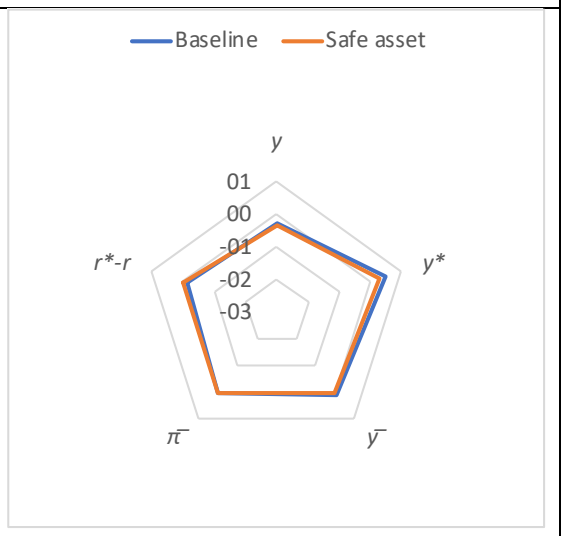
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 3a: Fiscal capacity 1 (policy variables)

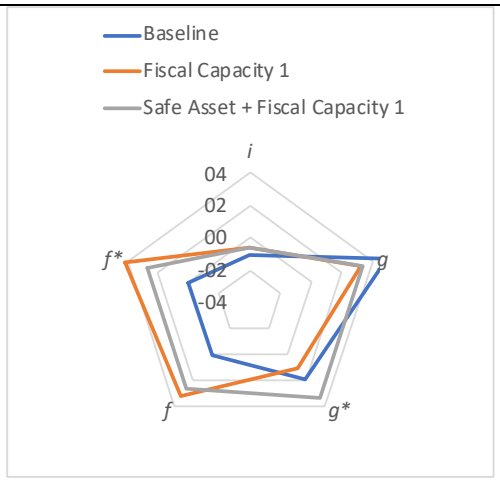
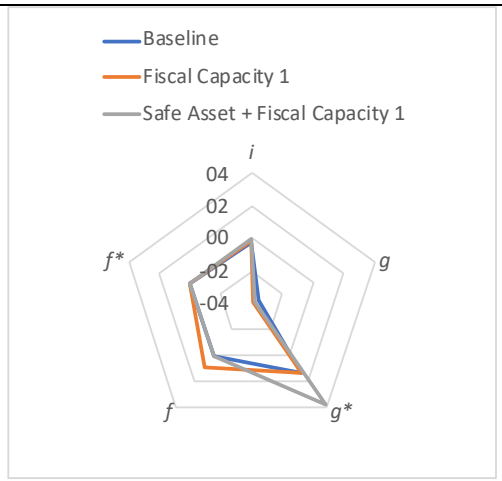
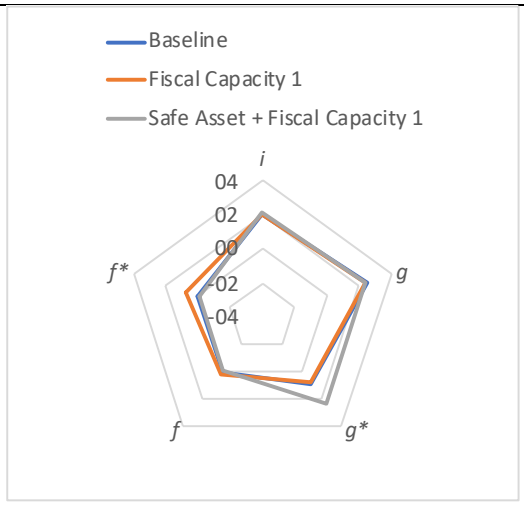
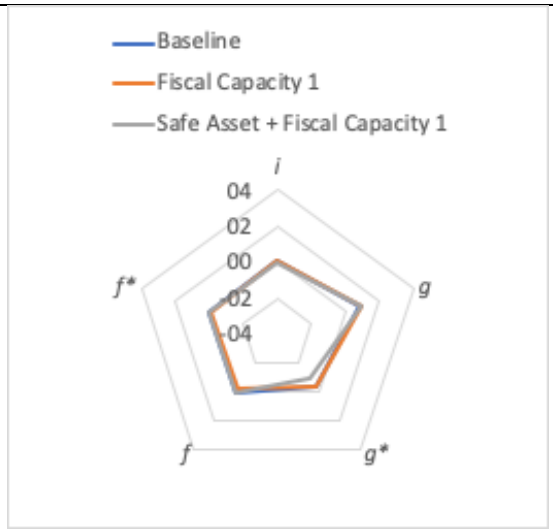
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 3b: Fiscal capacity 1 (economy)

