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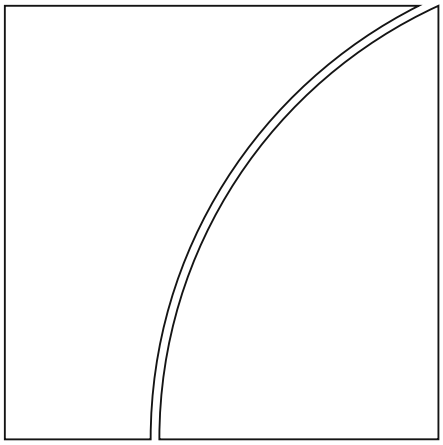

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Credit and growth after financial crises

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Monetary and Economic Department

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JEL classification: G01; E32.

Keywords: creditless recovery; financial crises; deleveraging; household debt; corporate debt.

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Credit and growth after financial crises

Előd Takáts and Christian Upper[1]

Abstract

We find that declining bank credit to the private sector will not necessarily constrain the economic recovery after output has bottomed out following a financial crisis. To obtain this result, we examine data from 39 financial crises, which – as the current one – were preceded by credit booms. In these crises the change in bank credit, either in real terms or relative to GDP, consistently did not correlate with growth during the first two years of the recovery. In the third and fourth year, the correlation becomes statistically significant but remains small in economic terms. The lack of association between deleveraging and the speed of recovery does not seem to arise due to limited data. In fact, our data shows that increasing competitiveness, via exchange rate depreciations, is statistically and economically significantly associated with faster recoveries. Our results contradict the current consensus that private sector deleveraging is necessarily harmful for growth.

JEL classification: G01; E32.

Keywords: creditless recovery; financial crises; deleveraging; household debt; corporate debt.

[1] The views expressed here are those of the authors and do not necessarily represent those of the Bank for International Settlements. We are grateful for comments from Claudio Borio, Mathias Drehmann, Madhusudan Mohanty, Philip Turner and from seminar participants at the BIS, the Deutsche Bundesbank, the Netherlands Bank, the Universitat Pompeu Fabra, the University of Lausanne and EPLF, and at the SUERF/Deutsche/Bundesbank/IMFS "The ESRB at 1" conference for useful comments. We thank Jakub Demski, Emese Kuruc and Garry Tang for their excellent research assistance. All remaining errors are our own.

There seems to be a consensus that declining levels of bank lending to the private sector will reduce economic growth in the coming years. For example, the Institute of International Finance (2011) argues that "private sector deleveraging will remain a major headwind to growth in the years ahead." But is this consensus right? Does lower level of bank lending after output has bottomed out necessarily slow down the post-crisis recovery even if credit grew to unprecedented levels in the pre-crisis period? Or could in such a situation deleveraging be neutral or even beneficial to economic recovery?

We answer these questions by examining 39 financial crises preceded by strong private sector credit growth in emerging and advanced economies over the past three decades. In other words, we focus our attention on crises which are similar to the current crisis in advanced economies. Contrary to the prevailing consensus, we find that lower bank lending to the private sector does not necessarily slow down economic growth after a financial crisis. The results show no correlation between economic growth in the first two years of recovery and the extent of bank credit growth during this period. As time progresses, the correlation becomes statistically significant but remains negligible in economic terms. This is not because of limited data: the standard errors are small and we find two other variables, real exchange rates and public debt, which statistically significantly correlate with the recovery. Importantly, the real effective exchange rate also has a meaningfully strong impact in economic terms. Our result is very robust to various debt measures (real debt or debt-to-GDP ratio) and also to the inclusion of several control variables.

Our main contribution to the "creditless recovery" literature is to document that if credit booms preceded the financial crisis then the relationship between economic recovery and bank lending to the private sector is different: recovery is not anymore negatively associated with deleveraging. In a sense, we confirm the results from Calvo et al (2006) and Claessens et al (2009) on the existence of creditless recoveries. However, we also show that recoveries from the financial crises which were preceded by strong private debt growth are different. While in general, as Abiad et al (2011) and Bijsterbosch and Dahlhaus (2011) document, creditless recoveries are slower than recoveries with credit growth, we show that this is not the case if we focus on financial crises which were preceded by credit booms. After these financial crises bank lending to the private sector becomes essentially uncorrelated with the speed of recovery. Our results therefore lie somewhere in between the "creditless recovery" literature and Bech et al (2012) who find that private sector deleveraging after financial crises leads to stronger recoveries.

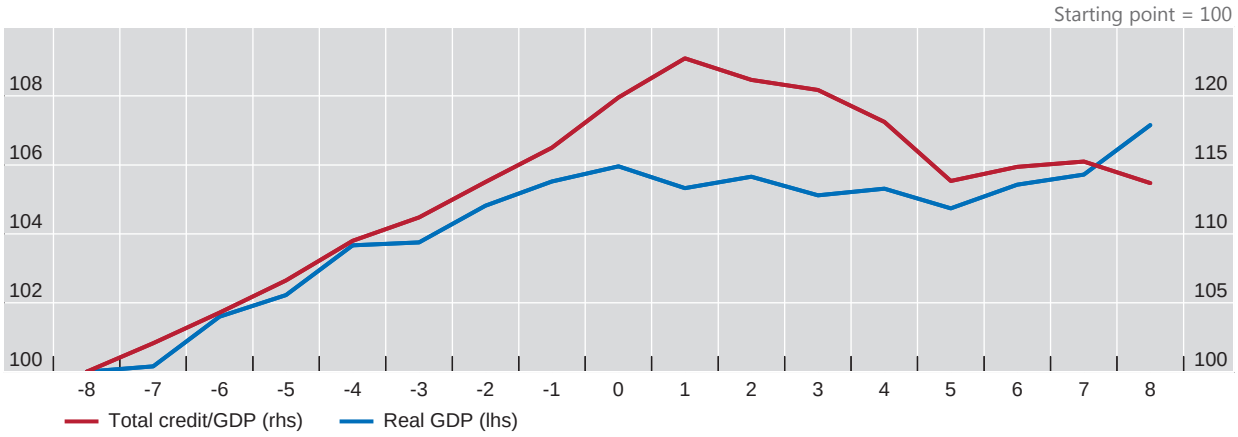
We investigate 39 emerging and advanced economy financial crises over the last 30 years which were preceded by credit booms. Graph 1 shows the average financial crisis experience in terms of output and credit. Real GDP (blue line) increases before the outbreak of the crisis (in period 0) and falls thereafter – and eventually recovers. The drop in GDP associated with most crises drives up the average credit-to-GDP ratio (red line) for another quarter after the outbreak of the crisis, but the ratio drops eventually and deleveraging begins as Tang and Upper (2010) showed.[2] On average, real GDP levels recover their peaks around 8 quarters after the onset of the crisis, while credit-to-GDP ratios remain well below their peaks for several years. Importantly, these averages mask substantial country specific

[2] Data that decomposes changes in credit into repayments, new lending and write-downs is unfortunately not available for any of the crises in our sample.

heterogeneity in deleveraging and recovery profiles (see Appendix Table A1). This heterogeneity allows us examine the correlations between bank lending to the private sector and economic growth systematically in our empirical analysis.

Deleveraging and recovery[1]

Average debt and output eight quarters before and after the crisis — Graph 1



[1] Simple average across countries where dates are indexed by quarters to their respective crisis dates.

Sources: Datastream; IMF, *International Financial Statistics*, *World Economic Outlook*; national data; BIS calculations.

In the empirical analysis, we consistently find no correlation between bank lending to the private sector and economic growth. Only at longer horizons does the correlation become statistically significant albeit economically negligible. To measure this correlation independently from the crisis related output loss, we focus on the time period after economic activity has troughed, ie reached its bottom after the slump in output that followed all the crises in our sample. For deleveraging, we use two debt measures: real credit and the credit-to-GDP ratio. For economic recovery, we focus on real economic growth after the crisis trough. In all cases, we control for the drop in economic activity between the pre-crisis peak and the post-crisis trough as well as for the changes in the real exchange rate and the public debt-to-GDP ratio during the recovery phase. (We discuss in detail how we arrived to use precisely these measures later.) We use several – one, two, three and four year – windows both for credit and growth.

No correlation arises between bank lending to the private sector and economic growth in two years or less. Once considering longer-term economic growth, the deleveraging variable becomes statistically significant. However, the effect is very small in economic terms, accounting for only a small fraction of overall growth during the recovery window.

