Financial Cycles and Fiscal Cycles*

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Abstract

There is a huge literature on the behaviour of fiscal variables in relation to the output cycle. In this paper, we show that fiscal variables also co-vary with the financial cycle, as captured by fluctuations in the current account balance and credit growth. These financial factors affect fiscal outcomes, over and above their influence on the output cycle. We argue that fiscal surveillance and the design of fiscal rules should pay close attention to the interaction between the financial cycle and the fiscal cycle.

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1 Introduction

The aim of this paper is to examine the role of financial cycles in driving the cyclical behaviour of fiscal policy. Traditionally, the predominant focus in the fiscal cyclicality literature has been on how fiscal variables co-move with the output cycle (see Lane 2003 and Alesina et al 2008, amongst many others). However, the deterioration in fiscal positions that has accompanied the global financial crisis has highlighted the sensitivity of fiscal outcomes to financial factors.[1] In this regard, Benetrix and Lane (2010) show that the scale of financial imbalances during the pre-crisis years is significantly correlated with the decline in fiscal balances during the crisis, even controlling for the variation in GDP outcomes. In particular, the scale of current account deficits and credit growth during the pre-crisis period are strongly correlated with the subsequent adverse fiscal developments.

There has been considerable research on the two-way inter-connections between financial crises and fiscal crises (Lane 2011). For instance, taking a broad sweep of the historical evidence, one of the most striking stylized facts uncovered by Reinhart and Rogoff (2009) is that public debt levels grow rapidly in the wake of a banking crisis. In related fashion, Honohan and Klingebiel (2003) document the mechanisms by which a banking crisis can generate a high fiscal burden. In the other direction, there are also negative feedback loops at work by which a weak sovereign can induce instability in the financial sector. For instance, Reinhart and Sbrancia (2011) highlight that financially-challenged sovereigns often turn to financial repression measures. The interplay between fiscal crises and financial crises is a central theme in the current European debt crisis.

However, while much of the recent focus has been on the implications of financial crises for fiscal policy, it is also important to gain a better understanding of the role played by financial factors in determining fiscal outcomes during "normal" times. In particular, financial cycles can induce volatility in fiscal balances. If the induced fiscal shocks are procyclical in direction, these may amplify macroeconomic imbalances and weakening the underlying capacity of the government to effectively respond upon the occurrence of a financial crisis. In the other direction, even if it turns out that the impact on fiscal balances is counter-cyclical, the additional volatility in fiscal variables poses a challenge for optimal fiscal management over the cycle.

Accordingly, the main contribution of this paper is to examine whether financial variables influence the cyclical behaviour of fiscal variables. We focus on net capital flows (as captured by the current account balance) and growth in domestic credit as key financial factors that may affect fiscal variables over the cycle. We report panel estimates for a set of 52 advanced and emerging-market economies over 1980-2007.

[1] Discretionary stimulus programmes only account for a small proportion of the total decline in fiscal balances in most countries (Benetrix and Lane 2010).

The structure of the rest of the paper is as follows. Section 2 provides a conceptual framework for the analysis and relates our contribution to the previous literature. We turn to the empirical analysis in Section 3. Some policy implications are laid out in Section 4, while Section 5 concludes.

2 Conceptual Framework

An extensive literature has examined the behaviour of fiscal variables over the output cycle (see Bayoumi and Eichengreen 1995, Gavin and Perotti 1997 and Lane 2003 for early contributions). A theme in this literature has been to measure whether the fiscal balance and/or public spending has been inappropriately procyclical in some country groups and identify the sources of such procyclicality.

However, in some of the literature, it has also been recognised that simple measures of the output cycle are not sufficient to capture all sources of fiscal volatility. For instance, Bouthevillain et al (2001) highlight that shifts in the distribution of income between labour income and profit income will alter the composition of the tax base and thereby the level of revenues. Similarly, these authors also emphasise that different components of total expenditure have different revenue implications (consumption versus exports, for example).

In relation to financial variables, Eschenbach and Schuknecht (2004) and Girouard and Price (2004) show that asset price cycles will influence fiscal outcomes. A striking finding is that asset price booms do not only raise revenues from asset-related taxes but also lead to generalised revenue growth, due to the wealth effect of increasing asset values on consumption.

Two recent papers have examined the role of the current account balance in influencing the fiscal cycle. Both Dobrescu and Salman (2011) and Lendvai et al (2011) emphasise that a current account deficit should improve revenues from indirect taxes, since net capital inflows finance a higher level of domestic absorption. A primary focus of these studies is to derive an augmented cyclical adjustment for the fiscal balance that takes into account the mechanical impact of the current account balance on tax revenues, in addition to the well-understood fiscal impact of GDP fluctuations through the automatic stabilisers. The objective is that such a corrected measure might better capture the true underlying structural fiscal position, net of both the output cycle and the current account cycle.

In addition to the current account, domestic financial variables may also influence fiscal outcomes. We focus on domestic credit growth. As was indicated in the introduction, Benetrix and Lane (2010) find that pre-crisis credit growth is a strong indicator of the

scale of fiscal deterioration during the 2008-2009 crisis period. The interpretation is that credit expansion may have fuelled additional revenue growth during the pre-crisis period, which then melted away when the credit cycle went into reverse.

The influence of credit growth on fiscal outcomes is highly visible in the detailed Irish revenue data (Lane 2007). Credit growth affects revenues through several channels. First, the positive impact of credit growth on domestic asset and property prices improves revenues through the direct and indirect channels highlighted by Eschenbach and Schuknecht (2004), Girouard and Price (2004) and Addison-Smyth and McQuinn (2010). Second, credit growth may fuel a greater volume of asset market turnover, which raises revenues from transactions taxes. Third, if credit growth is associated with a shift in the composition of production towards the construction sector and other nontradables, this may alter the composition of the tax base to the extent sectors differ in the distribution of income between wages and profits and in composition of spending between taxable domestic spending and non-taxed exports. Fourth, credit growth may be associated with inflation and/or real exchange rate appreciation (an increase in the relative price of nontradables) and thereby raise revenues, since tax systems are not fully inflation-indexed.

We prefer to use credit growth rather than other domestic financial indicators, such as asset price indices (housing prices or equity prices). First, the credit data are far more widely available and more easily comparable across countries.[2] Second, as is documented by Claessens et al (2011), credit growth is highly correlated with house prices and equity prices, so that it may be a good general proxy variable. Third, credit growth may be more easily targeted by policymakers than asset prices. Fourth, the relation between credit growth and macroeconomic variables may be more stable than the relation between asset prices and macroeconomic variables.