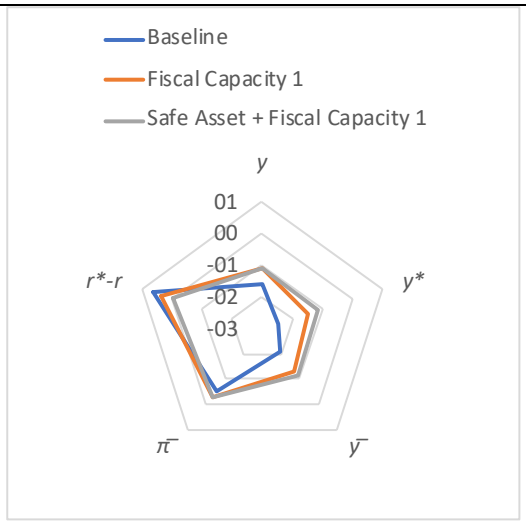
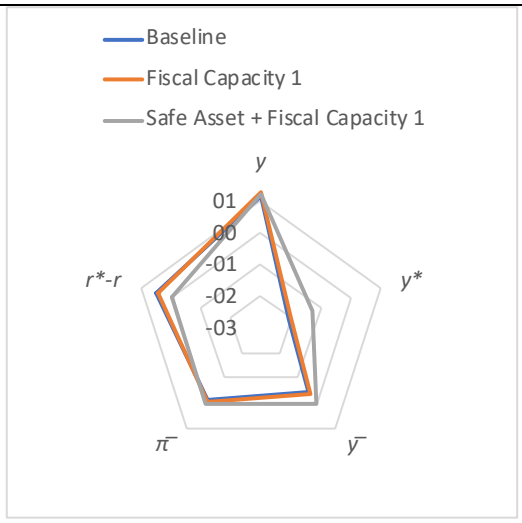
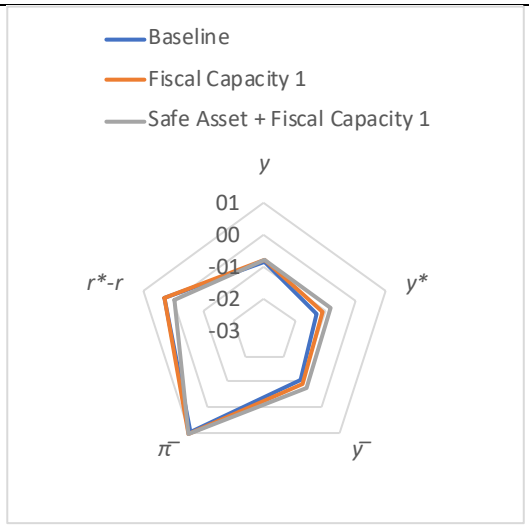
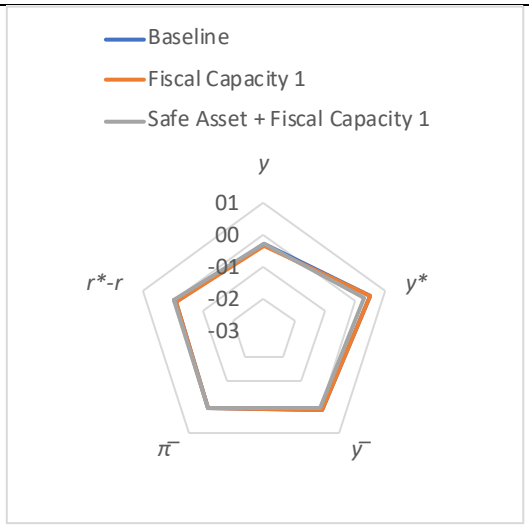
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 4a: Fiscal capacity 2 (policy variables)

