Monetary policy in a downturn: Are financial crises special?

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Abstract

The accommodative monetary policy actions taken by central banks during the financial crisis were instrumental in preventing a deeper recession. However, there is disagreement how long they should be kept in place. At the heart of this debate is the notion that a prolonged period of policy accommodation creates distortions. Some argue that the distortions are limited and that further monetary policy stimuli strengthens the subsequent recovery, while others hold that extending such policies is counterproductive as they postpone the necessary balance sheet adjustments and hence prolong the economic weakness. We present empirical evidence showing that accommodative monetary policy during a "normal" downturn indeed strengthens the subsequent recovery. However, this effect is more elusive when the downturn is associated with a financial crisis. Here, the benefits of accommodative monetary policy appear to be short-lived. In addition, we find that private sector deleveraging during a downturn induces a stronger recovery. Both results hold even after controlling for the stance of fiscal policy, movements in the real exchange rate and developments in the international environment. That said the evidence is tentative due to the size and other limitations of our sample.

JEL classification: E2, E3, E6, F3, F4, H6, N10

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1. Introduction

Almost five years after the onset of the financial crisis significant parts of the world economy have not recovered. Calibrating the appropriate policy response is - recent progress notwithstanding - complicated by a dearth of economic models that adequately account for the interaction between the financial system and the real economy; in particular in the aftermath of a bust.[2] Against this backdrop it is perhaps not surprising that policymakers are receiving diverging advice from economists with regards to the appropriate role of monetary policy. While realizing that the room for manoeuvre is limited, some forcibly argue that further stimulus is needed to boost growth. Others are of the view that substantial stimulus has already been provided and that benefit of additional support is likely to be small (but they don't see alternatives at the current juncture). Finally, another view is that exceptionally accommodative and prolonged monetary easing is counterproductive, as it delays the necessary restructuring of balance sheets[3] and, in the longer run, undermines central banks' credibility.

The differences in advice reflect tensions between - at least - three different strands of the literature on monetary policy. The first strand holds that monetary policy should be always counter-cyclical. For example, in standard versions of the New Keynesian model stabilizing inflation is equivalent to stabilizing the welfare-relevant output gap. Hence, central banks do not face an inflation-output trade-off when conducting monetary policy, a situation known as "divine coincidence" (Goodfriend and King, 1997). Aghion et al. (2012) go one step further and argue that not only should monetary policy smooth the business cycle but also claim that countercyclical monetary policy enhances long term growth.[4]

The second strand of the literature disputes that "divine coincidence" exists. Central banks face a trade-off between stabilizing inflation and stabilizing the output.[5] Moreover, in the case of a severe recession monetary policy effectiveness may be limited due to impairment in the monetary transmission mechanism and central banks may more than ever be "pushing on a string". This reinforces the case for a conservative central bank that only cares about inflation (Rogoff, 1989).

The third emerging strand of literature springs in part from a dissatisfaction with the way in which the traditional new Keynesian model deals with the financial sector (see references in footnote 2). Without financial frictions or default, cost and benefit analysis of monetary policy before, during and after financial crisis is an exercise in futility. Related to this strand is the so-called risk-taking channel of the monetary transmission mechanism (Borio and Zhu 2008; Adrian and Shin 2010). In general, low interest rates for a prolonged period can increase incentives for asset managers to take on more risks for contractual, behavioural or institutional reasons (for example, to meet a target nominal return; Rajan 2005). Moreover,

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[2] Examples of macro economic models that analyze the link between the financial sector and the real economy more explicitly include Brunnermeier and Sannikov (2011) and Curdia and Woodford (2011).

[3] The contrasting experiences of Japan and the Nordic countries can be highlighted as examples of the different potential outcomes. In short, the Nordics could not afford very easy monetary (or fiscal policy) in the aftermath, had serious recessions but then recovered relatively quickly (after repairing aggressively banks' balance sheets; see Borio et al 2010). On the other hand, in Japan monetary policy was easy and the restructuring of balance sheets not as intense. The initial recession was less severe but the pain has been more protracted.

[4] In particular, Aghion et al. (2012) argue that if real short term interest rates are lower in recessions and higher in upturns, then this has a disproportionately larger positive impact on subsequent growth in industries that are prone to be credit or liquidity constrained.

[5] Blanchard and Gali (2005) stress that the "divine coincidence" is due only to a special feature of the new Keynesian model: the absence of non-trivial real imperfections. When the baseline new Keynesian model is extended to allow for real wage rigidities, the "divine coincidence" disappears. Central banks indeed face a trade-off between stabilizing inflation and stabilizing the welfare-relevant output gap. Mankiw (2005) points out "if supply shocks are not simply shifts in productivity but also represent shifts in how distorted the economy's production process is then it turns out that the divine coincidence also disappears."

during a financial crisis and its aftermath, low interest rates could also induce "ever-greening policies" and postpone necessary adjustments in banks' balance sheets (Barseghyan, 2010). Given the low cost of forbearance, very low interest rates may disguise underlying credit weakness; encouraging banks to "extend and pretend" that loans of low-quality borrowers will become good. This is an issue especially for supervisory authorities. Past experience has shown that low policy rates allow for the increase of "zombie lending" policies, i.e. the rollover of non-viable loans. The experience of Japan in 1990s is instructive: banks permitted debtors to roll over loans on which they could afford the near zero interest payments but not repayments of principal (Caballero et al 2008). Very low rates keep poor-quality borrowers afloat, reducing the incentives to reallocate resources to areas of more vigorous growth, and thus may lower potential output. There is also more recent evidence based on credit register data that ever-greening practices have taken place during the crisis in Italy (Albertazzi and Marchetti 2010).

In addition, historical evidence indicates that financial cycle bust coexist with permanent output losses and are followed by slow and long recoveries (BCBS, 2010). This can be due to many reasons: i) overestimation of potential output and growth during the boom; ii) misallocation of resources, notably of capital, during that phase; iii) oppressive effect of the subsequent debt and capital overhang; iv) subsequent disruptions to financial intermediation (Borio, 2012). Moreover, Schularick and Taylor (2011) study the behaviour of money, credit, and macroeconomic indicators on a historical dataset for 12 developed countries over the years 1870–2008. In particular, they document that monetary policy responses to financial crises have been more aggressive post-1945, but despite these policies the output costs of crises have remained large.

In our view, this debate raises a fundamental question about the extent to which the impact of monetary policy in downturns associated with a financial crisis is different relative to downturns, in which financial crisis do not occur. The aim of this paper is to look at historical episodes to try and establish a set of stylized facts that can provide guidance for further research. Inevitably, though, financial crises are (luckily) rare events. This is a challenge for any empirical analysis as the number of observations is bound to be "small", thereby adversely affecting the quality of any inference. There are basically three ways to try and get around this problem. One is to look back in time, another is to look across countries and the third is to do both. The downside is that all cases imply comparing potentially very different economies and episodes.