In addition to the mechanical impact of financial variables on tax revenues, financial shocks may also operate through political economy channels. The fiscal cyclicality literature has emphasised that political distortions may induce the discretionary component of fiscal policy to respond procyclically to output shocks, since the political equilibrium may exhibit a pattern by which an expansion in tax revenues induces matching increases in public spending or an offsetting reduction in tax rates (see Tornell and Lane 1999, Talvi and Vegh 2003, Alesina et al 2009, amongst others). Accordingly, the overall fiscal response to a shock may go in either direction, depending on the relative importance of the automatic and discretionary responses. The political economy literature is general in scope, such that the underlying shock might be an output shock, a terms of trade shock

[2]Although the availability of housing price indices is improving, the cross-country coverage is still relatively low and there are differences in the scope and definition of these indices. Stock market development varies widely across countries and over time, such that the representativeness of national equity price indices as a domestic financial indicator is open to question.

or a resource endowment shock, such as the discovery of oil.[3] By the same token, if a financial boom induces a revenue windfall, it may trigger similar political dynamics that result in increased public spending or discretionary tax cuts.

Accordingly, our main focus is on how the overall fiscal balance responds to the financial cycle. Our empirical specification generally follows the literature but with the addition of financial variables to the fiscal equation. We write the baseline specification as follows

$$FISCAL_{it} = \alpha_i + \beta CYCLE_{it} + \gamma Z_{it} + \lambda DEBT_{it-1} + \rho FISCAL_{it-1} + \varepsilon_{it}. \quad (1)$$

where $FISCAL$ is the fiscal variable of interest. We include a country-specific intercept term to allow for differences in average fiscal values across countries and the fixed-effects estimation means that our focus is on explaining the time series variation in the data, rather than the cross-sectional differences. The $CYCLE$ variable captures the cyclical state of production - we try different measures in our empirical work. The coefficient β captures the responsiveness of the fiscal variable to the output cycle. In the case where the fiscal variable of interest is the government balance, $\beta > 0$ indicates a countercyclical pattern, while $\beta < 0$ a procyclical one.[4]

The Z_t vector comprise two financial variables that are included individually or jointly as additional regressors. These are the current account balance and the growth in private credit, both scaled by GDP.[5] Since the output cycle is always included in the specification, these variables should only be important if financial factors have additional fiscal effects, over and beyond their influence on output dynamics.

In addition, we include the lagged level of the public debt ($DEBT$), since a positive relation between the stock of public debt and the primary fiscal balance is typically required to support non-explosive debt dynamics.[6] We also include the lag of the fiscal variable, since fiscal variables typically exhibit considerable persistence.

In terms of cyclical measures, we first use the deviation of GDP from its trend value (expressed as percentage point deviations). The GDP trend is obtained as the predicted values of a model regressing GDP on a linear and quadratic trends.[7] Second, we use the

[3] See Kaminsky (2010) on the impact of terms of trade shocks on fiscal outcomes.

[4] In most of our specifications, the fiscal variable is scaled as a ratio to GDP. Accordingly, there is some terminological ambiguity about the meaning of cyclicality for such a ratio. For instance, a constant deficit to GDP ratio over the cycle may be termed acyclical in one sense but is procyclical in terms of underlying dynamics, with revenue gains during upswings used to finance spending increases or tax cuts and revenue declines during downturns inducing spending cuts or tax rate hikes. However, in some specifications, we do not scale by GDP and this is a useful cross-check.

[5] That is, credit growth is measured as the change in the credit/GDP ratio between $t-1$ and t.

[6] See Bohn (1998), Ballabriga and Martinez-Mongay (2002), Galí and Perotti (2003), Wyplosz (2006) and Fatás and Mihov (2010).

[7] An alternative could have been the use of output gap. However, these data are not available for the

deviation of absorption from its trend. Again, the trend is obtained from a regression model where absorption is defined as the difference between gross national income and the current account surplus. Since both are derived from underlying stock positions, we consider the current account balance and credit growth as stationary variables, even if these may be quite persistent.

As noted, our main focus is on aggregate fiscal measures rather than confining attention to cyclically-adjusted variables.[8] This allows the financial cycle to operate through discretionary fiscal responses as well as through the automatic stabilisers. Discretionary responses include both general expenditure changes but also changes to the tax code and transfer programmes, which have the effect of altering the sensitivity of the automatic stabilisers to the output cycle. In terms of evaluating policy performance, the aggregate fiscal variables may provide a better guide, since measures of cyclically-adjusted fiscal variables are subject to large ex-post revisions.[9]

3 Empirical Analysis

As a prelude to the econometrics, Tables 1 and 2 report some descriptive statistics. Table 1 shows the mean, standard deviation and first autocorrelation coefficient for each variable, where Panel A reports the statistics for the full sample, Panel B shows the advanced-country sample and Panel C the emerging-market sample. All variables are expressed as deviations from country means, so the focus is on within-country variation.

Table 2 shows the matrices of bivariate correlations among the variables. In the terms of the full sample, the aggregate fiscal surplus is pro-cyclical vis-a-vis both the GDP cycle and the absorption cycle. Not surprisingly, these correlations are considerably smaller in the case of the cyclically-adjusted fiscal balance. Both the current account and credit growth show mildly positive correlations vis-a-vis the fiscal balance measures. In terms of covariation with the GDP cycle and the absorption cycle, the current account surplus is counter-cyclical, while credit growth is pro-cyclical. Finally, faster credit growth is associated with a larger current account deficit.

These patterns are largely similar across the advanced-country and emerging-market subsamples. However, the correlations of the financial variables with the fiscal balance are stronger for the emerging economies, while the correlations of these variables with the output and absorption cycles are weaker for the emerging economies.

full time span.

[8] In the next draft, we will also report results for primary fiscal variables, net of pre-determined debt servicing costs.

[9] In addition, it would be interesting to look at the behaviour of real-time estimates of cyclically-adjusted fiscal variables, as in Cimadomo (2008) and Beetsma and Guilodori (forthcoming). However, these real-time datasets are not available for a wide panel of countries or for a long time series.

Turning to the econometric results, Table 3 reports estimates of the specification laid out in equation (1) for the full sample, where the fiscal measure is the aggregate fiscal balance. Columns (1)-(4) show the OLS estimates of all our alternative specifications. In column (1), we see that the fiscal balance is mildly counter-cyclical vis-a-vis the output cycle and that, as expected, it is increasing in the level of outstanding public debt. In relation to the sensitivity to financial factors, a more positive current account balance is in fact associated with a more positive fiscal balance and this result is significant at the 10 percent level. In column (2), we consider credit growth as as the financial factor but this variable is not individually significant. In column (3), we enter both financial variables jointly: the current account is individually significant at the 5 percent level, while credit growth is individually significant at the 10 percent level. Finally, we combine the current account and output into the absorption measure in column (4).[10] Under this specification, the fiscal balance is acyclical vis-a-vis the absorption cycle, while credit growth is not individually significant in this case.