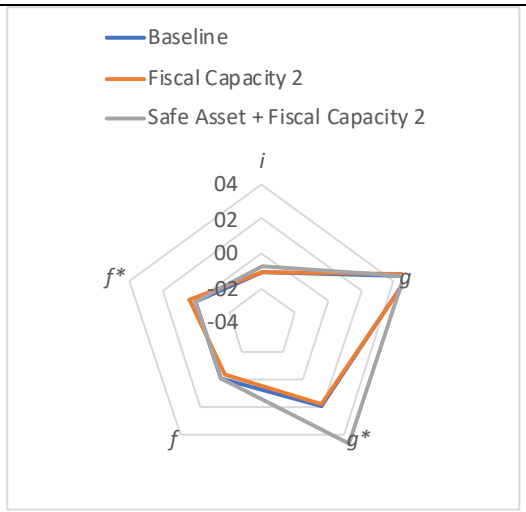
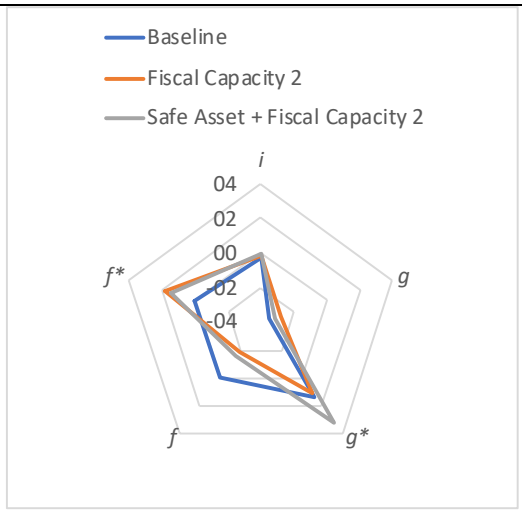
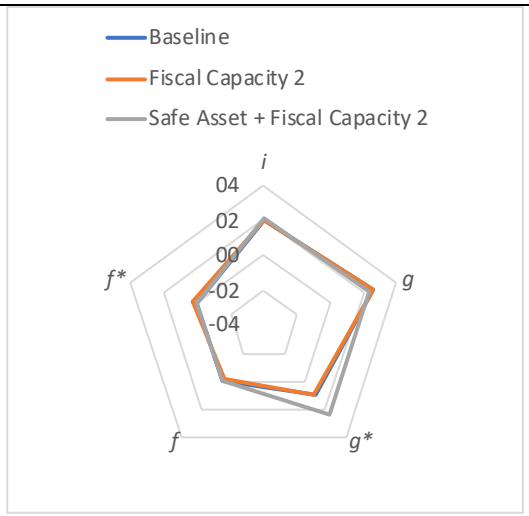
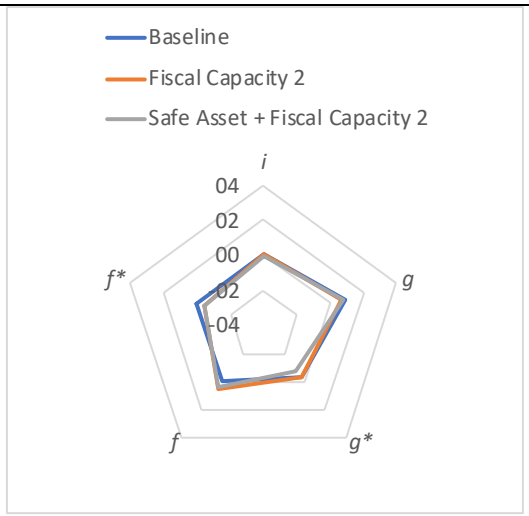
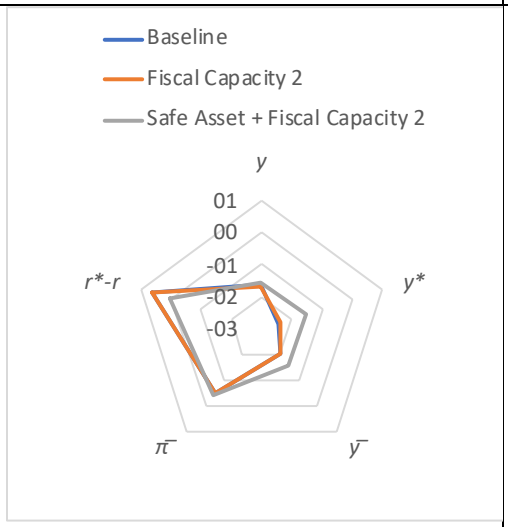
