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Austerity and recovery: Exchange rate regime choice, economic growth, and financial crises

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ABSTRACT

Our study investigates the role of the exchange rate regime to explain the empirical link between financial crises and economic activity. We examine the relationship between real per capita GDP growth, exchange rate regimes, and the incidence of crises. Asymmetries are also explored. While exchange rate regimes of all types can promote positive economic growth, disaggregation by region or country type yields significantly different results. Pegged regimes work best for emerging market economies while crawling regimes deliver the greatest boost to economic growth in the G20. However, unlike the extant literature, the foregoing positive influences are offset when economies are in a downturn. An important finding is that exchange rate regimes and financial crises interact. In almost all cases and types of financial crises, pegged regimes exert a negative impact on economic growth even after controlling for several economic factors.

1. Introduction

The global financial crisis of 2008/2009 focused the attention of policy makers on the real economic consequences of such events. Typically, following financial crises, countries experience a severe recession. The global financial crisis resulted in a generalized negative real per capita GDP growth around the world. Only the fallout from the bursting of the tech bubble in 2001 comes close.[1] The Asian financial crisis of 1997–1998 is largely a regional episode.

Reinhart and Rogoff (2009a) made clear that recovery from some financial crises can be a long drawn-out process. Moreover, the duration and size of fiscal responses can vary greatly. Likely just as important are the initial economic conditions faced by the affected countries at the outset of a financial crisis. For example, some countries may have relatively more resilient banking systems or they may have experienced fiscal surpluses or a falling debt to GDP ratio on the eve of a financial crisis. Nevertheless, the mere observation of a financial crisis is not enough to predict its real economic consequences because not all financial crises are associated with the same amount of financial instability. For example, a financial crisis that begins in advanced economies may well be more virulent than one which originates in an emerging market. Clearly, how financial crises spread, and their global impact, will be partly a function of spillover effects. One important mechanism that can facilitate or prevent the spread of economic shocks or the real or financial varieties is the exchange rate regime.

Our study focuses on the role of the exchange rate regime in explaining the connection between financial crises and economic activity. Interestingly, Reinhart and Rogoff's (2009a) seminal analysis of financial crises pays virtually no attention to the role of the exchange rate regime. Over three decades ago, Choudhri and Kochin (1980) demonstrated that floating exchange rates have textbook-like insulating properties. Their analysis focuses on the real economic effects of financial crises. Flood and Rose (2010) provide empirical support for the view that the adoption of inflation targeting may well have contributed to raising the synchronicity of business cycles. This may seem surprising at first since the *sine qua non* of inflation targeting regimes is their commitment to floating exchange rates. However, commitment to low and stable inflation contributes to better economic performance and provides the motivation for business cycles to begin looking alike. Yet, for example, in Canada, where adherence to the floating exchange rate regime is the most durable in history, the Bank of Canada now acknowledges that financial stability considerations raise doubts about the ability of a floating regime to fully absorb all types of economic shocks (Murray, 2010, 2011).[2]

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[1] The recession of the early 1980s, associated with de-industrialization in advanced economies, was not directly the result of a financial crisis.

[2] Murray (2011), at the time Deputy-Governor of the Bank of Canada, notes, '. . .flexible exchange rates, which have a great deal to recommend them, have failed to live up to their initial optimistic billing. (Canada's positive experience with a flexible exchange rate through the 1950s and early 1960s might have contributed to this overly sanguine assessment.) Their stabilizing properties were shown to be more limited than previous enthusiasts had credited.'

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The Bank of Canada's earlier views are consistent with economic analyses since at least Mundell–Fleming who argued that less flexible exchange rate regimes must absorb external shocks. Hence, the argument was made that floating regimes represent the best way to insulate against policy strategies chosen in other economies. Unfortunately, the global financial crisis put paid the notion that floating regimes can fully insulate a domestic economy against foreign shocks in part because the Mundell–Fleming framework did not adequately discriminate between real and financial sources of disturbances. Together with the globalization of finance of recent decades, the possibility of interactions between exchange rate regime choice and other elements of a monetary policy strategy, as well as the incidence of financial crises, has emerged. The present study investigates the empirical significance of these interactions.

Meanwhile, it is known that commitment to a flexible exchange rate regime among inflation targeting central banks in emerging markets is not absolute. In part for this reason, there is a 'fear of floating.' Indeed, the earlier observation about the insulating properties of floating regimes is one that is keenly felt in emerging market economies. Hence, Raghuram Rajan, Governor of the Reserve Bank of India, has commented that 'there is the age-old mantra "let the exchange rate do the talking and then you are insulated" . . . That advice is garbage. A number of emerging markets are not insulated—you are affected' (Mallet, 2014).

We provide empirical evidence that seeks to address a variety of questions. They are: does the adoption of a fixed exchange rate regime influence the real economic impact of financial crises to a greater extent than do floating regimes? Put differently, in what way are fiscal responses and consequences linked to the choice of exchange rate regime in place? Is economic recovery following a crisis also related to exchange rates? Finally, if financial crises are economically more costly, to what extent does the choice of exchange rate regimes contribute to financial stability and recovery? Because financial crises, and macroeconomic conditions more generally, cannot be divorced from the impact of the chosen exchange rate regime, interaction effects must also be considered as noted above.

We examine the relationship between real per capita GDP growth, exchange rate regimes, and the incidence of crises. To test the relevant hypotheses, we construct a panel dataset and apply fixed effects and GMM estimators and examine the determinants of real per capita GDP growth. The results not only have implications for the study of the real economic effects of fiscal policy but also for the policy discussion concerning the balance of risks and financial imbalances that follow from fiscal actions.

The paper is organized as follows. First, we summarize the relevant literature of the influence of fiscal adjustment, exchange rate regimes, and financial crises on economic growth. Section 3 describes the dataset and some stylized facts are presented. Section 4 outlines the methodology of the paper while the empirical results are discussed in Section 5. The final section concludes, provides policy implications, and offers suggestions for future research.

2. Literature review

Our focus is on studies that examine the consequences of financial crises for economic growth and the role played by the choice of exchange rate regimes. We also briefly consider the impact of fiscal adjustments on economic growth.

Frankel and Rose (1996), relying on a probit model for 105 developing countries covering the 1971–1992 period, conclude that real output growth per capita declines before a currency crisis and rises thereafter. Frankel and Rose detect no clear direction of causality between currency crises and economic performance. In a cross-country analysis of 67 countries for the 1965 to 2000 period, Barro (2001) observes a strong decline in economic growth for a combination of currency and banking crises. However, when the A financial crisis of 1997/1998 is considered, a sharp decline in output is followed by a strong recovery and economic growth is quickly restored to pre-crisis levels. The cross-country analysis of Park and Lee (2003) for five East Asian economies also supports the decline followed by a strong recovery hypothesis. An increase of real GDP growth, a large real depreciation, expansionary monetary and fiscal policy, and an improvement in the global economic environment were crucial determinants in these findings.

Bordo et al. (2001) examine the determinants of banking and currency crises, also referred to as twin crises.[3] Twin crises are negatively driven by inflation. For banking crises, the impact on GDP per capita is also negative. Lane and Milesi-Ferretti (2010) examine the severity of the global financial crisis 2008/2009 and show that GDP growth and consumption growth are determined by economic development, private credit to GDP, current account deficits to GDP, and the relation between openness and trade. The exchange rate regime plays an indirect role in these findings.

Examining 40 emerging markets during the global financial crisis, Berkmen et al. (2012) find that exchange rate flexibility mitigates output losses in cross-country-regressions. Cuaresma and Feldkircher (2012) conclude that the level of income, exchange rate misalignments, and the combined variable of economic growth and FDI inflows prior to 2007 drove the global financial crisis. Cerra and Saxena (2005) rely on a regime-switching common factor model covering two decades of quarterly data to examine output recovery from the Asian crisis in six economies of the region. The model reveals permanent output losses in all countries after a crisis. This contradicts the findings by Park and Lee (2003) and Hutchison and Noy (2005).

Reinhart and Rogoff (2009b), among other results, also observe an asset market collapse, and a decline in output for 14 different banking crises in history. Analyzing the periods before and after the global financial crisis of 2008/2009 in emerging market countries and relying on quarterly data, Blanchard et al. (2010) find evidence that unexpected GDP growth is negatively affected by short-term external debt and current account deficits while unexpected GDP growth of partner countries has a positive impact on unexpected growth. Fixed exchange rate regimes have a negative but insignificant influence on unexpected growth.

