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Eric Ruscher and Guntram Wolff

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Corporate balance sheet adjustment: stylized facts, causes and consequences

Eric Ruscher* and Guntram B. Wolff**

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Abstract:

Using national account data, we define corporate balance sheet adjustment episodes as periods during which major increases in non-financial corporations' net lending/borrowing are experienced. An analysis of such episodes in Germany and Japan, and a more systematic exploration of a sample of 30 countries, show that corporate balance sheet adjustment tends to be long lasting and associated with significant effects on current accounts, wages and investment. Adjustment episodes lead to significant changes in corporate balance sheets ratios with a build-up of liquidity and a reduction of leverage. The adjustment is generally achieved by reducing investment and increasing savings on the back of a falling wage share. A panel econometric exercise shows that balance sheet adjustment periods are triggered by macroeconomic downturns as well as balance sheet stress due to high debt, low liquidity and negative equity price shocks.

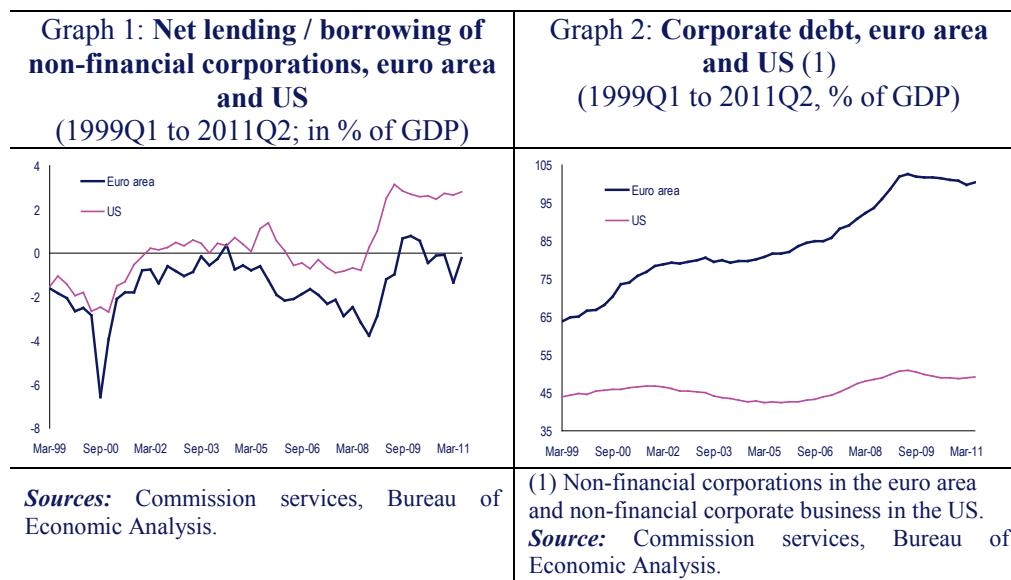* Eric Ruscher: European Commission. Email: eric.ruscher@ec.europa.eu
** Guntram Wolff: Bruegel. Email: guntram.wolff@bruegel.org

1.   Introduction

There is now ample evidence that deep economic crises are associated with stress in public and private sector balance sheets and followed by protracted periods of balance sheet adjustment.[1] However, while economists have recently spent much time assessing sovereign debt and the financial health of banks, the balance sheets of non-financial corporations have been subject to less scrutiny. This paper endeavours to fill the gap by analysing the causes and sometimes substantial and persistent macroeconomic consequences of balance sheet adjustment processes in the non-financial corporate sector.

Balance-sheet adjustment can be captured by changes in corporate net lending or borrowing (NLB). Corporate NLB measures corporations' net needs in terms of external finance (if negative) or, alternatively, their net financial investments (if positive). In the euro area, corporate NLB increased significantly following the downturn of the early 2000s, rising by more than 3 percentage points of GDP between 2000 and 2004 before decreasing again during the recovery (see Graph 1). The global economic crisis has left a similar footprint on euro-area corporate net lending which surged again by more than 3 percentage points between its pre-crisis trough and its recession peak, entering into positive territory. NLB has fallen somewhat with the recovery but remains high by historical standards. Similar cyclical developments can be observed in the US where corporate net lending has remained firmly in positive territory since the global financial crisis.

Graph 1: **Net lending / borrowing of non-financial corporations, euro area and US** (1999Q1 to 2011Q2; in % of GDP)	Graph 2: **Corporate debt, euro area and US** (1) (1999Q1 to 2011Q2, % of GDP)
Sources: Commission services, Bureau of Economic Analysis.	(1) Non-financial corporations in the euro area and non-financial corporate business in the US. ***Source:*** Commission services, Bureau of Economic Analysis.

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[1]   See for instance Reinhart and Rogoff (2008) and Reinhart and Reinhart (2010).

When corporate net lending increases, savings increase relative to investment in the corporate sector, leading to a reduction in domestic demand all else equal. Indeed, corporate NLB is negatively associated with the business cycle and positively associated with the current account, showing that large increases in corporate NLB are not fully offset by other domestic sectors' net lending.