This initial set of results provides some insight into the relation between financial factors and the fiscal cycle. In relation to the current account, columns (1) and (3) show a positive comovement pattern, which is not the expected pattern under the hypothesis that a current account deficit improves tax revenues which in turn feeds into a superior fiscal balance. However, it is striking that the fiscal balance is acyclical in respect of the absorption cycle in column (4). In the case of credit growth, it is positive and marginally significant in column (3), such that faster credit growth is associated with an improvement in the fiscal surplus. This is consistent with mechanisms by which credit growth is associated with a shift in economic activities to tax-rich sectors such as construction and/or a shift in the tax base, with an increase in asset values. Finally, the current account and credit growth are jointly significant in column (3).

A standard concern in the estimation of fiscal equations is the potential endogeneity problem, by which the output cycle is affected by the fiscal balance (see Gavin and Perotti 1997, Gali and Perotti 2003, Lane 2003, Jaimovich and Panizza 2007 and Fatas and Mihov 2010). In addition, the "twin deficits" hypothesis suggests that the current account balance may be affected by the fiscal balance. To guard against these potential problems, we estimate instrumental variables versions of the previous empirical specifications in columns (5) to (8).

Our strategy is to treat output/absorption and the current account as endogenous

[10]Dobrescu and Salman (2011) also report some panel regressions that look at the relation between the absorption cycle and different fiscal measures. They do not report IV estimates and do not control for credit growth. In addition, their data set only begins in 1990. Also, differences in the construction of variables make it hard to compare results.

variables.[11] We instrument output or absorption with trade-weighted averages of rest-of-the world values for these variables, which is similar to Gali and Perotti (2003), Lane (2003) and Jaimovich and Panizza (2007). Following Lane and Milesi-Ferretti (2011), we instrument the current account balance with the oil price (multiplied by the net oil trade position), since the oil price is a major source of exogenous fluctuations in trade balances. We test the significance of these instruments for the first-stage regression to make sure that these do not suffer from the "weak instruments"problem. The F-statistic for the joint significance of the instruments in the first-stage regression as well as the Cragg-Donald Wald F statistic indicate that these instruments perform well. In addition, the Kleibergen-Paap rk statistic indicates that these are sufficiently strong instruments and span the endogenous regressors. Finally, the Sargan Test supports the exclusion restrictions on the listed instruments. (Table A1 in the appendix shows these diagnostic statistics for the instrumental-variables estimates.)

The IV estimates are reported in columns (5) to (8) of Table 3. In fact, the absolute magnitude of the estimated coefficients on output/absorption and the current account balance are larger than in the OLS estimates. In addition, the current account is now significant at the 1 percent level in columns (5) and (7), while the credit growth variable is significant at the 10 percent level in column (6) and at the 1 percent level in column (7). Finally, the absorption cycle is now significant at the 5 percent level in column (8). In relation to the latter result, it remains the case that the fiscal surplus is less pro-cyclical vis-a-vis the absorption cycle than in relation to the output cycle in columns (5)-(7). Taken together, the IV estimates strengthen the case for taking into account financial factors in the analysis of the fiscal cycle. An increase in the current account deficit is associated with an increase in the fiscal deficit in columns (5) and (7), while faster credit growth is associated with an improvement in the fiscal surplus in columns (6) and (7).

Tables 4 and 5 provide separate estimates for the advanced-country and emerging market subsamples. Taking first the OLS estimates, the financial factors are not individually significant in columns (1)-(4) of Tables 4 and 5.[12] However, these variables are jointly significant in column (3) for the advanced countries but not for the emerging market economies.

The IV estimates are quite similar across the two subsamples in columns (5)-(8) of Tables 4 and 5. In particular, an improvement in the current account surplus in either

[11]We treat the time varation in credit growth as exogenous to time variation in fiscal aggregates, even if cross-country differences in average credit levels may be influenced by the fine details of the tax code (such as deductability of interest payments) and the generosity of social insurance systems.

[12]In addition, we note that the OLS estimates suggest that: the fiscal surplus is less pro-cyclical in emerging market economies; the lagged level of public debt is significant for advanced economies but not for emerging markets; and, finally, the fiscal balance is more persistent for advanced countries than for emerging markets.

group is associated with an improvement in the fiscal balance, while faster credit growth is associated with an improvement in the fiscal surplus in column (7). The absorption variable in column (8) is significantly positive for the emerging market group but not for the advanced-country group. We also note that the fiscal surplus is procyclical vis-a-vis the output cycle for the emerging market economies but this effect is only significant in column (5) for the advanced-country sample.[13] In summary, Tables 4 and 5 confirm that the full-sample results for the financial factors are also broadly similar within the advanced-country and emerging-market subsamples.

Due to data limitations, Tables 6 and 7 focus on the advanced-country sample. In Table 6, we look at a different measure of the fiscal balance and also at the behaviour of the underlying revenue and expenditure components. In columns (1) and (2), we consider a real general government balance index measure as the dependent variable.[14] So far, we have examined the ratio of the general government balance to GDP as the endogenous variable. While this is common in the literature, it has the limitation that shifts in the fiscal ratio may be driven by movements in the GDP denominator rather than in the fiscal measures. This is especially problematic, since the GDP cycle (or absorption cycle) is a key regressor. Using an unscaled version of the fiscal balance avoids this feature.

It turns out that the results for this alternative measure of the fiscal balance in columns (1) and (2) are very similar to the corresponding estimates in columns (3) and (7) of Table 4. In particular, both financial factors are individually significant at the 1 percent level in the IV estimates in column (2), while they are jointly significant in the OLS estimates in column (1).

Next, we investigate whether the results for the fiscal balance can be linked to the underlying behaviour of revenues and expenditures. In relation to the output cycle, the results in columns (3) and (4) show the strong procyclicality of revenues , while columns (5) and (6) show that goverment spending is acyclical. The OLS estimates show a significant pattern for the current account balance. In particular, a larger current account deficit is associated with greater revenues but also an even larger increase in public spending. The revenue result is consistent with the mechanism by which a current account deficit finances a higher level of domestic absorption, thereby increasing revenues from spending-related taxes. However, it turns out that a current account deficit is also associated with a surge in public spending, such that the revenue windfall is not applied to improving the fiscal position.

[13]This is consistent with the results in Jaimovich and Panizza (2007) who show that fiscal policy in emerging markets is similar to fiscal policy in industrial countries once the endogeneity problem is dealt with through IV estimation. We also note that the lagged level of public debt is always significant for the emerging market group in the IV estimates, in contrast to the OLS estimates.

[14]See data appendix for further details on this and the rest of the alternative fiscal variables.