Whether the exchange rate regime could be an important factor in explaining the output implications of financial crises and the associated fiscal adjustments yields mixed evidence. Ghosh et al. (1997) report no significant impact of exchange rate regimes on growth for 140 countries covering a span of 30 years beginning in 1960. However, pegged regimes are associated with slower economic growth and reduce and stabilize inflation rates. Rose (2011) obtains different findings depending on the type of exchange rate regime classification used. He employs a panel regression study consisting of 178 countries for a sample from 1974 to 2007. Based on IMF data, economies that adopt a narrow crawling exchange rate band grow significantly faster than fixed exchange rate regimes. When the Reinhart and Rogoff (2004) classification is employed, countries that adopt managed floating regimes grow significant more slowly than fixed regimes. Nevertheless, a statistically significant difference between floating and fixed regimes is not found. For 37 rich small countries, Breedon et al. (2012) emphasize currency unions or currency board arrangements are more stable than narrow bands or de facto pegs.

Levy-Yeyati and Sturzenegger (2003) use a pooled regression with 183 countries from 1974 to 2000 to consider a connection between economic growth and the choice of exchange rate regimes. Less flexible regimes lead to lower economic growth. For industrial countries, no impact from the type of exchange rate regime is found. Huang and Malhotra (2004) also obtain different results depending on the grouping of countries using panel data from 1976 to 2001. For 18 advanced European countries, the exchange rate regime does not influence

[3] Twin crises refer to the simultaneous appearance of banking and currency crises. A typical indicator for a banking crisis is the financial distress in aggregate banking system capital. A currency crisis is often represented by an index of exchange market pressure.

economic growth, but the same is not true for 12 developing and emerging Asian countries. In a cross-country regression, De Grauwe and Schnabl (2004) conclude the impact of exchange rate stability on real growth of ten Central Eastern European countries in the years 1994 to 2002 to be highly significant and positive. The choice of exchange rate regimes for economic growth more generally seems to be important for developing and emerging countries.

A few studies consider the relationship between financial crises and the exchange rate regimes. Eichengreen and Rose (1998), in a multivariate probit regression for 105 countries for a sample from 1975 to 1990, examine the determinants of banking crises. They show that more stable exchange rates reduce the probability of banking crises. Exchange rate regimes are insignificant in explaining banking crises. Domaç and Martinez Peria (2003) also analyze banking crises and their determinants. For 95 developed and developing countries between 1980 and 1997, exchange rate regimes influence banking crises. In fixed regimes, the likelihood of crises is lowest and losses are highest. The duration of banking crises is not correlated with the type of exchange rate regime. Esaka (2009) estimates probit models with an unbalanced panel dataset for 84 countries from 1980 to 2001 and shows that floating regimes most raise the probability of currency crises, at least compared with pegged regimes. For pegged regimes with no capital controls, the probability of crises falls. Angkinand and Willett (2011) use a logit model for 114 countries during 1990 and 2003 to show that the probability of banking crises is lower in flexible regimes and higher in intermediate regimes.[4] The coherence of exchange rate regimes and banking crises is determined through the channels of net foreign borrowing and the frequency of currency crises.

Bubula and Otker-Robe (2003) report a higher occurrence of currency crises among pegged regimes than in floating regimes for the period 1990 to 2001. Similarly, Haile and Pozo (2006) report that the de jure pegged exchange rate regimes increase the likelihood of currency crises. Aşici (2011), for 163 countries covering the 1990 and 2007 period, shows that the choice of exchange rate regimes should be influenced by country characteristics like the volatility of terms of trade, capital account openness, and the institutional quality. If countries do not adopt an exchange rate regime on the basis of these characteristics, the probability of currency crises rises. Karimi and Voia (2011) also examine effects of exchange rate regimes on the occurrence of currency crises. They use a quarterly panel of 21 countries over the 1970 and 1998 period to conduct Cox proportional models. Unlike the other studies cited above, they find that pegged or intermediate regimes reduce the probability of currency crises.

The overarching conclusion is that the literature finds a large number of variables, indicators, or factors linking financial crises and their consequences to economic outcomes. Relatively less attention has been devoted to the role played by exchange rate regime choice nor has the connection between financial crises and the resulting level of financial system stability been fully explored. We now turn to providing some empirical evidence on the relevant issues.

3. Data and stylized facts

We use annual data for 47 countries covering all the regions of the globe.[5] The number of economies considered is dictated by the availability of comprehensive exchange rate regime classifications and financial crises data for the period from 1980 to 2010. Additionally, we have constructed a separate unbalanced sample for the G20 major economies over the same period. Over the past several years, and especially since the global financial crisis, the G20 has taken on the lead role in global economic governance. We begin in 1980, because this is the first available data point from the IMF's World Economic Outlook data series. The IMF's data represent a *de facto* classification and differ from the *de jure* classification created by the IMF. Reinhart and Rogoff (2004) create their categories by asking whether exchange rates are unified or dual, multiple, or of the parallel varieties. Statistical verification is then used to identify different exchange rate regimes.[6] When there is no official announcement or no verification, the regime is classified according to inflation performance. Otherwise, *de facto* and *de jure* regimes are defined in the same way.[7] As pointed out by Eichengreen and Razo-Garcia (2011), among others, caution should be exercised when using *de facto* exchange rate classifications. Accordingly, we augment our specifications with a wide variety of variables to control for these covariates.[8]

Figs. 1 to 4 present bar charts of the distribution of exchange rate regimes for several types and country groupings. In the first figure, the exchange rate regimes are presented for the full sample. Between 1980 and 2007, the number of countries with pegged exchange rate regimes has grown substantially. At the same time, the number of crawling exchange rate regimes fell, especially among the advanced economies. The same pattern is observed for the G20 economies. One reason is the introduction of the euro zone which eventually created 'irrevocably' fixed exchange rate regimes for 18 sovereign countries. Whereas the number of crawling type or limited exchange rate flexibility regimes remained stable, freely falling exchange rate regimes reached their climax in the 1990s and fell to zero in the 2000s. Fig. 4 shows that emerging and developing countries increasingly began to adopt crawling exchange rate regimes in the 2000s.

Financial crisis data are taken from Reinhart and Rogoff (2011). We construct dummies for banking crises, currency crashes, domestic defaults, external defaults, inflation crises ,and stock market crashes. Reinhart and Rogoff define a banking crisis as a bank run leading to the closure, merging, or takeover by the public sector, regardless of whether one or more financial institutions are involved. When there are no bank runs, only the closure, merger, takeover, or large-scale assistance by the government of one important financial institution indicates the onset of a banking crisis. Currency crashes are identified if the local currency depreciates by 15% or more against the US dollar or the relevant anchor currency. A debasing of the local currency is observed if the metallic content of coins in circulation is reduced by 5% or more, or if a new currency replaces a much-depreciated earlier currency in circulation. External debt crises appear when principal or interest payments cannot be paid on the due date or rescheduled debt that is extinguished is less valuable than the original obligation. In the case of domestic crises, bank deposit freezes or the forcible conversions of such deposits from dollars to local currency are considered important. The identification of inflation crises is indicated by periods when annual inflation exceeds 20%.

Figs. 5–8 present the data for financial crises for the full sample, the G20 countries, advanced economies, and the remaining economies within the dataset. All figures show a large number of crises occurring during the 1980s and 1990s, a substantial reduction in the number of crises during the mid of the 2000s followed by a spike 2008, the year the global financial crisis erupted. This crisis and the tech bubble of 2000/2001 were driven by banking crises, currency crises, and stock market crashes in particular. Whereas advanced economies, as shown in Fig. 7, have not experienced many crises in

[4] Flexible regimes are managed or independent floats, and intermediate regimes are soft pegs, crawls, and tightly managed floats.

[5] For a list of countries, consult the appendix.

[6] The data have been updated to 2010. See http://www.carmenreinhart.com/data/browse-by-topic/topics/11/.

[7] Reinhart and Rogoff's approach effectively amounts to distinguishing between no legal tender, currency board, peg, band, crawling peg, crawling band, moving band, managed float, freely floating, freely falling, and hyperfloating regimes. The data were updated by Reinhart et al. (2011).

[8] Even if there is agreement across proxies, disagreements do emerge depending on the type of economy in question (e.g., advanced versus middle income countries), the level of financial development, and even when crises erupt since these are also indications that the exchange rate regime may change.

