AN EVALUATION OF FISCAL POLICY EFFECTIVENESS DURING BANKING CRISES

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ABSTRACT

The late 2000s banking crisis and the attendant surge in fiscal stimulus packages among the world’s major advanced economies have exposed economists’ divergent views and taxpayers’ skepticism on the effectiveness of fiscal policy on the economy. The intersection of fiscal stimulus and banking crisis recovery poses important questions as public debt levels build up to staggering heights owing to the occurrence of banking crises, and there is well-documented evidence that financial crises and associated fiscal stimulus contribute significantly to this phenomenon. Based on an unbalanced panel of 20 OECD countries for the period 1970-2009, this study examines whether during banking crises, changes in governments’ cyclically-adjusted primary fiscal balances have a significant asymmetric effect on short-run economic growth, that is, whether this effect is different from that observed during more “normal” circumstances. Results suggest that fiscal stimulus is likely to have such an asymmetric effect on growth both in the year following a banking crisis and two years after. However, over longer time horizons, other factors operating through monetary policy appear to be more important.
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The views, findings, and interpretations presented in this paper are exclusively those of the author, and in no way represent the views of any institutions, organizations, countries, or associations referred to herein.
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I. Introduction

Banking crises are serious and in many cases protracted events. The recent experience has shown –rather dramatically- how trouble in a small part of the financial sector can transcend a global financial center like the U.S., and the ensuing credit crunch quickly spread and wreak havoc across globally intertwined financial markets exposed to the same risks, hitting integrated economies\(^1\). The still-vivid memory of the late 2000s crisis provides a rather chilling example of this, with a “Great Recession” in the United States that lasted 18 months\(^2\), the longest recession since WWII, and unemployment still standing at 8.8 percent at the time of this writing.\(^3\)

Given the above, it is not surprising that governments go to great lengths to enact timely macroeconomic stimulus, attempting to facilitate a faster recovery from these shocks. Stimulus policies, however, come at high costs. These high costs include both direct fiscal support to the financial system\(^4\), the indirect long-term costs these may generate in terms of public debt accumulation,\(^5\) and output losses, which evidence suggests, are not temporary deviations from the projected growth path, but rather shocks leading to a persistently lower steady-state GDP growth rate; on average, even looking at a 10-year window, output losses due to banking crises

\(^{1}\) This is not intended to be a generalization of the chain of events associated with banking crises and how they damage the broad economy. For a concise discussion on the origins and contagion of banking crises, see Reinhart and Rogoff, 2008.

\(^{2}\) National Bureau of Economic Research (NBER), 2009.


\(^{4}\) As Laeven and Valencia (2010) explain, direct fiscal support measures broadly comprise liquidity support measures and guarantees on bank liabilities during crises’ “containment” phase, as well as capital injections, asset purchases, and guarantees, which are part of crises’ “resolution” phase. Bank holidays or deposit freezes were not used this time around; they were also rarely used in past banking crises.

\(^{5}\) The literature recognizes that the cost of these direct fiscal support measures is very difficult to calculate. Reinhart and Rogoff (2009) also argue, as explained below, that public debt build-up following financial crises is not so much a result of those costs, but a consequence of declining tax revenues and fiscal stimulus following the severe economic downturns associated with crises.
amount to more than 15 percent for high income countries (Cerra and Saxena, 2008). Evidence also shows that on average, the level of real per capita GDP falls 9.3 percent from peak to trough over almost two years, unemployment rises about 7 percent over almost five years, and housing and equity prices fall a staggering 35.5 percent and 55.9 percent over six and three years, respectively (Reinhart and Rogoff, 2009). As these figures imply, there are very high social costs to crisis as well.

Against this backdrop, the fiscal stimulus measures taken to promote economic recovery in the wake of crisis episodes are at the heart of this study. In particular, increased reliance on such measures among major advanced economies during the late 2000s crisis has exposed economists’ divergent views on the effectiveness of fiscal policy in promoting output growth, and an implicit belief that automatic stabilizers might be insufficient (Auerbach and Gale, 2009) to bring the economy out of the Great Recession.

This question is an important one from at least three perspectives. First, the recent literature stresses that in the recent conjuncture, with several central banks having driven interest rates near zero, the case for fiscal stimulus was stronger (Auerbach and Gale, 2009; Benetrix and Lane, 2010; Turrini et al, 2010). But even if fiscal policy were the only policy option left to exhaust, the sheer magnitude of the costs entailed in providing fiscal stimulus merits closer attention, especially as the current outlook for public debt among several advanced economies

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6 In the same study, the corresponding output loss for all countries in the sample is about 7.5 percent.

7 For the post-WWII period output losses have been smaller for advanced economies than for emerging ones, potentially due to the vulnerability of the latter to so-called “sudden stops”, or reversals of foreign credit availability (Reinhart and Rogoff, 2009).

8 An in-depth analysis of the preamble and aftermath of banking crises is outside the scope of this paper –and very well covered in the literature. A non-exhaustive list of widely-cited studies in this area include Kaminsky and Reinhart (1999) and Reinhart and Rogoff (2008, 2009, 2010).

9 The terms fiscal stimulus and fiscal expansions are used interchangeably along the paper, as are fiscal contractions, retrenchment, and adjustments.

10 Fiscal policy refers to the use of government spending and/or revenue adjustments to stimulate or dampen economic growth, or to reduce debt-GDP ratios.
looks bleak. Second, given that several advanced economies –of which the U.S. is not an exception- are facing mounting pressures vis-à-vis public debt accumulation and the fiscal outlook, some economists warn that if a given country’s debt level is already high and its fiscal situation is perceived to be unsustainable, fiscal policy may not be the most appropriate stabilization tool at hand and could actually be counterproductive if it results in lower consumer and investor confidence (Spilimbergo et al, 2008). Debt implications are indeed critical, as evidence suggests that three years following systemic banking crises, government debt typically increases about 86 percent,\(^{11}\) that banking crises are a significant predictor of debt crises, and that public debt surges –typically observed in the run-up to banking crises- are significantly and positively correlated with the probability of default (Reinhart and Rogoff, 2009, 2010). The debt buildup associated with banking crises is, surprisingly, not a direct result of large bailout and bank recapitalization costs as has been much touted in the literature, but rather a consequence of the perverse combination of declining tax revenues resulting from protracted economic contractions and countercyclical fiscal stimulus to promote recovery (Reinhart and Rogoff, 2009). Third, while the frequency of banking crises has declined somewhat post-WWII, evidence suggests that both the preamble and the aftermath of banking crises across both advanced and emerging economies alike have much in common, and the question of whether countries eventually graduate from these major episodes still remains (Reinhart and Rogoff, 2008). Thus, because banking crises are likely to remain a possible threat for some time, the question of fiscal policy efficacy in facilitating economic recovery during these episodes is a central one in and of itself. Fourth, while much has been studied about fiscal policy and overall growth in general, as section IV shows, the intersection of fiscal policy and banking crises is becoming a rather

\(^{11}\) The staggering buildup of government debt is characteristic of the aftermath of banking crisis for over a century (Reinhart and Rogoff, 2009).
nascent but growing area of research especially concerned with the channels through which fiscal policy likely facilitates (or not) economic recovery during periods of severe financial system distress.

The study is structured as follows. Section II sets the context by providing basic stylized facts from the literature on banking crises and discusses fundamental questions facing fiscal policy decisions in said context; section III describes the existing theoretical foundations describing the relationship between short-run economic growth and fiscal policy, both in general, and in the special case of fiscal policy enacted during banking crises; section IV reviews the available literature on fiscal policy and economic growth; section V presents the data, empirical strategy and findings, followed by section VI on model limitations. Section VII concludes by analyzing policy implications and possible routes for further research.