The finding that the spending increase is greater than the revenue increase explains why the overall fiscal balance deteriorates if there is an expansion in the current account deficit. Moreover, this pattern is consistent with the presence of a "voracity effect" whereby the political equilibrium response to a increase in revenues is a more-than-proportionate increase in public spending, as is laid out in Tornell and Lane (1999). However, these results are not significant in the IV estimates in columns (4) and (6), so should not be over-emphasised at this point. Finally, in relation to credit growth, the significant impact of credit growth on the fiscal balance in column (2) cannot be systematically linked to the individual revenue and expenditure components in columns (4) and (6). This may reflect cross-country heterogeneity whereby the the improvement in the fiscal surplus reflects higher revenue streams in some countries but lower expenditure levels in other countries.[15]

Columns (3)-(4) and (5)-(6) provide estimate for revenues and government expenditure respectively. As expected, revenues are strongly procyclical vis-a-vis the output cycle, while government spending is acyclical. In terms of the OLS estimates, a striking finding is that both revenues and expenditures are significantly negatively associated with the current account balance. That is, an expansion in the current account deficit is associated with growth in both revenues and public spending. Since both revenues and public spending move in the same direction and the coefficient on public spending is larger in absolute terms, this is consistent with the zero or positive impact on the fiscal balance that was found in columns (1)-(2).

The positive impact of a current account deficit on revenues is consistent with the sensitivity of taxation to the level of domestic spending, which is boosted by a current account deficit. The positive impact on public spending supports the view that governments are more likely to spend such revenue windfalls rather than to accumulate a larger surplus. Moreover, the greater elasticity of spending than revenue is consistent with the "voracity effect" phenomenon whereby fluctuations in revenue trigger larger fluctuations in spending (Tornell and Lane 1999).

In relation to credit growth, this variable is not individually significant in columns (3)-(6). Accordingly, while credit growth was significantly positive in columns (1)-(2), the mechanisms by which credit growth affect the fiscal balance are not stable across the individual revenue and expenditure components.

So far, we have focused on the aggregate fiscal balance. In Section 2, we provided a set of reasons why this may be preferable to examining the cyclically-adjusted balance. Still, we next turn to the cyclically-adjusted balance in Table 7. It is not too surprising

[15]In relation to public spending, if credit growth is associated with a surge in employment, transfer payments associated with non-employment may decline.

that the output cycle has no systematic association with the cyclically-adjusted balance across different specifications in Table 7. In relation to the financial variables, the current account is not individually significant. However, credit growth is significant in the OLS estimates in column (3) and the IV estimates in columns (6)-(8). The sensitivity of the cyclically-adjusted balance to credit growth suggests that this is not an accurate measure of the "permanent" component of the budget balance, since fluctuations in credit growth will be associated with volatility in the cyclically-adjusted budget balance.

In summary, the econometric evidence so far supports a role for fiscal factors in driving the cyclical behaviour of fiscal policy. In relation to the current account, there is evidence of a destabilising pattern, in the sense that a current account deficit is associated with a revenue windfall but an even greater increase in public spending. In relation to credit growth, it seems that faster credit growth is associated with larger fiscal surpluses. While this counter-cyclical pattern may provide some macroeconomic stabilisation, an approach that focuses only on the output cycle might mistakenly attribute a credit-driven improvement in the cyclically-adjusted fiscal balance as a permanent increase in the underlying structural fiscal position.

In addition to the basic specification, we also consider an augmented specification for the advanced-country sample. In particular, we follow the related literature by allowing for shifts in fiscal cyclicality in line with institutional reforms in Europe. In particular, Galí and Perotti (2003), Fatás and Mihov (2010) and Bénétrix and Lane (2010) have found that the introduction of the Maastricht Treaty altered the cyclical profile of fiscal policy for EU member countries. In particular, these studies show that fiscal policy became more counter-cyclical after the Maastricht Treaty, while the sensitivity of the fiscal balance to the outstanding level of public debt also increased. In contrast, there is no evidence in these studies that the introduction of the euro further altered the cyclical behaviour of fiscal policy, despite the incentives to run a more counter-cyclical fiscal policy for members of a monetary union.

Accordingly , we augment the previous model to account for the effects of the Maastricht Treaty and European Monetary Union in the following specification

$$FISCAL_t = \alpha_1 + \alpha_2 MT_t + \alpha_3 EMU_t + \beta_1 X_t + \beta_2 \left(MT_t * X_t\right) + \beta_3 \left(EMU_t * X_t\right) + \varepsilon_t \qquad (2)$$

where X_t is the set of standard regressors (GDP cycle, current account, credit growth, lagged public debt, lagged fiscal balance), MT is a Maastricht Treaty dummy variable taking the value 1 in the period 1992-2007 for EU member countries and 0 otherwise, while EMU is a dummy variable that equals 1 in 1999-2007 for EMU member countries

and 0 otherwise.[16] [17]The α_2 coefficient captures the change in the intercept after the Maastricht Treaty while β_2 measures the change in the variable coefficients. In the same fashion, α_3 captures the impact of EMU on the intercept while β_3 captures any change in the variable coefficients after the introduction of the single currency.

We allow the coefficients on the output cycle, the lagged level of public debt and lagged dependent variable to shift in response to both regime changes. However, to preserve degrees of freedom, we only allow the coefficients on the financial variables to shift upon joining EMU in 1999. This seems the more relevant structural break for the relation between the financial cycle and the fiscal cycle, in view of the impact of monetary union on the external and domestic financial environments of the member countries. Furthermore, since the interactions between the EMU dummy and the lagged debt and lagged dependent variable were nowhere significant, we also dropped these from the final specification.

The results for the aggregate fiscal balance are reported in Table 8. In relation to the OLS estimates, the financial variables are typically not individually significant, with the sole exception that credit growth is positive and significant at the 10 percent level during the EMU period in column (4). However, the financial variables are jointly significant across the OLS estimates in columns (1)-(4). In terms of the other variables, the estimates confirm the results of previous studies in that the fiscal balance becomes more procyclical and more responsive to the outstanding level of public debt after the Maastricht Treaty but that the improved cyclical behavior of the fiscal balance dissipates after the introduction of the euro in 1999.

The financial variables are more significant in the IV estimates in columns (5)-(8), with the current account balance and credit growth both individually significant in each of these regressions. Moreover, there is evidence that the fiscal impact of financial factors shifted after the introduction of the euro. In particular, the positive relation between the current account balance and the fiscal balance is attenuated for the EMU period, while the positive impact of credit growth on the fiscal balance is magnified. However, only the current account interaction term is individually significant when both interactions are included in column (8).

Finally, Table 9 provides results for the cyclically-adjusted fiscal balance. In relation to the OLS estimates, the current account balance is individually significant for the post-

[16]Although the Maastricht Treaty entered into force on the 1st of November 1993, we take 1992 as part of the post-Maastricht Treaty period. The reason for this choice is that negotiations finished in 1991 and the Treaty was signed on February 1992. Taking this into account, it is reasonable to assume that countries started taking fiscal actions in 1992.

[17]We also checked whether there may be just time variation in the coefficients for all countries in the sample by allowing fiscal responses to also change in 1992 for non-EU member countries and in 1999 for non-EMU member countries. However, there were no significant effects for the non-member countries in either case.