Based on a combination of case study and panel econometrics, this paper analyses the typical pattern of corporate balance sheet adjustment episodes, their main drivers and their macroeconomic impact. A better understanding of these patterns will inform policy makers regarding the speed and shape of the recovery. Moreover, corporate balance sheet adjustment has been an important driver of current account surpluses in some euro-area Member States over the past decade.[2] Understanding the determinants of corporate balance sheet adjustment is therefore critical for a better understanding of the factors driving current account divergences within the euro area.
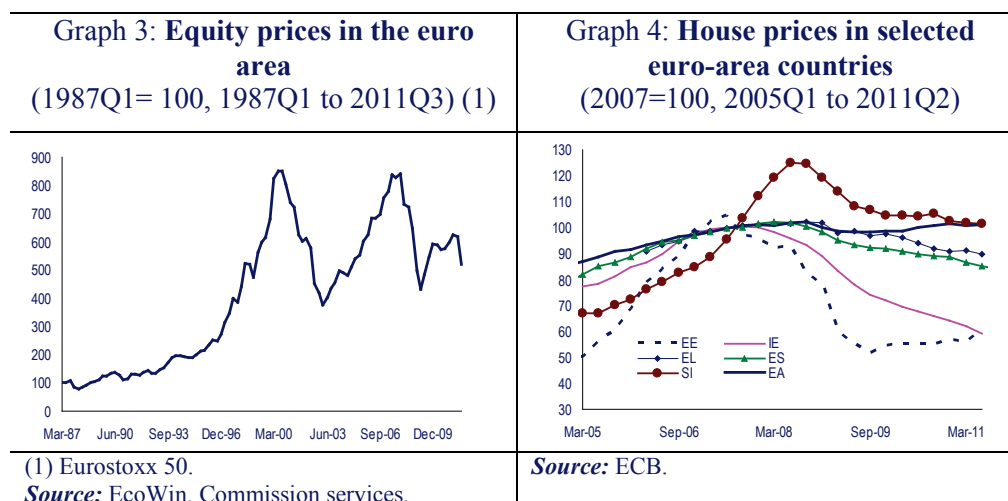
An important strand of the finance literature investigates the determinants of corporate balance sheets. This literature offers two competing models of financing decisions and balance sheet structure. In the trade-off model, firms identify their optimal leverage ratio by weighing the costs and benefits of additional debt. The benefits of debt include, for example, the tax deductibility of interest and the disciplining effect of debt in case of agency problems between managers and shareholders (Jensen, 1986). The cost of debt includes potential bankruptcy costs and others. In the pecking order model (Myers and Majluf, 1984), equity issuance and, to a lesser degree, debt issuance comes with a cost due to asymmetric information between managers and investors. In this model, companies prioritise their sources of financing, using internal funds first before resorting to debt and ultimately equity. The pecking order model predicts that a firm's debt issuance is an inverted function of its net cash flows (cash earnings minus investment layouts). Fama and French (2002) test both models with firm-level data and find supporting and contradicting evidence for both models, suggesting that both of them may partially hold.

Our paper is partially related to the literature on optimal capital structures. Indeed, we test if balance sheet adjustment processes are more likely to occur when corporate debt is high, corporate liquidity is low or asset prices are falling. Implicitly, we thus assume that the corporate sector targets optimal balance sheet ratios. However, our paper differs from the corporate finance literature insofar as we do not study firm level data but macroeconomic aggregates. In particular, the paper relies on flow-of-funds data that have recently become popular (Be Duc and Le Breton, 2009;, Bezemer, 2009; and Castren and Kavonius, 2009). Moreover, we do not specify specific balance sheet items as targets but rather focus on the more general net lending/borrowing of the aggregate non-financial

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[2]   See European Commission (2010a and 2010b).

corporate sector. This allows us investigate the macroeconomic consequences of balance sheet adjustment processes, notably in terms of GDP growth, and to shed some light on the linkages between finance and the business cycle.

Several factors could explain the current high level of corporate NLB. First and foremost, non-financial corporations showed signs of high indebtedness before the onset of the financial crisis. Corporate debt increased rapidly in the euro area in the late 1990s and, after a pause over 2002-04, picked up again in the run-up to the global financial crisis pushing the ratio of debt to GDP up by almost 40 percentage points between 1999 and 2009 (see Graph 2). A pick up in corporate debt was also visible in the US in pre-crisis years but on a much lower scale, with an overall increase of the debt ratio of only 5 percentage points over the same period. These figures are suggestive of an unsustainable debt dynamics, particularly in the euro area. Sorensen et al (2009) actually estimate that by the end of 2006, the debt overhang in the euro-area corporate sector was as much as 15% (i.e. corporate debt was as much as 15% above its estimated equilibrium level). Judging by intra-area differences in the pace of debt accumulation over the past decade, the overhang could be considerably larger in some Member States. Since the mid-1990s the ratio of (non-consolidated) debt to GDP has increase by about 70-80 percentage points in countries such as Belgium, Portugal and Spain.

Graph 3: **Equity prices in the euro area** (1987Q1= 100, 1987Q1 to 2011Q3) (1)	Graph 4: **House prices in selected euro-area countries** (2007=100, 2005Q1 to 2011Q2)
(1) Eurostoxx 50. *Source:* EcoWin, Commission services.	*Source:* ECB.

Pressures to deleverage resulting from the pre-crisis debt overhang have probably been aggravated by the falls in asset prices brought by the financial crisis. Equity prices have recovered from the very depressed levels reached in early 2009 but in the third quarter of 2011 remained almost 40% below their pre-crisis peak (see Graph 3). The crisis has also entailed a substantial deceleration in the growth of house prices in the euro area (see Graph 4). The fall in asset prices has been more pronounced in some Member States than others, particularly regarding

housing, pointing to potentially stronger balance-sheets effects in these countries. The drop in asset prices can induce companies to restructure their balance sheets via various channels. For example, it weighs on the value of the assets held by corporations and thereby reduces the available collateral to be offered against new bank loans and raises the cost of borrowing. It also raises debt to equity ratios and, thereby, risks of default and bankruptcy.

Finally, and somewhat more speculatively, deleveraging pressures could also be aggravated by some of the structural changes initiated by the crisis. First, the crisis has brought a change in risk attitudes that should translate in a lasting increase of risk premia. This will likely raise the cost of external finance relative to internal finance and could induce companies to step up internal funding. Second, the ongoing deleveraging in the banking sector is likely to render bank financing durably more expensive. Non-financial corporations are likely to adjust their balance sheets accordingly, with a shift away from loans to securities (debt and equity) or internal funds. Third, the serious stress or disruptions experienced over the past year with most forms of financial intermediation – whether via banks or corporate bonds, commercial paper and equity markets – could induce non-financial corporations to adopt more careful funding strategies that confer a more prominent place to internal funds. This effect could be aggravated by the recognition that the Great Moderation was partly illusory and that the volatility of real activity and, therefore, default risks are higher than thought a few years ago. Last and not least, there is a serious risk that the crisis has durably affected GDP growth in the euro area.[3] A persistent downshift in the economy's growth path would make corporate strategies involving high leverage more risky and could lead to an overall lower level of corporate debt.