While our main contribution is to document that deleveraging does not seem to affect the recovery after financial crises preceded by credit booms, we also explore two factors that are statistically significantly correlated with the speed of recovery: real exchange rates and public debt. First and more importantly, real exchange rate depreciations are correlated with not only statistically but also economically significantly faster growth: it seems that the price channel of external adjustment can give meaningful boost to economic recovery. Second, declining public debt ratios are associated with faster recoveries, ie fiscal consolidation is associated with stronger economic growth – but the economic impact seems to be

small. Still, this result, similarly to Bech et al (2012), casts doubt on the efficacy of additional, deficit increasing fiscal stimulus after financial crises.

But our baseline estimates could be misspecified along a number of dimensions. In order to confirm the robustness of the results we therefore extend the analysis in several directions. First, we show that the exclusion of "borderline" financial crises does not affect the results. Second, we rerun the regressions for nominal debt as the measure of deleveraging, where the correlation becomes weakly statistically significant for shorter recovery windows and less statistically significant for longer windows – but it remains insignificant in economic terms. Third, replacing GDP growth by consumption and investment growth yields no correlation in any specification. We thus rule out that increases in public spending or net exports mechanically offset any drop in growth of domestic private expenditure brought about by deleveraging. Fourth, we consider non-overlapping windows for credit and growth to address endogeneity concerns. Again, the coefficients of interest remain insignificant. All of these robustness checks confirm the initial finding: in financial crises preceded by credit booms bank lending to the private sector and the speed of economic recovery is uncorrelated except over very long windows.

We suspect that the results arise because of the low quality of debt accumulated during the massive credit growth prior to the financial crisis. While debt is normally "good", ie positively correlated with economic growth, excessive and misallocated debt has a darker side. "Bad" debt, via debt overhang (as explained in Lamont (1995) and Philippon (2009)), zombie firms (Caballero, Hoshi and Kashyap (2008)) and excessive debt levels (as argued in Cecchetti, Mohanty and Zampolli (2011) and Cecchetti and Kharroubi (2012)) can all lower economic growth. This would suggest that while normally increasing credit improves economic performance bad debt is detrimental. In this framework, the lack of correlation between bank lending to the private sector and economic growth could mean that substantial amount of "bad", ie low quality, debt could have accumulated during the pre-crisis credit boom.

Of course, our results should be read with appropriate caveats. Though we devote more space later to discuss them, we feel important to highlight the potential limitations of this exercise. First, we report correlations, not causal relationships. We are not able to distinguish between the part of deleveraging that is due to supply constraints – which presumably has a large impact on growth – and the part that reflects lower demand for credit – ie which may be the result of low growth. Second, the economies currently in crisis differ from our sample in many important aspects, which might make historical experiences not directly useful for policymakers.

Our results seem to be relevant when thinking about policy challenges advanced economies face now, because they also saw massive private debt increases prior to their crisis. First, bank lending to the private sector does not seem to be a major determinant of the speed of economic recovery now that the crisis has troughed. Efforts to avoid deleveraging could be misleading and distract policy attention from areas which might matter for the recovery, such as structural reforms. Second, our results on public debt cast some doubt on the efficiency of prolonged fiscal stimulus in the recovery phase. Third, our results on real exchange rates suggest that structural reforms to boost competitiveness, via labour market reforms for instance, could be valuable. Such reform might be especially useful in euro area countries which do not have flexible exchange rates. Finally, the strong

impact of exchange rates on the recovery and the global nature of the current crisis highlight the potential risk of countries turning to zero-sum competitive devaluations.

The rest of the paper is organized as follows. The second section introduces the database. The third one details the empirical analysis. The fourth performs a robustness tests. The fifth discusses the caveats and the final one concludes with policy implications.

Data

We focus on financial crises that were preceded by strong increases in credit. Our list of crises draws from Laeven and Valencia (2008) and Drehmann, Borio and Tsatsaronis (2011). We exclude crises that (i) happened before 1970 or in very poor economies, (ii) took place in economies that were in the early stages of a transition from a centrally planned to a market economy, (iii) occurred in an environment of hyperinflation, or (iv) where deleveraging has not yet run its course (such as the United Kingdom and the United States after 2007). For the remaining crises we only include those which followed an expansion in private sector debt/GDP for two or more consecutive years. Table A1 in the appendix provides an overview of the crises in our sample. We experimented with other measures for identifying credit booms, but they were not fully satisfactory for this study. For instance, Tang and Upper (2010) use two measures of credit booms, namely that by Mendoza and Terrones (2008) and by Borio and Drehmann (2009). These two measures define a credit boom as an episode where the credit-to-GDP ratio or real credit, respectively, exceeds its long-term trend by a certain threshold. We decided not to use these approaches because the long term debt trend was negative in some cases, which would have led to identifying debt booms with contracting debt.

Our private credit measure uses besides the standard domestic bank credit to the private sector (from the IMF IFS database) the claims of BIS reporting banks on the domestic nonbank financial sector (from the BIS consolidated banking statistics).[3] This definition excludes bonds and other debt securities other than those held by BIS reporters, loans by other financial institutions (eg insurance corporations), securitised credit (held by non-commercial banks), and trade credit. Thus, our dataset is not directly comparable to flow of funds data, which is not available for the vast majority of episodes in our sample. Nevertheless, this does not materially hinder our analysis as bank debt was by far the most dominant source of finance for both households and non-financial corporations in all the crises of our sample. Unfortunately, this kind of data might be less useful for analysing the current advanced economy financial crises where securitization was widespread.[4]

[3] This bank credit construction captures both lending by domestic bank and international banks to the domestic economy. Furthermore, it is widely available on a quarterly basis for our crises. The most recent BIS Banking Statistics series provide a more precise picture by combining locational and consolidated data, which might be useful for future studies on more recent crises.

[4] More recently, the BIS has published series on total credit for a large cross-section of countries. We do not use these series because they do not include most of the episodes in our sample. For details see Dembiermont et al (2013).

We also use several standard control variables in the robustness tests. Real and nominal GDP figures, GDP deflator, consumption, gross fixed capital formation (investment), nominal and real effective exchange rates (the latter discounted by the consumer price index), current account balances, consumer price indices, population data, public debt and short term interest rates are obtained from the IMF IFS database. Trading partner growth is obtained from the IMF directions of trade database, and world economic growth from the IMF WEO (World Economic Outlook) database.

Almost all of the countries in our sample experienced significant deleveraging after the financial crisis (Tang and Upper, 2010)). On average, the ratio of private debt to GDP fell by eight percentage points two years after the crisis started. This compares to an increase of 38 percentage points in the two years before the crisis. That said, the deleveraging experience varies greatly across countries. At one extreme, the build-up in private sector debt paused for just one quarter when Argentina went through the Tequila crisis in early 1995. This contrasts with debt reductions in excess of 60 percentage points of GDP in many South East Asian economies in the late 1990s and in Uruguay in the early 2000s. The post-crisis deleveraging in Asia was particularly sharp because the post-crisis appreciation of local currencies pushed down the local currency value of foreign currency denominated debt.

Empirical analysis

In the empirical analysis, we focus on what happens pots-crisis after real GDP has reached its trough. We do this because financial crises tend to be associated with sharp drops in output, which often take place before any deleveraging gets under way. Furthermore, we control for crisis-related output losses from trough to peak. Intuitively, we allow for the possibility that deeper crises imply steeper rebounds to the extent that part of the output loss is not permanent. We also control for the change in real effective exchange rates and public debt, because these variables turn out to be consistently both economically and statistically significant in our preliminary analysis (detailed in the next subsection). The regression we run is formalized in equation (1):

$$\Delta_{trough}^{trough+g} y_i = \alpha + \beta \Delta_{trough}^{trough+c} cr_i + \gamma \Delta_{peak}^{trough} y_i + \phi \Delta_{trough}^{trough+g} REER_i + \delta \Delta_{trough}^{trough+g} pd_i + \varepsilon_i \quad (1)$$

where *y* denotes real GDP in natural logarithms, *cr* credit (we allow for two different measures: real credit in natural logarithms and the credit-to-GDP ratio in percentages), *REER* real effective exchange rates, and *pd* public debt (as percent of GDP); α, β, γ, δ and ϕ are model parameters and ε the error term; *trough* represents the time real GDP is lowest, *peak* the time real GDP was highest prior to the crisis; *g* and *c* denote the window taken for growth (Δy) and change in credit (Δcr), respectively. The subscript *i* denotes the individual crises. In the subsequent analysis, we augment the regression with additional controls to test the robustness of the results.