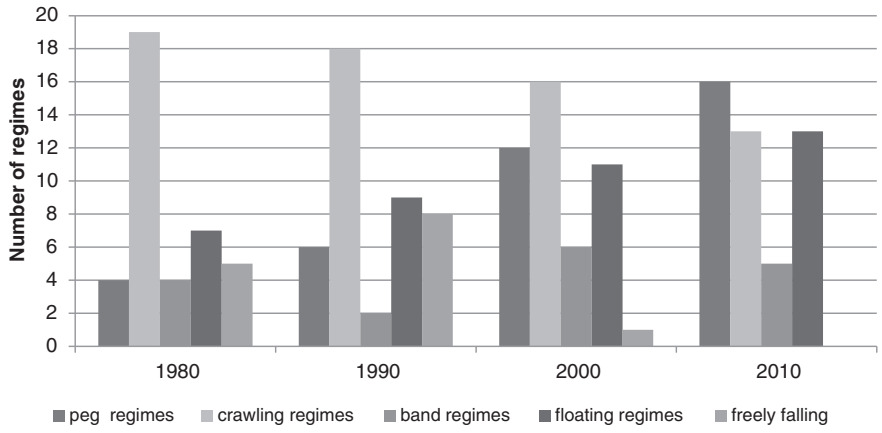

Fig. 1. Exchange rate regimes (full sample).
Sources: Reinhart et al. (2011).

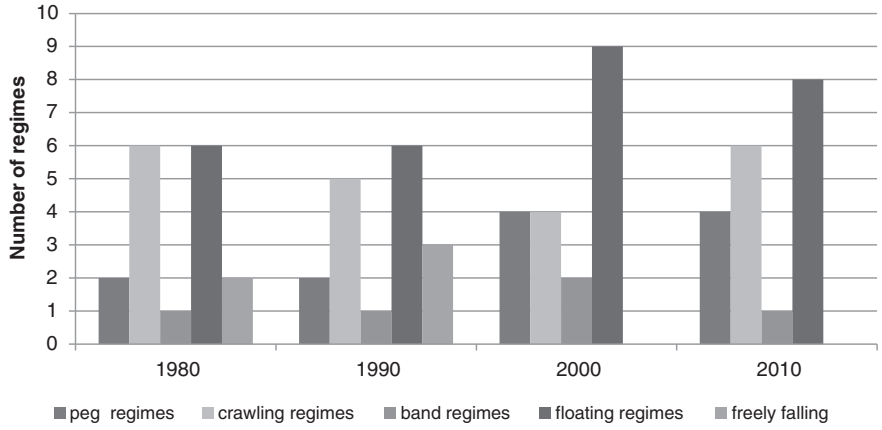

Fig. 2. Exchange rate regimes (G20).
Sources: Reinhart et al. (2011).

the 1980s and 1990s, emerging and developing countries shown in Fig. 8 did. The tables were not quite turned during the global financial crisis of 2007 but the non-G20 economies experienced relatively fewer crises than their counterparts elsewhere in the world economy.

From the IMF's World Economic Outlook database, we collected data for the current account, and total investments as share of the GDP. The exchange rate is defined as domestic currency per US dollar, while government consumption, external balance, inflation in consumer prices, and nominal GDP per capita are also taken from

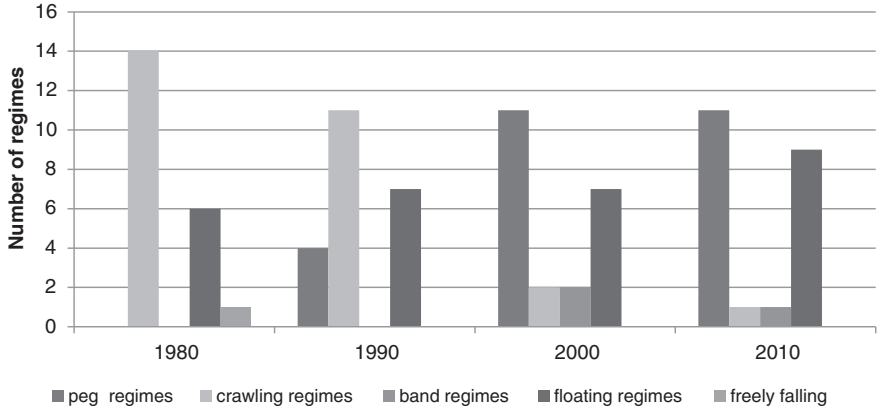

Fig. 3. Exchange rate regimes (advanced economies).
Sources: Reinhart et al. (2011).

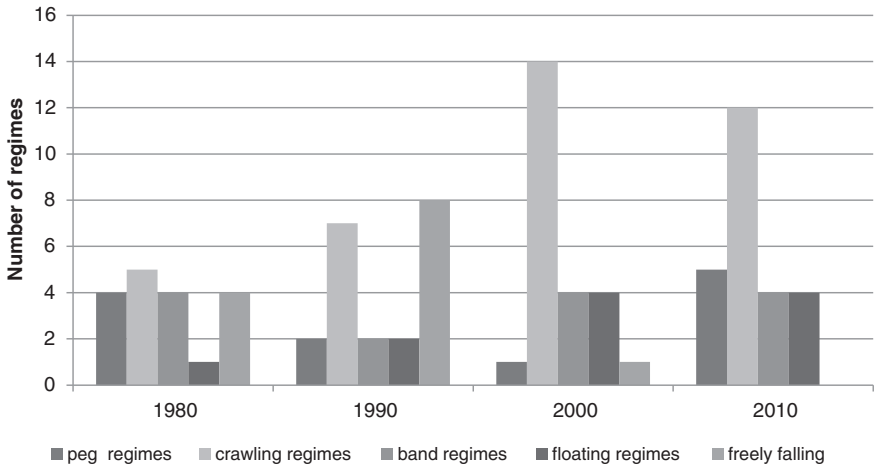

Fig. 4. Exchange rate regimes (rest).
Sources: Reinhart et al. (2011).

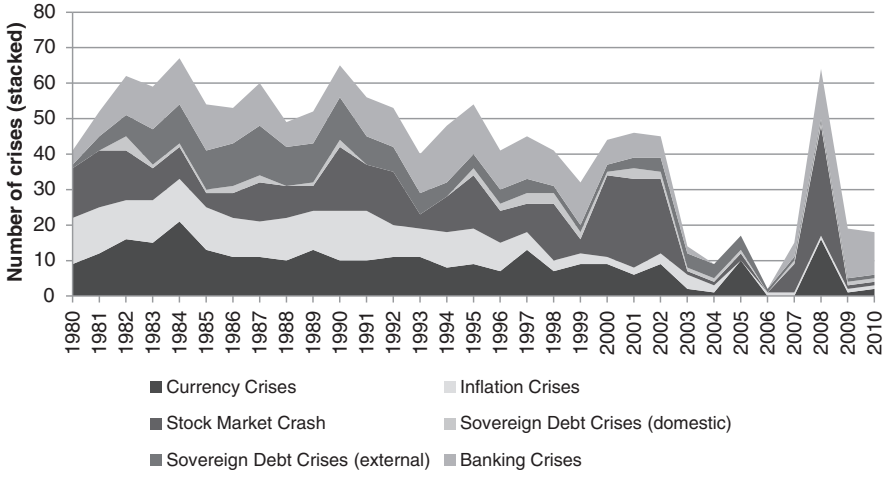

Fig. 5. Frequency of crises (full sample).
Sources: Reinhart and Rogoff (2009a,b), and Laeven and Valencia (2008).

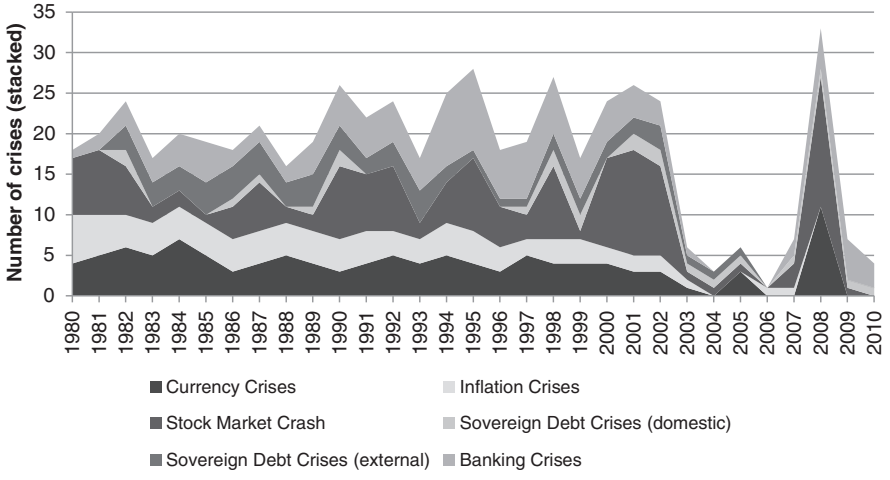

Fig. 6. Frequency of crises (G20).
Sources: Reinhart and Rogoff (2009a,b), and Laeven and Valencia (2008).