Beyond the causes of the ongoing balance sheet restructuring, it is also important to assess its broader economic consequences. A considerable body of empirical literature has examined the impact of firms' financial structure on investment. Starting with the seminal paper by Fazzari et al. (1988), much of this literature has focused on whether and how the importance of credit constraints could be assessed on the basis of the sensitivity of investment to changes in the cash flow. In recent years, a number of studies have also looked into the impact of leverage and other balance sheet measures on capital formation (see for instance Martinez-Carrascal and Ferrando, 2008).

However, it is important to stress that balance sheet adjustment affects the economy and growth not only through the investment channel but also through an income channel. Faced with the need to consolidate balance sheets, corporations can also squeeze labour and intermediate costs in order to raise the required cash. To the best of our knowledge, this

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[3]   See, for instance, European Commission (2009).

income channel has remained little discussed in the literature, despite its potentially important macroeconomic consequences.[4]

The remainder of this paper aims to shed more systematic light on these factors. Section 2 studies two important episodes of balance sheet adjustment in the recent history namely Japan in the 1990s and Germany in the early 2000s. Section 3 characterises the pattern of typical balance sheet adjustment episodes in a sample of 30 countries. Section 4 offers an econometric analysis of the main drivers of past episodes of balance sheet adjustment. The last section concludes and draws lessons for the ongoing recovery.

2. Balance sheet adjustment: lessons from Japan and Germany

As shown in Graph 5, Japan and Germany experienced episodes of substantial rises in corporate NLB starting, respectively, around the mid-1990s and in the early 2000s. These shifts in the level of NLB have proved to be particularly persistent: in both countries, corporate NLB currently remains in positive territory and has not yet returned to its normally negative territory. Most of the increase took place in the non-financial corporate sector although the financial corporate sector also played a role. During these episodes, changes in NLB in the corporate sector had a strong impact on macroeconomic aggregates and were in particular key drivers of demand, GDP growth and the external balance. For example, the current account balance in Germany increased by 8.8 percentage points of GDP between 1999 and 2007, of which 5 percentage points are attributable to the corporate sector (see Wolff 2010 for a discussion).

**Graph 5: Corporate net lending/borrowing**
(% of GDP)
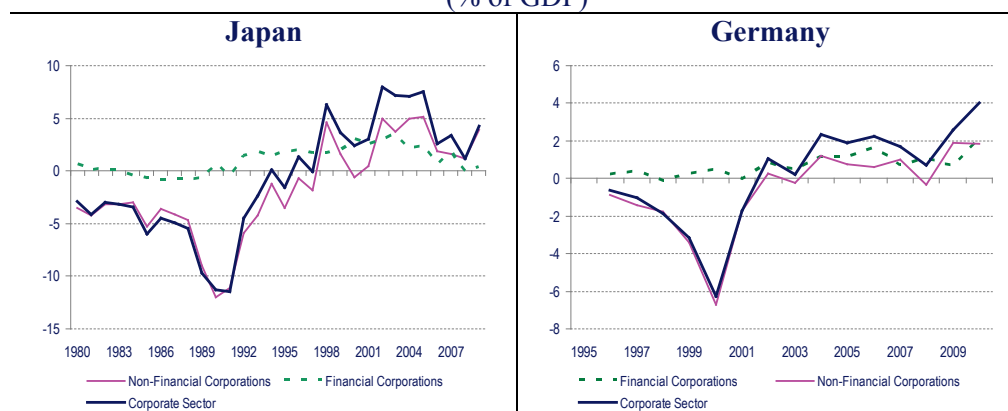
Source: Cabinet office Japan and Eurostat sectoral accounts.

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[4]   Exceptions include Benito and Hernando (2007) and Hernando and Martinez-Carrascal (2008).

The Japanese and German episodes offer a number of interesting insights as to the shape and drivers of balance sheet adjustments. As shown in Graph 6, in both countries, corporate net lending was adjusted both by raising corporate savings and by curbing investment.[5]

Graph 6: **Determinants of NLB in the non-financial corporate sector**
(% of GDP)
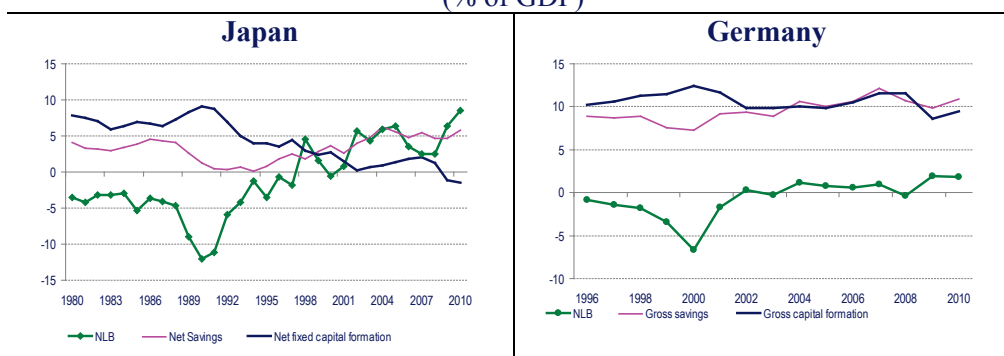
Source: Cabinet office Japan and Eurostat sectoral accounts.

Graph 7: **Determinants of savings in the non-financial corporate sector**
(% of GDP)
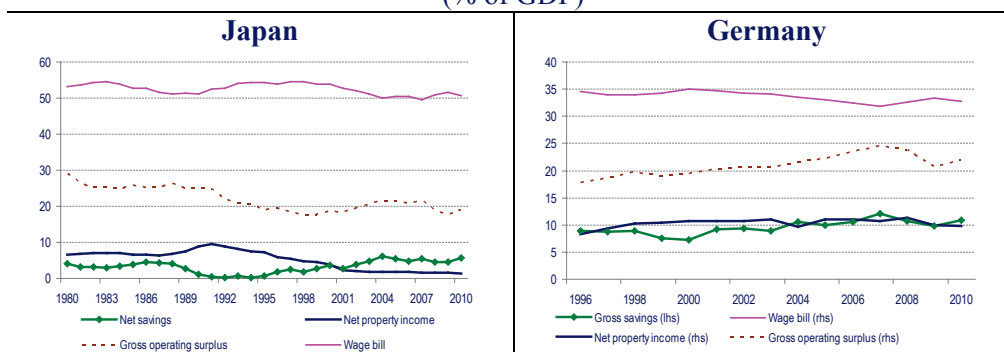
Source: Cabinet office Japan and Eurostat sectoral accounts.