In this paper, we look at a set of 24 developed countries from the mid-1960s and investigate what drives the strength of the recovery. In particular, we are interested in the effects (if any) that monetary policy during the downturn may have on the strength of the subsequent recovery. Furthermore, we seek to assess whether the impact of monetary policy is different if the downturn is associated with a financial crisis. Using a simple regression framework, we find that easy monetary policy during a "normal" downturn leads to a stronger recovery afterwards. However, this is not the case for accommodative monetary policy during downturns associated with a financial crisis. In the case of financial crises we also find that deleveraging is beneficial for the subsequent recovery. These results hold also after controlling for the stance of fiscal policy, movements in the real exchange rate and economic conditions abroad.

The paper is structured as follows. The next section presents our empirical methodology and following one describes our data. In section IV, we discuss our results and the last section concludes.

2. Downturns and recoveries

Our empirical framework is simple but non-standard. To start with, we construct a cross section of downturns and subsequent recoveries from a sample of 24 developed countries

based on data going back to 1960.[6] Some series are not available at the quarterly frequency so we used annual data. We define downturns as periods of one or more consecutive years with negative real GDP growth. With a view to expand the number of observations, we include forecasted value for real GDP until 2016 from the OECD's Economic Outlook database. We index the downturns by *k*. For example, the first downturn in the first country in our sample (Australia) has the index *k = 1* while the first downturn in the second country (Austria) has the index *k = 4* as Australia experienced 3 downturns since 1960 according to our methodology. Moreover, we make a distinction between whether or not a financial crisis occurs in connection with the downturn. Specifically, we say that a financial crisis is associated with the downturn if a crisis occurred in the country during the two years prior to the bust or during the downturn itself.[7] We rely on a combinations of Borio and Drehmann (2009), Laeven and Valencia (2008 and 2010) and Reinhart and Rogoff (2009) in terms of dating financial crisis.[8]

Similarly, we define the subsequent recovery as the period from the trough to the year when real GDP reaches the previous peak again.[9] The recoveries inherit the index from the downturns. For the ease of exposition, we refer to the combination of a downturn and a recovery as a "downturn cycle" or just cycle.

A graph is helpful to illustrate the methodology. Figure 3 shows real GDP for Finland since 1960 both in terms of annual growth and level measured in log dollars. Local peaks in real GDP are colored green whereas downturns and recoveries are colored red and blue, respectively.

Over this period, Finland experienced two downturn cycles according to our methodology. The first one saw real GDP peak in 1990 and the downturn phase with falling real GDP lasted through 1993. The Finnish economy recovered to the 1990 level in 1996. The economic crisis in the early 1990s was triggered in part by the collapse of the former Soviet Union – Finland's main trading partner at the time. However, prior to the bust Finland had also gone through a period of financial liberalization. This led to a domestic credit and housing boom; fueled in part by large capital inflows. As a consequence of to rapidly falling asset prices and corporate bankruptcies, a major banking crisis erupted in 1991. The year of financial crisis is shown by the dashed vertical line and as it is within one year of the peak it is treated as a downturn cycle with a financial crisis.

Finland saw another fall in real GDP during the recent global financial crisis, but it did not experience a domestic financial crisis. Our procedure finds that 2008 is the year of peak GDP and that the slump ends in 2009. Based on the forecast from OECD Finland's real GDP will be just above the 2008 level in 2012. Hence in our methodology the recovery is complete and the episode is included in our sample. Similar graphs for the other countries in our sample are shown in Annex 1.

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6 The countries are: Australia (AU), Austria (AT), Belgium (BE), Canada (CA), Denmark (DK), Germany (DE), Finland (FI), France (FR), Greece (GR), Iceland (IS), Ireland (IE), Italy (IT), Japan (JP), South Korea (KR), Luxembourg (LX), the Netherlands (NE), Norway (NO), New Zealand (NZ), Portugal (PO), Spain (SP), Sweden (SW), Switzerland (CH), United Kingdom (UK) and USA (US).

7 We rely on other studies to identify crises and their timing. A sizeable number of crises are declared to take place in the last quarter of the year in which they happen. Restricting the definition of downturns associated with a financial crisis to those for which a financial crisis happens at most one year before the downturn would exclude a non-trivial number of downturns, which were actually preceded by a financial crisis at least 5 quarters before.

8 In cases where these sources disagree on the timing of the financial crisis, we relied on judgement and correspondence with central banks.

9 We treat potential "double dips" as follows. If peak real GDP for episode k+1 is lower than that of episode k, then the two episodes are merged and considered as one. The episode index is adjusted accordingly by removing the latter episode.

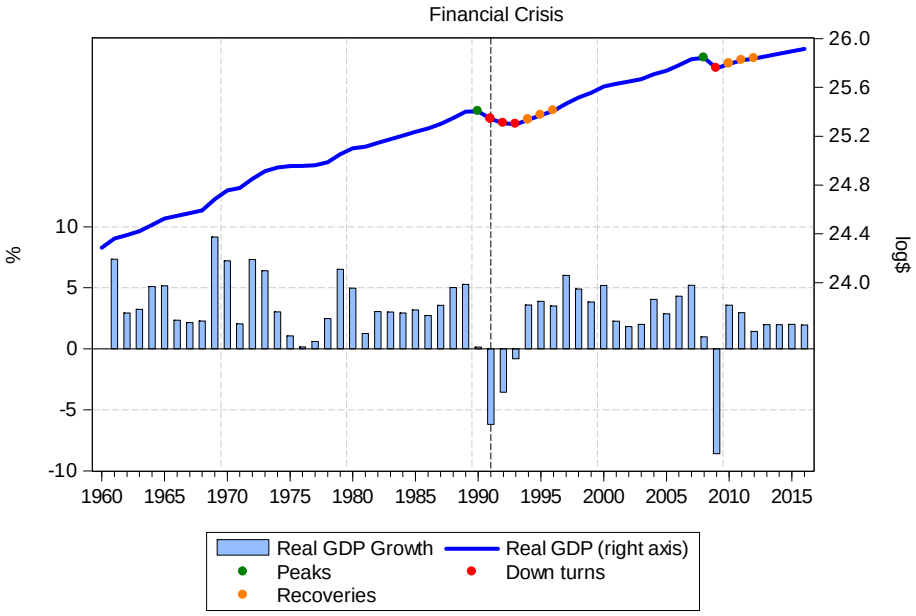


Figure 1: Finland

Using our dating methodology, we identify 79 downturns for the 24 countries. Moreover, the sources listed above, identifies 34 financial crises for the countries over the sample period. Switzerland, for example, saw five downturns and two financial crises while Ireland only shows one downturn and one financial crisis as data is only available from 1990. Four financial crises were not associated with a downturn in real GDP (Spain 1977, Iceland 1985, New Zealand 1987 and Norway 1990).[10] The full list of episodes is reported in Table 1.

Descriptive statistics for our key variables are provided in Table 2. As expected, the episodes associated with financial crises are more severe and longer lasting than those without. When there is no financial crisis the average loss in output is of 1.9% in real terms and the average length on an episode is 3.8 years. With a financial crisis, we find that the loss is about 8.2% and the duration is longer at 5.1 years.