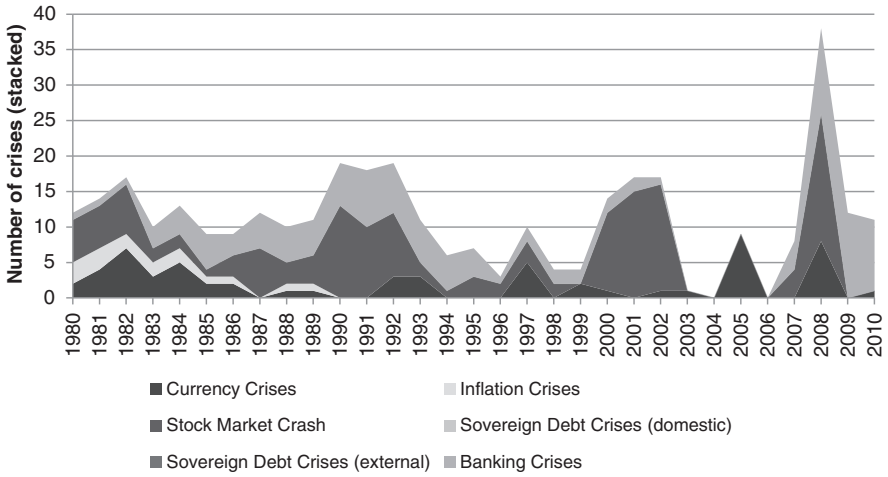

Fig. 7. Frequency of crises (advanced economies).
Sources: Reinhart and Rogoff (2009a,b), and Laeven and Valencia (2008).

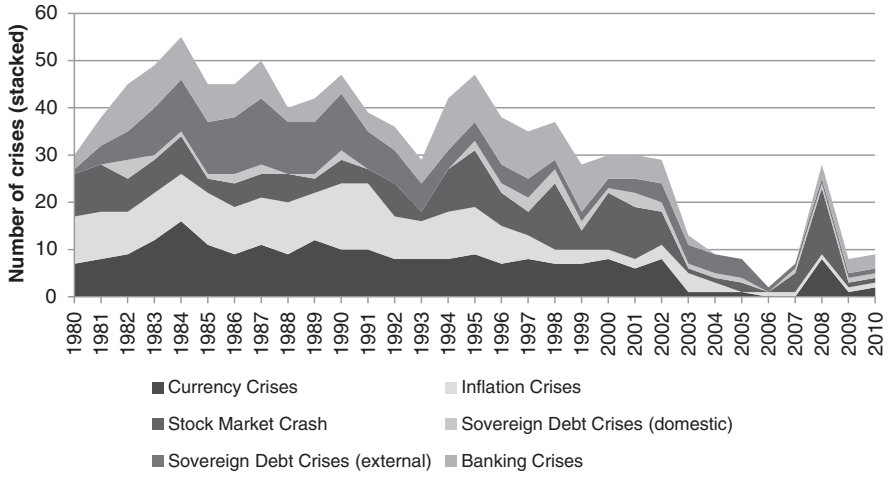

Fig. 8. Frequency of crises (rest).
Sources: Reinhart and Rogoff (2009a,b), and Laeven and Valencia (2008).

the IFS database. Gross public debt to GDP data are taken from Mauro et al. (2013).

Table 1 presents the descriptive statistics for selected variables in the dataset. We divide the sample according to types of exchange rate regimes. Generally speaking, in all exchange rate regimes except pre-announced pegs, regimes with narrow bands, and freely falling regimes, all countries experience positive growth.[9] Notice that economies which adopted pegs of various kinds experienced real per capita growth rates that are approximately twice as high as for all or G20 economies in the sample. Of course, this group overwhelmingly includes emerging market economies which recorded surging growth rates over much of the period examined. Not surprisingly, countries with freely falling regimes experience the highest CPI inflation rates. Otherwise, there is considerable variety in the inflationary experience of economies operating under different exchange rate regimes. Nevertheless, freely floating exchange rate regimes experience approximately half the inflation rate of most pegged exchange rate regimes. With the exception of countries that adopt a moving band exchange rate regime, all countries have negative ratios of current account to GDP. For the rest of the variable, the values do not vary greatly across types of exchange rate regimes. Finally, it is interesting to note that there is comparatively less diversity in government consumption to GDP and gross public debt to GDP across exchange rate regime types than in the other series shown in Table 1. Nevertheless, debt to GDP is relatively higher among free floaters than for most countries that adopt pegged regimes.

4. Methodology

The basic panel data model specification is written as follows:

$$y_{i,t} = \alpha + X_{i,t}\beta + \gamma y_{i,t-1} + D_{i,t}\delta + I_{i,t}\rho + \mu_i + \varepsilon_{i,t} \quad \text{for } i = 1, \ldots, N \text{ and } t = 2, \ldots, T \tag{1}$$

where $y_{i,t}$ is real per capita GDP growth, X is a set of exogenous variables, D is a matrix representing dummy variables for exchange rate regime types, types of financial crises, inflation targeting countries, dummies for fiscal consolidations, and austerity, the region of the world, and time. The variable I represents interaction terms between exchange

[9] Countries that adopted pre-announced pegs, currency board arrangements, or pre-announced horizontal bands are observed too infrequently to discuss separately.

Table 1
Descriptive statistics for selected variables in the data set for the 1980–2011.

	Real GDP growth per capita	CPI inflation rate	Total investments/GDP	Current account/GDP	Government consumption/GDP	Gross public debt/GDP	Secondary school attainment	Life expectancy
Total (1380)	2.250 (5.826)	43.594 (419.430)	22.613 (5.896)	− 1.112 (4.794)	15.786 (5.181)	52.280 (29.528)	41.173 (14.371)	72.958 (6.505)
G20 (571)	2.631 (5.851)	31.760 (191.302)	23.754 (6.650)	− 0.207 (4.818)	16.505 (4.980)	52.933 (33.604)	43.121 (15.127)	72.199 (6.978)
No separate legal tender (120)	1.910 (2.808)	2.289 (2.016)	22.594 (3.419)	− 1.159 (5.507)	19.265 (3.061)	65.310 (23.741)	51.836 (11.804)	78.943 (1.462)
Pre-announced peg or currency board arrangement (22)	− 2.908 (4.506)	45.937 (144.337)	20.045 (3.767)	− 4.172 (5.041)	13.597 (1.335)	38.912 (14.764)	29.377 (9.734)	69.363 4.847)
Pre-announced horizontal band that is narrower than or equal to ± 2% (2)	− 1.505 (1.435)	5.897 (2.313)	16.650 (0.573)	− 1.529 (0.182)	20.746 (0.314)	38.269 (0.356)	46.91 (0.099)	76.259 (0.248)
De facto peg (125)	4.024 (4.196)	4.436 (4.873)	26.117 (7.465)	− 0.013 (3.752)	17.933 (5.200)	49.166 (25.272)	42.523 (15.658)	74.181 (4.408)
Pre-announced crawling peg (7)	4.321 (13.851)	40.943 (30.530)	20.125 (3.044)	− 3.564 (1.666)	11.326 (3.186)	33.880 (19.343)	31.420 (3.135)	70.511 (0.533)
Pre-announced crawling band that is narrower than or equal to ± 2% (16)	4.140 (8.385)	23.306 (26.597)	26.994 (8.584)	0.363 (4.207)	14.235 (3.843)	27.282 (14.225)	30.648 (15.746)	71.513 (1.545)
De facto crawling peg (125)	2.878 (4.694)	8.309 (5.353)	25.044 (7.807)	− 1.773 (4.110)	15.089 (6.089)	47.564 (23.104)	35.816 (11.220)	68.636 (5.849)
De facto crawling band that is narrower than or equal to ± 2% (255)	3.173 (6.265)	9.195 (6.964)	22.538 (4.977)	− 1.673 (3.617)	15.486 (5.222)	54.091 (26.586)	42.332 (12.341)	73.005 (5.807)
Pre-announced crawling band that is wider than or equal to ± 2% (17)	3.908 (4.140)	8.736 (6.760)	27.843 (7.930)	− 4.486 (4.427)	10.763 (1.138)	50.164 (16.896)	65.561 (16.991)	73.120 (1.366)
De facto crawling band that is narrower than or equal to ± 5% (102)	2.768 (6.099)	14.892 (13.149)	23.056 (5.046)	− 2.320 (3.170)	13.178 (3.855)	51.749 (34.415)	35.489 (10.927)	71.562 (5.040)
Moving band that is narrower than or equal to ± 2% (40)	2.288 (2.414)	1.936 (1.264)	20.603 (4.118)	4.282 (5.374)	17.862 (6.522)	53.294 (11.864)	46.166 (13.516)	78.269 (3.533)
Managed floating (195)	3.015 (5.192)	8.450 (7.928)	22.387 (5.442)	− 0.607 (6.099)	16.192 (5.239)	43.788 (19.854)	39.841 (12.469)	73.716 (5.799)
Freely floating (141)	1.975 (3.000)	4.384 (5.470)	22.451 (4.864)	− 1.471 (3.191)	16.813 (2.482)	60.041 (45.153)	50.111 (11.638)	74.012 (8.444)
Freely falling (115)	− 2.131 (8.932)	430.961 (1398.696)	19.330 (5.545)	− 1.940 (4.188)	11.046 (3.454)	58.303 (36.406)	26.953 (10.131)	66.226 (6.104)
Dual market in which parallel market data is missing (16)	3.129 (10.149)	17.584 (6.185)	17.800 (6.044)	6.670 (5.766)	16.227 (3.872)	43.276 (33.094)	30.571 (10.659)	66.859 (6.045)