II. Background: Context and Relevant Policy Questions

While the incidence of banking crises has dropped considerably since the end of WWII, factoring in the late 2000s crisis would result in the decline becoming less prominent.\textsuperscript{12} Even a cursory look at recent studies reveals that the pattern of banking crisis incidence is likely here to stay; in fact, they are “an equal opportunity menace” for advanced and emerging economies alike and novel data have uncovered evidence of the pattern of banking crisis occurrence that can be traced as far back as the 1800s (Reinhart and Rogoff, 2008, 2010). What is most remarkable is that for the world’s greatest financial centers -the United States, the United Kingdom, and France- the historical pattern points to serial banking crises, counting 13, 12, and 15 episodes,

\textsuperscript{12} In the post-WWII period, only one country (Portugal) has averted banking crisis (Reinhart and Rogoff, 2010). The late 2000s crisis was the country’s exception.
respectively. Most notably, during banking crises, countries’ fiscal positions deteriorate sharply as a result of falling revenues and higher expenditures, and government debt grows by 86 percent in the three years following the beginning of a banking crisis (Reinhart and Rogoff, 2008, 2009, and 2010).

Other costs associated with banking crises include governments’ direct support to the banking system in the form of liquidity injections or guarantees—which in turn create contingent liabilities and expose governments to balance sheet risks. Laeven and Valencia (2010) estimate that while the median direct fiscal cost of the 2007-2009 systemic banking crises for all countries was about 4.9 percent of GDP, or about half the historical (1970-2006) median of 10 percent, for advanced economies these costs were higher (5.9 percent of GDP compared to 3.7 percent historically), partly reflecting a larger average banking system size. Similarly, for all countries, the 2007-2009 crisis entailed higher costs in terms of the median increase in public debt and output losses, although for advanced economies more specifically, these two types of costs were lower this time around.

In the U.S., policy prescriptions to deal with the severe downturn that resulted from the recent crises called for measures to be (i) timely, to ensure that measures were enacted neither too early nor too late; (ii) targeted, meaning each stimulus dollar should maximize short-run GDP growth, and (iii) temporary, implying these measures should not place any additional strains on the budget deficit over the long term (Elmendorf and Furman, 2008). The timeliness of fiscal measures matters and implementation lags are actually at the center of standard criticisms of fiscal policy vis-à-vis monetary policy (Auerbach and Gale, 2009), while the latter is also

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13 In fact, as Reinhart and Rogoff (2008) point out, “while many now-advanced economies have graduated from a history of serial default on sovereign debt, or very high inflation (above 20 percent), graduation from banking crises has proven, so far, virtually impossible”.
preferred for central banks’ ability to act independently of political pressures (Elmendorf and Furman, 2008). Arguably, while public investment in infrastructure may contribute to increases in productivity in the longer-term, it may come with administrative delays not present with public spending in goods and services, where disbursements are almost immediate. However, if the outlook calls for a protracted downturn, timeliness may in fact not be policymakers’ main concern. In this sense, the composition of fiscal policy packages may be more important (Turrini et al, 2010; Auerbach and Gale, 2009; Baldacci et al, 2009). Recent evidence suggests that composition matters for effectiveness and that a 10 percentage point increase in the share of government consumption in the budget is associated with lower crisis length (three to four months), and that reducing the share of income taxes is less effective than consumption taxes in promoting a faster exit from crisis (Baldacci et al, 2009).

In the United States, fiscal measures embodied in the “Economic Stimulus Act of 2008”, which amounted to 1.2 percent of GDP and the “American Recovery and Reinvestment Act of 2009” (ARRA)\textsuperscript{14} contained a number of temporary household tax rebates and business investment incentives to combat the so-called “Great Recession” amounting to 5.5 percent of GDP. It was expected that the ARRA increase the fiscal deficit by 2.1 percent of GDP in 2009 and 2.4 percent of GDP in 2010. Meanwhile, in 2010, the U.S. debt-to-GDP ratio had soared to 50 percent after doubling for the past two years, partly as a result of these recent measures (Auerbach and Gale, 2010).

As a whole, members of the Organization of Economic Cooperation and Development (OECD) enacted fiscal stimulus packages averaging 2.5 percent of GDP. For advanced

\textsuperscript{14} It included government spending provisions for infrastructure projects and aid to state governments.
economies as a whole, median public debt levels have increased by 25.1 percent of GDP, compared to 36.2 percent of GDP for banking crises over the 1970-2006 period (Laeven and Valencia, 2010).

III. Theoretical Framework

Before delving into a review of the existing literature, this section discusses the theoretical foundations that are most relevant to the study of fiscal policy effectiveness by contrasting theory at the most general level with relatively more recent models looking at possible sources of asymmetry in how output growth responds to fiscal policy in recessions vis-à-vis expansions. This latter area of the theoretical literature is closest to the intersection between fiscal policy and banking crises. The selection of variables for the model discussed in section V below was driven by theoretical considerations, as well as other factors previously shown to be important in the empirical literature.

A. Fiscal Policy and Short-Run Growth: Basics

The basic theoretical anchor for studies relating fiscal policy to short-run output growth is the neoclassical Keynesian model whereby activist fiscal policy is justified by the view that recessions are periods of sluggish aggregate demand. To John Maynard Keynes, father of this model and a witness of the Great Depression of the 1930s, to reduce unemployment and ensure the economy’s operation at its full potential, aggregate demand had to be stimulated to be brought up to par with aggregate supply (Mankiw, 2005; Van Brusselen, 2009).

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15 Includes Austria, Belgium, Denmark, Germany, Iceland, Ireland, Latvia, Luxembourg, Mongolia, Netherlands, Ukraine, United Kingdom, and United States (Laeven and Valencia, 2010).
At the heart of this model is the assumption that prices in the short-run are sticky (i.e. do not adjust fully to clear markets as they do in the long-run under the classical model), and thus this market imperfection may lead to temporary deviations of output and employment from their full potential levels. Under the Keynesian view, a fiscal expansion\textsuperscript{17} (increased government spending and/or tax cuts) generates a “multiplier” effect whereby each additional dollar spent or of foregone tax revenues provides additional income to households, which in turn spend a portion of it, triggering a second round of spending effects, and so forth\textsuperscript{18}. The Keynesian multiplier is in theory greater than unity\textsuperscript{19}, meaning that this chain of events continues until the overall effect on output growth is that the first dollar of additional fiscal stimulus increases growth by more than a dollar.

As explained below in more detail, the empirical literature offers a wide variety of estimates of fiscal multipliers, a consequence of the existence of more than one estimation method of choice. The theoretical literature deals with the factors that are important to the sign and magnitude of Keynesian multipliers, as discussed below.

\textbf{B. Crowding Out}

While crowding out does not change multipliers’ sign, it does alter their magnitude. Fiscal stimulus under this model leads to a higher interest rate, which “crowds out” private investment, meaning that output grows thanks to public sector stimulus at the expense of the private sector, for which the cost of investment becomes higher. The same may be true for

\textsuperscript{17} Specifically, consumption increases after a fiscal expansion financed with future lump-sum taxes as disposable income increases in the current period (Tagkalakis, 2008).

\textsuperscript{18} The opposite effects hold for fiscal contractions (spending cuts or tax increases).