3. Basic findings

The main purpose of the paper is to investigate how the impact of monetary policy on economic activity differs across cycles with or without financial crises. As a first take, we split the sample in two and regress the average (real) GDP growth rate over the cycle ($\dot{y}_k^c$) on the stance of monetary policy at the peak (i_k^p), ie coming into the cycle, and the average stance of monetary policy over the cycle itself (i_k^c).[11] That is, we run regressions of the following type

$$\dot{y}_k^c = \alpha + \beta i_k^p + \gamma i_k^c + \varepsilon_k \qquad (1)$$

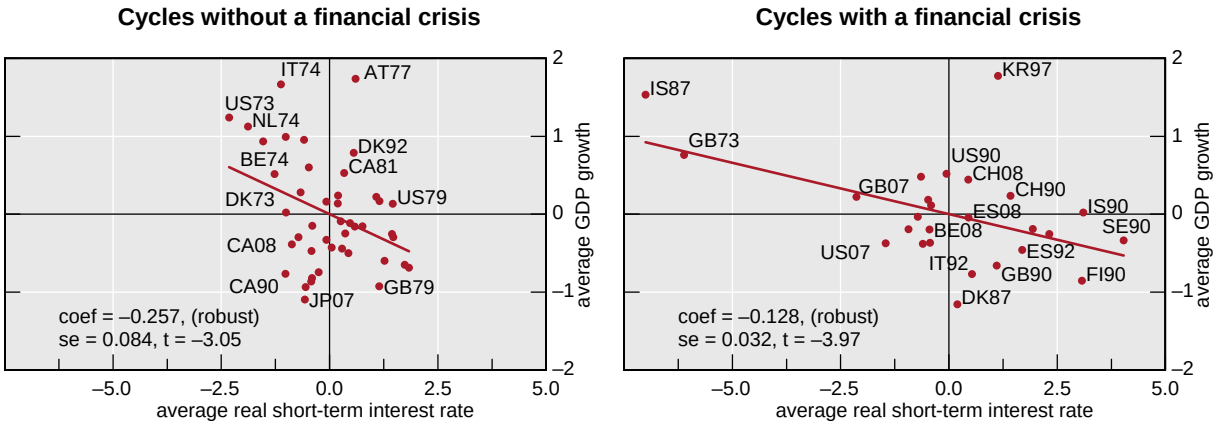
[10] Due to some data limitations we had to discard two other episodes: Luxemburg 1974 and Japan 1973. The last case is also borderline to be identified as a recession (see the figure for Japan in Annex 1).

[11] From Table 2, we note that the average change in the real interest rate is equal to -1.06 during a complete cycle associated with a financial crisis and practically around zero in the remaining cases.

where the stance of monetary policy is measured as the real short-term interest rate. In doing so, however, we had to drop a number of observations. First, two cycles (Korea 1979 and Iceland 1982) were clear outliers. In South Korea the downturn in the late seventies was associated with an average level of the real short-term interest rate higher than 30 per cent, while in Iceland the average rate of inflation during the downturn at the beginning of the eighties reached a value close to 70 percent. Moreover, we exclude from the exercise four downturns for which a full recovery was not complete by 2016 (Italy 2007, Portugal 2008, Spain 2008 and Greece 2008).

Figure 2 summarizes the results for the sample split according to cycle type. Each panel shows the impact of the average real short-term interest rate over the cycle on the average output growth over the cycle controlling for the real short term interest rate at the peak. That is, we plot the residuals from regressing i_k^c on i_k^p against the residuals from regressing $\dot{y}_k^c$ on i_k^p.

Both panels show a negative correlation, which implies that accommodative monetary policy (ie lower real interest rate) is associated with higher average output growth over the cycles. However, the magnitude of the correlation differs. In case of cycles associated with financial crises the correlation (right panel) is half that of cycles not associated with a financial crisis (left panel).



Note: Partial-regression plots

Figure 2: Monetary policy and financial crises

While correlation does not imply causality, the results do not contradict the notion that monetary policy in connection with a financial crisis is less effective. We would ascribe this to impairment of the transmission mechanisms. For example, over-indebted economic agents may not consume the windfall of lower interest payments but rather seek to repay debt. Moreover, a struggling banking system may be less inclined to pass on lower rates to the rest of the economy. In other words, the lower elasticity of output growth with respect to the real interest rates means that, all else equal, larger cuts in the policy rate is needed to yield a given increase in demand.

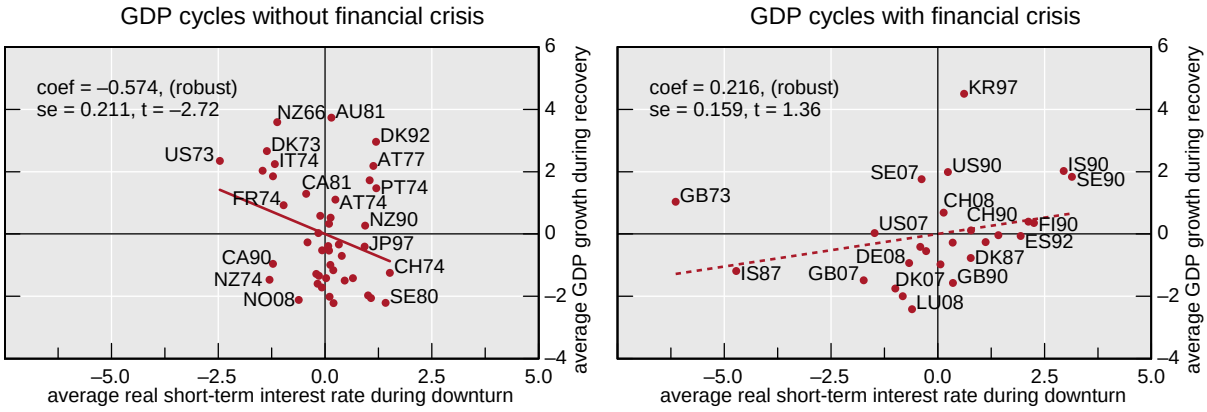
However, an important caveat is the issues of endogeneity. Monetary policy is not set in vacuum but responds to macroeconomic conditions so it is impossible to identify with certainty cause and effect.[12] In order to mitigate this problem, we consider – in a second take – the narrower question of how monetary policy in the downturn influences the subsequent

[12] In order to avoid having to rely on expectations of the future path of monetary and fiscal policies we excluded from the exercise the cases for which a full recovery was not complete by 2016.

recovery (controlling for the severity of the downturn). Here we separate in time the policy decision from the outcome, and consequently, the hope is that identification is easier. That is, we run regressions of the following type

$$\dot{y}_k^r = \alpha + \beta i_k^p + \gamma i_k^d + \delta \dot{y}_k^d + \varepsilon_k \tag{2}$$

where $\dot{y}_k^r$ and $\dot{y}_k^d$ are the average (real) GDP growth rate during the recovery and downturn, respectively. Moreover, i_k^d is average real short term interest rate during the downturn. Figure 3 summarizes the results for the sample split according to cycle type. Each panel shows the impact of the average real short-term interest rate during the downturn on the average GDP growth during the recovery controlling for the average growth during downturn as well as the real short-term interest rate at the peak.[13]



Note: Partial-regression plots

Figure 3: Monetary policy in downturns and subsequent recovery strength

The two panels highlight a difference in the impact of monetary policy on the recovery strength depending on the presence of a financial crisis or not. The left panel shows that for "normal" downturns, lower levels of real interest rates are associated with stronger recoveries (left panel). That is, accomodative monetary policy is beneficial for the subsequent recovery. For downturns associated with a financial crisis, however, there is no statistically significant relationship between monetary policy during downturns and the strength of the recovery (right hand panel). In other words, we do not find - in this sample - that lower real interest rates improve subsequent economic growth when financial crisis are involved.