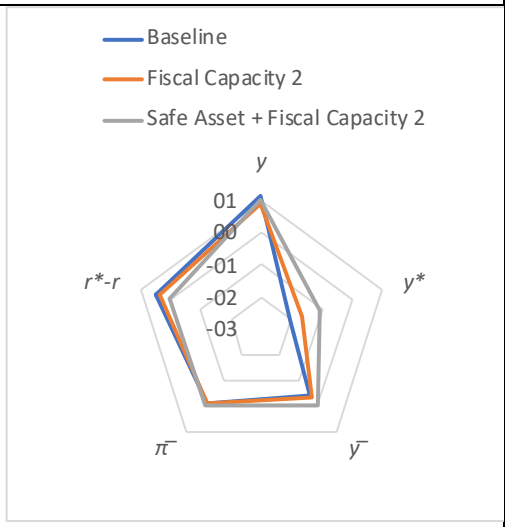
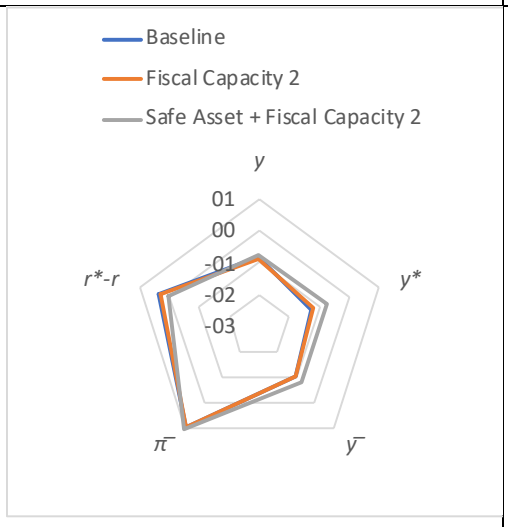
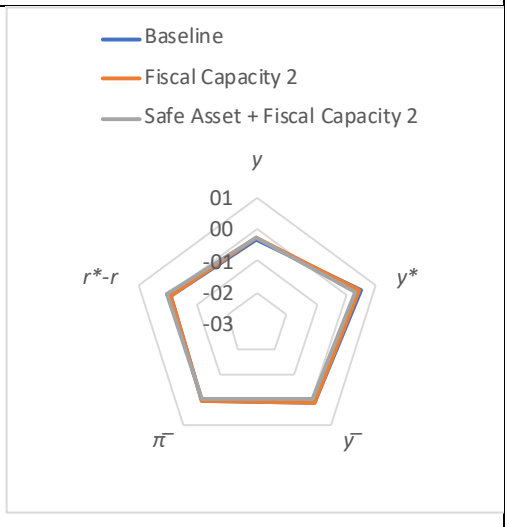
Shock	Symmetric	Asymmetric
Demand		
Supply		