Note: Standard deviation in parenthesis; parentheses in the first column indicate number of observations. A list of countries can be found in the appendix.

rate regime types and select variables (see below), the focus of the present study as explained in the introduction. μ_i is the unobserved individual-level effect, and $\varepsilon_{i,t}$ is the error term. We define the dummy for fiscal consolidations as the percent difference between the logarithm of the government consumption to GDP and its Hodrick–Prescott filtered value (smoothing parameter = 6.25). If this difference is negative for two consecutive years, the dummy is set to 1, and is 0 otherwise. We followed the same procedure for generating the dummy for austerity relying on the gross public debt series.

We generated the interaction terms by multiplying the exchange rate regime indicator with the government consumption to GDP ratio, the gross public debt to GDP, or with the inflation rate. These variables are believed to be representative of the importance of fiscal policy, the consequences of sovereign borrowing, and the outcome of monetary policy actions. We also add four different dummies to capture observations for negative real GDP per capita growth. First, a dummy, which is one for negative growth values, is added. Second, a dummy, where the series are the negative values only for real per capita GDP growth and zero elsewhere. Third, a trend variable is added, that goes from 1 to M where M is the number of consecutive years that real per capita GDP growth is negative. Finally, a combination variable is created where the trend variable is multiplied by the negative growth dummy.

Estimating a conventional fixed effects regression to study empirical growth models creates several challenges. First, some right-hand-side variables are likely to be endogenous. This is especially true for some fiscal and monetary variables. These regressors will be correlated with the error term. Second, time-invariant country effects could be correlated with the explanatory variables. Third, the inclusion of lagged dependent variable $y_{i,t-1}$ suggests the possibility of autocorrelation. Furthermore, if $y_{i,t-1}$ is correlated with the unobserved individual effect μ_i so that the within transformation produces an inconsistent estimator.

To correct these problems, the Arellano and Bond (1991) first-difference GMM estimator is used. First, differencing of Eq. (1) yields the following specification:

$$\Delta y_{i,t} = \alpha + \Delta X_{i,t}\beta + \gamma \Delta y_{i,t-1} + \Delta D_{i,t}\delta + \Delta I_{i,t}\rho + \varepsilon_{i,t} \quad \text{for } i = 1, \ldots, N \text{ and } t = 2, \ldots, T \tag{2}$$

so that the unobserved individual effects are eliminated. As instruments lagged, values of $y_{i,t}$ is used as well as the regressors X.[10] Furthermore, there exist unobserved individual-specific effects, so that $\varepsilon_{i,t} = \eta_i + \upsilon_{i,t}$ with

$$E[\eta_i] = 0,\ E[\upsilon_{i,t}] = 0,\ E[\upsilon_{i,t}\eta_i] = 0 \text{ for } i = 1, \ldots, N \text{ and } t = 2, \ldots, T \tag{3}$$

The assumption made is that the transient errors are serially uncorrelated

$$E[\upsilon_{i,t}\upsilon_{i,s}] = 0 \text{ for } i = 1, \ldots, N \text{ and } s \neq t \tag{4}$$

and that the initial conditions $y_{i,1}$ are predetermined so that

$$E[y_{i,1}\upsilon_{i,t}] = 0 \text{ for } i = 1, \ldots, N \text{ and } t = 2, \ldots, T. \tag{5}$$

These assumptions imply the moment restrictions

$$E[y_{i,t-s}\Delta\upsilon_{i,t}] = 0 \text{ for } t = 3, \ldots, T \text{ and } s \geq 2. \tag{6}$$

Bond et al. (2001) report poor finite sample properties for the first-difference GMM estimator in empirical growth models. Lagged levels of the dependent variable are weakly correlated with the first differences of the series, so that the instruments are weak. When the number

[10] There are s − p*(p + 1)/2 moment conditions in a model of one lagged dependent variable, s exogenous variables, and p = T − 2 periods.

of time periods is small, the first-difference GMM estimator is not recommended. They recommend the system GMM model relying on the Arellano–Bover or Blundell–Bond estimator. Arellano and Bover (1995) and Blundell and Bond (1998) add additional moment conditions, which are the lagged first differences of the dependent variable. The problem of endogenous regressors is handled by using lagged values of the endogenous series as instruments for the first-difference GMM estimator and lagged first differences of endogenous series as instruments for the system GMM estimator. The additional assumption is

$$E[\eta_i \Delta y_{i,2}] = 0 \text{ for } i = 1, \ldots, N. \tag{7}$$

Combined with the assumptions set before, this yields $T - 2$ further linear moment conditions

$$E[\varepsilon_{i,t} \Delta y_{i,t-1}] = 0 \text{ for } i = 1, \ldots, N \text{ and } t = 3, 4, \ldots T. \tag{8}$$

We will test all three kinds of estimators to check the robustness of the model. To verify the validity of the additional instruments of the GMM estimators, we use the standard Sargan test of over-identifying restrictions and Hausman tests to assess the adequacy of both estimators (Arellano and Bond, 1991). The resort to different kinds of estimators improves the robustness of our investigation of economic growth under different exchange rate regimes in times of crises. Most approaches in the existing literature are using only a simple fixed effects model.[11]

5. Empirical results

The Sargan tests show no difference between the two GMM methods, but the Hausman test finds in favor of the first-difference GMM estimator. Accordingly, only those results are discussed below.[12] Tables 2 and 3 present regression results relying on the first-difference GMM estimator for the full data set and the G20 group of economies. Two other groups of economies are also examined. They are advanced economies and emerging market economies (Tables 4 and 5). We also estimated all of the specifications for the full data set. The estimates are organized from the most to the least parsimonious specifications.[13] The least parsimonious specifications include interaction effects while all specifications consider a role for the chosen exchange rate regime, the focus of the present study.

For ease of exposition, the discussion only examines statistically significant coefficients and we compare the largest coefficients obtained. Consider first the overall response of real per capita economic growth to the type of exchange rate regime for the complete data set. Contrary to Levy-Yeyati and Sturzenegger (2003), less flexible regimes are found to have the lowest positive impact on real economic activity. Instead, crawling regimes show the biggest positive impact. However, there is no statistically significant difference between pegged and floating regimes, as confirmed by Wald tests (not shown).

Equally interesting is what is obtained when the data are disaggregated by region or type of economy. For example, for the G20 economies (Table 2), crawling regimes produce the largest impact on real economic activity while exchange rate bands are not found to be statistically significant. Note also that exchange rate regime choice has a relatively bigger impact on real GDP in the G20 than for the full data set. As others have reported (e.g., Huang and Malhotra, 2004; Levy-Yeyati and Sturzenegger, 2003), exchange rate regime choice has a negligible effect on growth in the advanced economies (Table 4), except when band regimes are adopted. Finally, emerging markets (Table 5) look similar to the complete data set, except that peg regimes have the biggest positive impact and band regimes the smallest. Nevertheless, not only do pegged regimes produce the biggest impact on growth but the impact for this group of economies is almost 50% higher that reported for the full data set.

Given the foregoing findings, we were also interested in whether the impact of exchange rate regime choice is asymmetric, a facet not systematically explored in the extant literature. Our estimates suggest that downturns have significantly negative effects on growth. For example, a downturn more than offsets the average positive influence of any exchange rate regime. Indeed, when an economy deviates from trend over time in a negative direction, the negative impact on economic growth is amplified. These results hold for all the country groupings considered in this study, but it is especially large for the emerging market group of countries.