4. Robustness checks

In the rest of the paper, we basically try to undo the basic finding with regards to the relative feebleness of monetary policy in connection with financial crises. We introduce a range of additional controls for other macroeconomic policies such as fiscal and exchange rate depreciation. We also investigate the role of leverage and international economic conditions. Moreover, we try an alternative way to measure the strength (severity) of the recovery (downturn). While, we learn interesting insights along the way, the basic finding remains.

[13] That is we plot the residuals obtained from regressing $\dot{y}_k^r$ and i_k^d on both i_k^p and $\dot{y}_k^d$.

With the additional controls, the partial regression graphs, used above, are no longer fit for purpose. Hence, we turn to a nested regression framework. Again, average real GDP growth during the recovery is our dependent variable. We have

$$\dot{y}_k^r = \alpha + \left(\beta_1 + \beta_2 D_k^{FC}\right)\dot{y}_k^d + \left(\beta_3 + \beta_4 D_k^{FC}\right)i_k^p + \left(\beta_5 + \beta_6 D_k^{FC}\right)i_k^d + \sum_{j=1}^{n}\left(\beta_{6+j} + \beta_{6+j} D_k^{FC}\right)x_k^j + \varepsilon_k \quad (3)$$

where D_k^{FC} is a dummy variable indicating if a financial crisis is associated with the downturn and x_k^j are additional control variables. In this set up, the statistical significance of the coefficient on the interaction between stance of monetary policy during the downturn and the financial crisis dummy (β_6) provides a test of whether the impact of monetary policy is different across the two types of downturns. In addition, the significance of the sum of β_5 and β_6 provides a test of the effectiveness of monetary policy in connection with financial crises. Our general approach is to go from simple to more complex specifications of equation (3) while being mindful of the limited degrees of freedom available.

The base line regression without additional controls is presented in the first column of Table 3. In this nested model, where we use all the information coming from the different cycles, the effect of monetary policy on the recovery strength again is different across cycles with and without financial crises. We find that easy monetary policy during a "normal" downturn phase leads to a stronger recovery. The coefficient for "normal" downturn episodes is -0.676*** which suggests that a one percentage point decrease in the real interest rate during the downturn increases average real GDP growth by 0.7 percentage points during the recovery[14].

In contrast, the marginal effect for downturn cycles with a financial crisis is 0.894***. Hence, the sum of $\beta_5 + \beta_6$ is positive (-0.676+0.894 = 0.218*) which taken at face value implies that accommodative monetary policy weakens the subsequent recovery in downturns financial crises! However, this result is only marginally significant (see the second F-test reported at the bottom of the Table 3) and it disappears once we include additional controls. To sum up: what is robust across specifications is that monetary policy in a downturn associated with a financial crisis is less effective in strengthening the subsequent recovery than in "normal" downturns. However, the results do not imply that monetary policy should be tight in such instances.

Moreover, this analysis does not take into account the effect of monetary policy during the downturn on the downturn itself. Presumably, a tighter monetary policy should lead to a deeper downturn in the first place.

4.1 Fiscal policy

Monetary policy is not the only tool available to counter an economic bust. Fiscal policy is often conducted in a pro-cyclical manner. Failure to account for this may well bias the results. Within our methodology, the fiscal policy both at the peak and during the downturn could conceivably matter

We measure the stance of fiscal policy in a given year as the primary fiscal balance relative to GDP. In general, fiscal policy is more expansionary in downturn cycles associated with a financial crisis (-2.5% of GDP on average) compared with cycles without (-1.8% of GDP on average). As reported in column B and C in Table 3, the stance of fiscal policy (measured both coming into and during the downturn) is not found to have any significant effect on the

[14] One, two and three stars denote statistical significance at the ten, five and one per cent level, respectively.

strength of the recovery. Of note, however, are the results presented in column D where we only control for fiscal policy during the downturn. Here, the recovery is strengthen by expansionary fiscal policy during "normal" downturn but not downturns associated with financial crises. In any case, controlling for fiscal policy does not undo the basic finding on the effectiveness of monetary policy.

4.2 The exchange rate and international economic conditions

Given the many observations from smaller open economies, a natural question is how robust the results are when we control for the exchange rate movements and economic conditions abroad. For example, exchange rate depreciation tends to boost output and can assist in the repair of firm balance sheets by increasing competitiveness and profits (see Table 4). More generally, export-driven recoveries are typical ways out of financial crises. To control for these mechanisms, we include in our regressions, one at the time, the real effective exchange rate, a measure of the terms of trade for a country, the growth of the world economy GDP, and the ratio of exports to imports. All variables are measured during the downturn period. It turns out that a depreciation of the exchange rate during a downturn associated with a financial crisis is beneficial for the subsequent recovery. Similarly, a reduction in terms of trade increase competiveness and is helpful for the recovery strength. [15]

4.3 Expectations about future economic conditions

A more fundamental and potentially crucial omission is that we do not control for expectations about the future state of the economy. For example, policy choices during the downturn are influenced by expectations about the strength of worldwide growth. To the extent that policymakers anticipate *correctly*, say, a negative term of trade shock in the future they might loosen policy more. This would tend to induce a spurious positive correlation between monetary policy in the downturn and monetary policy in the recovery. We try to remove this effect by including the relevant variables for the international conditions measured over the recovery period. Here, endogeneity or reverse causality could be a worry, as changes in economic conditions abroad might be in response to the state of the economy of larger countries, i.e., the strength of the recovery in US for example. However, our cross sectional analysis covers mostly smaller economies so this is likely a lesser problem. With these caveats in mind, the regressions, not reported, did not show any significant changes in the coefficients for monetary policy.[16]

4.4 The role of leverage

Debt and leverage have been found to play crucial roles in the booms prior to financial crises (Fisher, 1933; Hayek, 1939; Kindleberger, 1978; Valencia, 2011). Hence, we also control for deleveraging during the downturn. The results of regressions where we include deleveraging are shown in Table 5. Deleveraging is measured as the average change over the downturn of either private debt to GDP (provided by all financial intermediaries or only provided by

[15] The significance of the effect is however very limited and we don't find for advanced economies the strong results typically detected for emerging market economies. This can be due to the fact that an export-growth model is less effective for large, more closed economies also due to beggar-thy neighbour situations. More in general induced exchange rate depreciation may result in unwelcome capital flows and exchange rate pressure elsewhere if economic and financial cycles are not synchronised.