EMU period in column (4). In the IV estimates, credit growth is significantly positive across columns (5)-(8) but there is no change in this relation after the introduction of the euro.

4 Some Policy Implications

In relation to the cyclical conduct of fiscal policy, there are several reforms that warrant consideration. First, the analysis in the preceding section suggests that the assessment of the cyclical fiscal stance should be broadened to take into account the financial cycle in addition to the output cycle. In this way, even if aggregate output is measured as being close to its potential level, surges in tax revenues from financial booms would be banked rather than used to boost public spending in a non-sustainable manner. In turn, running larger surpluses during financial booms would facilitate greater fiscal counter-cyclicality upon a reversal in financial conditions.

As has been widely advocated in recent years, the implementation of a formal fiscal framework may help improve fiscal effectiveness. A central element in such a framework is the specification of numerical fiscal rules. Typically, the set of fiscal rules includes a target for the cyclically-adjusted fiscal balance. The potential sensitivity of the real-time estimate of the cyclically-adjusted fiscal balance to financial factors suggests that such rules should be designed to take account of the financial cycle as well as the output cycle.

Given the complexity of estimating the current state of the financial and output cycles, the robustness of the set of rules is an important criterion in assessing the value of a rules-based approach. In such an environment, an independent fiscal council may play an especially valuable role in identifying the cyclical state of the economy and the distribution of macroeconomic risk factors (Lane 2010). Taken together, these considerations reinforce the importance of a well-designed institutional framework for the conduct of fiscal policy. While the literature on independent fiscal councils has largely focused on output stabilisation, such a council could also assess the appropriate fiscal stance in guarding against risks that may be embedded in the financial system.

Finally, the scope for the financial cycle to destabilise the fiscal position provides an additional rationale for preventive policies to minimise financial volatility. In relation to the current account, Summers (1988), Blanchard (2007) and Lane (2010) describe the conditions under which policymakers may wish to target excessive imbalances, with a possible role for various fiscal instruments in external stabilisation. Similarly, there is a vast literature on the policy tools that are available to curb volatility in credit growth. In terms of implementation, the new economic governance proposals for member countries of the European Union put a premium on external and sectoral imbalances in assessing

macroeconomic stability and the appropriate stance for fiscal policy.

5 Conclusions

This paper has investigated the role of the financial cycle in driving the fiscal cycle. Although the results vary across specifications, we find some empirical evidence that current account deficits are fiscally destabilising but that credit booms are associated with improvements in the cyclically-adjusted fiscal balance. At a minimum, the sensitivity of fiscal outcomes to financial factors means that surveillance of fiscal positions needs to go beyond the output cycle to also incorporate the financial cycle. Moreover, it may be the case that the fiscal impact of the financial cycle should be incorporated into the design of numerical fiscal rules and the monitoring role of independent fiscal councils. In addition, the potential for financial cycles to destabilise the fiscal position may provide additional motivation for preventive policies that can limit the macroeconomic impact of financial volatility.

In terms of the future research agenda, the estimates in this paper should be probed in further empirical analysis. Along one dimension, there may be non-linearities in the relation between the financial cycle and the fiscal cycle. Accordingly, examining fiscal behaviour during large financial booms and busts may be especially revealing. Along another dimension, the prior literature has repeatedly shown that the cyclical behaviour of fiscal policy varies across different institutional and political environments. An investigation of how such factors influences the fiscal impact of the financial cycle would be interesting.

In terms of mechanisms, the financial cycle affects fiscal outcomes through two types of channels. First, there may be formulaic effects, by which financial shocks affect the importance of different types of automatic stabilisers. Second, financial shocks may induce discretionary fiscal responses. Further work on the relative contributions of these two channels is clearly warranted.

Finally, the dynamic relation between financial shocks and fiscal outcomes could be further investigated using alternative empirical methods. For instance, it may be useful to set up a VAR model, by which the impulse responses of fiscal variables to financial shocks may be traced out in more detail.

Data Appendix

The dataset covers the period 1980-2007 and includes annual data for 52 countries. It is composed of 22 advanced countries and 30 emerging market economies. The former

group is formed by Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States. The latter group includes Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Estonia, Hong Kong, Hungary, India, Indonesia, Israel, Korea, Latvia, Lithuania, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Thailand, Turkey and Venezuela.

Fiscal Variables

The fiscal balance measure used in Tables 3-5 is the general government balance scaled by GDP. The source of these data varies across groups of countries. For the advanced country set, we use data from the OECD Economic Outlook (OECD EO), with the exception of Switzerland. For this we use the IMF World Economic Outlook, since it has better coverage than the OECD EO. For the emerging market economies group, we combine different sources. For China, Israel and Korea we use the OECD EO. For Chile, Egypt, India, Indonesia, Malaysia, Pakistan, Peru, Philippines, Singapore, South Africa, Thailand and Venezuela we use the World Bank World Development Indicators (WDI). For Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia we use the Annual Macro-Economic database from the European Commission (AMECO). For Turkey and Russia we use the Forecasts and Annual Indicators from the European Bank for Reconstruction and Development (EBRD). In addition, we fill missing data points for Czech Republic and Hungary using EBRD data. For Argentina, Brazil, Colombia and Mexico we use the Latin American and Caribbean Macro Watch Data Tool from the Inter-American Development Bank (IDB). In addition, we use this source to improve the series in Chile and Venezuela. Finally, Hong Kong's general government balance was obtained from national sources.

For the advanced country group, we also use alternative fiscal measures. These include the real general government balance, real general government revenues relative to trend, real general government expenditure relative to trend and the cyclically-adjusted general government balance scaled by GDP. The source of the data is the OECD EO.

The real balance is the logarithm of an index number taking value 100 in 1990. Its growth rate is constructed as the weighted difference between the growth rates of revenues and expenditure, with the weights being revenues/(revenues + expenditure) and expenditure/(revenues + expenditure), respectively. Real revenues and expenditure are measured as deviations from trend. To obtain real measures we used GDP prices as the deflator. In order to obtain deviations from trend we take the residuals of a linear regression model regressing each of these variables on a linear and quadratic trends.

Explanatory Variables

We use two alternative measures for the business cycle: real GDP relative to trend and real absorption relative to trend. The source of the former is the World Bank WDI. The latter is constructed as the difference between nominal GDP and net exports. The source of the latter is the IMF Direction of Trade Statistics (DOTS). We deflate nominal absorption using GDP prices. Our regression models use GDP and absorption relative to trend. As in the case of revenues and expenditure, these are the residuals of regression models using linear and quadratic trends as explanatory variables.

The current account balance is scaled by GDP and the source is the IMF World Economic Outlook. Private credit is private credit by deposit money banks and other financial institutions scaled by GDP. The source for this variable is database on Financial Structure by Beck et al (2010). Debt is the debt to GDP ratio obtained from the Historical Public Debt Database from Abbas et al (2010) at the IMF.