Table 4b: Fiscal capacity 2 (economy)

Shock	Symmetric	Asymmetric
Demand		
Supply		

Appendix 2: Model Solution

Reduced forms output and inflation equations (5)-(8)

$$y = -\phi_1(\Delta_1 + \Delta_2 - \Delta_0)i + (\phi_2 - \phi_1\vartheta)[(\Delta_1 - \Delta_0)g + \Delta_2 g^*] + \phi_2[(\Delta_1 - \Delta_0)f + \Delta_2 f^*] + \phi_3\omega(\Delta_1 - \Delta_2 - \Delta_0)(\varepsilon^s - \varepsilon^{*s}) + (\Delta_1 - \Delta_0)\varepsilon^d + \Delta_2\varepsilon^{*d} - \Delta_2\phi_1\eta g^*$$

$$y^* = -\phi_1(\Delta_1 + \Delta_2)i + \phi_2(\Delta_2 g + \Delta_1 g^*) + \phi_2(\Delta_2 f + \Delta_1 f^*) + \phi_3\omega(\Delta_2 - \Delta_1)(\varepsilon^s - \varepsilon^{*s}) + \Delta_2\varepsilon^d + \Delta_1\varepsilon^{*d} - \Delta_1\phi_1\eta g^*$$

$$\pi = \omega\{-\phi_1(\Delta_1 + \Delta_2 - \Delta_0)i + \phi_2[(\Delta_1 - \Delta_0)g + \Delta_2 g^*] + \phi_2[(\Delta_1 - \Delta_0)f + \Delta_2 f^*] + \phi_3\omega(\Delta_1 - \Delta_2 - \Delta_0)(\varepsilon^s - \varepsilon^{*s}) + (\Delta_1 - \Delta_0)\varepsilon^d + \Delta_2\varepsilon^{*d} - \Delta_2\phi_1\eta g^* - \varepsilon^s\}$$

$$\pi^* = \omega\{-\phi_1(\Delta_1 + \Delta_2)i + \phi_2(\Delta_2 g + \Delta_1 g^*) + \phi_2(\Delta_2 f + \Delta_1 f^*) + \phi_3\omega(\Delta_2 - \Delta_1)(\varepsilon^s - \varepsilon^{*s}) + \Delta_2\varepsilon^d + \Delta_1\varepsilon^{*d} - \Delta_1\phi_1\eta g^* - \varepsilon^{*s}\}$$

Where

$$\Delta_0 = \frac{\phi_1\eta\tau}{\Delta}$$

$$\Delta_1 = \frac{1 + \phi_2\tau + \phi_3\omega + \phi_4}{\Delta}$$

$$\Delta_2 = \frac{\phi_3\omega + \phi_4}{\Delta}$$

$$\Delta = (1 + \phi_2\tau)^2 + 2(1 + \phi_2\tau)(\phi_3\omega + \phi_4) - (1 + \phi_2\tau + \phi_3\omega + \phi_4)\phi_1\eta\tau$$

Monetary policy reaction function (10)

$$i = \frac{\phi_1\omega^2\left(\Delta_1 + \Delta_2 - \frac{1}{2}\Delta_0\right)(\Delta_1 + \Delta_2)}{{\phi_1}^2\omega^2\left(\Delta_1 + \Delta_2 - \frac{1}{2}\Delta_0\right)(\Delta_1 + \Delta_2) + \alpha}\Big\{\phi_2\left(\frac{1}{2}g + \frac{1}{2}g^*\right) + \phi_2\left(\frac{1}{2}f + \frac{1}{2}f^*\right) + \left(\frac{1}{2}\varepsilon^d + \frac{1}{2}\varepsilon^{*d}\right) - \phi_1\eta\frac{1}{2}g^* - \left(\frac{1}{2}\varepsilon^s + \frac{1}{2}\varepsilon^{*s}\right)/(\Delta_1 + \Delta_2) - \frac{1}{2}\Delta_0\left[\phi_2 g + \phi_2 f + \phi_3\omega(\varepsilon^s - \varepsilon^{*s}) + \varepsilon^d\right]/(\Delta_1 + \Delta_2)\Big\}$$