[16] If policymakers are forward looking, expectation of strong recoveries should be translated into high interest rates during the downturn. If this is true our estimates of the effect of monetary policy on the subsequent recovery is biased upwards. This means that if an endogeneity issue is in place the "true" effect of reducing interest rates on the subsequent recovery is larger in normal downturns (the absolute value of the slope in Figure 3, panel a is larger). On the contrary, in a financial crisis due to the higher uncertainty this bias is less likely to hold. This should reinforce the diff-in-diff results that monetary policy is less effective in a financial crisis.

banks; see columns A and B in Table 5) or the average real growth of private credit (provided by all financial intermediaries or only provided by banks; see columns C and D in Table 5).[17] In all specifications the coefficient on the change in leverage is positive (but not statistically significant) during "normal" downturn episodes and negative (and significant) in the cases of downturns associated with a financial crisis. This suggests that deleveraging during a normal downturn does not produce significant benefits during the subsequent recovery. By contrast, deleveraging during a downturn associated with a financial crisis is positively and significantly correlated with the subsequent recovery strength. For example, in column A we have $\beta_9 + \beta_{10} = -6.44^{**}$, this implies that a 10 percentage decrease of the debt-to-GDP ratio leads to a 0.6 percentage point increase in average output growth during the recovery.

A potential rationale for the different impact of leverage across the two types of downturns is the following. In normal business cycles (where debt levels are not very high) an increase in leverage is beneficial to finance profitable investment projects and consumption. By contrast, these benefits are more than compensated by the costs of failing to repair balance sheets in the aftermath of a financial crisis.

The introduction of the leverage variable does not change the main results on the effectiveness of monetary policy in a financial crisis. This suggests that any delaying effect that monetary policy may have on deleveraging is not the only channel through which monetary policy may fail to ignite a strong recovery whenever financial crises occur.

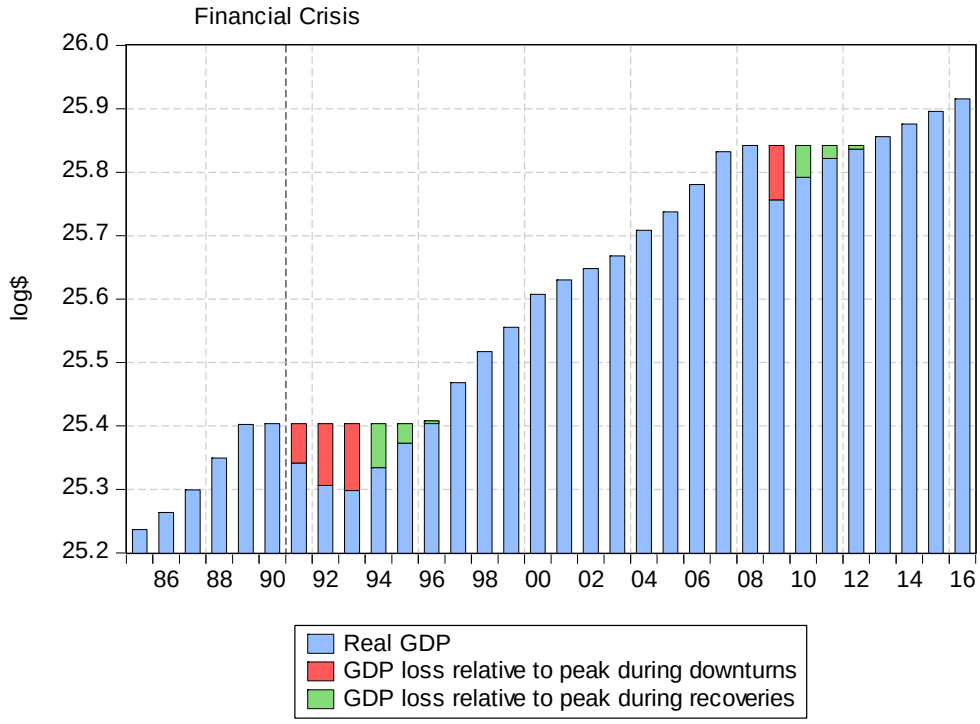


Figure 4: GDP losses relative to peaks for Finland 1985 - 2016

4.5 GDP loss

We test the robustness of our findings by using an alternative measure of the strength of the recovery. In particular, we take the cumulative sum of differences between the peak real GDP and real GDPs realised during the recovery phase. This can graphically interpreted as

[17] We did not include in Table 5 the initial levels of debt-to-GDP ratios (at the peak) because they turned out to be not significant.

an area that represents the relative loss in GDP that the economy suffers during the recovery with respect to the level experienced prior to the downturn. This means that, everything else equal, the smaller the area the stronger is the recovery. Therefore, we compute the strength of the recovery by multiplying this sum by minus one. A graphical illustration of the alternative dependent variable for the case of Finland is represented in Figure 4. In particular it is represented by the sum of the green and the red histograms.

As mentioned above, we relate the strength of recovery episodes to the severity of the preceding downturn, which in this case we measure as the relative cumulative sum of GDP losses during this period.

The results reported in Table 6 for the baseline specification indicate that using this alternative measure do not change the main message of the study: The differential effects of monetary policy in normal downturns and in episodes associated with a financial crisis still holds.[18]

4.6 Additional robustness checks

We also checked if our results are driven by observations associated with the recent (global) financial crisis. This has a cost in terms of degrees of freedom as the number of observations drops from 73 to 53. Nevertheless, the results indicate that the main conclusions regarding the reduced effectiveness of monetary policy in a downturn associated with a financial crisis are still statistically valid.

Our empirical methodology involves comparing different economies across time. In all the regression presented so far we tried to mitigate this by using robust standards errors clustered by country to take into account different institutional characteristics. However, time variation also plays an important role. In particular in our econometric exercise we analyse busyness cycles over more than forty years, comparing potentially very different episodes. In order to gauge the importance of this problem, we ran all the regressions using clustering by time (year). The standard errors remain practically the same and if anything tend to fall slightly; increasing the statistical significance of the results.

The final robustness test was to employ an alternative measure of the monetary policy stance. We used the difference between the real policy rate and the natural rate (Altunbas et al (2010)). This measure turned out to be highly correlated with the real interest rate, the monetary policy indicator used in the main regressions (0.94***). Not surprisingly, the main results remained unchanged.

5. Conclusions

Most agree that in face of a severe financial crisis a forceful response by the central bank - both in terms of liquidity support and easing of monetary policy - is required to prevent the implosion of the financial system and its detrimental effect on the real economy. However, there are different views on how long monetary policy should be accommodative. The fear is that protracted easing may delay the necessary balance-sheet adjustments and hence prolong economic weakness (BIS, 2012).