Instruments

We instrument the cycle measures using the trade-weighted rest-of-the-world counterparts. For real GDP, we use the weighted average of the real GDP of trading partners. To construct the weights, we use bilateral trade data from the IMF DOTS database. The instrument for real absorption is constructed in the same fashion. We also instrument the current account balance. For this variable we use the oil trade balance as the instrument.

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Table 1: Descriptive statistics

Panel A: *All countries*

	Mean	SD	Autocorrelation
GGBAL	-1.97	4.66	0.86
GDP	0.00	5.34	0.79
ABS	0.00	6.14	0.65
CA	-0.63	5.52	0.85
DCRE	1.97	7.19	0.51

Panel B: *Advanced*

	Mean	SD	Autocorrelation
GGBAL	-2.46	4.42	0.91
CAGGBAL	-2.73	3.48	0.89
GDP	0.00	2.69	0.78
ABS	0.00	3.64	0.73
CA	-0.31	4.85	0.90
DCRE	2.96	8.29	0.55

Panel C: *Emerging*

	Mean	SD	Autocorrelation
GGBAL	-1.34	4.87	0.80
GDP	0.00	6.72	0.79
ABS	0.00	7.59	0.63
CA	-0.89	6.00	0.83
DCRE	1.06	5.86	0.42

Note: GGBAL is general government balance scaled by GDP, CAGGBAL is cyclically-adjusted general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance scaled by GDP. DCRE is the percentage point difference in private credit scaled by GDP.

Table 2: Correlations

Panel A: *All countries*

	GGBAL	CAGGBAL	GDP	ABS	CA
CAGGBAL	0.92				
GDP	0.25	0.10			
ABS	0.21	0.07	0.81		
CA	0.12	0.17	-0.28	-0.44	
DCRE	0.26	0.26	0.23	0.25	-0.27

Panel B: *Advanced*

	GGBAL	CAGGBAL	GDP	ABS	CA
CAGGBAL	0.92				
GDP	0.31	0.11			
ABS	0.25	0.08	0.91		
CA	0.18	0.17	-0.22	-0.39	
DCRE	0.30	0.26	0.21	0.25	-0.26

Panel C: *Emerging*

	GGBAL	CAGGBAL	GDP	ABS	CA
CAGGBAL					
GDP	0.25				
ABS	0.21		0.79		
CA	0.06		-0.30	-0.47	
DCRE	0.17		0.30	0.33	-0.31

Note: De-meaned variables by country. GGBAL is general government balance scaled by GDP, CAGGBAL is cyclically-adjusted general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance scaled by GDP. DCRE is the percentage point difference in private credit scaled by GDP.

Table 3: General government balance. Full sample.

	OLS				IV			
BAL(t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.10***	0.06**	0.09***		0.18***	0.10**	0.17***	
	(0.03)	(0.03)	(0.03)		(0.05)	(0.04)	(0.05)	
ABS(t)				0.03				0.09**
				(0.03)				(0.03)
CA(t)	0.09*		0.09**		0.26***		0.24***	
	(0.05)		(0.04)		(0.05)		(0.05)	
DCRE(t,t-1)		0.02	0.03*	0.02		0.02*	0.04***	0.02
		(0.02)	(0.02)	(0.02)		(0.01)	(0.01)	(0.01)
DEBT(t-1)	0.02**	0.02***	0.02***	0.02***	0.01***	0.02***	0.02***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
BAL(t-1)	0.71***	0.77***	0.74***	0.78***	0.67***	0.76***	0.70***	0.76***
	(0.06)	(0.04)	(0.03)	(0.04)	(0.03)	(0.02)	(0.03)	(0.02)
CONS.	-1.32***	-1.58***	-1.52***	-1.54***	-1.17***	-1.67***	-1.43***	-1.73***
	(0.37)	(0.35)	(0.35)	(0.34)	(0.26)	(0.24)	(0.25)	(0.25)
R^2	0.60	0.63	0.64	0.63				
Sig. CA&DCRE			0.024				0.000	
Obs.	968	952	952	952	950	952	934	952
Countries	52	51	51	51	52	51	51	51

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. BAL is general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. The IV versions reported in columns (5)-(8) treat the cycle measures and the current account balance as endogenous variables. The former are instrumented with the trade-weighted average of other countries cycle measures, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA and DCRE.

Table 4: General government balance. Advanced countries.

	OLS				IV			
BAL(t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.14**	0.11**	0.14**		0.14*	0.05	0.12	
	(0.06)	(0.04)	(0.05)		(0.08)	(0.07)	(0.08)	
ABS(t)				0.04				0.03
				(0.03)				(0.06)
CA(t)	0.08		0.10		0.23***		0.24***	
	(0.07)		(0.06)		(0.06)		(0.06)	
DCRE(t,t-1)		0.01	0.03	0.02		0.02	0.04***	0.02
		(0.02)	(0.02)	(0.02)		(0.01)	(0.01)	(0.01)
DEBT(t-1)	0.02**	0.03***	0.02**	0.03***	0.02***	0.03***	0.02***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
BAL(t-1)	0.83***	0.84***	0.80***	0.85***	0.80***	0.85***	0.78***	0.85***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
CONS.	-1.61***	-1.86***	-1.77***	-1.79***	-1.26***	-1.80***	-1.52***	-1.78***
	(0.52)	(0.49)	(0.49)	(0.47)	(0.31)	(0.29)	(0.30)	(0.29)
R^2	0.73	0.73	0.74	0.72				
Sig. CA&DCRE			0.070				0.000	
Obs.	574	573	573	573	556	573	555	573
Countries	22	22	22	22	22	22	22	22

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. BAL is general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. The IV versions reported in columns (5)-(8) treat the cycle measures and the current account balance as endogenous variables. The former are instrumented with the trade-weighted average of other countries cycle measures, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA and DCRE.

Table 5: General government balance. Emerging markets.

	OLS				IV			
BAL(t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.08***	0.05	0.07***		0.22***	0.13**	0.20***	
	(0.02)	(0.03)	(0.02)		(0.06)	(0.05)	(0.06)	
ABS(t)				0.02				0.13***
				(0.04)				(0.04)
CA(t)	0.08		0.06		0.31***		0.26***	
	(0.07)		(0.06)		(0.08)		(0.08)	
DCRE(t,t-1)		0.02	0.04	0.03		0.00	0.06*	0.00
		(0.04)	(0.04)	(0.04)		(0.03)	(0.03)	(0.03)
DEBT(t-1)	0.01	0.01	0.01	0.01	0.01	0.02**	0.02**	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
BAL(t-1)	0.50***	0.60***	0.59***	0.61***	0.47***	0.57***	0.53***	0.58***
	(0.11)	(0.08)	(0.08)	(0.08)	(0.04)	(0.05)	(0.05)	(0.05)
CONS.	-0.74	-1.03**	-1.03*	-1.00*	-0.90**	-1.31***	-1.29***	-1.62***
	(0.54)	(0.50)	(0.51)	(0.49)	(0.44)	(0.41)	(0.43)	(0.47)
R^2	0.39	0.43	0.43	0.42				
Sig. CA&DCRE			0.541				0.005	
Obs.	394	379	379	379	394	379	379	379
Countries	30	29	29	29	30	29	29	29

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. BAL is general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. The IV versions reported in columns (5)-(8) treat the cycle measures and the current account balance as endogenous variables. The former are instrumented with the trade-weighted average of other countries cycle measures, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA and DCRE.