The increase in gross savings was, however, achieved in different ways in the two countries. In the German corporate sector, savings were increased on the back of strong gross operating surpluses driven by weak compensation of employees (Graph 7). In contrast, in Japan, compensation of employees remained relatively stable as a share of GDP in the early stages of the balance sheet adjustment and only began to weaken in the early 2000s. Japanese gross operating surplus actually fell in the first years of the adjustment and only picked again after the turn of the century. During the second half of the 1990s, the rise in corporate

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[5] NLB is broadly defined as the difference between gross savings and gross investments. The main drivers of gross savings are the gross operating surplus (which is essentially the difference between value added and labour compensation) and net property income (i.e. the difference between property income received and property income paid). The corresponding identities are provided in Box 1.

savings was mostly achieved by a significant decline in net payments in property income. These figures suggest that the Japanese corporate sector had a problem with operating profitability and that the adjustment took place via shareholders – i.e. by squeezing distributed profits and interest payments – rather than employees, at least in its first years. The adjustment was also facilitated by very low interest rates.

The date for Japan and Germany also show that a persistent rise in NLB is associated with significant effects in terms of on the size and the structure of corporate balance sheets. Leverage in the Japanese corporate sector increased until the early 1990s, when balance sheet adjustment started. This lead to a falling leverage subsequently. In Germany, developments of corporate debt and leverage remained very subdued compared to major European partners during the balance sheet adjustment phase indicating the effect of the balance sheet adjustment.

A number of factors may explain the adjustment of balance sheets in the two countries. Balance sheets of Japanese corporations massively deteriorated after the collapse of asset prices in Japan in 1990 (Koo 2003). Similar asset price considerations could also be part of the explanation for the balance sheet adjustment of Germany relative to its European partners. In fact, stock market developments in the late 1990s and early 2000s have been less supportive in Germany than in other major European countries such as France. Moreover, Germany witnessed a spectacular bubble in the Neuer Markt in the late 1990s, the first and most important European market for high-tech stocks (von Kalckreuth and Silbermann, 2010). The large decline in this market constituted a significant shock to corporate balance sheets in an dynamic segment of the market. But potential explanations for Germany's balance sheet adjustment do not all revolve around asset prices. Potential GDP growth expectations declined around the time of the adjustment, making high leverage more risky, and the availability of credit from banks deteriorated. The increasing relative costs of bank loans due to the restructuring of the German financial system could have increased the pressure on the non-financial corporate sector (Schumacher, 2006) Finally, Germany introduced a major tax reform in 2001, which affected corporate as well as income taxation. This likely influenced the saving decisions of the German non-financial corporate sector. Changes in the corporate tax law favoured internal relative to external financing. In particular, the quantitatively most important reduction in tax revenue due to the tax reform stems from a decrease of the tax rate on retained profits from 40 to 25% while the reduction in distributed profit taxes was smaller falling form 30 to 25%. The Bundesbank highlights that this, in combination with the respective income tax treatment, increased the tax bias in favour of profit retention.[6] Tax law therefore provided an incentive to use corporations as 'piggybank'. Moreover, the tax reform reduced

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[6]   Monthly bulleting article of August 2000 (p. 58)

depreciation possibilities rendering investment less favourable. This could partly explain the weakening of corporate investment in Germany.[7] The tax reform of 2008 partly reformed these incentives.

Overall, the case studies show that corporate balance sheet adjustment has had significant effects on the German and Japanese economy. The case studies suggest that a number of factors could potentially drive balance sheet consolidation. To characterize the typical pattern of balance sheet adjustment, the next section studies balance sheet adjustment in a larger sample. Moreover, an econometric analysis undertaken in the section thereafter will uncover the drivers of balance sheet adjustment.

3. The pattern of balance sheet adjustment: evidence from a sample of 30 countries.

To capture general trends in corporate balance sheet adjustments, we have built a large data set covering 30 countries and for some countries more than 30 years of macroeconomic data focussing on the non-financial corporate sector.[8]

The analysis is undertaken using mostly national account data. In particular, Eurostat's database of financial accounts is used to retrieve balance sheet and income data for non-financial corporations in EU Member States, Norway and Switzerland. For data for non-financial corporations in Australia, Canada, Japan and the US, we turn to national statistical sources and use the closest comparable concept to the respective Eurostat data.[9] For other macroeconomic data such as GDP, inflation and interest rates, we use the European Commission"s AMECO database.

The proper identification of balance sheet adjustment episodes is central for the empirical strategy. The available literature often uses changes in investment as a proxy for balance sheet adjustment (see e.g. Jaeger 2003). This approach, however, looks only at one of the two main levers that corporations have at their disposable to adjust their balance sheets and neglects the other one, namely savings.

We use non-financial corporations' net lending/borrowing data as a marker of balance sheet adjustment processes. NLB is defined as the difference between gross savings and gross investment and measures

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[7]   Moreover, the favouring of self-finance will tend to interfere with the allocation function of capital markets and will put young firms with a greater propensity to invest at a relative disadvantage.

[8]   The dataset includes all EU Member States (excluding Cyprus, Luxembourg and Malta), Norway, Switzerland, Australia, Canada, Japan and the US.

[9]   For these countries, data sources are, respectively, ??, ??, the Financial Statement Statistics of the Ministry of Finance of Japan. the Bureau of Economic Analysis.

corporations' net financial needs or net financial savings (see Box 1 for a description of some related national accounting concepts). NLB can move for numerous reasons unrelated to balance sheet adjustment. For example, it can increase temporarily because of a temporary surge in corporate earnings. However, large and persistent changes in the level of NLB have significant effects on balance sheets. An increase in NLB indicates that corporations are either lifting the rate of accumulation of financial assets or reducing the rate of accumulation debt (or both). Obviously, corporations may also consolidate their balance sheets by raising their equity capital. This type of consolidation, however, is likely to have considerably less effect on demand as it will not be associated with changes in corporate savings or investment.[10] We therefore focus on persistent changes in NLB as markers of balance sheet adjustment processes as those are likely to be more damaging from a macroeconomic perspective. More specifically, we define a balance sheet adjustment episode to exist when:

- Non-financial corporations' NLB increases by 2 percentage points of GDP in one year and is not reverted in the next year.