[18] Shifting from a model in growth rates to a model in level produces two interesting changes that deserve attention: First, the R^2 of these regressions are significantly higher than those reported in Tables 3-5. Second, in all specification the severity of the downturn does matter. It takes longer to get back to the previous peak when the GDP drop is large. Intuitively, therefore the severity of the downturn is negatively related to the strength of recovery. The coefficient suggests that for every percentage point in real GDP lost during the downturn (relative to the peak) an additional 0.81 percentage points will be lost during the recovery. Economic downturns are like quicksand. The deeper you fall in, the harder it is to get out (Bordo and Haubich (2011).

In this paper we construct a cross section of downturns and subsequent recoveries from a sample of 24 developed countries with data going back to the 1960s. Across these episodes, we investigate the extent to which different types of monetary policies affect the strength of the recovery. We control for the stance of fiscal policy, exchange rate movements, economic conditions abroad, and the evolution of debt aggregates. We find a number of interesting results (tentative due to the limited data sample).

First, easy monetary policy during the downturn does lead to a stronger recovery in the case of normal downturns. However, in downturns associated with a financial crisis this result is no longer statistically significant.

Second, deleveraging (measured by changes in the private debt-to-GDP ratio or by the real growth of private debt) during a downturn associated with a financial crisis has a positive effect on the subsequent recovery: A 10 per cent reduction in the debt-to-GDP ratio during the downturn leads to a 0.6 percentage point increase in the average output growth during the recovery.

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Table 1: Downturns and Financial Crises

	Australia	Austria	Belgium	Canada	Denmark	Germany	France	Finland
Downturns	1981	1974	1974	1981	1973	1992	1974	1990
	1990	1977	1980	1990	1979	2002	1992	2008
		1980	1992	2008	1987	2008	2008	
		2008	2008		1992			
					2007			
Financial Crisis	1989	2008	2008		1987	2007	1994	1991
					2008		2008	

	Greece	Iceland	Ireland	Italy	Japan	Korea	Luxembourg	Netherlands
Downturns	**2008**	**1982**	2007	1974	**1973**	**1979**	**1974**	1974
		1987		1992	1997	1997	1980	1980
		1990		2002	2007		2008	2008
		2008		**2007**				
Financial Crisis	**2008**	**1985**	2008	1992	1992	1997	2008	2008
		1993						
		2008						

	Norway	New Zealand	Portugal	Spain	Sweden	Switzerland	UK	USA
Downturns	1987	1966	1974	1980	1976	1974	1973	1973
	2008	1974	1982	1992	1980	1981	1979	1979
		2007	2002		2007	2002	2008	1990
Crisis				1993	2008	2007	1990	2007
				20				
							2007	

Note: Financial crisis years in bold are not included in the sample because of (i) the absence of any downturn in real GDP or (ii) incomplete recovery. Downturn years in bold characters indicate years in which a GDP downturn happened but could not be included in sample estimation because of (i) missing data, (ii) abnormal data or (iii) incomplete recovery.

Table 2: Descriptive Statistics

	Number of observations	Real GDP Loss	Length (years)	CPI Inflation*	Nominal interest rate*	Real interest rate change*	Primary Fiscal balance to GDP change*	Real Effective Exchange Rate change**	Private debt in real terms change***	Private debt to GDP change***
	Full downturn cycle									
All Episodes	73	4.44	4.34	6.13	6.85	-0.42	-1.91	-0.59	3.75%	3.83%
- with financial Crisis	29	8.24	5.10	4.36	5.60	-1.06	-2.54	-1.85	5.15%	8.01%
- no financial Crisis	44	1.93	3.84	7.30	7.67	-0.01	-1.82	0.23	2.82%	1.08%
	Downturn									
All Episodes	73	3.95	2.48	6.74	7.60	-0.28	-1.52	-0.48	4.29%	4.74%
- with financial Crisis	29	5.82	2.72	4.74	6.63	-0.42	-2.16	-2.00	6.14%	9.12%
- no financial Crisis	44	2.72	2.32	8.06	8.24	-0.20	-1.43	0.51	3.06%	1.85%
	Recovery									
All Episodes	73	0.48	1.86	5.11	5.70	-0.55	-2.46	-0.58	2.26%	-0.61%
- with financial Crisis	29	2.42	2.38	3.67	3.82	-2.15	-2.97	-1.13	-0.20%	-2.60%
- no financial Crisis	44	-0.79	1.52	6.02	6.90	0.49	-2.46	-0.27	3.12%	0.09%

Notes *: Averages for recoveries include 72 episodes (all) instead 73 and 28 episodes with financial crises instead 29. **: Averages for recoveries include 69 episodes (all) instead 73, 25 episodes with financial crises instead 29. ***: Averages for recoveries include 54 episodes (all) instead 73, 14 episodes with financial crises instead 29, 40 episodes without financial crises instead 44.

Table 3: Baseline regressions

Dependent variable: Recovery strength				
Explanatory variables	A	B	C	D
1. Severity of downturn	-0.282	-0.302*	-0.211	-0.277
	(0.173)	(0.170)	(0.192)	(0.163)
2. × financial crisis	0.139	0.152	-0.062	0.044
	(0.169)	(0.185)	(0.246)	(0.216)
3. MPS at peak	0.512**	0.561**	0.468*	0.547**
	(0.216)	(0.229)	(0.227)	(0.235)
4. × financial crisis	-0.599**	-0.675***	-0.579**	-0.632**
	(0.214)	(0.224)	(0.272)	(0.235)
5. MPS during downturn	-0.676***	-0.725***	-0.629**	-0.708***
	(0.228)	(0.239)	(0.290)	(0.247)
6. × financial crisis	0.894***	0.993***	0.892**	0.924***
	(0.262)	(0.289)	(0.322)	(0.283)
7. PFB at peak		-0.0963	0.176	
		(0.083)	(0.235)	
8. × financial crisis			-0.269	
			(0.283)	
9. PFB during downturn		0.026	-0.329	-0.162**
		(0.106)	(0.262)	(0.0728)
10. × financial crisis			0.475	0.250*
			(0.285)	(0.133)
Obs.	73	73	73	73
Adj. R^2	0.092	0.089	0.135	0.143
F–test, H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$	1.017	1.248	1.378	1.187
p-value	0.324	0.276	0.253	0.288
F–test, H_0: $\beta_5 + \beta_6 = 0$	3.656	3.971	3.153	3.404
p-value	0.069	0.059	0.089	0.079
F–test, H_0: $\beta_9 + \beta_{10} = 0$			2.009	0.762
p-value			0.170	0.392

Notes: MPS = Monetary policy stance, PFB = Primary Fiscal Balance to GDP, Robust standard errors clustered at the country level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The numbers of β-coefficients in the null hypotheses correspond to the numbers assigned to the explanatory variables.