Next, we turn to a summary description of the impact of the other variables in the specification. We were particularly interested in the interaction of exchange rate regime choice and financial crises. Financial crises, as expected, negatively impact real per capita GDP growth. Nevertheless, the impact is vastly different in various regions of the world. For example, in the full data set (Table 2), virtually all forms of financial crises reduce real economic activity. Sovereign debt crises are the lone exception. However, when the G20 economies are examined (Table 3), the negative effects of financial crises are primarily obtained from inflation and sovereign debt crises. In the advanced group of economies (Table 4), stock market, inflation crises, and banking crises have pervasive negative effects on growth, while for the emerging market economies (Table 5), inflation crises and stock market crashes are the most influential forms of financial crises to influence growth. It is also interesting to note that while sovereign debt crises have essentially no impact in the full data set (Table 2), reduce growth slightly in the G20 (Table 3), growth in emerging market economies (Table 5) rises sharply. The latter result perhaps reflects inducements to growth if the crisis effectively reduces the financial burden of the countries in question.

Turning to fiscal restraint measures, the subject of considerable debate recently, austerity programs consistently reduce economic growth in the full data set (Table 2), but this is apparently largely driven by the experience of advanced economies (Table 3). In contrast, fiscal consolidation programs are found to have zero impact on growth in the advanced economies, negative effects in emerging market economies (Table 5) but produce a boost to economic growth among the G20 (Table 3). The bottom line then is that fiscal policies have vastly different influence across various regions and types of economies. Therefore, generalizations about the effects of fiscal policies are fraught with danger.

We conclude with a brief overview of the impact from some of the other growth determinants considered in this study. Two economic determinants clearly have consistent and economically large effects on economic growth. They are the current account (as a proportion of GDP) and government spending (again, as a fraction of GDP). An increase in the former raises economic growth. However, the impact is much larger among the G20 and emerging market economies group of economies (Tables 3 and 5) than in the advanced economies. Indeed, the positive impact of the current account is as much as 6–7 times larger outside the advanced economies (Table 4). In contrast, whereas a larger government[14] always reduces economic growth, the impact is felt most keenly in the advanced group of economies followed closely by the G20.

[11] A referee expressed concern over the proliferation of instruments. This explains the resort to several estimators to ensure that the results are not affected by this possibility. In this connection, see Roodman (2009). Researchers must, however, be equally aware of the weak instruments problem and this too motivates us to rely on several estimators. Finally, we also implement several model adequacy tests to mitigate mis-specifications and note below any impact on our conclusions.

[12] For the full sample, the Hausman test the χ^2 value is 35.22 and the corresponding p-value is 0.01. Results based on the other method are available on request.

[13] We examined models with several financial and monetary variables. Only the most reliable results are discussed below. However, the appendix contains additional results not discussed here to conserve space. Finally, we should also note that since the foregoing series are not available for all economies, the resulting reduction in the number of observations is substantial (e.g., T falls to around 400 from 1300 for the full data set).

[14] A rise in the variable need not only represent an expansionary fiscal policy but may also reflect a desire to expand the size and role of government.

Table 2
Determinants of per capita real GDP growth and the role of exchange rate regimes, first-difference GMM.

	Endogenous variable: real GDP per capita growth					
Exogenous variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged real GDP per capita growth	−0.023 (0.026)	−0.025 (0.023)	−0.114*** (0.024)	−0.021 (0.026)	−0.013 (0.026)	−0.026 (0.026)
Current account /GDP	0.352*** (0.061)	0.220*** (0.054)	0.237*** (0.055)	0.369*** (0.062)	0.374*** (0.061)	0.358*** (0.062)
Total investment /GDP	0.687*** (0.117)	0.431*** (0.103)	0.535*** (0.105)	0.665*** 0.118)	0.678*** (0.118)	0.653*** (0.118)
Foreign direct investments /GDP	0.037 (0.048)	0.015 (0.042)	0.005 (0.043)	0.035 (0.049)	0.034 (0.048)	0.041 (0.048)
Gross capital formation /GDP	−0.397*** (0.123)	−0.384*** (0.107)	−0.474*** (0.110)	−0.368*** (0.124)	−0.342*** (0.124)	−0.380*** (0.124)
External balance /GDP	−0.061 (0.050)	−0.006 (0.044)	−0.015 (0.045)	−0.090* (0.051)	−0.087* (0.050)	−0.106** (0.050)
Government consumption /GDP	−1.237*** (0.152)	−0.624*** (0.135)	−0.788*** (0.138)	−1.329*** (0.160)	−1.297*** (0.155)	−1.254*** (0.152)
Gross public debt /GDP	0.008 (0.015)	0.002 (0.013)	−0.001 (0.013)	0.004 (0.015)	−0.039** (0.016)	0.007 (0.014)
CPI inflation rate	−0.001 (0.000)	−0.001 (0.000)	−0.001 (0.000)	−0.001* (0.000)	−0.000 (0.000)	−0.001* (0.000)
Austerity	−1.605*** (0.406)	−1.359*** (0.354)	−1.310*** (0.363)	−1.615*** (0.409)	−1.860*** (0.408)	−1.634*** (0.405)
Consolidation	−1.337*** (0.407)	−0.404 (0.356)	−1.037*** (0.364)	−1.405*** (0.413)	−1.364*** (0.409)	−1.377*** (0.405)
Inflation crises	−4.606*** (0.705)	−1.973*** (0.623)	−2.802*** (0.637)	−5.553*** (0.704)	−4.819*** (0.708)	−6.877*** (0.682)
Stock market crash	−1.341*** (0.396)	−0.424 (0.346)	−0.895** (0.355)	−1.396*** (0.400)	−1.361*** (0.398)	−1.364*** (0.399)
Sovereign debt crises (external)	0.789 (0.729)	0.704 (0.634)	0.776 (0.652)	0.576 (0.737)	0.573 (0.730)	0.281 (0.731)
Banking crises	−3.098*** (0.460)	−1.497*** (0.406)	−1.815*** (0.417)	−3.117*** (0.466)	−3.047*** (0.464)	−3.087*** (0.463)
Peg regimes	3.978*** (1.124)	2.573*** (0.980)	2.303** (1.009)			
Crawling regimes	5.117*** (0.815)	4.202*** (0.710)	3.670*** (0.732)			
Floating regimes	4.134*** (0.934)	2.299*** (0.816)	2.227*** (0.840)			
Band regimes	5.079*** (1.215)	3.365*** (1.060)	3.497*** (1.089)			
Negative growth dummy		−8.031*** (0.327)				
Trend dummy			−3.342*** (0.172)			
Peg regimes*government consumption /GDP				0.132* (0.075)		
Crawling regimes*government consumption /GDP				0.196*** (0.063)		
Floating regimes*government consumption /GDP				0.118* (0.068)		
Band regimes* government consumption /GDP				0.162* (0.085)		
Peg regimes*public debt /GDP					0.048*** (0.018)	
Crawling regimes*public debt /GDP					0.061*** (0.013)	
Floating regimes*public debt /GDP					0.061*** (0.016)	
Band regimes*public debt /GDP					0.103*** (0.023)	
Peg regimes*CPI inflation rate						0.022 (0.085)
Crawling regimes*CPI inflation rate						0.114*** (0.026)
Floating regimes*CPI inflation rate						0.079* (0.042)
Band regimes*CPI inflation rate						0.196** (0.080)
Constant	13.189*** (3.152)	11.481*** (2.743)	14.326*** (2.819)	16.814*** (3.132)	16.959*** (3.106)	17.749*** (3.079)
Number of observations	1289	1289	1289	1289	1289	1289
Method	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM
Number of instruments	485	486	486	485	485	485

Note: Eq. (1) is estimated; endogenous variable: real GDP per capita growth; standard errors in parenthesis.
* Significance at the 10% confidence level.
** Significance at the 5% confidence level.
*** Significance at the 1% confidence level.

The comparable impact among emerging market economies is almost double the estimate for other economies in the data set (Tables 2 and 5).

The remaining variables, such as FDI, gross capital formation, and total investment, found in other studies that investigate the determinants of economic growth, are either statistically insignificant or are seen to impact economic growth in either the G20 or advanced economies alone. Of these, total investments (as a proportion of GDP) have the biggest impact of the remaining variables.

6. Conclusion

Studies of the determinants of economic growth have been the staple of international macroeconomic investigations for many years. Most recently, the focus has been on the role played by economic policies, most notably expansionary and contractionary fiscal policies. The latter have been termed austerity or fiscal consolidation programs. The present study continues in this vein but follows a road less traveled by asking how the choice of exchange rate regime impacts real per capita economic growth.