- The episode lasts until NLB falls below the pre-adjustment average NLB.[11]

Such a definition allows capturing well persistent moves in NLB until they are reverted to NLB levels existing before the adjustment period. Annex B provides more details on the balance sheet adjustment episodes identified in our dataset and, notably, their starting years and time profile. Overall, we have identified more than 35 such episodes. Most of them are quite persistent, lasting between 5 and 10 years with an average of 8.3 years.

Box 1: **Some accounting identities and concepts**

National accounts distinguish between five institutional sectors (households, financial corporations, non-financial corporations, government and the rest of the world). For each sector the following concepts are available:

GOS: gross operating surplus
VA: value added
GS: gross savings

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[10] A range of factors, mostly related to the existence of asymmetric information and corporate control issues, may induce corporations to use internal funds rather than equity to consolidate balance sheets. For instance, asymmetric information between managers and equity holders tends to drive a wedge between the cost of internal funds and external funds, making consolidation via equity issuance more costly. Corporate control considerations may also induce existing equity holders to restrict new equity issuance. Balance sheet adjustment also frequently takes place in adverse cyclical conditions when equity prices are depressed and equity capital is more costly.

[11] The pre-adjustment average is calculated as the average in the 4 years preceding the balance sheet adjustment plus a margin of 3 percentage points.

GBPI: gross balance of primary income
GDI: gross disposable income
GS: gross savings
NLB: net lending or borrowing

These concepts are linked by the following identities:

GOS = VA – labour compensation – production taxes + production subsidies   (1)

GBPI = GOS – Net property income   (2)

GDI = GBPI + net current transfers received – current taxes on income and wealth   (3)

GS = GDI – Adjust. for the change in net equity of households on pension funds   (4)

NLB = GS – investment – other capital expenditure   (5)

NLB = net acquisition of financial assets – net incurrence of liabilities   (6)

Net lending or borrowing (NLB) can be derived from two sets of accounts. In the income accounts of the institutional sectors, it corresponds to the difference between savings (after tax profits minus dividend payments) and investment (see equations (1) to (5)). But NLB is also the balancing variable of the financial transactions accounts. It is then the difference between the acquisition of financial assets and the incurrence of new liabilities (equation (6)).

Corporate NLB is normally negative, reflecting the fact that the corporate sector is a net recipient of financial capital from other institutional sectors. Corporations tend to issue more liabilities than they acquire financial assets because the additional financial capital is also used for physical investment (machines, buildings, etc). But NLB may also move temporarily into positive territory when the corporate sector becomes a net acquirer of financial assets or pays back its debts. This may reflect unexpected shocks (e.g. a decrease in the income tax rate or a reduction in investment opportunities) to which corporations will adapt quickly (e.g. by increasing distributed profits and thereby reducing savings) or a deliberate attempt to alter balance sheets. In the latter case, the move into positive territory can be lasting. Balance-sheet adjustment can indeed turn out to be rather long processes due to the larger size of stock variables (balance-sheet variables) relative to flow variables (NLB). For instance, with a level of corporate debt close to 100% of GDP in the euro area, a 10% cut in debt would require an increase in NLB of 2% of GDP during 5 years.

Finally, it is also worth mentioning that national accounts now also include detailed accounts on both the financial transactions and balance sheets of institutional sectors. These allow to analyse developments in typical balance-sheet ratios (e.g. the debt to equity ratio, debt to GDP ratio) and to identify the financial transactions that are the counterpart to a changes in NLB (e.g. whether the additional internal funds from an increase in NLB have been used to pay back debt or swap external capital with internal capital).

Table 1 characterizes the observed episodes of corporate balance sheet adjustment for those countries, for which financial account stock data are

available.[12] We show the development in time of a number of central variables, starting from the year prior to the balance sheet adjustment episode (*t=0*) up to the year *t=4*. The set of countries is kept constant during this period so that changes in the values are not driven by changing samples. For different variables, the data availability is different and this explains the different number of observations per variable considered.

Table 1: **Consequences of corporate balance sheet adjustment (1)**

	t=0	t=4	Actual change (2)	Average change in entire sample	Effect of balance sheet adjustment	Number of episodes
	(A)	(B)	(C)=(B)-(A)	(D)	(E)=(C)-(D)	(F)
Debt / GDP	60.3	58.4	-1.9	5.2	-7.1	12
Leverage (3)	101.2	85.3	-15.9	-1.2	-14.7	12
Liquidity / VA (4)	30.0	33.4	3.4	0.9	2.5	10
Investment / VA	26.1	23.2	-2.9	-0.2	-2.8	16
Savings / VA	17.2	22.3	5.0	0.4	4.6	16
Compensation of employees / VA	60.2	55.6	-4.6	-0.9	-3.7	20
Real growth			6.6	9.9	-3.3	24

(1) To ensure a constant size of the sample for every year, the table covers only those events which lasted more than 4 years and for which the respective data are available. The number of observations per variable differs due to data availability reasons. Period. t=0 is the year prior to the balance sheet adjustment. ""VA"" is value added.
(2) In the case of "real growth" the actual change is the difference between the cumulated growth during the 4-year adjustment period and the cumulated growth in the broader sample during an average 4 year period.
(3) Leverage is measured by the ratio of debt to equity (data from the balance sheet section of national accounts).
(4) Liquidity is measured by corporations"" holdings of ""currency and deposits"" (data from the balance sheet section of national accounts).

A number of interesting stylised facts on corporate balance sheet adjustment processes can be derived from the table.

(1) The Debt to GDP ratios are significantly reduced, in particular when compared to the overall sample, in which debt tends to follow an upward trend. Similarly, corporate leverage (i.e. the ratio of debt to equity) is reduced significantly by almost 16 pp.

(2) Corporate balance sheet adjustments are associated with significant increases in the holdings of liquid funds. The increase in the sample averages 3.4 pp of corporate value added.

(3) Compensation of employees as a share of corporate value added falls by almost 5 pp.

(4) At the same time, corporate savings in percent of corporate value added increases substantially by 5 percentage points. The increase in

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[12]   Unfortunately, data coverage is much more limited for stock data than for flow data.

savings thus corresponds very much to the decrease in labour compensation.