Table 4: Regressions with controls for international activity during the downturn

Dependent variable: Recovery strength					
	Explanatory variables	A	B	C	D
1.	Severity of downturn	-0.231	-0.232	-0.247	-0.261*
		(0.158)	(0.166)	(0.165)	(0.140)
2.	× financial crisis	0.0776	-0.106	0.0606	0.120
		(0.182)	(0.232)	(0.185)	(0.166)
3.	MPS at peak	0.573**	0.512*	0.543*	0.532**
		(0.244)	(0.248)	(0.305)	(0.241)
4.	× financial crisis	-0.686***	-0.553*	-0.705**	-0.638**
		(0.238)	(0.271)	(0.301)	(0.239)
5.	MPS during downturn	-0.732***	-0.687**	-0.714**	-0.698**
		(0.251)	(0.271)	(0.347)	(0.250)
6.	× financial crisis	0.865***	0.903***	0.949**	0.804**
		(0.263)	(0.318)	(0.357)	(0.286)
7.	PFB during downturn	-0.157**	-0.152*	-0.162**	-0.153*
		(0.071)	(0.078)	(0.071)	(0.074)
8.	× financial crisis	0.296**	0.217	0.319**	0.308*
		(0.131)	(0.143)	(0.142)	(0.159)
9.	Δ real exchange rate	0.0618			
		(0.056)			
10.	× financial crisis	-0.238**			
		(0.102)			
11.	World GDP growth		21.18		
			(22.24)		
12.	× financial crisis		-33.80		
			(27.28)		
13.	Δ terms of trade			2.201	
				(7.774)	
14.	× financial crisis			-45.91**	
				(19.61)	
15.	Δ exports to imports ratio				15.27
					(22.05)
	× financial crisis				30.47
					(37.20)
Obs		73	73	73	73
Adj. R^2		0.203	0.148	0.208	0.197
F–test, H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$		0.0843	2.028	0.819	0.003
p-value		0.774	0.168	0.369	0.995
F–test, H_0: $\beta_5 + \beta_6 = 0$		4.389	2.437	7.583	0.702
p-value		0.063	0.133	0.077	0.411
F–test, H_0: $\beta_7 + \beta_8 = 0$		1.723	0.410	1.601	1.329
p-value		0.203	0.529	0.211	0.261

Notes: MPS = Monetary policy stance, PFB = Primary Fiscal Balance to GDP, Δ denotes year on year change in variable. Robust standard errors clustered at the country level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The numbers of β-coefficients in the null hypotheses of the F-tests correspond to the numbers assigned to the explanatory variables.

Table 5: Leverage, monetary policy and recovery strength

Dependent variable: Recovery strength				
Explanatory variables	A	B	C	D
1. Severity of downturn	-0.268	-0.265	-0.237	-0.238
	(0.163)	(0.159)	(0.166)	(0.164)
2. × financial crisis	-0.189	-0.235	-0.110	-0.112
	(0.249)	(0.271)	(0.201)	(0.204)
3. MP at peak	0.541**	0.539**	0.508**	0.517**
	(0.240)	(0.238)	(0.232)	(0.237)
4. × financial crisis	-0.614**	-0.616**	-0.551**	-0.555**
	(0.236)	(0.234)	(0.239)	(0.241)
5. MP during downturn	-0.703**	-0.699**	-0.672**	-0.680**
	(0.257)	(0.256)	(0.244)	(0.242)
6. × financial crisis	0.894***	0.872***	0.857***	0.849***
	(0.288)	(0.278)	(0.291)	(0.285)
7. FP during downturn	-0.161**	-0.159**	-0.157*	-0.156*
	(0.074)	(0.0741)	(0.0759)	(0.0758)
8. × financial crisis	0.226*	0.206*	0.264**	0.264**
	(0.127)	(0.117)	(0.119)	(0.120)
9. Δ private credit to GDP	0.071			
	(4.121)			
10. × financial crisis	-6.510**			
	(3.257)			
11. Δ private credit by banks to GDP		0.749		
		(7.732)		
12. × financial crisis		-7.676*		
		(3.398)		
13. Δ real private credit			1.521	
			(4.066)	
14. × financial crisis			-9.315***	
			(3.099)	
15. Δ real private credit by banks				0.459
				(4.820)
× financial crisis				-8.537**
				(3.645)
Obs.	73	73	73	73
Adj. R^2	0.159	0.197	0.153	0.155
F–test, H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$	1.002	0.793	1.248	1.077
p-value	0.328	0.383	0.276	0.311
F–test, H_0: $\beta_5 + \beta_6 = 0$	3.160	3.253	1.873	1.622
p-value	0.089	0.085	0.185	0.216
F–test, H_0: $\beta_7 + \beta_8 = 0$	0.583	0.396	1.911	1.867
p-value	0.453	0.536	0.181	0.186

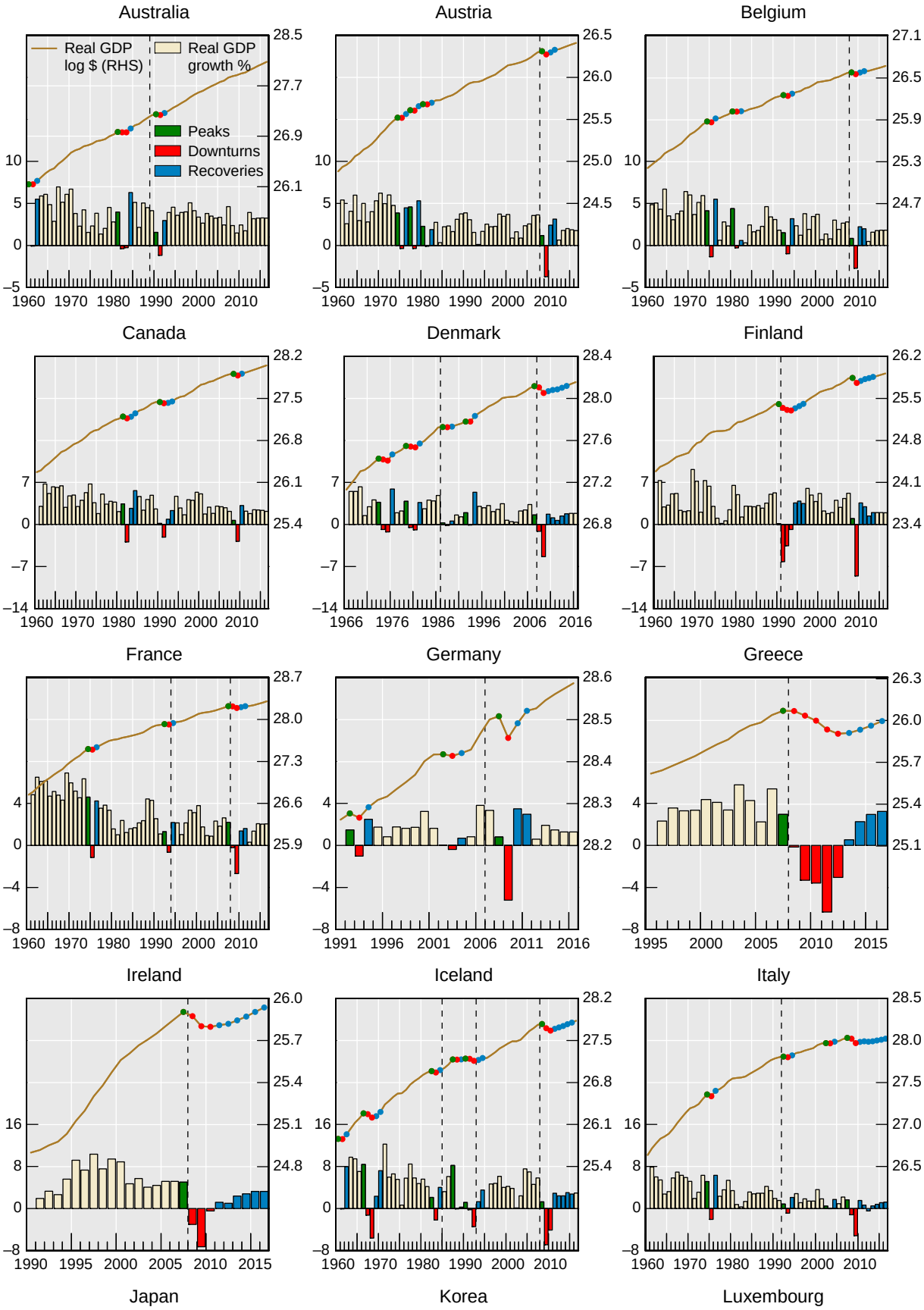
Notes: MPS = Monetary policy stance, PFB = Primary Fiscal Balance to GDP, Δ denotes year on year change in variable. Robust standard errors clustered at the country level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The numbers of β-coefficients in the null hypotheses of the F-tests correspond to the numbers assigned to the explanatory variables.