\textsuperscript{19} The formula for the Keynesian spending multiplier is derived from an infinite geometric series that converges to $1/(1-\text{MPC})$ where MPC stands for consumers’ marginal propensity to consume, or the portion of each additional dollar of disposable income that is actually consumed. The formula for the tax multiplier is given by $-\text{MPC}/(1-\text{MPC})$ and as such, its absolute value is smaller than the that for spending (Mankiw, 2005; Van Brusselen, 2009). Tax multipliers also vary depending on the type of tax (proportional income or consumption, lump-sum) being changed (Hemming et al, 2002).
consumption items that are sensitive to interest rates (Baldacci et al, 2009). In the open economy version of the model\textsuperscript{20} the higher interest rate makes assets denominated in that country’s currency more attractive, which generates capital inflows, which in turn lead to currency appreciation (through the greater demand for the currency by foreigners to purchase those assets). In this sense, in the case of fiscal expansions with flexible exchange rates, the extent of crowding out may be greater as some of that fiscal stimulus will spill over to foreigners in the form of greater demand for imports facilitated by a higher exchange rate that makes imports more attractive. Under fixed exchange rates, the central bank must expand the money base to offset currency appreciation and so provides additional stimulus (Ilzetzki et al, 2009).

\textbf{C. Monetary Policy and Liquidity Traps}

While the extent of crowding out depends on how investment behaves facing higher interest rates, fiscal stimulus and a concomitant (accommodative) monetary expansion can offset the effect of a higher interest rate, partly or wholly (Romer, 1999; Galí, 2007).

Under the special case of a liquidity trap,\textsuperscript{21} which manifests itself when nominal interest rates are very close to zero, monetary policy can do little to stimulate the economy and fiscal policy can be very effective, especially as the potential for crowding out diminishes greatly. The same may occur when interest rates are above zero but there is high risk-aversion due to higher perceived market risks, prompting households to prefer to hold cash than investing in interest-bearing assets (Van Brusselen, 2009).

\textbf{D. Fiscal Policy during Banking Crises: Possible Sources of Asymmetry}

\textit{a. Consumption Response}

\textsuperscript{20} This is best known as the Mundell-Fleming model.

\textsuperscript{21} In terms of the standard IS-LM model described in textbooks, a liquidity trap is depicted by a horizontal LM curve.
To examine the possible sources of asymmetry in how the economy responds to fiscal stimulus during banking crises, the nascent literature on this question (for example, Afonso et al, 2010; Baldacci et al, 2009; Turrin et al, 2010) points to Real Business Cycle theory (RBC). This strand of the theoretical literature analyzes changes in consumption, the largest aggregate demand component, and models households’ consumption behavior following fiscal policy changes. In this sense, these models come to fill in for the lack of microeconomic foundations in the Keynesian model, which have been the object of much of the criticism it has typically received. The centerpiece of models under the umbrella of RBC theory is the notion of individuals’ intertemporal substitution of labor, that is, the implied cost-benefit calculation to determine how much labor (hours) to supply across time, depending on the prevailing real interest and wage rates.\(^{22}\) That is, households are “Ricardian”\(^{23}\) or forward-looking, and make consumption and labor decisions based on an intertemporal budget constraint taking into account the present value of their expected income.\(^{24}\)

Unlike the Keynesian model, under the RBC model, consumption declines following an increase in government spending financed through higher lump-sum taxation\(^{25}\) due to the negative wealth effect generated by the lower disposable (i.e. after-tax) income. This also prompts individuals to ramp up the hours of labor supplied, which results in a lower equilibrium real wage rate, as well as higher employment and output. The increase in employment in the

\(^{22}\) Specifically, assuming a window of two time periods, an individual’s intertemporal wage rate is given by \((1+r)*W_1/W_2\), where \(W_i\) denotes the prevailing wage rate in each period and \(r\) the real interest rate (Mankiw, 2005).

\(^{23}\) “Ricardian” consumers owe their name to the theory of Ricardian equivalence, which posits that increases in government spending, financed (either debt or tax-financed) are fully offset by higher private saving. Evidence on Ricardian equivalence is mixed.

\(^{24}\) Mankiw (2005) offers a concise descriptive (non-mathematical) overview of these models. Concrete examples of this literature are Aiyagari et al (1990) and Gali et al (2007).

\(^{25}\) If distortionary taxes are used instead, there are both intertemporal as well as intratemporal effects, as individuals would work more and consume more in the period with lower taxes, and work more when the cost of work relative to leisure is low (Tagkalakis, 2008).
long-run may lead to a higher return to capital, which also makes investment more attractive (Tagkalakis, 2008; Gali et al, 2007).

While both theories predict similar effects on overall output, the structure of RBC models, heavily microeconomic in nature, has been used to model how there may be asymmetry in how consumption responds to fiscal shocks during recessions vis-à-vis expansions, as described below.

b. Liquidity and Credit Constraints

Another strand of research focuses on the “non-Keynesian” effects of fiscal policy and the role that liquidity constraints play in how consumption responds to government spending shocks. Under this view, if there exists a large proportion of “rule of thumb” consumers who focus more on current than on future income when making consumption decisions, and assuming a high degree of price stickiness, public spending shocks may be associated with a positive consumption response, but a negative one when the shock is more persistent and thus generates a negative wealth effect due to higher taxation in the future (Tagkalakis, 2008). Additionally, some studies have also shown that given the coexistence of credit-constrained and credit-unconstrained households, fiscal contractions may actually be expansionary in the presence of a large proportion of unconstrained households because these lower the future tax burden, leading to greater private consumption and generating a positive wealth effect that could lead to an expansion. However, when the proportion of constrained households is high enough, fiscal contractions could lead to the usual Keynesian effects due to a weaker wealth effect (Tagkalakis, 2008; Giavazzi and Pagano, 1990). This is better known as the so-called “expansionary fiscal contractions hypothesis”.
Tagkalakis (2008) claims that during recessions, less-widespread access to credit markets implies that consumers and businesses experience weaker wealth effects associated with fiscal expansions. In this sense, fiscal expansions during recessions, which are periods when liquidity constraints are more binding, could actually lead to the usual Keynesian response of (greater) private consumption, in turn leading to higher growth. Thus, if there is a large enough portion of credit-constrained consumers in the population, for whom future implications of current fiscal policy changes may not matter, they will spend all of the additional disposable income obtained from fiscal stimulus. They confirmed this result empirically confirming that the effect is larger for recessions than for expansions. In the opposite case of a fiscal contraction during an economic boom, liquidity constraints are more likely to affect a smaller portion of the population, and so fiscal retrenchment could boost consumption through the positive wealth effect associated with lower future taxation. Overall, in this case, fiscal contractions could be expansionary.

IV. Literature Review

A. Fiscal Policy Effects

Much has been studied about fiscal policy and its effect on overall output growth. A recurrent theme in prior studies is the classification of the relevant literature among at least two broad areas according to the estimation techniques employed: (i) microeconomic studies of the effects of fiscal policy on individual output components (consumption or investment); and (ii) models looking at the overall output response to fiscal policy based on direct and indirect effects and private sector responses, which include the extensive vector autoregression (VAR)
beginning with Blanchard and Perotti (2002), and large-scale macroeconomic simulation models such as those used by governments, the International Monetary Fund and private consulting companies. (Auerbach and Gale, 2009). One of the main characteristics of this literature is that the variety of techniques used results in rather wide-ranging estimates of fiscal multipliers. These wide-ranging estimates are also a result of the fact that the precise estimation of fiscal multipliers is complicated by data availability –especially for emerging and developing economies- and the likelihood of endogeneity (i.e. back and forth relationships) between fiscal policy and output growth. As a result, many studies in the literature have focused on the statistical significance –rather than the magnitude- of the estimated coefficients for fiscal policy.