(5) Investment in percent of corporate value added equally falls substantially by around 3 percentage points.

The descriptive evidence from a large sample of corporate balance sheet adjustment episodes thus confirms that corporate balance sheet adjustments have very large and significant effects on wages, investment, savings and corporate balance sheets themselves. Indeed, the descriptive evidence supports the notion that corporate balance sheet adjustments have strong income effects as they are associated with persistent periods of wage moderation. The rise in corporate gross savings is therefore mostly achieved by weakening labour remuneration. Moreover, the results highlight that investment is subdued during episodes of corporate balance sheet adjustment. Corporate balance sheets are thus adjusted by reducing investment and increasing savings on the back of falling labour cost, with the latter channel of adjustment being at least as large as the former. Hence, looking at the overall growth effect of balancing sheet consolidation only via the investment channel – as is frequently done in forecasting exercises – means ignoring half of the picture, i.e. the effect of consolidation on the income distributed by corporations and ultimately on private consumption. Finally, corporate balance sheet adjustment is found to be associated with significant decreases in leverage and debt as well as sizeable increase in liquidity held by the corporations.

Understanding the drivers of corporate balance sheet adjustment will be of large policy relevance as the consequences of balance sheet adjustment are substantial. An econometric study in the next section aims to discern a number of key drivers.

4.   Determinants of balance sheet adjustment: panel econometric evidence

We have defined balance sheet adjustment episodes in the last section. To capture the triggers of the balance sheet adjustment, the balance sheet adjustment variable is set to one only when the adjustment starts.[13] The variable takes on a value of one or zero and is our dependent variable. As the dependent variable is binary, a probit estimation approach is warranted. Put in simple terms, the probit equation uncovers to what extent the right hand side variables increase the probability to observe an episode of balance sheet adjustment.

More formally:

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[13] Such a definition also helps avoiding endogeneity issues as during the ongoing adjustment the explanatory variables improve due to the adjustment.

P{y=1| x}=F(xβ)

where the probability to observe a balance sheet adjustment is a function of the vector of explanatory variables x, which reflect economic fundamentals. For F a standard normal distribution function is chosen so that a probit model is chosen.

As explanatory variables *x* for the corporate balance sheet adjustment we include the main factors identified in the case studies. In particular, we include the first difference in the real GDP growth rate to capture shocks to economic growth. Moreover, we include debt and liquidity measured in percent of the value added as well as leverage computed as debt over equity. Finally, we include the first difference of the main national stock market index (Dax, Cac40 etc.). All variables are included with the first lag to avoid reverse causality problems.

4.1   Main results

Table 2 presents our main estimation results. A number of variables turn out to significantly increase the likelihood of observing a corporate balance sheet adjustment event. First, we find that a negative shock to economic growth will significantly increase the likelihood of the corporate sector to perform a balance sheet adjustment in the next year. We also find a significant role of negative stock market shocks. However, due to the relatively large correlation with economic growth, the effects of the two variables cannot clearly be distinguished. When we omit economic growth, the stock market variable becomes highly significant (regression E).

Moreover, we find a strong and significant role for balance sheet variables. When the debt to value added ratio of the non-financial corporate sector is high, balance sheet adjustment becomes more likely (regression B). Since leverage and debt are quite strongly correlated, we present the results of an estimation, in which we exclude the debt variable and include leverage instead. We find a significant effect of leverage on the likelihood of observing a balance sheet adjustment (Regression H). Moreover, we find a role for the liquidity situation of the corporate sector. In particular, when the liquidity of the corporate sector is high, the corporate sector is less likely to perform balance sheet adjustments. However, the result is not significant in the entire sample. In regressions H and I, we therefore drop Japan, which we found to have a very a-typical pattern of liquidity developments.[14] Excluding Japan, liquidity becomes a significant variable (Regressions I and J).

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[14] Specifically, in Japan, the liquidity of the corporate sector has been falling throughout the 1990s. This corresponds to the result of our case study that corporate profitability in Japan was also weak during the 1990s.

Table 2: Determinants of balance sheet adjustment

	A	B	C	D	E	F	G	H	I	J
Change in real GDP growth (t-1)	**-7.80**	**-31.83**	**-31.65**	**-23.96**				**-31.44**	**-23.21**	
	-3.11	-4.6	-4.57	-2.71				-4.56	-2.49	
Corporate debt/VA (t-1)		**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**		**0.01**	**0.01**
		1.88	1.98	1.39	1.73	2.44	2.05		1.86	2.2
Corporate liquidity/VA (t-1)			**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**0.00**	**-0.03**	**-0.03**
			-0.82	-1.23	-1.39	-0.89	-0.99	-0.67	-1.66	-1.87
Change in stock market index (t-1)				**-0.99**	**-1.89**				**-0.82**	**-1.70**
				-1.5	-3.1				-1.17	-2.67
Long term real interest rate (t-1)							**-0.06**			
							-1.15			
Corporate leverage(t-1)								**0.005**		
								2.16		
Number of observations	795	315	315	251	251	332	283	315	224	224

Note: Results of a probit regression analysis. VA is corporate value added.

Our overall sample of balance sheet adjustments is above 30, Table A1 in the annex presents the events. Unfortunately, however, the availability of balance sheet stock variables in more limited. However, the results are still based on a relatively broad sample of balance sheet adjustment episodes. For the core regressions presented above, namely regressions B, C and H, 19 balance sheet adjustment episodes form the basis of the sample. The table below gives the country and year of event. While a number of these events are from last year's deep recession, we also have a significant amount of events before that. In Table 3 below, we present the estimation results, in which we exclude the current recession from the sample.

Table 3: Balance sheet adjustment episodes

Country	year	Country	year
At	2002	Lt	2008
At	2009	Nl	1993
De	2002	No	2000
Dk	2009	Pl	2001
Ee	1999	Pt	2009
Ee	2008	Se	2002
Es	2009	Si	2009
It	2009	Sk	1999
Jp	1993	Us	2002
Lt	2000		

Note: Balance sheet adjustment episodes as used in the regressions.