Fiscal policy reaction functions (12) and (13)

$$g = \frac{\phi_2(\Delta_1 - \Delta_0)}{{\phi_2}^2(\Delta_1 - \Delta_0)^2 + \beta}\{(\Delta_1 + \Delta_2 - \Delta_0)\phi_1 i - \Delta_2(\phi_2 - \phi_1\eta)g^* - \phi_2[\Delta_2 f^* + (\Delta_1 - \Delta_0)f] - \phi_3\omega(\Delta_1 - \Delta_2 - \Delta_0)(\varepsilon^s - \varepsilon^{*s}) - (\Delta_1 - \Delta_0)\varepsilon^d - \Delta_2\varepsilon^{*d}\}$$

$$g^* = \frac{(\phi_2 - \phi_1\eta)\Delta_1}{(\phi_2 - \phi_1\eta)^2{\Delta_1}^2 + \beta^*}\{\phi_1(\Delta_1 + \Delta_2)i - \phi_2\Delta_2 g - \phi_2(\Delta_2 f + \Delta_1 f^*) - \phi_3\omega(\Delta_2 - \Delta_1)(\varepsilon^s - \varepsilon^{*s}) - \Delta_2\varepsilon^d - \Delta_1\varepsilon^{*d}\}$$

Reaction functions for the fiscal capacity (15) and (16)

$$f = \frac{\phi_2(\Delta_1 + \Delta_2 - \Delta_0)(\Delta_1 + \Delta_2)\left(\frac{1}{2}\right)^2}{\left[\phi_2(\Delta_1 + \Delta_2 - \Delta_0)\frac{1}{2}\right]^2 + \gamma}\left[2\phi_1 i - \phi_2(g + g^*) - \phi_2 f^* - \left(\varepsilon^d + \varepsilon^{*d}\right) + \phi_1\eta g^* - \frac{\Delta_0}{(\Delta_1 + \Delta_2)}\{\phi_1 i - \phi_2 g - \phi_3\omega(\varepsilon^s - \varepsilon^{*s}) - \varepsilon^d\}\right]$$

$$f^* = \frac{\phi_2(\Delta_1 + \Delta_2)^2\left(\frac{1}{2}\right)^2}{\left[\phi_2(\Delta_1 + \Delta_2)\frac{1}{2}\right]^2 + \gamma}\left[2\phi_1 i - \phi_2(g + g^*) - \phi_2 f - \left(\varepsilon^d + \varepsilon^{*d}\right) + \phi_1\eta g^* - \frac{\Delta_0}{(\Delta_1 + \Delta_2)}\{\phi_1 i - \phi_2 g - \phi_2 f - \phi_3\omega(\varepsilon^s - \varepsilon^{*s}) - \varepsilon^d\}\right]$$

Reaction functions for the fiscal capacity (18) and (19)

$$f = \frac{\left(\frac{1}{2}\right)^2\phi_2}{\left(\frac{1}{2}\phi_2\right)^2 + \gamma}\left[-\phi_1\Delta_0 i - \phi_2(\Delta_1 - \Delta_2)(g - g^*) + \phi_2 f^* - 2\phi_3\omega(\Delta_1 - \Delta_2)(\varepsilon^s - \varepsilon^{*s}) - (\Delta_1 - \Delta_2)\left(\varepsilon^d - \varepsilon^{*d}\right)\right]$$

$$f^* = \frac{\left(\frac{1}{2}\right)^2\phi_2}{\left(\frac{1}{2}\phi_2\right)^2 + \gamma}\left[\phi_1\Delta_0 i + \phi_2(\Delta_1 - \Delta_2)(g - g^*) + \phi_2 f + 2\phi_3\omega(\Delta_1 - \Delta_2)(\varepsilon^s - \varepsilon^{*s}) + (\Delta_1 - \Delta_2)\left(\varepsilon^d - \varepsilon^{*d}\right)\right]$$

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