Thus, while the majority of economists have settled on the sign of size of fiscal multipliers -implying that (from a Keynesian point of view), fiscal stimulus should be associated with output expansions and fiscal contractions with sluggish growth- consensus on their magnitude is confounded by the sheer variety of estimates (see for example, Blanchard, 2004). Even in some cases, some evidence has cast doubt on multipliers’ sign. As Blanchard (2004) also points out, a study (Perotti, 2002) found that GDP responses to tax shocks across OECD countries were likely negative for the 1980-2000 period, in contrast to 1960-1980, although he argues that model assumptions, the data used, or other unknown factors may be to blame. Also, a seminal paper by Giavazzi and Pagano (1990) points to two specific cases (Denmark and Ireland) in which estimated multipliers turned out to be negative. Their work began what is known as the “expansionary fiscal contractions” hypothesis, as explained in section III. Along similar lines, the “contractionary fiscal expansions hypothesis” argues that because fiscal

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26 Vector autoregression (VAR) models are a commonly used technique in estimation with time series data, used in much of the fiscal policy literature. Their essence lies in that models include several lags of the dependent variable; under structural VAR (SVAR) models, in addition, equations may be used to define the basic assumptions of the model, which in turn are taken into account in the SVAR to estimate the growth response.
expansions can affect expectations about future taxes, in times of large public deficits and rising public debt, increased public spending and public debt can indeed prompt a fall in consumption by triggering fear of a future fiscal crisis (Perotti, 1999).

For tax cuts, there is some evidence looking at individual household responses to tax cuts or rebates, and similar techniques may be used for the study of how businesses respond to incentives (such as those enacted within the 2008 and 2009 stimulus packages). Consistent with this interest in how consumption responds to tax cuts or rebates, there is a fair amount of literature studying the microeconomic (household-level) responses of consumption to tax cuts enacted at different points in time. Some of the focus has been on whether permanent tax cuts, as opposed to temporary ones, generate larger effects on consumption behavior, and whether the effect occurs at the time of enactment as opposed to around the announcement of the tax measures; studies have found that consumption behavior changes upon enactment rather than announcement (Auerbach and Gale, 2009). Some of this empirical literature is related to RBC models (for example, see Aiyagari et al, 1990).

As explained in more detail in section V, the study of fiscal policy and output growth in the short-run faces limitations, mostly arising from the fact that it is almost impossible to fully eliminate endogeneity. The so-called narrative approach relies on detailed analysis of presidential reports, legislation, executive-branch documents to identify the enactment of stimulus or contractions as purely discretionary policy responses. This detailed analysis is then followed by estimation of effects using simple equations. The beauty of this approach is that although very time-consuming, by identifying exogenous changes in fiscal variables, equations to estimate the output response to those changes should at least in theory yield results devoid of omitted variables bias. Romer and Romer (2007) provide a widely-cited example of this
approach as applied to the study of tax changes. Another seminal example is Ramey and Shapiro (1998), who do the same for public spending changes.

On the variety of multiplier estimates, Robert Barro (2009), for instance, argues that peacetime multipliers are essentially zero, while the Obama administration has used a multiplier of about 1.5 to anchor their estimates of the number of jobs generated by the recent stimulus package, as based on a large-scale macro-simulations model (Auerbach and Gale, 2009; Ilzetzki et al, 2009). To put this into context, these rather opposing views could differ by much as 3.7 million jobs by the end of 2010 (Ilzetzki et al. 2009). From an international perspective, multipliers differ across countries and some literature points to a decline in multipliers in many countries over the 1980s and 1990s (Afonso et al. 2009), likely as a result of greater financial integration, meaning that capital flows may have become more sensitive to interest rate fluctuations resulting from fiscal policy changes (Turrini et al, 2010). For instance, Ilzetzki et al (2009) estimate the initial impact of government spending on growth and its persistence (in quarters). They divided a sample of 45 countries into high-income and developing, those with fixed and those with flexible exchange rate regimes, and those with debt-to-GDP ratios below and above 50 percent. They found that the growth response to fiscal stimulus in developing countries is smaller (0.01 percent output growth, compared to 0.05 percent for high-income countries) and becomes statistically insignificant after 10 quarters (vis-à-vis 24 quarters for high-income countries). Their estimates of long-run multipliers (measured in cumulative terms) for high-income countries amount to 1.04, while that for developing countries is only 0.79, suggesting that whereas $1 worth of government spending raises output by about the same amount in high-income countries, it crowds out some other component of GDP (such as investment, consumption or net exports) by about 21 cents in developing countries. They also
found that the degree of trade openness (defined as the sum of imports and exports divided by GDP) as well as the degree of financial fragility (defined as a debt-to-GDP ratio above or below 50 percent) also have had a hand in determining the size of fiscal multipliers. For open economies, the authors found that the immediate response and the long-run response are statistically insignificant, while for “closed” economies (those with imports and exports below 60 percent of GDP), they are 0.26 and 1.6, respectively (and statistically significant).

**B. Automatic Stabilizers**

Much less research has been conducted on the efficacy of automatic stabilizers, that is, provisions embedded in law whereby fiscal policy responses are triggered automatically depending on the state of the economy. One widely-cited example of this literature is provided by Fatás and Mihov (2001), who find that larger governments are associated with less GDP business cycle volatility, but that this less volatile behavior cannot be explained by automatic stabilizers. As Blanchard (2004) notes, more work in this area must still be undertaken, especially on the question of which automatic stabilizers are more effective under different economic conditions.

**C. Fiscal Policy Composition**

A more recent strand of the literature examines the question of whether the composition of fiscal stimulus or adjustment packages is more relevant than the size. Alesina and Ardagna (2010) found that composition does indeed matter. Fiscal stimulus packages more heavily reliant on tax reductions –especially those based on income, business, and indirect taxes- are more likely to result in economic expansions than those based upon the spending increases. Consistent

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27 An interesting discussion of automatic stabilizers during crises in both the U.S. and Europe is that by Dolls et al (2010).
with this finding, for the case of fiscal adjustments, spending reductions associated with higher GDP growth are those in which the largest share of the reduction of the primary deficit-to-GDP ratio (the main variable of interest in their study) is done on the spending side.

This research strand has gained relevance recently as pressures mount on governments facing large public deficits. The most recent IMF World Economic Outlook report (IMF, 2010) looks for evidence in the same direction as Alesina and Ardagna (2010). However, they found that fiscal contractions that rely on spending reductions are not as contractionary for the economy as those based on tax increases. The argument is that following spending reductions, central banks tend to provide monetary stimulus to avoid an inflationary surge as may be likely with certain tax hikes.

D. Asymmetric Effects At Different Real Interest Rates

Interest rates may influence the economic growth-fiscal policy relationship. Choi and Devereux (2005) studied the varying response of output growth to fiscal policy at different real interest rates levels. The evidence found in this study is that government spending increases spur growth at low levels of the real interest rate. Their findings suggest that fiscal policy may spur short-run growth when real interest rates are low. The intuition behind this result is that given a certain tolerance level for the debt-to-output ratio, a government that incurs debt to finance additional spending may run into the upper limit of that level, leading economic agents to perceive that future fiscal consolidation will be necessary, expecting future taxes on wages and capital income. Therefore, when real interest rates are low, debt-financed fiscal expansion (as opposed to higher taxes) will raise the stock of outstanding debt, albeit without increasing the risk that the government will reach the upper tolerance limit of the debt ratio. The effect on the economy, which depends on the effect on consumption and investment, is strongly related to the
Ricardian effect. The evidence found in this study is that government spending increases spur growth at low levels of the real interest rate.