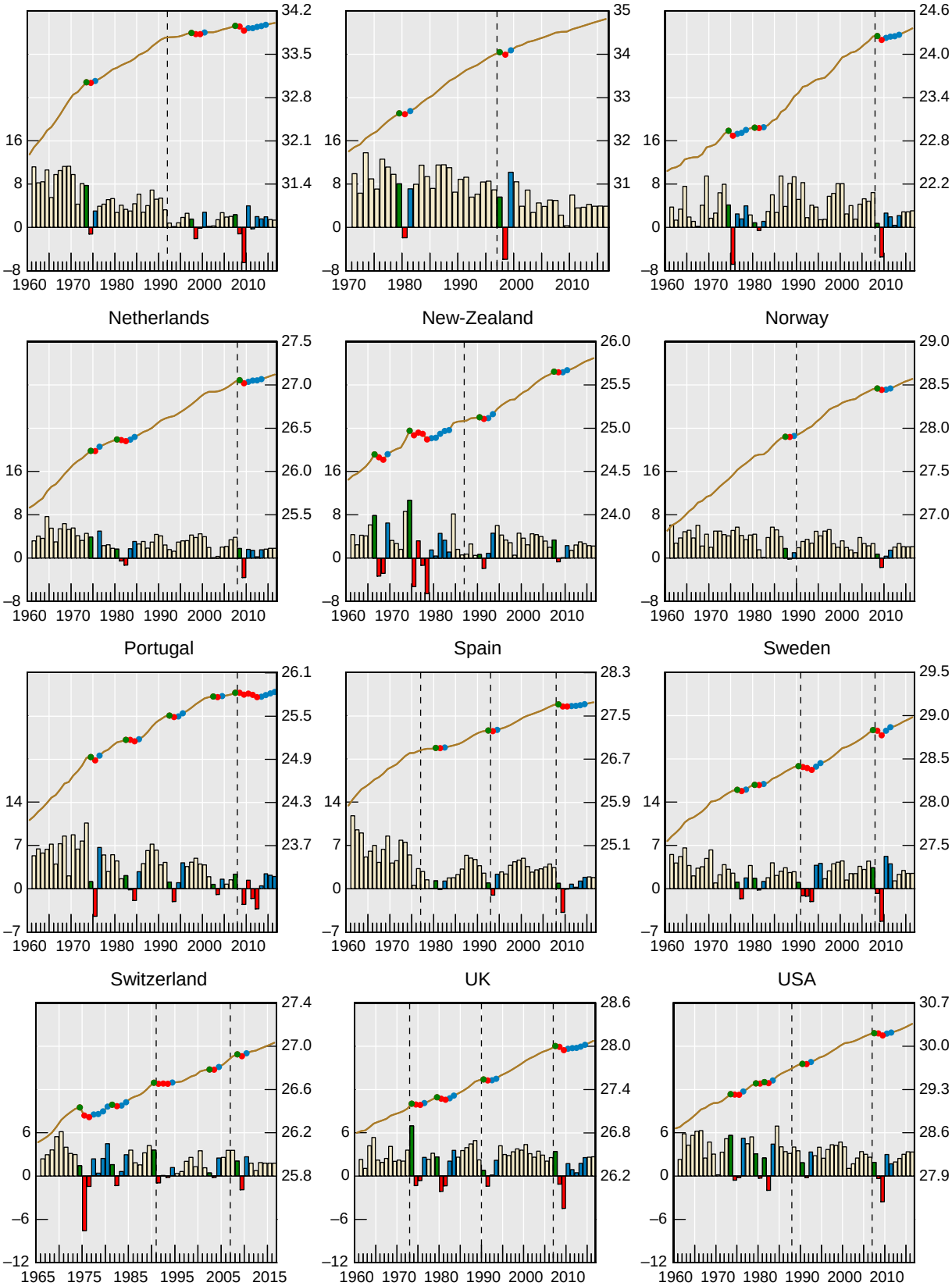
Table 6: Alternative measures of recovery strength: in log level terms

Dependent variable: recovery strength in log level terms				
Explanatory variables	A	B	C	D
1. Severity of downturn	-0.888***	-0.964***	-0.965***	-1.000***
	(0.131)	(0.0527)	(0.0599)	(0.0474)
2. × financial crisis		0.0842	0.0937	0.300
		(0.152)	(0.154)	(0.217)
3. MP stance at peak	-0.154	0.632**	0.666**	0.613*
	(0.142)	(0.276)	(0.295)	(0.327)
4. × financial crisis		-0.947***	-1.007**	-0.900**
		(0.334)	(0.357)	(0.377)
5. MP during downturn	0.204	-0.763***	-0.797**	-0.743**
	(0.192)	(0.270)	(0.286)	(0.313)
6. × financial crisis		1.288***	1.363***	1.239***
		(0.379)	(0.397)	(0.424)
7. FP during downturn			-0.089	0.198
			(0.271)	(0.271)
8. × financial crisis				-0.355
				(0.432)
Obs.	73	73	73	73
Adj. R^2	0.706	0.718	0.710	0.729
F–test, H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$		1.130	1.277	1.256
p-value		0.299	0.271	0.275
F–test, H_0: $\beta_5 + \beta_6 = 0$		3.994	4.639	2.224
p-value		0.0582	0.0425	0.150
F–test, H_0: $\beta_9 + \beta_{10} = 0$				1.134
p-value				0.298

Notes: MPS = Monetary policy stance, PFB = Primary Fiscal Balance to GDP, Robust standard errors clustered at the country level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The numbers of β-coefficients in the null hypotheses correspond to the numbers assigned to the explanatory variables.

Annex 1: All downturn cycle episodes





[1] Vertical lines represent financial crises.

Sources: OECD and national statistics.