We are content to report the results as correlations, because the regression cannot establish causality unfortunately. Furthermore, the size of the database limits econometric techniques and the number of control variables.

Baseline estimation

Table 1 documents the regression results from equation (1). The upper panel shows the results with using real credit for our credit variable, while the lower panel uses credit-to-GDP ratios for measuring changes in bank lending to the private sector. The rows show the parameter estimates with two-sided standard errors in parenthesis. One, two and three stars (*) denote statistical significance at 10, 5 and 1 % level, respectively. The columns show the time windows we applied to measure the correlation between credit and growth. We take one-, two-, three- and four-year windows. We focus on shorter or equally long credit windows (*c*) than growth windows (*g*) because we are interested on the effect of credit on economic growth. To provide an example on how to read the table, the correlation coefficient between two year change in real credit *(c=2)* and four year growth *(g=4)* is 0.108 with a standard error of 0.084, which is not significant even at the 10% level.

Baseline estimation — Table 1

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Dependent variable: change in real output (Δ Y)										
A. Real credit										
Δ real credit	0.042	0.090	0.115	0.137	0.099*	0.089	0.108	0.135***	0.162***	0.167***
	(0.040)	(0.066)	(0.084)	(0.104)	(0.052)	(0.068)	(0.084)	(0.045)	(0.058)	(0.047)
Prev. drop in output	0.018	–0.130	–0.272	–0.346	–0.234	–0.334	–0.432*	–0.443**	–0.555**	–0.618***
	(0.099)	(0.160)	(0.205)	(0.253)	(0.160)	(0.206)	(0.252)	(0.170)	(0.208)	(0.200)
Δ REER	–0.065	–0.145*	–0.168	–0.207	–0.170**	–0.173	–0.221*	–0.195	–0.244**	–0.254**
	(0.046)	(0.078)	(0.101)	(0.125)	(0.077)	(0.103)	(0.127)	(0.093)	(0.114)	(0.110)
Δ Public debt ratio	–0.055	–0.088	–0.106	–0.168	–0.011	–0.046	–0.068	–0.019	–0.038	–0.004
	(0.070)	(0.111)	(0.138)	(0.168)	(0.043)	(0.055)	(0.067)	(0.037)	(0.045)	(0.037)
Constant	0.031***	0.063***	0.093***	0.128***	0.058***	0.088***	0.120***	0.083***	0.114***	0.104***
	(0.007)	(0.011)	(0.015)	(0.018)	(0.010)	(0.014)	(0.017)	(0.012)	(0.015)	(0.015)
R^2	0.25	0.45	0.48	0.50	0.46	0.48	0.50	0.60	0.62	0.65
# obs.	39	39	39	39	39	39	39	39	39	39
B. Credit/GDP										
Δ credit/GDP	0.001	–0.020	0.056	0.088	–0.031	0.006	0.021	0.040	0.063	0.058
	(0.058)	(0.091)	(0.117)	(0.140)	(0.060)	(0.076)	(0.091)	(0.062)	(0.062)	(0.070)
Prev. drop in output	–0.018	0.014	–0.132	–0.225	0.003	–0.155	–0.254	–0.149	–0.245	–0.255
	(0.062)	(0.093)	(0.124)	(0.154)	(0.099)	(0.130)	(0.160)	(0.123)	(0.151)	(0.158)
Δ REER	–0.056	–0.126*	–0.168*	–0.176*	–0.130*	–0.153	–0.164	–0.155	–0.161	–0.159
	(0.042)	(0.068)	(0.093)	(0.114)	(0.070)	(0.094)	(0.116)	(0.096)	(0.116)	(0.120)
Δ Public debt ratio	0.023	–0.141**	–0.127	–0.205	–0.054**	–0.063	–0.096*	–0.057	–0.088**	–0.067*
	(0.047)	(0.069)	(0.085)	(0.100)	(0.033)	(0.040)	(0.048)	(0.032)	(0.037)	(0.035)
Constant	0.027***	0.063***	0.094***	0.135***	0.058***	0.090***	0.127***	0.090***	0.130***	0.127***
	(0.006)	(0.010)	(0.013)	(0.016)	(0.010)	(0.012)	(0.015)	(0.012)	(0.015)	(0.015)
R^2	0.15	0.44	0.43	0.45	0.42	0.43	0.44	0.45	0.48	0.46
# obs.	39	39	39	39	39	39	39	39	39	39

Standard errors in parenthesis. *,**,*** Significance at 10, 5 and 1% level.

Consider first the shorter time windows, ie when either the growth or the growth windows are one or two years long (first seven columns of Table 1). The correlations are statistically insignificant in all specifications. Perhaps even more interestingly, the estimates are also economically insignificant. In order to assess economic significance for real debt (upper panels) one needs to recognize that these coefficient estimates are elasticities because both recovery and deleveraging are in natural logarithms. Hence, a coefficient in the upper panel represents a correlation between x percent increase in output and one percent change in real credit. The largest value of 0.108 arises for the two year change in real debt *(l=2)* and four year recovery *(r=4)*. Even this value would imply only 1.2 percentage points output response over four years given that the average decline in real debt is 11 % over two years. This is small compared to the average economic growth of 17% in the first four years of the recovery.

In order to assess the economic significance of the debt-to-GDP ratio parameter estimate (lower panel) over the short-run (ie first seven columns) consider the largest parameter estimate. The largest change in the credit variable (0.088, c=1, g=4) and the average decline in the credit-to-GDP ratio in the year after the trough of 5.7 percentage points implies around 0.5% decrease in output. Again, this is certainly not large compared to the average growth of 17% in the first four years of the recovery. Furthermore, the coefficients are not only small economically, but are often negative, ie reductions in debt are associated with *higher* output growth (as Bech et al (2012) found more generally).

Importantly, even in the short-run windows the economic significance rises as we extend the recovery window. This suggests that considering longer time windows might actually increase economic significance. Indeed, if we consider the longer-run (last three columns of Table 1) real credit (upper panel) becomes highly statistically significant. However, economic significance remains weak. The largest value (0.167, c=g=4) would imply only 40 basis points output response over four years given that the average decline in real debt is 2.5 % over four years. This is very small in the light of 17% economic growth in the first four years of the recovery. Furthermore, the long-run correlation between deleveraging and recovery remains both statistically and economically insignificant for the debt-to-GDP ratio as independent variable (lower panel for the last three columns of Table 1).

In sum, we found that the correlation between credit and growth is both economically and statistically insignificant over the short-run, ie over one or two year windows. While real credit becomes statistically significant over the long-run, ie over three of four year windows, it remains economically insignificant. The credit-to-GDP ratio remains both economically and statistically insignificant even over the long-run. Thus, the correlation between credit and growth is economically insignificant in all time windows. While the lack of statistical significance might be the consequence of small sample size, the absence of economic significance might well imply that there is no strong relationship between deleveraging and recovery.

In the following, we first discuss how we arrived to the specification in equation (1) and which other variables we considered in the process. After that we turn to discuss the results on real effective exchange rates and public debt.

Explanatory variables

In this subsection we explain how we arrive to our baseline specification, more specifically to the crisis related output drop, real effective exchange rates and public

debt as controls in equation (1). The problem is that any simple regression aimed at uncovering the relationship between credit and growth is subject omitted variable bias, as the strength of economic recovery is likely to be also driven by other factors than the extent of bank lending changes. In order to control for such potential bias, we consider 13 additional explanatory variables, one at the time.[5] More specifically, we run a regression explaining growth by the change in debt during the crisis and several control variables one-by-one as shown in equation (2) formally:

$$\Delta_{trough}^{trough+g} y_i = \alpha + \beta \Delta_{trough}^{trough+c} cr_i + \phi control_i + \varepsilon_i \quad (2)$$

Naturally, we continue to use both real credit and the credit-to-GDP ratio as our dependent variables.

We group the potential control variables across several dimensions (see rows of Table 2). At first, we control for output drop during the financial crisis. The motivation is straightforward: a larger output drop might imply faster recovery as part of the crisis related output loss is not permanent.