The celebrated work of Reinhart and Rogoff (2009) hardly mentions the role of exchange rate regime choice while only a very small handful of studies can be said to cover the ground covered in this paper and these are now a decade old (e.g., De Grauwe and Schnabl, 2004; Huang and Malhotra, 2004; Levy-Yeyati and Sturzenegger, 2003). Accordingly, we investigate the link not only between economic growth and exchange rate regime choice but also the interaction between this aspect of macroeconomic policy making and financial crises.

Briefly, we conclude that while exchange rate regimes of all types can promote positive economic growth disaggregation by region or country type yields significantly different results. Pegged regimes work best for emerging market economies while crawling regimes deliver the greatest boost to economic growth in the G20. Exchange rate regime choice is found to have a negligible impact in the advanced economies. These results, in spite of a more comprehensive econometric specification than most comparable studies, are not inconsistent with the small comparable literature. What is different is that the foregoing positive influences are more than offset when economies are below trend or in a downturn. In particular, pegged exchange rate regimes are not a panacea but the same is also true of floating regimes. As Frankel (1999) pointed out more than a decade ago 'no single exchange rate regime is right for all countries.'

As noted in the Introduction, fiscal restraint programs are rarely undertaken in isolation. They are often accompanied by other policy changes. Moreover, our estimates do not take a direct stand on the

Table 3
Determinants of per capita real GDP growth and the role of exchange rate regimes for the G20 economies, first-difference GMM.

	Endogenous variable: real GDP per capita growth					
Exogenous variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged real GDP per capita growth	−0.094**	−0.052	−0.131***	−0.054	−0.055	−0.106***
	(0.038)	(0.033)	(0.034)	(0.039)	(0.038)	(0.037)
Current account /GDP	0.771***	0.603***	0.667***	0.795***	0.680***	0.877***
	(0.083)	(0.072)	(0.073)	(0.086)	(0.0887)	(0.084)
Total investment /GDP	0.311***	0.160*	0.183*	0.301***	0.350***	0.393***
	(0.111)	(0.096)	(0.098)	(0.115)	(0.114)	(0.107)
Foreign direct investments /GDP	−0.434***	−0.428***	−0.465***	−0.438***	−0.463***	−0.354***
	(0.131)	(0.112)	(0.115)	(0.136)	(0.134)	(0.128)
Gross capital formation /GDP	−0.542***	−0.129	−0.130	−0.219	−0.26909***	−0.200
	(0.091)	(0.111)	(0.113)	(0.134)	(0.133)	(0.124)
External balance /GDP	−0.542***	−0.327***	−0.410***	−0.586***	−0.474***	−0.576***
	(0.091)	(0.078)	(0.080)	(0.094)	(0.091)	(0.085)
Government consumption /GDP	−1.325***	−0.734***	−0.781***	−1.478***	−1.392***	−1.246***
	(0.201)	(0.174)	(0.181)	(0.218)	(0.210)	(0.194)
Gross public debt /GDP	0.000	0.002	−0.006	0.000	−0.084***	−0.004
	(0.013)	(0.011)	(0.011)	(0.014)	(0.020)	(0.013)
CPI inflation rate	0.000	−0.000	−0.000	0.001	−0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Austerity	−0.757	−0.699*	−0.524	−0.822*	−0.873*	−0.585
	(0.482)	(0.413)	(0.423)	(0.175)	(0.485)	(0.454)
Consolidation	0.493	0.818**	0.683*	0.314	0.500	0.040
	(0.455)	(0.390)	(0.399)	(0.469)	(0.467)	(0.428)
Inflation crises	−2.566**	−1.683*	−1.490	−3.977***	−2.021*	−6.559***
	(1.037)	(0.891)	(0.913)	(1.034)	(1.072)	(0.983)
Stock market crash	−0.573	0.031	−0.341	−0.575	−0.578	−0.649
	(0.438)	(0.377)	(0.384)	(0.452)	(0.450)	(0.425)
Sovereign debt crises (external)	−2.468**	−1.151	−0.681	−3.470***	−2.711***	−2.471**
	(0.990)	(0.853)	(0.880)	(1.017)	(1.022)	(0.959)
Banking crises	−1.296***	−0.401	−1.028**	−1.364***	−1.445***	−1.353***
	(0.470)	(0.406)	(0.412)	(0.487)	(0.482)	(0.460)
Peg regimes	4.456***	2.821***	2.807**			
	(1.246)	(1.073)	(1.099)			
Crawling regimes	7.440***	5.307***	5.610***			
	(1.052)	(0.913)	(0.933)			
Floating regimes	4.790***	2.455***	2.573***			
	(1.020)	(0.888)	(0.909)			
Band regimes	0.941	0.917	0.641			
	(1.520)	(1.302)	(1.332)			
Negative growth dummy		−6.552***				
		(0.429)				
Trend dummy			−3.143*** (0.249)			
Peg regimes*government consumption /GDP				0.141 (0.088)		
Crawling regimes*government consumption /GDP				0.306*** (0.080)		
Floating regimes*government consumption /GDP				0.144** (0.073)		
Band regimes* government consumption /GDP				−0.067 (0.100)		
Peg regimes*public debt /GDP					0.099*** (0.020)	
Crawling regimes*public debt /GDP					0.125*** (0.019)	
Floating regimes*public debt /GDP					0.095*** (0.019)	
Band regimes*public debt /GDP					0.068** (0.029)	
Peg regimes*CPI inflation rate						0.178** (0.080)
Crawling regimes*CPI inflation rate						0.212*** (0.029)
Floating regimes*CPI inflation rate						0.061 (0.052)
Band regimes*CPI inflation rate						−0.944*** (0.204)
Constant	18.117***	12.578***	13.138***	22.782***	23.212***	19.028***
	(4.022)	(3.412)	(3.530)	(4.010)	(4.088)	(3.755)
Number of observations	511	511	511	511	511	511
Method	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM
Number of instruments	412	413	413	412	412	412

Note: Eq. (1) is estimated; endogenous variable: real GDP per capita growth; standard errors in parenthesis.
* Significance at the 10% confidence level.
** Significance at the 5% confidence level.
*** Significance at the 1% confidence level.

Notes to Table 4:
Note: Eq. (1) is estimated; endongenous variable: real GDP per capita growth; standard errors in parenthesis.
* Significance at the 10% confidence level.
** Significance at the 5% confidence level.
*** Significance at the 1% confidence level.

Table 4
Determinants of per capita real GDP growth and the role of exchange rate regimes for advanced economies, first-difference GMM.

Advanced economies	Endogenous variable: real GDP per capita growth					
Exogenous variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged real GDP per capita growth	−0.005	0.014	−0.072**	−0.000	−0.010	0.008
	(0.035)	(0.030)	(0.031)	(0.035)	(0.035)	(0.034)
Current account /GDP	0.100**	0.088**	0.035	0.108**	0.082*	0.111**
	(0.047)	(0.041)	(0.041)	(0.047)	(0.047)	(0.046)
Total investment/GDP	0.114	0.007	0.073	0.111	0.125	0.148
	(0.154)	(0.135)	(0.135)	(0.154)	(0.154)	(0.153)
Foreign direct investments /GDP	0.041	0.033	0.040	0.038	0.031	0.035
	(0.030)	(0.026)	(0.026)	(0.030)	(0.030)	(0.029)
Gross capital formation /GDP	0.290*	0.207	0.102	0.287*	0.255	0.239
	(0.158)	(0.138)	(0.139)	(0.159)	(0.157)	(0.157)
External balance /GDP	0.031	0.005	0.053	0.011	0.014	−0.028
	(0.050)	(0.044)	(0.044)	(0.050)	(0.050)	(0.047)
Government consumption /GDP	−1.425***	−0.940***	−1.084***	−1.428***	−1.490***	−1.487***
	(0.118)	(0.107)	(0.106)	(0.125)	(0.121)	(0.117)
Gross public debt /GDP	0.018*	0.011	0.008	0.017*	0.041*	0.016*
	(0.009)	(0.008)	(0.008)	(0.009)	(0.023)	(0.009)
CPI inflation rate	−0.277***	−0.145***	−0.167***	−0.284***	−0.293***	−0.254***
	(0.035)	(0.032)	(0.032)	(0.034)	(0.034)	(0.038)
Austerity	−1.264***	−1.083***	−1.083***	−1.293***	−12946***	−1.320***
	(0.263)	(0.230)	(0.231)	(0.263)	(0.264)	(0.260)
Consolidation	−0.274	0.079	−0.187	−0.257	−0.259	−0.302
	(0.246)	(0.216)	(0.216)	(0.245)	(0.244)	(0.244)
Inflation crises	−2.178**	−1.466	−1.602*	−2.143**	−2.089**	−2.223***
	(1.053)	(0.922)	(0.926)	(1.054)	(1.045)	(1.104)
Stock market crash	−1.132***	−0.714***	−0.878***	−1.126***	−1.112***	−1.016***
	(0.253)	(0.223)	(0.233)	(0.254)	(0.253)	(0.254)
Sovereign debt crises (external)	0	0	0	0	0	0
	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Banking crises	−0.995***	−0.023	−0.216	−0.974***	−0.930***	−0.896***
	(0.292)	(0.261)	(0.261)	(0.293)	(0.293)	(0.293)
Peg regimes	−0.281	−0.080	0.809			
	(1.375)	(1.186)	(1.194)			
Crawling regimes	1.345	1.264	2.418**			
	(1.285)	(1.124)	(1.131)			
Floating regimes	1.056	0.085	1.237			
	(1.340)	(1.173)	(1.177)			
Band regimes	2.591*	1.224	2.506*			
	(1.487)	(1.302)	(1.306)			
Negative growth dummy		−4.308***				
		(0.237)				
Trend dummy			−2.185***			
			(0.138)			
Peg regimes*government consumption /GDP				−0.057		
				(0.060)		
Crawling regimes*government consumption /GDP				0.011		
				(0.058)		
Floating regimes*government consumption /GDP				0.012		
				(0.062)		
Band regimes* government consumption /GDP				0.053		
				(0.069)		
Peg regimes*public debt /GDP					−0.043*	
					(0.022)	
Crawling regimes*public debt /GDP					−0.018	
					(0.022)	
Floating regimes*public debt /GDP					−0.017	
					(0.022)	
Band regimes*public debt /GDP					0.012	
					(0.026)	
Peg regimes*CPI inflation rate						−0.223**
						(0.089)
Crawling regimes*CPI inflation rate						−0.031
						(0.047)
Floating regimes*CPI inflation rate						−0.087
						(0.064)
Band regimes*CPI inflation rate						−0.13
						(0.244)
Constant	20.888***	16.384***	19.361***	22.118***	23.697***	23.602***
	(3.644)	(3.196)	(3.202)	(3.343)	(3.461)	(3.325)
Number of observations	650	650	650	650	650	650
Method	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM
Number of instruments	443	444	444	443	443	443