These results correspond to our finding that the balance sheet adjustment process indeed leads to a substantial change of balance sheet variables. Especially it was found that liquidity is significantly increased due to the balance sheet adjustment. This corresponds to the econometric finding that a low liquidity position increases the odds of observing a balance sheet adjustment. Similarly, we found that leverage is significantly reduced. This would correspond to the finding that high debt levels as well as high leverage ratios increase the likelihood of balance sheet adjustments.

4.2   Robustness

In a first robustness check, we omit all those countries for which a different data source than Eurostat was used. We want to do so to be sure that the results are not driven by the fact that different data sources with slightly different data definitions were combined. Table 4 presents the results.

The results confirm our previous findings. In particular, we again find that negative growth and stock market shocks increase the probability of balance sheet adjustments. Moreover, we also find that balance sheet

variables play an important role in determining the likelihood of balance sheet adjustments. Especially, we again find that high debt and low liquidity increase the probability of balance sheet adjustments.

Table 4: Results for the EU sample only							
	A	B	C	D	E	F	G
Change in real growth (t-1)	**-17.36**	**-32.00**	**-31.56**	**-23.10**			
	-3.91	-4.15	-4.01	-2.32			
Corporate debt/VA (t-1)		**0.00**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
		1.36	2.4	2.16	2.35	2.63	2.61
Corporate liquidity/VA(t-1)			**-0.04**	**-0.04**	**-0.04**	**-0.04**	**-0.04**
			-2.03	-1.92	-2.05	-2.3	-2.27
Change in stock market index (t-1)				**-0.77**	**-1.66**		
				-1.06	-2.57		
Long term real interest rate (t-1)							**-0.06**
							-0.87
N		379	209	209	202	202	209	185
Note: Results from a probit estimation.							

In a second robustness check, we introduce country dummies in the estimation. So far, the estimation results presented do not take into account unobserved country specific heterogeneity. We therefore also present probit estimation results, in which we include country specific dummies. It is well known from the literature that the unconditional fixed effect probit model suffers from the incidental parameters problem, which raises questions about the statistical properties of the estimator. Greene (2004a) finds that the estimator is not well behaved and that in particular standard errors appear to be biased downward thereby falsely inflating the respective t-statistics.[15] We nevertheless present the estimation results keeping this caveat in mind. Moreover, when estimating the probit with country dummies, we face the difficulty that for a number of countries, the dummy fully determines the outcome. These countries are dropped from the sample.[16]

The estimation results presented in Table 5 confirm our previous findings. We clearly find that a higher debt to value-added ratio increases the odds that the corporate sector of the country will embark on a balance sheet adjustment. Moreover, if the liquidity situation of the country's corporate sector is good, corporate balance sheet adjustments are less likely. Finally, negative growth and stock market shocks are consistently associated with a greater likelihood of balance sheet adjustment.

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[15] See also Greene (2004b) and Katz (2001)
[16] The countries dropped are BE, BG, EL, FI, FR, NO, RO.

Table 5: Results with country specific fixed effects

	A	B	C	D	E	F	G	H	I
Change in real GDP growth (t-1)	**-22.72**	**-29.12**	**-26.64**	**-18.29**				**-16.62**	
	-4.07	-3.39	-3.02	-1.55				-1.35	
Corporate debt/VA (t-1)		**0.04**	**0.06**	**0.06**	**0.06**	**0.07**	**0.09**	**0.06**	**0.07**
		3.19	3.42	3.26	3.55	4.12	3.78	3.29	3.56
Corporate liquidity/VA (t-1)			**-0.10**	**-0.10**	**-0.11**	**-0.12**	**-0.10**	**-0.11**	**-0.11**
			-1.91	-1.84	-1.98	-2.3	-1.65	-1.84	-1.95
Change in stock market index (t-1)				**-0.67**	**-1.56**			**-0.68**	**-1.47**
				-0.72	-2			-0.69	-1.82
Long term real interest rate (t-1)							**0.15**		
							1.36		
N	330	204	204	198	198	204	181	171	171

Note: Probit estimation. VA stands for value added.

In a different robustness check, we propose an alternative approach to identifying balance sheet adjustment. We define balance sheet adjustment as an episode, where the corporate sector increases its gross savings by 0.2 percent of GDP while at the same time it reduces gross investments by 0.2 percent. Such a definition might be particularly suited to capture deliberate decisions by the corporate sector to adjust balance sheets. This definition excludes all those events, where shocks drive both, investment and savings in one direction but with different strength so that it would falsely appear as a balance sheet adjustment. Such a situation can arise for example in a business cycle downturn, where investment falls more strongly than savings leading to an increase in corporate net lending. This alternative definition excludes such episodes and focuses on those events where in fact corporations deliberately increase savings and decrease investments.

Table 6 presents the estimation results for this different definition of balance sheet adjustment periods. We find our previous results again confirmed. There is both a role for the macroeconomic conditions as well as balance sheet variables in determining balance sheet adjustments.

Table 6: Estimation results for different definition of balance sheet adjustment

	A	B	C	D	E	F	G
Change in real growth (t-1)	-11.02	-17.06	-16.33	-11.38			
	-2.72	-2.63	-2.46	-1.4			
Corporate debt/VA (t-1)		0.01	0.01	0.01	0.01	0.01	0.01
		2.33	2.72	2.47	2.65	2.93	2.63
Corporate liquidity/VA(t-1)			-0.02	-0.02	-0.02	-0.02	-0.02
			-2	-2.01	-2.09	-2.15	-1.94
Change in stock market index (t-1)				-1.02	-1.42		
				-1.7	-2.63		
Long term real interest rate (t-1)							0.01
							0.17
N	430	259	259	250	250	259	235

Note: A balance sheet adjustment episode is defined by a simultaneous increase in savings and decrease in investment. VA is value added.

Overall, the robustness checks confirm that balance sheet adjustment processes are triggered by macroeconomic downturns as well as high debt, low liquidity of the corporate sector and falling stock markets.

5. Conclusion

The global economic crisis has put banks' balance sheet in the spotlight, showing the strong potential impact of imbalances in the financial sector on the functioning of the real economy. The analysis presented in this paper suggests that the balance sheets of non-financial corporations should also feature prominently in macroeconomic surveillance because

of the possible large effects of balance sheet adjustments in that sector on domestic demand, GDP growth and the current account.