Second, we consider variables related to the credit boom which preceded the financial crisis. Again, the motivation is straightforward: if the pre-financial crises credit boom matters, then variations in this pre-crisis credit growth might further affect the speed of recovery. In this group, we consider first how much the credit-to-GDP ratio increased over the five years before the crisis, which is a useful proxy for the magnitude of the credit boom. Second, we consider the level of credit-to-GDP at the start of the crisis as another potential proxy for excessive debt accumulation before the crisis. Third, following Drehmann et al (2012) we consider a more explicit measure of excess debt: the credit gap and credit-to-GDP gaps. These measures provide perhaps the most direct measures of financial imbalances in the economy. Fourth and finally, we consider the extent of deleveraging which has already taken place during the contraction period, ie before our recovery window starts. This is proxied by the change in the credit-to-GDP ratio from peak to trough.

The third set of variables is related to the global economic and financial conditions during the recovery phase. We use these controls as recoveries might be faster in a favourable international environment. In this group, we consider first global economic growth as a straightforward proxy for the external environment. Second, we shift focus to growth of trading partners to approximate the conditions of an external adjustment via net exports. Third, we consider global financial stress conditions proxied by the VIX. Stress in the global financial system could reduce the availability of external funding and thus slow the recovery.

As for the fourth and final set of variables we consider those variables which are affected by domestic policies. In this context, we focus on real effective exchange rates first. Real exchange rates, as relative prices between domestic and foreign products, proxy the price channel for competitiveness gains and external sector adjustment. Second, we consider explicitly the extent of external adjustment: the changes in current account balances, which reflect besides the effects of exchange rate policies domestic demand management. Third, we investigate the impact of the evolution of public debt ratio in order to capture the interaction between fiscal

[5] Unfortunately, with a sample of only 39 observations and a large number of explanatory variables it is very likely that all coefficients will be statistically insignificant in the estimation. And indeed when we estimated equation (1) with the full set of 13 control variables of Table 2, all of them turned out to be insignificant.

policy and recovery, and additionally the assumption of private debt by the government. Finally, we use nominal and real interest rates as proxies for monetary policy stance.

Explanatory variables

Table 2

	short-run windows						long-run windows			
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Dependent variable: change in real credit (Δ CR/P)										
Drop in output		##	###	##	##	##	##	###	###	*,###
Δ credit-to-GDP prev.5 years[3]						*	**			
Credit-to-GDP at start of crisis[4]							*			
Credit gap at start of crisis[4]						*	**			
Credit-to-GDP gap at start of crisis[4]						*	*			
Δ credit-to-GDP peak-trough						*	*			
World economic growth[2]	#						*			
Growth trading partners[2]										
VIX[2]						*	*			
Δ real exchange rate[1]	##	###	###	###	###	###	###	*,###	###	**,###
Δ Current account/GDP[2]							*			
Δ Public debt ratio[2]		###	###	###	#	*,##	###	###	###	###
Nominal interest rate[2]							*			
Real interest rate[2]							*			
Dependent variable: change in credit-to-GDP (Δ CR/Y)										
Drop in output			##	##	#	##	##	##	##	##
Δ credit-to-GDP prev.5 years[3]					*	*	*			
Credit-to-GDP at start of crisis			*,##	*,##	**	***,###	***,###	**,###	*,#	*,#
Credit gap at start of crisis[4]										
Credit-to-GDP gap at start of crisis[4]										
Δ credit-to-GDP peak-trough					*					
World economic growth[2]	#				*	*				
Growth trading partners[2]					*					
VIX[2]										
Δ real exchange rate[1]		###	###	###	###	###	###	###	###	###
Δ Current account/GDP[2]										
Δ Public debt ratio[2]		###	##	##	###	##	##	##	##	##
Nominal interest rate[2]										
Real interest rate[2]										

*, **, *** Deleveraging variable significant at 10, 5 and 1% level. #, ##, ### Control variable significant at 10, 5, 1% level. Changes in dependent variables and control variables are from trough to trough + g. Changes in debt variables are from trough to trough + c.

[1] Average effective real exchange rate between trough and trough + g minus that observed in the two years before the crisis. [2] trough to trough + c. [3] 5 years before the crisis. [4] Deviation of debt or debt/GDP from HP-trend with λ=14400.

Table 2 shows the results with these controls variables. We continue to use stars (*) to show the significance of the coefficient on our measure of deleveraging with one, two and three stars implying significance at 10, 5 and 1 percent, respectively. The upper and lower panel of Table 2 show the results for real credit

and credit-to-GDP as our measure for deleveraging, respectively. In addition, we use crosses (#) to show the significance of the coefficient on the control variable (such as the real exchange rate) and again with one, two and three crosses implying significance at 10, 5 and 1 percent, respectively.

Two findings emerge from Table 2. First, the results confirm our decision to include the crisis related output drop, the real effective exchange rate and the public debt in the baseline regression (1). All of these variables are very often highly significantly correlated with economic recovery. The inclusion of credit-to-GDP at the start of crisis is more ambiguous: it is only significant for some cases when investigating changes in the credit-to-GDP ratio (lower panel). While we do not include credit-to-GDP at the start of crisis in our baseline regression, we did check that its inclusion (which is always insignificant) does not materially affect the results.

Interestingly, even though the results on Table 2 are likely to exhibit omitted variable bias, real debt turns out to be significant at the four year window – foreshadowing our results that real debt is statistically significant over the longer run.

Real exchange rates, public debt and economic growth

In our baseline regression bank credit and growth were at best statistically significant over the long-run, but not economically important even on that range. However, Table 1 also shows that real effective exchange rates and public debt were often statistically significant – and as we will show real effective exchange rates are also economically significant.

Given the small sample size and the relatively large regression, perhaps economic significance is even more important than the statistical one. For economic significance, consider as an example the case with real credit (upper panel, Table 1) with four year deleveraging and recovery windows (ie where c=g=4). On average the real effective exchange rate drops around 14% below the pre-crisis level. Combining this with the coefficient estimate of approximately 0.254 implies roughly 3.6% higher output over the period, or approximately 0.9% higher growth per year. Furthermore, the coefficient estimates tend to be remarkable stable throughout the sample: for other time windows and also for credit-to-GDP ratio as our deleveraging measure. Thus, the fall in real exchange rates is correlated with substantially stronger economic growth.

This finding suggests that depreciating real exchange rates meaningfully help net exports via relative prices. Interestingly, the current account balances are insignificant in the same exercise, ie improvements in the current account balances are not significantly correlated with the recovery. This might be puzzling at first sight, but we have to understand that not only the price channel (ie real exchange rates) but also the demand channel (ie domestic output) plays a role in current account adjustments. The price channel impact is unambiguously positively associated with recovery as our results on real effective exchange rates confirm. However, the demand channel is negatively associated: shrinking domestic demand (ie slower growth) improves external balances. The coefficient on current accounts captures both the positive price effect and the negative demand effect, which explains why it turns out to be insignificant.

Table 1 also shows that the correlations between growth and public debt are often significant statistically and are always *negative*. This means that faster

increases of public debt are associated with slower recoveries. However, the impact is not very significant economically. For instance, the highest coefficient for the public debt (-0.168 for a l=1 and r=4) implies a reduction in economic growth of 1.7% over four years for a 10 percentage point increase in public debt-to-GDP ratio over the same period. Again, this compares to an average rate of growth of 17%. Admittedly, this is a case when reverse causality is the most likely as a stronger output recovery in itself would make the public debt-to-GDP ratio to move slower. Hence, the weaker relationship in case of debt-to-GDP ratio compared to real debt could be partly natural reflection of this reverse causality.

Still, this result might be relevant given the ongoing debate on the economic impact of fiscal stimulus.[6] In this context, our results suggest that increased fiscal stimulus, which would result in higher public debt, would be slightly detrimental to economic growth. Of course, one should take this reading with appropriate caveats. Public debt and public deficit increases simply might signal more severe crisis – and this severity might not be captured by our control variable of crisis related output drop. Notwithstanding these concerns, our data clearly does not suggest that increased fiscal expenditures would lead to faster recovery.

While our main results are negative, ie we establish the lack of significant correlation between deleveraging and recovery, we also show significant negative correlations with real exchange rates and public debt. In particular, we highlight that those recoveries where real exchange rates depreciated the economic turned out to be meaningfully faster. We thus believe that the paper might also be useful in describing not only what is *not* important for the current recovery (ie bank lending to the private sector), but also what might well be important (ie real exchange rates and public debt).

Finally, in order to confirm that our results hold under different specifications, we undertake a series of robustness tests in the next section.