Table 5
Determinants of per capita real GDP growth and the role of exchange rate regimes for emerging market economies, first-difference GMM.

	ENdogenous variable: real GDP per capita growth					
Exogenous variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged real GDP per capita growth	−0.001	0.001	−0.097**	0.020	0.006	−0.021
	(0.044)	(0.035)	(0.039)	(0.044)	(0.044)	(0.043)
Current account /GDP	0.648***	0.494***	0.517***	0.724***	0.645***	0.682***
	(0.123)	(0.099)	(0.107)	(0.124)	(0.123)	(0.121)
Total investment/GDP	0.371***	0.292***	0.303**	0.376***	0.388***	0.347**
	(0.140)	(0.112)	(0.121)	(0.143)	(0.140)	(0.137)
Foreign direct investments /GDP	−0.006	−0.025	−0.061	0.004	0.007	0.008
	(0.075)	(0.060)	(0.065)	(0.076)	(0.075)	(0.073)
Gross capital formation /GDP	−0.015	−0.216	−0.154	−0.029	−0.042	0.030
	(0.163)	(0.132)	(0.142)	(0.168)	(0.164)	(0.160)
External balance /GDP	−0.128	−0.114	−0.143*	−0.198*	−0.123*	−0.150
	(0.101)	(0.081)	(0.087)	(0.103)	(0.101)	(0.097)
Government consumption /GDP	−0.810***	−0.370*	0.358*	−0.910***	−0.826***	−0.681***
	(0.235)	(0.190)	(0.206)	(0.259)	(0.236)	(0.232)
Gross public debt /GDP	−0.068***	−0.058***	−0.081***	−0.075***	−0.132***	−0.076***
	(0.022)	(0.018)	(0.019)	(0.023)	(0.025)	(0.022)
CPI inflation rate	−0.004***	−0.004***	−0.004***	−0.004***	−0.004***	−0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Austerity	−0.669	−0.683	−0.029	−0.780	−0.764	−0.305
	(0.662)	(0.533)	(0.576)	(0.682)	(0.663)	(0.647)
Consolidation	−1.961***	−0.565	−1.543**	−2.132***	−1.831***	−2.469***
	(0.703)	(0.572)	(0.609)	(0.718)	(0.707)	(0.682)
Inflation crises	−3.196***	−1.048	−1.644**	−3.994***	−3.229***	−5.992***
	(0.922)	(0.753)	(0.808)	(0.925)	(0.922)	(0.910)
Stock market crash	−1.524**	−0.608	−1.153**	−1.626***	−1.408*	−1.583***
	(0.608)	(0.493)	(0.527)	(0.622)	(0.613)	(0.595)
Sovereign debt crises (external)	2.331**	2.922***	3.349***	1.984**	2.077**	1.642*
	(0.929)	(0.749)	(0.809)	(0.943)	(0.922)	(0.895)
Banking crises	−1.375*	−0.855	−1.377**	−1.351*	−1.548**	−1.622**
	(0.714)	(0.575)	(0.616)	(0.727)	(0.713)	(0.697)
Peg regimes	5.601***	2.889**	2.583*			
	(1.643)	(1.332)	(1.443)			
Crawling regimes	5.036***	3.089***	2.865***			
	(1.119)	(0.907)	(0.984)			
Floating regimes	4.607***	2.444***	2.518**			
	(1.138)	(0.925)	(1.000)			
Band regimes	3.616**	1.293	1.020			
	(1.456)	(1.179)	(1.277)			
Negative growth dummy		−9.436***				
		(0.553)				
Trend dummy			−3.361***			
			(0.282)			
Peg regimes*government Consumption /GDP				0.248*		
				(0.146)		
Crawling regimes*government Consumption /GDP				0.202**		
				(0.092)		
Floating regimes*government Consumption /GDP				0.188**		
				(0.086)		
Band regimes* government Consumption /GDP				0.064		
				(0.123)		
Peg regimes*public debt /GDP					0.133***	
					(0.036)	
Crawling regimes*public debt /GDP					0.085***	
					(0.020)	
Floating regimes*public debt /GDP					0.085***	
					(0.021)	
Band regimes*public debt /GDP					0.058*	
					(0.030)	
Peg regimes*CPI inflation rate						0.312***
						(0.103)
Crawling regimes*CPI inflation rate						0.163***
						(0.034)
Floating regimes*CPI inflation rate						0.205***
						(0.054)
Band regimes*CPI inflation rate						0.120
						(0.078)
Constant	5.933	9.541***	8.855***	10.169***	10.156***	7.770***
	(3.890)	(3.129)	(3.374)	(3.926)	(3.851)	(3.802)
Number of observations	428	428	428	428	428	428
Method	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM	First-difference GMM
Number of instruments	373	374	374	373	373	373

size of the fiscal multiplier. Hence, we are unable to assess the impact of this factor on our estimates of output losses when the added influence of exchange rate regime choice is considered, e.g., see Alesina and Ardagna (1998, 2010) versus Blanchard and Leigh (2013). Nevertheless, our study suggests that the build-up of financial risks and imbalances, surely tied to exchange rate regime choice, also interacts with austerity and fiscal consolidation programs. Hence, this provides an additional argument for continued efforts at reforming the international monetary system.

An additional important finding of our study is that exchange rate regime choice and the type of financial crisis do interact with each other. Almost all cases and all types of financial crises that interact with pegged regimes exert a negative impact on economic growth beyond the stage of the business cycle or the other determinants of economic growth considered in this study. International cooperation in developing and implementing economic policies might be desirable and more effort needs to be devoted to achieving some common aims. Moreover, as large economically as the G20 is, the response to exchange rate regime choice and various types of financial crises differs enough from those found in emerging market economies and advanced economies to raise questions about the potential coherence of this group of economies.

At least two other obvious extensions to the current research would be desirable. First, once data availability permits, expanding the coverage of economies and updating the data set to cover the entire period of the most recent global financial crisis would be useful if only to determine whether the last crisis was indeed different. Second, if different regions of the world yield idiosyncratic results, then we should also consider more explicitly the role of any spillovers from one region of the world (e.g., advanced economies) to others (e.g., emerging market economies). These extensions are left for future research.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.econmod.2015.11.017.

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Notes to Table 5:
Note: Eq. (1) is estimated; endogenous variable: real GDP per capita growth; standard errors in parenthesis.
* Significance at the 10% confidence level.
** Significance at the 5% confidence level.
*** Significance at the 1% confidence level.