We identify balance sheet adjustment episodes as periods during which corporations raise significantly their net lending (NLB). Our analysis of a sample of adjustment episodes in advanced economies, as well as a closer look at the Japanese and German experiences over the past two decades, suggest a number of typical macroeconomic features of balance sheet consolidation processes in the non-financial corporate sector. First, the processes are generally quite protracted, most of them lasting between 5 and 10 years, and are associated with a marked deceleration of GDP growth. Second, consolidation entails changes on the liability side of the balance sheet, with a significant reduction in debt ratios, but also on its asset side with the accumulation of liquid assets. Third, the funds needed for consolidation are accumulated by a combination of higher corporate savings and lower corporate investment. Both levers of adjustment affect growth although through different channels. Lower investment has a negative impact on domestic demand in the short-term but can also weighs on supply in the more medium term. Higher corporate savings may be achieved by various combinations of cuts in labour costs and in dividend payments with negative implications for household disposable demand and private consumption.

We also present an econometric analysis of the drivers of balance sheet adjustment. Results of a Probit model indicates that standard balance sheet ratios have an important signalling role. Non-financial corporations are more likely to enter a consolidation process when their debt is high and their holdings of liquid assets are low. Furthermore, asset prices and GDP growth also play a role, although the high correlation between these two variables makes it impossible to disentangle their respective roles. A drop in equity prices and a deceleration of growth both increase the likelihood of a balance sheet adjustment process.

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Annex

Corporate balance sheet adjustment events

Table A1: Identified balance sheet adjustment events			
id	Year	id	Year
At	2002	ie	2008
At	2009	it	1993
Au	1991	it	2009
Au	2000	jp	1993
Au	2008	lt	2000
Bg	1996	lt	2008
Cz	1998	nl	1993
De	1982	no	2000
De	2002	pl	2001
Dk	1991	pt	2009
Dk	2009	ro	1997
Ee	1999	se	2002
Ee	2008	si	2009
El	2000	sk	1999
Es	2009	uk	1992
Fi	1977	uk	2002
Fi	1993	us	2002
Fr	1984		

Note: Identified balance sheet adjustment episodes used to characterize the development of key macroeconomic variables.

Figure: Balance sheet adjustment
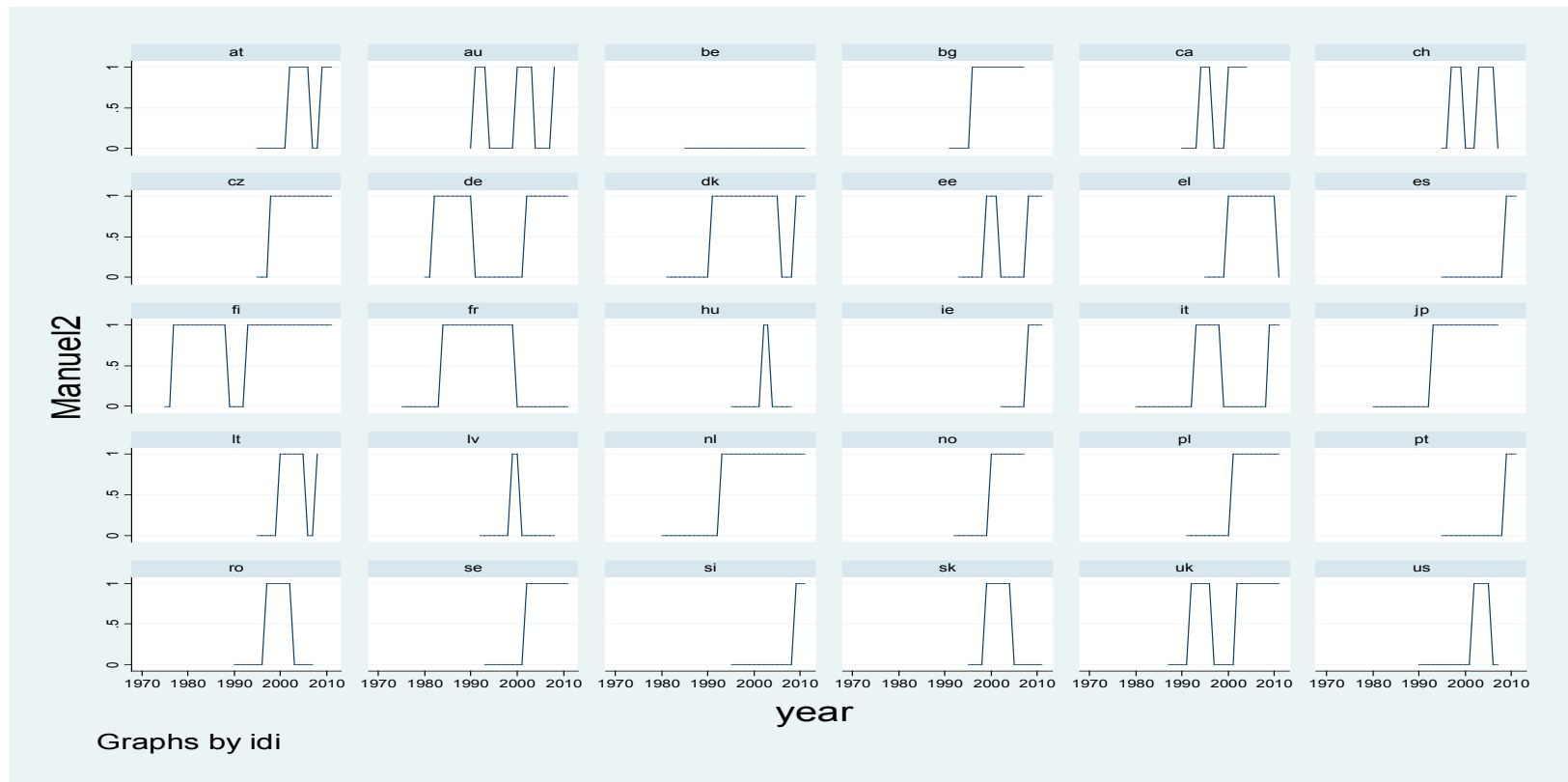
Note: Dummy=1 if NLB increases by 2 pp of GDP and remains above 2% plus average level prior to adjustment. Precise definition, see section 5.Source: Eurostat, AMECO, authors' calculations.