Robustness tests

In order to confirm the results we next undertake a set of robustness tests to exclude the possibility that weak correlations arise due to data problems. First, we exclude borderline financial crises, where the banking system experiences stress but not necessarily a systemic financial crisis. Second, we extend the investigations to cover changes in nominal debt as an explanatory variable. Third, we replace output growth as the dependent variable by the growth of private consumption and investment to take out the impact of net exports and the government. Fourth, we repeat the baseline analysis focusing on non-overlapping deleveraging and recovery windows to address potential endogeneity concerns. Finally, we add the additional control variables to address potential further omitted variable concerns. The robustness tests confirm our baseline result.

[6] For example, in the model by Eggertsson and Krugman (2011) higher public spending, financed by higher public debt, could compensate for the fall in consumption demand from debt-constrained households and thus weaken the costs of the zero lower bound on nominal interest rates.

Excluding borderline crises

First, we exclude the less severe crises from our analysis. Our motivation is to confirm that the irrelevance of bank credit for economic recovery does not result from the inclusion of relatively mellow economic crises. To undertake this robustness test, we remove the crises which are not included in the Laeven and Valencia (2008) dataset. As the Laeven and Valencia (2008) dataset has a stricter definition of what constitutes a systemic banking crisis than the Drehmann, Borio and Tsatsaronis (2011) dataset that we used in the baseline analysis, this exercise cuts the number of financial crisis to 25 from 39.

Excluding borderline crises — Table 3

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Dependent variable: change in real output (Δ Y)										
A. Real credit										
Δ real credit	0.025	0.067	0.067	0.097	0.101	0.065	0.085	0.133**	0.158**	0.176***
	(0.046)	(0.081)	(0.098)	(0.114)	(0.065)	(0.083)	(0.098)	(0.052)	(0.062)	(0.052)
Prev. drop in output	0.084	–0.061	–0.153	–0.259	–0.208	–0.265	–0.392	–0.403*	–0.544**	–0.595**
	(0.120)	(0.205)	(0.252)	(0.299)	(0.208)	(0.261)	(0.308)	(0.206)	(0.242)	(0.216)
Δ REER	–0.024	–0.077	–0.051	–0.069	–0.148	–0.097	–0.119	–0.147	–0.170	–0.205
	(0.059)	(0.107)	(0.132)	(0.150)	(0.105)	(0.138)	(0.159)	(0.120)	(0.138)	(0.128)
Δ Public debt ratio	–0.103	–0.147	–0.206	–0.252	0.001	–0.045	–0.059	–0.009	–0.022	–0.016
	(0.086)	(0.142)	(0.164)	(0.188)	(0.054)	(0.066)	(0.076)	(0.043)	(0.050)	(0.040)
Constant	0.048***	0.088***	0.131***	0.171***	0.074***	0.115***	0.153***	0.109***	0.145***	0.136***
	(0.011)	(0.019)	(0.023)	(0.026)	(0.016)	(0.021)	(0.025)	(0.018)	(0.021)	(0.020)
R2	0.23	0.33	0.36	0.42	0.31	0.29	0.35	0.49	0.54	0.61
# obs.	25	25	25	25	25	25	25	25	25	25
B. Credit/GDP										
Δ credit/GDP	0.022	0.007	0.060	0.063	–0.015	0.005	–0.006	0.054	0.046	0.066
	(0.072)	(0.113)	(0.142)	(0.156)	(0.077)	(0.094)	(0.105)	(0.081)	(0.089)	(0.091)
Prev. drop in output	0.026	0.061	–0.070	–0.181	0.074	–0.078	–0.196	–0.063	–0.186	–0.185
	(0.061)	(0.124)	(0.166)	(0.192)	(0.142)	(0.182)	(0.211)	(0.175)	(0.202)	(0.206)
Δ REER	–0.055	–0.093	–0.110	–0.077	–0.130	–0.120	–0.093	–0.135	–0.095	–0.105
	(0.061)	(0.099)	(0.135)	(0.150)	(0.102)	(0.136)	(0.154)	(0.138)	(0.155)	(0.160)
Δ Public debt ratio	0.026	–0.158*	–0.144	–0.221*	–0.045	–0.055	–0.085	–0.049	–0.077*	–0.055
	(0.060)	(0.086)	(0.103)	(0.109)	(0.042)	(0.049)	(0.054)	(0.039)	(0.042)	(0.040)
Constant	0.039***	0.085***	0.122***	0.169***	0.074***	0.111***	0.153***	0.114***	0.156***	0.160***
	(0.011)	(0.016)	(0.021)	(0.024)	(0.016)	(0.021)	(0.024)	(0.022)	(0.023)	(0.025)
R^2	0.06	0.40	0.31	0.37	0.32	0.27	0.32	0.30	0.35	0.33
# obs.	25	25	25	25	25	25	25	25	25	25

Standard errors in parenthesis. *, **, *** Significance at 10, 5 and 1% level.

However, excluding these borderline crises does not change the results in any material way as Table 2 shows. The only change is that the real effective exchange rate now becomes insignificant for every window combination. The coefficients are also very close to those in the baseline regressions, but the standard errors a somewhat larger. In addition, the fit of the regressions is lower than for the full set

of crises, but this is expected as the number of observations is halved. In short, bank debt and economic growth remains uncorrelated even if we focus on larger crises.

Nominal debt as measure for leverage

Second, we estimate equation (1) using nominal debt as a measure for private sector leverage in order to see whether nominal debt declines, which could be relevant in the current economic setup, would affect the results. Table 4 shows clearly that the correlation between nominal bank debt and economic growth becomes statistically significant at short horizons but loses some of its statistical significance at longer horizons. However, the economic significance of nominal debt remains low.

Nominal credit as dependent variable — Table 4

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Δ nominal credit	0.068**	0.065	0.116*	0.157**	0.030	0.050	0.072	0.050*	0.068**	0.072**
	(0.030)	(0.050)	(0.062)	(0.073)	(0.031)	(0.038)	(0.046)	(0.025)	(0.029)	(0.027)
Prev. drop in output	–0.005	0.024	–0.102	–0.189	0.018	–0.123	–0.209	–0.082	–0.155	–0.141
	(0.056)	(0.089)	(0.117)	(0.142)	(0.100)	(0.128)	(0.224)	(0.121)	(0.145)	(0.146)
Δ REER	–0.088**	–0.167**	–0.212**	–0.223**	–0.175**	–0.200**	–0.224*	–0.201**	–0.219*	–0.233**
	(0.040)	(0.066)	(0.088)	(0.106)	(0.070)	(0.092)	(0.113)	(0.090)	(0.108)	(0.109)
Δ Public debt ratio	0.047	–0.118	–0.100	–0.177*	–0.048	–0.058	–0.092*	–0.053*	–0.083	–0.050
	(0.045)	(0.069)	(0.082)	(0.094)	(0.033)	(0.039)	(0.046)	(0.030)	(0.034)	(0.032)
Constant	0.022***	0.057***	0.082***	0.120***	0.053***	0.079***	0.113***	0.075***	0.108***	0.100***
	(0.006)	(0.011)	(0.013)	(0.016)	(0.011)	(0.014)	(0.017)	(0.013)	(0.016)	(0.017)
R^2	0.28	0.48	0.49	0.52	0.43	0.46	0.49	0.51	0.55	0.56
# obs.	39	39	39	39	39	39	39	39	39	39

Standard errors in parenthesis. *, **, *** Significance at 10, 5 and 1% level.

While this result suggests that nominal declines in bank lending would be more likely to affect economic growth after the financial crisis has bottomed out, the impact seems to be low in economic terms. Thus, even nominal debt is not economically significantly correlated with the recovery.

Consumption plus investment as alternative dependent variable

Third, we rerun equation (1) with private consumption and private investment growth as the new dependent variable. The reason for replacing GDP growth is that theoretically the coefficients on the deleveraging measure could be insignificant if public spending or net exports boosts growth offsetting the adverse effects of debt reduction. However, in spite of these theoretical concerns the results confirm our baseline results: deleveraging, both in real debt and debt-to-GDP ratios, remains uncorrelated with private consumption and investment growth (Table 5). In fact, the correlations become even weaker – further strengthening our baseline results.