**E. Recovery from Recessions**

Some studies in the literature also focus on whether fiscal policy is effective in promoting recovery from recessions. For example, Cerra et al (2009) examined whether macroeconomic policies and other structural factors such as labor market rigidities are associated with faster or more sluggish recoveries. Specifically, they showed that the growth response to fiscal and monetary policy during recovery years –defined as those immediately following a trough- was different from that during other expansion years. Floating exchange rate regimes were associated with speedier recoveries, and surprisingly, trade openness was associated with faster recoveries, even when it might not be beneficial in the long-run. They also found that fiscal policy is especially effective in promoting short-run growth among industrial countries that are recovering from banking crises. In particular, they found that a one-percentage point increase in the fiscal deficit with respect to GDP is associated with a post-banking crisis recovery that is 0.3 percentage points faster relative to other recessions.

**F. Asymmetric Response to Fiscal Policy During Financial Crises**

As explained above, while considerable attention has been devoted to the effects (and the effectiveness) of fiscal policy on overall growth, only recently attention has been devoted to fiscal policy effectiveness during banking crises. There are at least three studies that tackle this issue directly. The first one (Afonso et al, 2010) found that there was no statistically significant difference between the effect of fiscal policy during crises as opposed to “normal” times. Their approach was to use instrumental variables to address the endogeneity problem inherent in fiscal policy analyses as discussed above. The second study (Turrini et al, 2010) is perhaps closest in
spirit to the present study, and found that fiscal policy does have a significant and positive effect on headline growth, and that fiscal multipliers appear to be higher during banking crises compared to “normal” times. The present study presents some refinements to that study, which are discussed in more detail in section V below. Lastly, Baldacci et al (2009) studied the effectiveness of fiscal policy in shortening the duration of banking crisis episodes, although controlling variables used include those related to the provision of direct fiscal support to the financial system during banking crises. The authors found that fiscal policy is indeed significantly associated with shorter crisis duration, as well as with post-crisis economic growth. They also looked at whether the composition of fiscal stimulus packages during crises matters, and found that stimulus to support government consumption is more effective than measures based on public investment in shortening crisis duration. In the sections that follow, some additional insights into these previous studies will be presented.

V. Data and Empirical Strategy

A. Hypothesis and Data

This study tests the hypothesis of whether there is asymmetry\(^28\) in how short-run GDP growth responds to fiscal policy in the presence of a banking crisis. Following prior studies in the literature,\(^29\) fiscal policy is operationalized as governments’ cyclically-adjusted primary fiscal balances (CAPB) as a percentage of potential GDP\(^30\). It estimates an OLS model based on an unbalanced panel of 20 OECD member countries for the period between 1970 and 2009 for a

\(^{28}\) The term “asymmetry” here refers simply to whether, due to financial market distress, the channels through which fiscal policy impacts growth in the short-run might become distorted. As such, it refers to whether the economy responds differently to fiscal stimulus during banking crisis as opposed to “normal” times.

\(^{29}\) For example, Alesina and Ardagna (2010) and Turrini et al (2010) among others.

\(^{30}\) Cyclically-adjusted primary fiscal balances (also called structural primary balances) are measured as a percentage of potential GDP to ensure that fluctuations related to the business cycle do not introduce distortions into the analysis.
maximum of 453 observations. Fixed effects were used to control for countries’ time-invariant characteristics. Countries included in the sample are shown in Appendix A.

The selection of countries comprising the sample was driven primarily by the availability of data on banking crisis start and end dates (Laeven & Valencia, 2010), covering the entire 1970-2009 period. The Laeven-Valencia dataset is the most current available source of banking crisis start dates and has recently been updated to include end dates as well. In using both start and end dates from this source, this study ensures that, unlike Turrini et al (2010) and Baldacci et al (2009), no alternative definitions of banking crisis end dates need to be constructed, which ultimately ensures more consistency in the quality of the data used, under a common definition. In this sense, this study adds to that relatively nascent literature by providing empirical evidence based on banking crisis start and end dates determined based on consistent criteria.

Countries in the sample were also chosen for the higher probability of advanced economies to have the fiscal capacity to enact countercyclical policies, compared to emerging or developing countries (Kaminsky et al, 2004). Also, in this way, the study is based on countries whose institutional and political environments facing fiscal policy decisions may be more directly comparable than would be the case if emerging and/or developing countries were also included.

Table 1 below shows the variables included in the model, with expected signs and justification for their inclusion per sources in the theoretical and empirical literature reviewed.

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31 These two studies used start dates from the same source, however, due to the lack of end dates at the time of their writing, these had to be constructed based on alternative definitions.

32 For example, Baldacci et al (2009) define the end of a crisis after two consecutive years of GDP growth above 0.5 percentage points per year. Robustness checks using crisis end dates defined based on stock market performance confirm the results obtained under the other definition, although the question remains as to whether stock market performance is related to output growth anyway.
Data on GDP annual growth rates, net exports, trade openness, annual growth rate of household final consumption expenditure were extracted from the World Bank Development Indicators (WDI) database. Data on real effective exchange rates and long-term government bond yields were extracted from the International Monetary Fund (IMF) International Finance Statistics (IFS) database. Cyclically-adjusted primary fiscal balances and short-term interest rates, which proxy for the monetary policy stance, were extracted from OECD Economic Outlook Database No. 88. Debt-to-GDP ratios were extracted from the Reinhart-Rogoff series (2008), and private credit growth data were obtained from the Beck et al (2010) New Development Database.

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33 Lagged and lead GDP growth rate variables were constructed based on these data.
B. Basic Descriptive Statistics

During the 1970-2009 period there were 73 banking crisis episodes, or about 10 percent of 719 country-years included in the dataset. All occurred between 1977 and 2009; 36 country-years (49.3 percent) correspond to the 2007-2009 crisis affecting 17 countries included in the dataset, 31 country-years (42.5 percent) correspond to crises over 1991-2001, one country (Spain) suffered a five-year long crisis over 1977-1981 (6.8 percent of all country-years), and one country (the United States) experienced a year-long crisis in 1988 (1.4 percent). The longest crises in the dataset lasted five years (Czech Republic, Finland, Hungary, Japan, and Sweden), while the briefest ones lasted two years (all corresponding to the 2008-2009 crisis, which only for the United Kingdom and the United States it is recorded as lasting three years, beginning in 2007).

As a first look at the data, figure I below shows that, without distinguishing between crisis versus non-crisis periods, CAPBs appear to be positively related to annual GDP growth. A positive relationship implies that primary surpluses are likely to be associated with positive year-on-year GDP growth. Distinguishing between crisis and non-crisis times, figure II shows that mean CAPB annual change during “normal” times is 0.002 percent, while that during crises is -4.025 percent. The difference between these two means is highly statistically significant (t-statistic of 7.26). A mean non-crisis CAPB of 0.002 percent means that on average, the economies in the sample roughly run balanced budgets during “good times”, while during crises they have typically run budget deficits of almost 4 percent of potential GDP.

34 Due to data availability for other variables used in the model, model results are based on 453 and 443 observations, as shown in Table 2 below.
35 This is by construction. End dates according to the authors’ criteria are set when real GDP growth and real credit growth are both positive for two consecutive years. Given that in some cases these two indicators may remain negative for extended time periods due to additional shocks affecting countries’ economies, they truncate crisis duration at 5 years.
These two graphs and the fact that there is a statistically significant difference between average CAPBs during crisis versus non-crisis times indicate that distinguishing between crisis and non-crisis times in evaluating the effectiveness of fiscal policy might be important.