Table 6: Alternative fiscal measures. Advanced countries.

	BALANCE		REVENUES		EXPENDITURE	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
GDP(t)	0.15**	0.16*	0.53***	0.45***	0.06	-0.09
	(0.06)	(0.09)	(0.10)	(0.10)	(0.09)	(0.11)
CA(t)	0.10	0.27***	-0.07*	-0.00	-0.13***	-0.09
	(0.08)	(0.07)	(0.04)	(0.07)	(0.04)	(0.08)
DCRE(t,t-1)	0.03	0.05***	0.01	0.02	-0.01	0.01
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
DEBT(t-1)	0.02*	0.01	0.02***	0.02***	-0.02***	-0.02***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
FISCAL(t-1)	0.78***	0.74***	0.52***	0.56***	0.61***	0.60***
	(0.03)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)
CONS.	1.01***	1.21***	-0.01***	-0.01***	0.01***	0.02***
	(0.15)	(0.20)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.68		0.61		0.44	
Sig. CA&DCRE	0.087	0.000	0.151	0.344	0.001	0.381
Obs.	566	548	566	548	566	548
Countries	22	22	22	22	22	22

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. BALANCE is real general government balance. REVENUES is real revenues relative to trend and EXPENDITURE is real expenditure relative to trend. GDP is real GDP relative to trend. Deviations from trend are the residuals of OLS models regressing each variable of interest on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. The IV versions treat the GDP and the current account balance as endogenous variables. The former is instrumented with the trade-weighted average of other countries GDP, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA and DCRE.

Table 7: Cyclically-adjusted general government balance. Advanced countries.

	OLS				IV			
BAL(t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.04	0.02	0.03		-0.06	-0.08	-0.08	
	(0.04)	(0.03)	(0.04)		(0.06)	(0.05)	(0.06)	
ABS(t)				0.01				-0.08
				(0.02)				(0.05)
CA(t)	0.02		0.04		0.05		0.05	
	(0.04)		(0.03)		(0.05)		(0.05)	
DCRE(t,t-1)		0.02	0.02*	0.02		0.02***	0.03***	0.03***
		(0.01)	(0.01)	(0.01)		(0.01)	(0.01)	(0.01)
DEBT(t-1)	0.02**	0.02***	0.02**	0.02***	0.01***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
BAL(t-1)	0.83***	0.82***	0.81***	0.83***	0.84***	0.84***	0.83***	0.83***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)
CONS.	-1.36***	-1.53***	-1.50***	-1.53***	-1.19***	-1.45***	-1.40***	-1.44***
	(0.40)	(0.37)	(0.37)	(0.37)	(0.26)	(0.25)	(0.25)	(0.25)
R^2	0.71	0.71	0.71	0.71				
Sig. CA&DCRE			0.061				0.034	
Obs.	566	565	565	565	548	565	547	565
Countries	22	22	22	22	22	22	22	22

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. BAL is cyclically-adjusted general government balance scaled by GDP. GDP and ABS are two alternative cycle measures. GDP is real GDP relative to trend while ABS is real absorption (defined as GDP minus net exports) relative trend. To construct these deviations from trend we take the residuals of OLS models regressing each cycle measure on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. The IV versions reported in columns (5)-(8) treat the cycle measures and the current account balance as endogenous variables. The former are instrumented with the trade-weighted average of other countries cycle measures, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA and DCRE.

Table 8: Maastricht Treaty and EMU effects. General government balance.

	GGBAL/GDP (OLS)				GGBAL/GDP (IV)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.14**	0.14**	0.14**	0.14**	0.02	0.05	0.04	0.06
	(0.06)	(0.06)	(0.06)	(0.07)	(0.11)	(0.11)	(0.11)	(0.11)
CA(t)	0.11	0.11	0.12	0.11	0.27***	0.30***	0.27***	0.30***
	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
DCRE(t,t-1)	0.02	0.02	0.02	0.02	0.04***	0.03**	0.02*	0.02*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
DEBT(t-1)	0.01	0.01	0.01	0.02	0.01	0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
BAL(t-1)	0.78***	0.78***	0.77***	0.78***	0.76***	0.73***	0.75***	0.73***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
MT	-1.08*	-1.08*	-1.32**	-1.34**	-1.41**	-1.38**	-1.78***	-1.60***
	(0.54)	(0.53)	(0.56)	(0.55)	(0.59)	(0.59)	(0.60)	(0.60)
MTxGDP(t)	0.17*	0.17*	0.17*	0.18*	0.62***	0.58***	0.63***	0.59***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.20)	(0.20)	(0.19)	(0.19)
MTxDEBT(t-1)	0.01*	0.01*	0.02**	0.02**	0.01	0.01	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
MTxrBAL(t-1)	-0.10	-0.10	-0.10	-0.10	-0.26***	-0.21***	-0.25***	-0.20***
	(0.07)	(0.07)	(0.08)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
EMU	0.71**	0.70**	0.38	0.36	0.88**	0.77**	0.39	0.51
	(0.31)	(0.31)	(0.35)	(0.36)	(0.35)	(0.35)	(0.37)	(0.37)
EMUxGDP(t)	-0.25***	-0.25***	-0.23**	-0.23**	-0.23	-0.26	-0.34	-0.32
	(0.09)	(0.09)	(0.09)	(0.09)	(0.23)	(0.23)	(0.22)	(0.23)
EMUxCA(t)		-0.02		0.03		-0.22**		-0.19*
		(0.08)		(0.07)		(0.10)		(0.11)
EMUxDCRE(t,t-1)			0.08	0.08*			0.12***	0.07
			(0.05)	(0.04)			(0.04)	(0.04)
CONS.	-1.46***	-1.45***	-1.48***	-1.50***	-1.11***	-0.99***	-1.13***	-1.02***
	(0.45)	(0.46)	(0.47)	(0.49)	(0.34)	(0.35)	(0.34)	(0.35)
R^2	0.74	0.75	0.75	0.75				
Sig. CA&DCRE	0.059	0.045	0.067	0.000	0.000	0.001	0.000	0.000
Obs.	573	573	573	573	555	555	555	555
Countries	22	22	22	22	22	22	22	22

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. GGBAL/GDP is general government balance scaled by GDP. GDP is real GDP relative to trend. To construct this we take the residuals of OLS models regressing GDP on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. MT and EMU are dummy variables. The former takes value 1 for the period 1992-2007 in EU member countries and zero otherwise. EMU dummy takes value 1 for the period 1999-2007 in EU countries belonging to the EMU and zero otherwise. The IV versions treat the GDP and the current account balance as endogenous variables. The former is instrumented with the trade-weighted average of other countries GDP, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA, DCRE and interaction of these with the EMU dummy.