Consumption + investment as dependent variable

Table 5

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
A. Real credit										
Δ real credit	0.134	0.207	0.119	0.090	0.162	0.113	0.052	0.193	0.164	0.201*
	(0.108)	(0.167)	(0.175)	(0.199)	(0.158)	(0.167)	(0.183)	(0.118)	(0.132)	(0.117)
Prev. drop in output	0.290	0.175	–0.033	–0.148	–0.060	–0.396	–0.471	–0.553	–0.691	–0.817
	(0.283)	(0.424)	(0.453)	(0.524)	(0.504)	(0.526)	(0.573)	(0.465)	(0.510)	(0.485)
Δ REER	–0.142	–0.074	0.133	0.100	–0.208	0.021	0.034	–0.033	–0.013	–0.048
	(0.133)	(0.210)	(0.226)	(0.252)	(0.248)	(0.270)	(0.288)	(0.262)	(0.284)	(0.280)
Δ Public debt ratio	–0.078	–0.593**	–0.791**	–0.847**	–0.092	–0.190	–0.252*	–0.033	–0.148	–0.083
	(0.198)	(0.289)	(0.292)	(0.327)	(0.130)	(0.132)	(0.142)	(0.262)	(0.106)	(0.090)
Constant	0.052**	0.128***	0.205***	0.221***	0.090**	0.159***	0.176***	0.150***	0.166***	0.154***
	(0.0123	(0.036)	(0.038)	(0.042)	(0.038)	(0.040)	(0.044)	(0.038)	(0.042)	(0.042)
R^2	0.31	0.43	0.44	0.44	0.19	0.22	0.29	0.30	0.35	0.39
# obs.	39	39	39	39	39	39	39	39	39	39
B. Credit/GDP										
Δ credit/GDP	0.210	0.142	0.087	0.038	0.102	0.073	0.014	0.216	0.135	0.174
	(0.181)	(0.036)	(0.298)	(0.338)	(0.213)	(0.220)	(0.238)	(0.219)	(0.240)	(0.221)
Prev. drop in output	0.374	0.405	0.100	–0.028	0.191	–0.225	–0.380	–0.307	–0.451	–0.544
	(0.252)	(0.391)	(0.407)	(0.466)	(0.432)	(0.445)	(0.477)	(0.443)	(0.481)	(0.482)
Δ REER	–0.148	–0.032	0.153	–0.119	–0.165	0.053	0.056	–0.010	0.049	0.044
	(0.135)	(0.223)	(0.234)	(0.259)	(0.254)	(0.271)	(0.286)	(0.278)	(0.296)	(0.296)
Δ Public debt ratio	0.073	–0.682**	–0.836	–0.892**	–0.119	0.054	–0.264*	–0.111	–0.171	–0.123
	(0.203)	(0.307)	(0.302)	(0.336)	(0.133)	(0.271)	(0.142)	(0.107)	(0.115)	(0.096)
Constant	0.062**	0.142***	0.213***	0.226***	0.104***	0.170***	0.180***	0.180***	0.188***	0.190***
	(0.023)	(0.036)	(0.037)	(0.042)	(0.040)	(0.042)	(0.045)	(0.042)	(0.047)	(0.046)
R^2	0.30	0.38	0.43	0.44	0.14	0.20	0.29	0.23	0.30	0.30
# obs.	39	39	39	39	39	39	39	39	39	39

Standard errors in parenthesis. *, **, *** Significance at 10, 5 and 1% level.

Non-overlapping windows

Fourth, we address causality concerns by running the baseline regression for non-overlapping windows. As we discussed earlier, our methodology is not able to identify whether debt affects growth or the other way around: growth drives debt. In order to address this concern on reverse causality we focus on non-overlapping windows, ie we investigate what happens to growth *after* the credit window is closed. In such a scenario timing prevents the reverse causality, ie that growth would affect credit. Formally, we estimate:

$$\Delta^{trough+c+r}_{trough+c} y_i = \alpha + \beta \Delta^{trough+c}_{trough} cr_i + \gamma \Delta^{trough}_{peak} y_i + \varepsilon_i \quad (3)$$

Equation (3) is identical to equation (1) except that the window for GDP growth starts after the end of the deleveraging window finished. In other words, we investigate how recovery is correlated with past deleveraging. In order to avoid having to drop crises close to the end of our sample period we limit our analysis to windows of one, two and three years.

Table 6 confirms that the coefficients on credit remain insignificant in all specifications. Again, this is not because standard errors are wide, but because the

estimated coefficients are small as in the baseline estimates. Furthermore, the credit variables also remain economically insignificant. These results suggest that the lack of correlation that we observe between growth and credit is not due to reverse causality problems.

Non overlapping windows

Table 6

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Dependent variable: change in real output (Δ Y)										
A. Real credit										
Δ real credit	0.043	0.075	0.103		0.012	0.000		0.023		
	(0.037)	(0.061)	(0.078)		(0.043)	(0.056)		(0.042)		
Prev. drop in output	–0.120	–0.268*	–0.316		–0.134	–0.102		–0.145		
	(0.093)	(0.149)	(0.190)		(0.132)	(0.171)		(0.157)		
Δ REER	–0.092**	–0.122*	–0.186*		–0.087	–0.142		–0.190**		
	(0.044)	(0.072)	(0.094)		(0.063)	(0.086)		(0.086)		
Δ Public debt ratio	–0.005	–0.012	–0.065		–0.033	–0.059		–0.023		
	(0.066)	(0.103)	(0.128)		(0.036)	(0.046)		(0.034)		
Constant	0.032***	0.061***	0.094***		0.061***	0.103***		0.104***		
	(0.006)	(0.011)	(0.014)		(0.008)	(0.011)		(0.011)		
R^2	0.53	0.52	0.56		0.44	0.48		0.55		
# obs.	39	39	39		39	39		39		
B. Credit/GDP										
Δ credit/GDP	–0.021	0.077	0.126		0.081	0.063		0.049		
	(0.056)	(0.085)	(0.107)		(0.051)	(0.063)		(0.052)		
Prev. drop in output	0.056	–0.094	–0.168		–0.224**	–0.222**		–0.176*		
	(0.060)	(0.086)	(0.113)		(0.085)	(0.108)		(0.103)		
Δ REER	–0.084*	–0.140**	–0.174**		–0.077	–0.145*		–0.220***		
	(0.041)	(0.063)	(0.085)		(0.060)	(0.078)		(0.080)		
Δ Public debt ratio	0.141***	–0.108*	–0.177**		–0.015	–0.016		0.004		
	(0.046)	(0.064)	(0.078)		(0.028)	(0.034)		(0.027)		
Constant	0.035***	0.065***	0.105***		0.070***	0.109***		0.104***		
	(0.006)	(0.010)	(0.012)		(0.008)	(0.010)		(0.010)		
R^2	0.57	0.50	0.53		0.44	0.47		0.56		
# obs.	39	39	39		39	39		39		

Standard errors in parenthesis. *, **, *** Significance at 10, 5 and 1% level.

Additional explanatory variables

Finally, we rerun the baseline regression adding one-by-one the same control variables that we included in our analysis which arrived to the baseline regression. Though these coefficients were not significant in the first run, which was the reason to not to include them in the baseline regression, the concern might arise that their omission could drive our no correlation results. Due to the small sample size, including all of these variables at the same time predictably results in insignificant results as we have shown earlier. Consequently, we test the robustness of our baseline results by adding these variables one-by-one to our baseline regression.

Table 7 confirms that our results remain essentially unchanged. The bank credit variable is statistically significant only in the long-run and even then only for the real credit variable (stars in the upper right-hand panel) – exactly as in the baseline regression. Furthermore, as in the baseline regression the economic significance of the credit variable remains small even in this case.

Additional explanatory variables — Table 7

	short-run windows							long-run windows		
c credit	1	1	1	1	2	2	2	3	3	4
g growth	1	2	3	4	2	3	4	3	4	4
Dependent variable: change in real output (Δ Y)										
A. Real credit										
Δ credit-to-GDP prev.5 years[3]								**	**	***
Credit-to-GDP at start of crisis[4]	##							***	***	***
Credit gap at start of crisis[4]								***	***	***
Credit-to-GDP gap at start of crisis[4]								***	***	***
Δ credit-to-GDP peak-trough								**	**	***
World economic growth[2]								***	***	***
Growth trading partners[2]								***	***	***
VIX[2]								***	***	***
Δ Current account/GDP[2]								**	**	**
Nominal interest rate[2]								***	***	***
Real interest rate[2]								***	***	***
B. Credit/GDP										
Δ credit-to-GDP prev.5 years[3]										
Credit-to-GDP at start of crisis[4]										
Credit gap at start of crisis[4]										
Credit-to-GDP gap at start of crisis[4]										
Δ credit-to-GDP peak-trough										
World economic growth[2]										
Growth trading partners[2]										
VIX[2]										
Δ Current account/GDP[2]										
Nominal interest rate[2]										
Real interest rate[2]										

*, **, *** Deleveraging variable significant at 10, 5 and 1% level. #, ##, ### Control variable significant at 10, 5, 1% level. Changes in dependent variables and control variables are from trough to trough + c. Changes in debt variables are from trough to trough + g.