Figure 3 superimposes the trends in GDP growth and changes in the CAPB distinguishing between crisis and non-crisis times, comparing both trends across time (at crises’ onset, one, and two years after). It shows more clearly that both trends remain relatively unchanged during “normal” times, whereas the CAPB deteriorates considerably at the onset of crisis, and improves gradually during each of the following three years. A strikingly similar pattern can also be observed for debt-to-GDP ratios, as shown in figure 4. Following Baldacci et al (2009), countries are coded as being highly-indebted (variable “HighDebt” equal to 1) when
the debt-to-GDP ratio is above the sample mean of 45.9 percent, and not highly-indebted otherwise.

**Figure 3: GDP Growth Rates and Fiscal Positions during Crises and Non-Crisis Times**
This basic analysis raises the following question: would the decline in GDP growth have been much greater had fiscal stimulus not been enacted? The model that follows constitutes this study’s attempt to answer this question.

**C. Model**

The general form of the model estimated is the following:

\[
\text{LeadGDPGr} = \beta_0 + \beta_1 \text{Crisis} + \beta_2 \text{CAPB} + \beta_3 \text{CAPB} \_\text{Crisis} + \beta_4 \sum X_{ij} + \alpha + \epsilon
\]

where GDP growth is defined on an annual basis in percentage terms. The variable is a “lead” variable, meaning that it measures the growth response to changes in the controlling variables the first and second years after. This definition is used to best deal with the fact that
fiscal policy may operate on a lag. Binary variable “crisis” identifies the occurrence of a banking crisis, while CAPB is as defined above. The coefficient on the interaction term CAPB_Crisis, $\beta_3$, captures the magnitude of the presence of an asymmetric effect (or lack thereof) of fiscal policy during banking crises. Other variables are included in the model as per Table 1 below. Parameter $\alpha$ denotes country time-invariant (“fixed”) characteristics the model controls for. The number of observations used to estimate each version of the model varies due to availability of data on the controlling variables used.

**D. Model Results**

As indicated in table 2 below, both models 1 and 2 show that banking crises are significantly associated with lower GDP growth the first year following a banking crisis, compared to average GDP growth following a non-crisis year. Models 1 and 2 also show that both fiscal policy and the interaction term capturing a possible asymmetric effect are both significant. The positive sign on CAPB indicates that fiscal surpluses are associated with higher GDP growth rates. However, the negative sign on the interaction term indicates that during banking crises, surpluses are associated with lower GDP growth rates the year following a banking crisis. These results seem to confirm the notion that the economy may react differently to fiscal stimulus under a conjuncture of banking system distress, than during normal times. In this sense, during banking crises, fiscal deficits are likely to help to dampen the fall of GDP growth rates by making it less severe.

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36 As shown in the appendix, however, the same models were estimated using contemporaneous GDP growth, leading to coefficients on the fiscal policy variables that were insignificant. These models also show that household consumption is highly significant. Because fiscal policy operates on a lag, these models were not used in the analysis below as it makes more sense to examine a longer time horizon.

37 Diagnostic tests results are shown in the appendix.

38 Results for a model estimated using contemporaneous GDP growth rates are provided in the appendix. They are not discussed here, as it seems that due to known implementation lags in fiscal policy, it is more relevant to look at a broader time period.
As for controlling variables, model 1 shows that comparing the typical year to the following one, the real effective exchange rate matters as a covariate of fiscal policy, and likely, that more flexible exchange rates are associated with lower GDP growth rates, as predicted by theory. The coefficient on the short-term interest rate, which in this model proxies for the monetary policy stance, indicates that lower interest rates—as may result from concurrent expansionary monetary policy—are likely to be associated with higher GDP growth rates. Presumably, one channel through which this may help is by reducing the extent of potential crowding-out of private investment or other interest-sensitive consumption items, as posited by theory. In addition, the growth in household final consumption expenditures also appears to be significantly related to GDP growth rates one year after, likely confirming that consumption is a very important channel through which fiscal policy operates leading to higher growth rates. The fact that private credit growth is also significant in model 1 indicates that credit constraints may indeed be important, as predicted by theory. In this case, model 2 shows that the more credit-unconstrained households or firms exist in the economy (as given by higher private credit growth rates), the lower GDP growth rates are likely to be, as indicated by the coefficient’s negative sign. Finally, while the coefficient on the variable indicating high levels of indebtedness is insignificant, long-term bond yields appear to be positively associated with GDP growth rates, indicating, plausibly, that because higher yields result in higher interest rates for mortgages (keeping in mind that housing price cycles can help predict banking crisis, as explained by Reinhart and Rogoff, 2008), higher bond yields that may hamper the development of boom cycles in the financial markets could actually be beneficial to growth. Another plausible explanation is that when accounting for positive expectations about the economy, fiscal policy itself loses importance. As the table also shows, results are robust to the inclusion of lagged
GDP, which is also significantly and positively associated with future GDP growth rates, as expected.

As for the second set of models, using GDP growth rates in the following two years, results change slightly. Most notably, the coefficient on CAPB became insignificant, while that on the interaction term became more significant. This suggests that during “normal” times, the fiscal stance may not contribute to growth over a longer time horizon, but that during banking crises, fiscal stimulus is very likely to be associated with higher GDP growth rates. What is also interesting is that while the coefficient on the interaction term is highly significant, that on the variable crisis alone became insignificant, suggesting that while crisis occurrence seems to not play a role in how GDP growth rates are determined over a two year time horizon, it does appear to make a difference when combined with fiscal expansions. It is important to note, however, for the purpose of recognizing the limitations of this study that, as shown above, mean CAPBs during normal times was very close to zero, and as such, results may be reflecting this feature of the sample. Also, the sample contains more non-crisis country-years than crisis ones -a feature that is common in other studies as well (for example, Turrini et al, 2010). However, even with a rather restricted sample in that sense, the sheer magnitude of the deterioration of fiscal positions (as shown by the difference between CAPBs during both normal and crisis times) seems to suggest that these results may actually hold some water.

An interesting note is that while as shown above, debt-to-GDP ratios increase significantly (i.e. mean differences are highly significant at all conventional levels), the dummy variable to denote highly indebted countries as those with debt-to-GDP ratios above the sample mean of 45.9 percent) is insignificant throughout. One plausible explanation is that related to Reinhart’s and Rogoff’s notion of debt intolerance, whereby emerging economies may be
“intolerant” to relatively low levels of debt with respect to GDP that would not pose major problems for advanced economies. In this vein, since the sample contains only advanced OECD economies, the results obtained might hint at much higher debt tolerance in their specific case. These results, however, are not consistent with Baldacci et al (2009), who find that high levels of public debt could offset the effects of expansionary fiscal policy. However, their study includes both advanced and emerging markets.