Table 9: Maastricht Treaty and EMU effects. Cyclically-adjusted general government balance.

	CAGGBAL/GDP (OLS)				CAGGBAL/GDP (IV)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP(t)	0.01	0.01	0.01	0.01	-0.13	-0.13*	-0.12	-0.13
	(0.04)	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.08)	(0.08)
CA(t)	0.04	0.03	0.04	0.03	0.06	0.05	0.06	0.05
	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.06)
DCRE(t,t-1)	0.02	0.02*	0.02	0.02	0.02**	0.02**	0.02*	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
DEBT(t-1)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
BAL(t-1)	0.79***	0.80***	0.79***	0.79***	0.80***	0.81***	0.80***	0.81***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
MT	-1.05**	-1.05**	-1.15**	-1.22**	-1.16**	-1.17**	-1.24**	-1.30***
	(0.44)	(0.46)	(0.43)	(0.45)	(0.48)	(0.48)	(0.50)	(0.50)
MTxGDP(t)	0.13*	0.14*	0.13*	0.14**	0.37***	0.37***	0.37***	0.38***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.14)	(0.14)	(0.14)	(0.14)
MTxDEBT(t-1)	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
MTxrBAL(t-1)	-0.10	-0.11	-0.09	-0.11	-0.14**	-0.15**	-0.14**	-0.15**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
EMU	0.41	0.43*	0.28	0.22	0.42	0.44	0.32	0.29
	(0.26)	(0.23)	(0.30)	(0.30)	(0.29)	(0.29)	(0.31)	(0.31)
EMUxGDP(t)	-0.14*	-0.14*	-0.13	-0.13	-0.26	-0.25	-0.29	-0.29
	(0.07)	(0.07)	(0.08)	(0.08)	(0.18)	(0.18)	(0.18)	(0.18)
EMUxCA(t)		0.06		0.09**		0.04		0.05
		(0.05)		(0.04)		(0.08)		(0.09)
EMUxDCRE(t,t-1)			0.03	0.05			0.03	0.04
			(0.03)	(0.03)			(0.03)	(0.04)
CONS.	-1.18***	-1.21***	-1.19***	-1.24***	-1.09***	-1.11***	-1.10***	-1.13***
	(0.29)	(0.29)	(0.30)	(0.31)	(0.27)	(0.28)	(0.27)	(0.28)
R^2	0.73	0.73	0.73	0.73				
Sig. CA&DCRE	0.056	0.039	0.072	0.003	0.102	0.147	0.164	0.178
Obs.	565	565	565	565	547	547	547	547
Countries	22	22	22	22	22	22	22	22

Notes: Robust standard errors in parenthesis. Statistical significance is reported as follows: * significant at 10%, ** significant at 5% and *** significant at 1%. These models are estimated with data for the 1980-2007 period. CAGGBAL/GDP is cyclically-adjusted general government balance scaled by GDP. GDP is real GDP relative to trend. To construct this we take the residuals of OLS models regressing GDP on a linear and quadratic trends. CA is current account balance and DEBT is the outstanding level of public debt (both are scaled by GDP). DCRE is the percentage point difference in private credit scaled by GDP. MT and EMU are dummy variables. The former takes value 1 for the period 1992-2007 in EU member countries and zero otherwise. EMU dummy takes value 1 for the period 1999-2007 in EU countries belonging to the EMU and zero otherwise. The IV versions treat the GDP and the current account balance as endogenous variables. The former is instrumented with the trade-weighted average of other countries GDP, the latter is instrumented with the oil trade balance scaled by GDP. Sig. CA&DCRE is the p-value of the test of joint significance of CA, DCRE and interaction of these with the EMU dummy.

Tables Appendix

Table A1: Instrument tests

Regression	Underidentification test (Anderson canonical corr rank test) F-statistic	Weak identification test (Cragg-Donald) F-statistic	Rank of matrix test (Kleibergen-Paap rk LM) Chi-sq statistic
Table 3, column (5)	160.4	90.8	135.3
Table 3, column (6)	168.8	193.3	229.2
Table 3, column (7)	158.1	89.5	135.3
Table 3, column (8)	141.9	157.2	198.5
Table 4, column (5)	92.3	52.7	103.4
Table 4, column (6)	111.2	131.7	128.2
Table 4, column (7)	95.6	54.9	103.4
Table 4, column (8)	78.4	86.7	89.5
Table 5, column (5)	66.2	36.4	65.2
Table 5, column (6)	67.9	75.5	127.1
Table 5, column (7)	63.6	34.8	65.2
Table 5, column (8)	62.8	68.7	118.5
Table 6, column (5)	92.7	53.1	103.4
Table 6, column (6)	122.7	149.5	128.2
Table 6, column (7)	95.6	55.1	103.4
Table 6, column (8)	86.7	97.6	89.5
Table 7, column (2)	94.9	54.6	103.4
Table 7, column (4)	86.7	49.0	103.4
Table 7, column (6)	101.3	59.1	103.4
Table 8, column (5)	79.4	21.7	92.9
Table 8, column (6)	81.2	17.8	70.0
Table 8, column (7)	79.2	21.6	92.9
Table 8, column (8)	80.6	17.6	70.0
Table 9, column (5)	74.3	20.1	92.9
Table 9, column (6)	76.5	16.6	70.0
Table 9, column (7)	74.0	20.0	92.9
Table 9, column (8)	76.0	16.5	70.0

Notes: We reject the null hypothesis in all models at 1 percent confidence level. For the Anderson canonical correlation rank test (Underidentification test), Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified) and Ha: matrix has rank=K1 (identified), where K1 is number of endogenous regressors. For the Cragg-Donald test (Weak identification test), Ho: equation is weakly identified. The Kleibergen-Paap (2006) rk statistic is a generalization of the Anderson canonical correlation rank test to the case of a non-Kronecker covariance matrix. This test is robust to various forms of heteroskedasticity, autocorrelation and clustering. Rejection of the null indicates that the matrix is identified. We also implemented a Sargan test for overidentifying restrictions. This tests the joint null hypothesis that the instruments are valid instruments. More specifically, it tests that the excluded instruments are uncorrelated with the error term of the IV model and that the excluded instruments are correctly excluded from the estimated equation. For all models this test shows the instruments are valid instruments.