[1] Average effective real exchange rate between trough and trough + c minus that observed in the two years before the crisis. [2] trough to trough + g. [3] 5 years before the crisis. [4] Deviation of debt or debt/GDP from HP-trend with λ=14400.

Furthermore, none of the additional control variables become significant. In particular, credit-to-GDP at the start of the crisis becomes significant only in the very short run (c=g=1) for real credit, which justifies our decision not to include it in the baseline regression.

As a final robustness test, we dropped all advanced economy crisis from our sample. As advanced economies are different in many ways from emerging markets, one could be concerned that their inclusion drives the results. However, our results

remain robust to the exclusion of advanced economy crisis: bank lending to the private sector is robustly uncorrelated with economic growth.[7]

The large number of robustness tests we have applied confirmed our main result: bank lending to the private sector is robustly uncorrelated with economic growth after the financial crisis has bottomed out. We undertook a large number of robustness tests because we understand that our results can be surprising to some readers. We are also content to provide our data and code for independent robustness tests.

Caveats

Although our empirical findings seem to remain stable in extensive robustness tests, we still find it important to detail some caveats here. First and most importantly, the extent of deleveraging could depend on growth. Thus, endogeneity should be a natural concern. Estimating the model with non-overlapping windows may control for this only to some extent. Moreover, the low number of observations does not allow us to use an estimator that controls for potential endogeneity.

But endogeneity might be less important than seems at first sight, because most shocks affect recovery and deleveraging similarly. For instance, credit supply shocks or external demand shocks affect both of our key variables in the same direction. Hence, these shocks would create some correlation between credit and growth. Consequently, they would work against our result of no correlation, because they would imply stronger correlation between deleveraging and recovery.

However, endogeneity might be a concern for those shocks that affect debt and output in the opposite way. For instance, an economic downturn in countries which are simultaneously important export markets and source of international bank lending could imply negative shocks to domestic output (through external demand) and positive shock to credit conditions (due to lower foreign country monetary expansion to offset the downturn). Such shocks could then weaken the observed correlation. However, the fact that external environment measures or the current account are insignificant suggests that this particular shock did not play a significant role in the crises of our sample. It is also possible that deleveraging could trigger structural reforms, which would in turn boost growth. Though such structural reforms could explain the lack of correlation, it is unlikely that they would be effective in the relatively short time windows we considered. In sum, though in theory some shocks could have weakened the observed correlation between deleveraging and recovery, few shocks in practice which would seem to work this way.

An additional concern is related to foreign currency debt. In some emerging market crises large share of the bank lending to the private sector was made in foreign currencies. In such cases, exchange rate changes do drive credit stocks. During most recoveries the exchange rate appreciated (after the crisis related sharp drop), which artificially reduced outstanding credit values. To the degree a stronger recovery implies a faster appreciating exchange rate, this effect could create a

[7] Unfortunately, we cannot undertake the opposite exercise, ie exclude emerging markets, because the number of advanced economy crises is too small in our sample.

negative correlation, or weaken an existing positive correlation, between credit and growth. Though theoretically relevant observation, this does not seem to drive the lack of correlation in our sample. Foreign currency denominated debt was particularly an issue in the Asian crisis of the late 1990s. Taking out these episodes reduces the significance of the coefficient on the debt variable, and only the one for the g=c=4 windows remains significant.

An additional concern is to derive general economic lessons from specific historical examples. Though we believe that the most important common feature of the financial crises advanced economies face currently and those in our sample is the debt increases which preceded them, numerous differences remain. Advanced economies in crises today are much larger, wealthier, are more dependent on debt than most of the advanced and emerging markets in our sample. The current crisis is also more global than the ones in our sample. All these differences should caution against very strong policy prescriptions.

Conclusion

We find that bank lending to the private sector and economic growth are essentially uncorrelated after those financial crises that were preceded by credit booms. This result is relevant for the major advanced economies recovering from the financial crisis, since the current crisis was also preceded by a credit boom. Our results suggest that the ongoing deleveraging in advanced economies might not be as harmful for the recovery as many fear.

We also find that depreciating real exchange rates are statistically and economically significantly associated with substantially stronger economic growth. This finding on real exchange rates shows that the price channel for external adjustment can contribute to stronger economic activities. Consequently, if crisis hit countries can generate substantial real effective exchange rate depreciation, either via nominal exchange rate depreciation or internal cost adjustments, this could hasten their recovery. However, given the global nature of the current crisis this solution might not be available for all countries at the same time.

Furthermore, we find some weak negative association between public debt ratios and recoveries: increasing public debt seems to lead to somewhat weaker recoveries. This might cast doubt on the claims that fiscal stimulus is the appropriate answer to fasten the recovery now.

While we are aware that these results come with caveats, we believe that our results provide a useful contribution to the creditless recovery literature. We hope that these finding would elicit debates and further research to understand debt dynamics, financial crises and how recoveries work.