Table 2. Fiscal Policy and GDP Growth Rates

<table>
<thead>
<tr>
<th>Fixed Effects Regression</th>
<th>GDP Growth Rate at t+1</th>
<th>GDP Growth Rate at t+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis</td>
<td>-1.376</td>
<td>-1.243</td>
</tr>
<tr>
<td></td>
<td>(-2.01)*</td>
<td>(-1.62)</td>
</tr>
<tr>
<td>Cyclically-Adjusted Primary Balance (CAPB)</td>
<td>0.089</td>
<td>0.070</td>
</tr>
<tr>
<td></td>
<td>(2.35)**</td>
<td>(1.63)</td>
</tr>
<tr>
<td>CAPB*Crisis</td>
<td>-0.330</td>
<td>-0.398</td>
</tr>
<tr>
<td></td>
<td>(-2.60)***</td>
<td>(-2.80)***</td>
</tr>
<tr>
<td>Net Exports</td>
<td>1.34E(-12)</td>
<td>2.22E(-12)</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(1.23)</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>0.107</td>
<td>0.619</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.55)</td>
</tr>
<tr>
<td>Real Effective Exchange Rate</td>
<td>-0.026</td>
<td>-0.021</td>
</tr>
<tr>
<td></td>
<td>(-2.44)**</td>
<td>(-1.71)</td>
</tr>
<tr>
<td>Short-Term Interest Rate</td>
<td>-0.347</td>
<td>-0.253</td>
</tr>
<tr>
<td></td>
<td>(-6.46)***</td>
<td>(-4.12)***</td>
</tr>
<tr>
<td>Household Final Consumption Growth</td>
<td>0.268</td>
<td>0.065</td>
</tr>
<tr>
<td></td>
<td>(7.14)**</td>
<td>(1.05)</td>
</tr>
<tr>
<td>Private Credit Growth</td>
<td>-0.471</td>
<td>-0.749</td>
</tr>
<tr>
<td></td>
<td>(-1.36)</td>
<td>(-1.75)</td>
</tr>
<tr>
<td>High Debt/GDP Ratio (&gt;sample median)</td>
<td>-0.063</td>
<td>0.102</td>
</tr>
<tr>
<td></td>
<td>(-0.31)</td>
<td>(0.43)</td>
</tr>
<tr>
<td>Long-Term Government Bond Yield</td>
<td>0.299</td>
<td>0.208</td>
</tr>
<tr>
<td></td>
<td>(4.54)***</td>
<td>(2.77)***</td>
</tr>
<tr>
<td>Lagged (t-1) GDP Growth</td>
<td>0.208</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td>(3.49)***</td>
<td>(-0.18)</td>
</tr>
<tr>
<td>Constant</td>
<td>4.539</td>
<td>4.408</td>
</tr>
<tr>
<td></td>
<td>(2.93)**</td>
<td>(2.46)**</td>
</tr>
<tr>
<td>Observations</td>
<td>453</td>
<td>433</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.4124</td>
<td>0.2637</td>
</tr>
<tr>
<td>F-statistic</td>
<td>11.57</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Note: T-statistics reported in parenthesis. (***.) indicates that coefficient is significant at the 1 percent level, (**) at 5 percent, and (*) at 10 percent.
The results obtained are in line with previous studies. For instance, the likely effect of fiscal policy, monetary policy (although operationalized via money supply growth) and more flexible exchange rates on growth during expansions was also documented by Cerra et al (2009) along similar lines. As for evidence of asymmetric effects, the nascent evidence is rather mixed, as Turrini et al (2010) have found that the effect of fiscal policy on economic growth is likely to be stronger during banking crises, but another study by Afonso et al (2010) was unable to find evidence of such an asymmetric effect.

VI. Limitations

This study is not devoid of limitations. An important one concerns the fact that, as the literature has much discussed, it is almost impossible to truly parse out variations in primary balances that are due to purely discretionary stimulus vis-à-vis those generated by the state of the economy itself. Therefore, this study does not claim to have solved endogeneity (i.e. likely back-and-forth relations) between fiscal policy and economic growth in the short run, and in doing so, it is not an exception compared to most other studies in the literature. The same idea applies for the relationship between crisis occurrence and GDP growth. A good deal of the literature suffers from this same limitation.

In addition, there are several well-known challenges surrounding the availability of fiscal data. The CAPB is the ideal fiscal policy measure to use. This offers two main advantages. First, it represents an isolation of discretionary fiscal policy components from those varying purely as a result of business cycle fluctuations, and as such, excludes so-called automatic stabilizers discussed above. Second, as a result of this, it mitigates the endogeneity problem implicit in all

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39 Endogeneity refers to the extent that a back-and-forth relationship between fiscal policy and GDP growth may exist.
analyses of fiscal policy and GDP growth. One caveat that most studies recognize, however, is that by being expressed as percentages of potential GDP growth, CAPBs are constructed based on a number of potentially imperfect assumptions about GDP growth trends, as potential or trend GDP are theoretical constructs and there is no single agreed upon method to calculate them (Cerra and Saxena, 2008).

Another challenge concerns the availability of CAPB data. The OECD and the European Commission have made CAPB data available, albeit only covering member economies. No such data are available for emerging or developing economies. While data on fiscal balances are available through the International Monetary Fund Government Finance Statistics (IMF-GFS) service, they cover a limited number of countries starting in the year 1990 and without cyclical adjustment. Indeed, many studies in the literature are based on authors’ own estimation of CAPBs using a number of techniques. Therefore, while myriad cyclical adjustment techniques may be used, one may argue that the resulting data will be no less imperfect than those calculated based on assumptions about GDP growth trends, albeit at the expense of restricting the number of countries to be included in the sample.

Also, due to the fact that data are not available uniformly for all variables used, the maximum number of observations used in the models estimated include only 21 banking crisis episodes. This is certainly a low number of cases to use if one bears in mind that econometric techniques lead to more “solid” results the greater is the variation is provided in the data. However, looking at the study by Turrini et al (2010), which included 52 banking crisis episodes, even looking at 56 advanced and emerging economies, this study compares relatively well to prior work.
VII. Policy Implications

A number of important policy implications emerge from the above analysis. First, as debt levels have accumulated to unprecedented heights, countries will be forced to implement fiscal consolidation measures in the near future. While most of the lessons learned from the recent crisis refer mainly to financial regulation and banking reform, knowing whether fiscal stimulus is an effective recovery tool may inform future decision-making in the event of another crisis. In this sense, this study could offer a better way to gauge the costs and benefits of different fiscal packages and weigh those against the future burden of debt. Tradeoffs involved in the very design and composition of fiscal stimulus packages (for example, Baldacci, 2009) should help policymakers to arrive at better-calibrated decisions, minimizing distortions imposed on the economy.

Also, stimulus policies that target consumption by those who will be more likely to spend the stimulus funds should add to the effectiveness of fiscal stimulus in preventing a deeper downturn. Policies aimed at generating positive expectations about the economy may also be important, as suggested by the results obtained for private credit growth and bond yields, both pointing out to the idea that plausibly, increased negative perceptions about potential financial system distress may be negatively associated with future GDP growth.
APPENDICES

APPENDIX A. COUNTRIES COMPRISING THE SAMPLE

Austria
Belgium
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Japan
Netherlands
Norway
Poland
Portugal
Spain
Sweden
Switzerland
United Kingdom
United States
APPENDIX B. VISUAL MODEL DIAGNOSTICS

Models Using Lead GDP Growth in t+1 as Dependent Variable

The plots below show that heteroskedasticity does not appear to be a problem for any of the models shown in Table 2 above. Estimation of each model thus proceeded without resorting to the use of robust standard errors. These checks based upon visual inspection were complemented with formal tests (Breusch-Pagan/Cook-Weisberg); tests results, as shown below, confirmed that heteroskedasticity is likely not a problem. Additional checks reveal that non-linearity might be very slight.

Model 1 (Table 2): Visual checks for heteroskedasticity and non-linearity

![Residuals vs. Fitted values](image1)

![Augmented component plus residual](image2)
Model 2 (Table 2): Visual checks for heteroskedasticity and non-linearity
Models Using Lead GDP Growth in t+2 as Dependent Variable

Model 1 (Table 2): Visual checks for heteroskedasticity and non-linearity
Model 2 (Table 2): Visual checks for heteroskedasticity and non-linearity

![Residuals vs Fitted values](chart1.png)

![Augmented component plus residual](chart2.png)
### Appendix C. Model Diagnostics: Heteroskedasticity, Multicollinearity, and Model Specification Tests – Lead GDP as the Dependent Variable

As the below tests show, models using lead GDP growth as the dependent variable perform better along all three dimensions (heteroskedasticity, multicollinearity, and model specification).

- For both sets of models shown in Table 1 above, VIF test values are below the benchmark of 10, indicating that multicollinearity is not a problem with either set of models.
- As for heteroskedasticity, Breusch-Pagan test results show that for models with GDP growth one year ahead of controlling variables (lead GDP growth at t+1), the p-values in both cases lead us to fail to reject the hypothesis that model residuals have homogeneous variance. The second set of models does not do as well in this regard, although visual inspection of fitted values plotted against residuals did not seem to indicate that heteroskedasticity is a problem. Nonetheless, in both cases, models were estimated without using robust standard errors.
- Both models do very well in terms of tests for omitted variables bias, showing t-statistics for \_hat\_sq and a p-value for the ovtests shown below that allow us to reject the hypothesis that the models have omitted variables.

#### Models with GDP Growth Rate at t+1 as the Dependent Variable

<table>
<thead>
<tr>
<th>VIF Test (Multicollinearity)</th>
<th>Breusch-Pagan/Cook-Weisberg Tests</th>
<th>Ramsey RESET Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ho: Constant Variance</td>
<td>Ho: Model has no omitted variables</td>
</tr>
<tr>
<td>Model 1 Mean VIF</td>
<td>chi2(1) 0.87</td>
<td>F 1.64 Prob &gt; F 0.1785</td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 0.3522</td>
<td></td>
</tr>
<tr>
<td>Model 2 Mean VIF</td>
<td>chi2(1) 0.05</td>
<td>F 1.26 Prob &gt; F 0.2878</td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 0.8188</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Linktest (Model Specification)</th>
<th>t-value on _hat</th>
<th>t-value on _hat_sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>6.76</td>
<td>0.22</td>
</tr>
<tr>
<td>Model 2</td>
<td>6.82</td>
<td>0.91</td>
</tr>
</tbody>
</table>

#### Models with GDP Growth Rate at t+2 as the Dependent Variable

<table>
<thead>
<tr>
<th>VIF Test (Multicollinearity)</th>
<th>Breusch-Pagan/Cook-Weisberg Tests</th>
<th>Ramsey RESET Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ho: Constant Variance</td>
<td>Ho: Model has no omitted variables</td>
</tr>
<tr>
<td>Model 1 Mean VIF</td>
<td>chi2(1) 0.14</td>
<td>F 1.54 Prob &gt; F 0.2032</td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 0.0762</td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>chi2(1) 0.15</td>
<td>F 1.80 Prob &gt; F 0.2244</td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 0.0760</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Linktest (Model Specification)</th>
<th>t-value on _hat</th>
<th>t-value on _hat_sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>3.68</td>
<td>0.30</td>
</tr>
<tr>
<td>Model 2</td>
<td>3.71</td>
<td>0.27</td>
</tr>
</tbody>
</table>
APPENDIX D. MODEL ESTIMATED USING CONTEMPORANEOUS GDP GROWTH RATE AS THE DEPENDENT VARIABLE AND DIAGNOSTICS

Model 1: Visual checks for heteroskedasticity and non-linearity
As the below tests show, models using lead GDP growth as the dependent variable perform better along all three dimensions (heteroskedasticity, multicollinearity, and model specification).

- For both sets of models shown in Table 1 above, VIF test values are below the benchmark of 10, indicating that multicollinearity is not a problem with either set of models.
- As for heteroskedasticity, Breusch-Pagan test results show that the p-values in both cases lead us to fail to reject the hypothesis that model residuals have homogeneous variance. Models, thus, were estimated without using robust standard errors.
- Both models do very well in terms of tests for omitted variables bias, showing t-statistics for \(_hatsq\) and a p-value for the ovtests shown below that allow us to reject the hypothesis that the models have omitted variables, although these p-values are not very large. The models do not perform well in terms of linktests, where the value of \(_hatsq\) is significant.

<table>
<thead>
<tr>
<th>Models with Contemporaneous GDP Growth Rate as the Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VIF Test (Multicollinearity)</strong></td>
</tr>
<tr>
<td>Mean VIF</td>
</tr>
<tr>
<td>Model 1</td>
</tr>
<tr>
<td>3.79</td>
</tr>
<tr>
<td>3.78</td>
</tr>
<tr>
<td>1.72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ch2(1)</td>
<td>1.52</td>
</tr>
<tr>
<td>Prob &gt; ch2</td>
<td>0.2174</td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1.73</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.1609</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Linktest (Model Specification)</strong></th>
<th>t-value on _hat</th>
<th>t-value on _hatsq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>15.27</td>
<td>-1.82</td>
</tr>
<tr>
<td>Model 2</td>
<td>15.51</td>
<td>-1.83</td>
</tr>
<tr>
<td>Variable</td>
<td>Model 2</td>
<td>Model 3</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Crisis</td>
<td>-0.674</td>
<td>-0.637</td>
</tr>
<tr>
<td></td>
<td>(-1.34)</td>
<td>(-1.22)</td>
</tr>
<tr>
<td>Cyclically-Adjusted Primary Balance (CAPB)</td>
<td>0.223</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.74)</td>
<td>(0.41)</td>
</tr>
<tr>
<td>CAPB*Crisis</td>
<td>-0.117</td>
<td>-0.122</td>
</tr>
<tr>
<td></td>
<td>(-1.20)</td>
<td>(-1.23)</td>
</tr>
<tr>
<td>Net Exports</td>
<td>-7.78E(-13)</td>
<td>-4.97E(-13)</td>
</tr>
<tr>
<td></td>
<td>(-0.76)</td>
<td>(-0.48)</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>3.917</td>
<td>3.604</td>
</tr>
<tr>
<td></td>
<td>(5.53)****</td>
<td>(5.01)****</td>
</tr>
<tr>
<td>Real Effective Exchange Rate</td>
<td>-0.009</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(-1.09)</td>
<td>(-1.02)</td>
</tr>
<tr>
<td>Short-Term Interest Rate</td>
<td>-0.073</td>
<td>-0.102</td>
</tr>
<tr>
<td></td>
<td>(-1.75)*</td>
<td>(-2.37)****</td>
</tr>
<tr>
<td>Household Final Consumption Growth</td>
<td>0.593</td>
<td>0.563</td>
</tr>
<tr>
<td></td>
<td>(20.13)****</td>
<td>(17.52)****</td>
</tr>
<tr>
<td>Private Credit Growth</td>
<td>-0.415</td>
<td>-0.354</td>
</tr>
<tr>
<td></td>
<td>(-1.56)</td>
<td>(-1.33)</td>
</tr>
<tr>
<td>High Debt/GDP Ratio (&gt;sample median)</td>
<td>0.221</td>
<td>0.252</td>
</tr>
<tr>
<td></td>
<td>(1.39)</td>
<td>(1.57)</td>
</tr>
<tr>
<td>Long-Term Government Bond Yield</td>
<td>0.113</td>
<td>0.142</td>
</tr>
<tr>
<td></td>
<td>(2.20)**</td>
<td>(2.71)****</td>
</tr>
<tr>
<td>Lagged (t-1) GDP Growth</td>
<td></td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.45)****</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.241</td>
<td>-1.317</td>
</tr>
<tr>
<td></td>
<td>(-1.04)</td>
<td>(-1.11)</td>
</tr>
<tr>
<td>Observations</td>
<td>471</td>
<td>464</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.6302</td>
<td>0.6363</td>
</tr>
<tr>
<td>F-statistic</td>
<td>27.70</td>
<td>27.13</td>
</tr>
</tbody>
</table>

Note: T-statistics reported in parenthesis. (***) indicates that coefficient is significant at the 1 percent level, (**) at 5 percent, and (*) at 10 percent.
REFERENCES


IMF (2010) World Economic Outlook, IMF October 2010