Appendix

Financial crises and deleveraging

Table A1

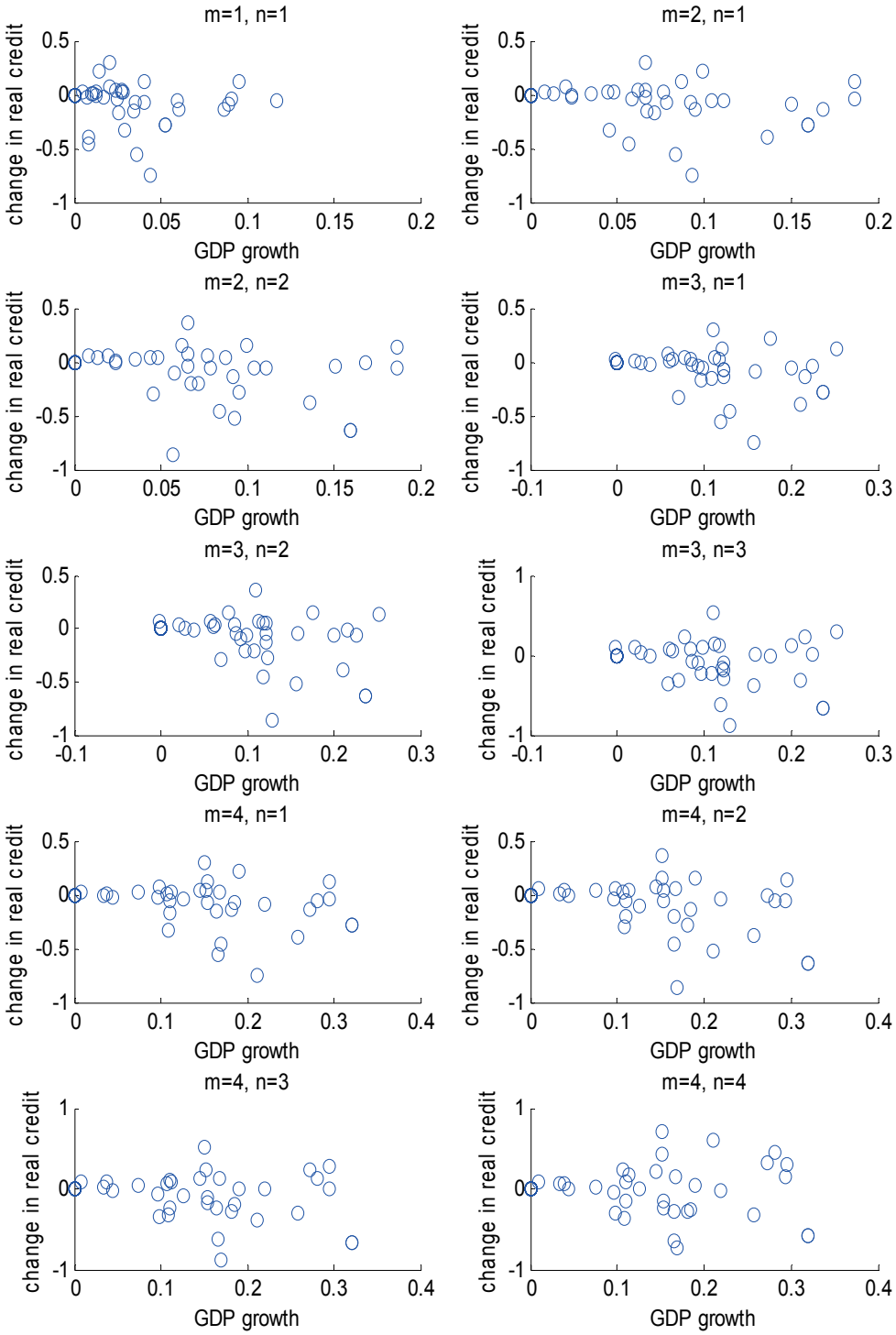
	Credit			Change in Credit/GDP		Mendoza & Terrones credit boom	Credit gap over 6%
	Start boom	Peak	End de-leveraging	Up	Down		
Argentina 1995	1991 Q4	1995 Q1	1995 Q2	9.9	–0.8		
Argentina 2001	1991 Q4	2002 Q1	2005 Q2	25.1	–27.1		
Chile 1981	1974 Q1	1982 Q4	1984 Q2	73.6	–13.4		
Colombia 1982	1980 Q2	1985 Q2	1988 Q4	15.4	–14.3		
Colombia 1998	1988 Q4	1998 Q4	2004 Q2	18.3	–22		
Dominican Republic 2003	1991 Q4	2003 Q2	2007 Q1	28.9	–23.5		
Ecuador 1998	1992 Q3	2001 Q1	2003 Q4	19.7	–13.1		
Finland 1991	1980 Q1	1992 Q1	1999 Q1	48.7	–42.1		
Indonesia 1997	1993 Q1	1998 Q2	2002 Q2	74.7	–100.7		
Jamaica 1996	1993 Q1	1996 Q1	1997 Q4	5.1	–3.3		
Japan 1992	1981 Q2	1990 Q4	2005 Q2	37	–21.8		
Mexico 1994	1989 Q1	1995 Q1	2005 Q3	28.6	–29.1		
Malaysia 1997	1988 Q4	1997 Q4	2008 Q3	90.7	–69.7		
Nicaragua 2000	1996 Q2	2000 Q4	2002 Q1	17.4	–14.2		
Norway 1990	1980 Q4	1990 Q2	1993 Q3	34.9	–12.2		
Paraguay 1995	1984 Q4	1995 Q2	1995 Q4	21.3	–4.1		
Philippines 1997	1991 Q2	1997 Q4	2008 Q1	60.4	–50.3		
Russia 1998	1996 Q3	1999 Q1	2000 Q3	16.6	–10		
South Korea 1997	1988 Q4	1999 Q1	2001 Q4	66.2	–26.8		
Sri Lanka 1989	1980 Q4	1988 Q4	1991 Q3	10.5	–18.4		
Sweden 1991	1985 Q3	1990 Q2	1996 Q3	20.6	–24.3		
Thailand 1997	1980 Q3	1997 Q4	2008 Q1	163.1	–106.2		
Turkey 2000	1995 Q3	1997 Q4	2003 Q3	15	–16.6		
Uruguay 1981	1974 Q2	1982 Q4	1992 Q3	55.9	–40.9		
Uruguay 2002	1992 Q3	2002 Q3	2005 Q3	63.8	–62.1		
Australia 1989*	1976 Q4	1991 Q2	1992 Q1	45.1	–0.5		
Denmark 1987*	1983 Q1	1986 Q4	1995 Q3	42.5	–31.3		
France 1994*	1979 Q1	1989 Q4	1998 Q4	16.9	–13.4		
Iceland 1985*	1979 Q1	1985 Q2	1987 Q2	26.4	–9.5		
Iceland 1993*	1990 Q4	1994 Q2	1995 Q2	7.9	–4.1		
Italy 1992*	1986 Q3	1993 Q1	1996 Q3	23.8	–11.9		
New Zealand 1987*	1983 Q3	1990 Q1	1990 Q3	68.3	–4.1		
Peru 1999*	1992 Q1	1999 Q1	2006 Q1	32.9	–19.1		
Spain 1977*	1965 Q1	1976 Q4	1980 Q4	45	–10.9		
Spain 1993*	1987 Q1	1991 Q4	1996 Q1	15.5	–10.7		
Switzerland 1991*	1974 Q4	1990 Q2	1994 Q4	54.8	–5.9		
Thailand 1979*	1957 Q2	1979 Q1	1980 Q3	32.6	–3.9		
United Kingdom 1990*	1981 Q1	1991 Q3	1994 Q2	47.8	–5.7		
United States 1990*	1983 Q3	1988 Q4	1994 Q1	6.8	–7.2		

* Borderline systemic crisis

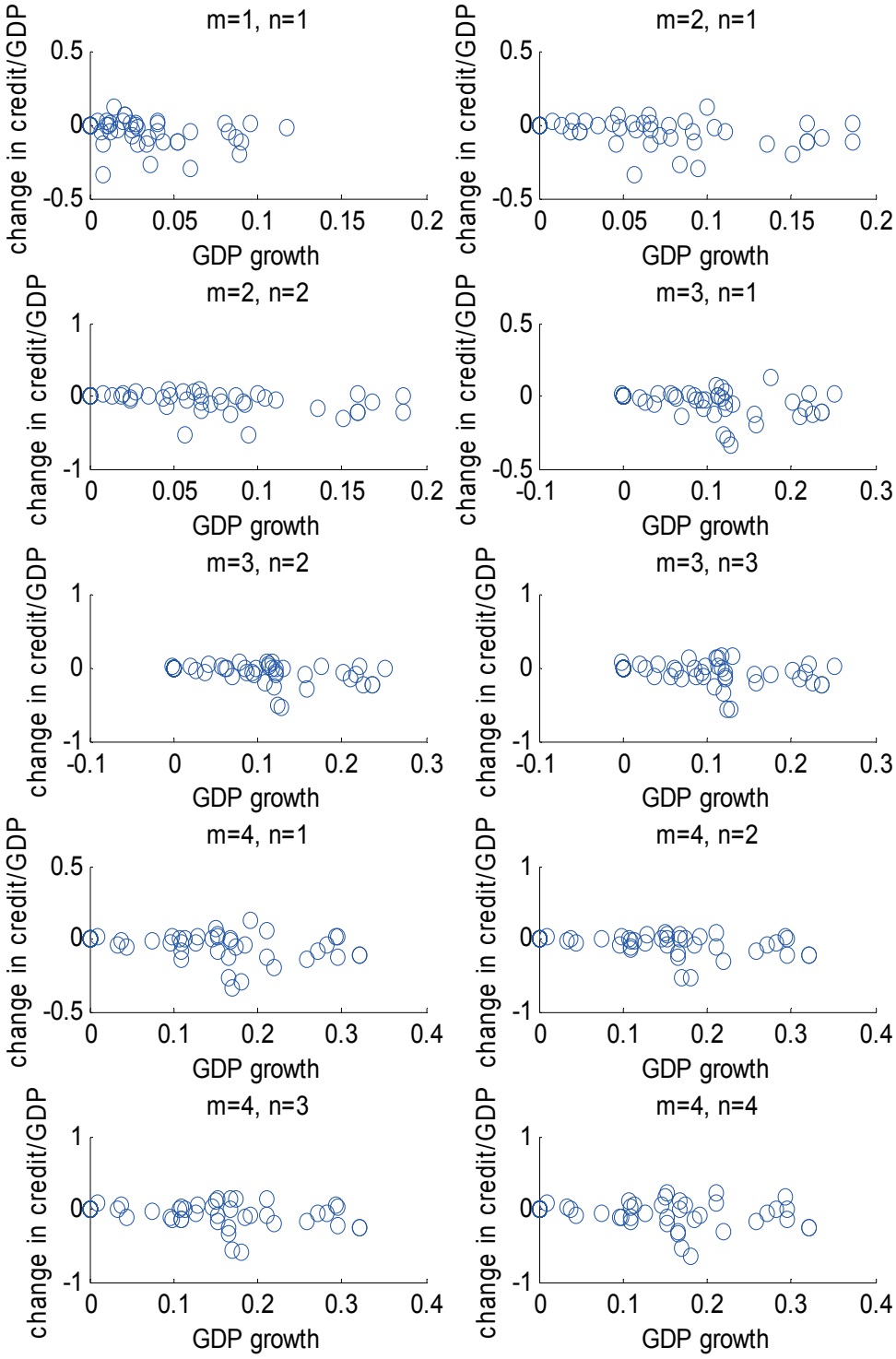
Sources: IMF; authors' calculations.

GDP growth during recoveries and change in real credit

Graph A1



GDP growth during recovery and change in credit/GDP Graph A2



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