Interlinkages between Household and Corporate Debt in Advanced Economies

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Jean-Charles Bricongne, Aurora Maria Mordonu

Abstract

This article contributes to the debate on deleveraging in the non-financial private sector. It proposes a framework to assess the interconnectedness of deleveraging in the household sector and in the non-financial corporations sector. In doing so, several factors are controlled for: inflation, interest rates, labour intensity and also the influence of the general government debt (neo-ricardian effects).

Panel regressions are performed on a set of OECD countries, between 1981 and 2013, to cover several crisis episodes, including the latest one. Instrumental regressions are used, with different instruments. Findings show robust results of mutual and positive influence between households and non-financial corporations' debts developments. It is also found that, in cases where the labour share of GDP is higher, deleveraging by non-financial corporations will take a heavier toll on deleveraging by households. This can be explained by an enhanced functioning of the income channel: corporations squeeze the wage bill in order to restore their profitability. Conversely, among other channels, household deleveraging affects their propensity to consume, which in turn affects corporations profitability that become more incited to deleverage.

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1. INTRODUCTION

The latest financial crisis highlighted the dire implications of excessively high private sector credit flows and indebtedness on financial stability and economic growth. While there is scarce evidence from the literature on an optimal level of debt in the economy, there is little controversy that high debt levels represent a vulnerability *per se*. Indeed, the prolonged period of credit expansion prior to the crisis has left many countries with large levels of accumulated debt. These were matched by an increase in net worth until the outburst of the crisis when the real estate prices began to drop and credit shortages materialized. As the level of debt with respect to income became unsustainable, deleveraging needs and credit shortages emerged.

The negative impact of on-going balance-sheet adjustments on internal demand and ultimately on financial stability remains a major source of concern. Designing policy responses aimed at facilitating the correction, promoting a gradual deleveraging process, as well as finding levers that promote real GDP growth in order to erode excessive debt levels are key policy challenges lying ahead.

Ideally, the build-up of excessive leverage in the private sector is identified at an early stage. Thus, the prevention of future unsustainable balance sheet developments in the private sector and excessive credit growth remain key surveillance objectives. One of the main shortcomings in economic policies and economic surveillance is that private sector debt has received little attention and that the complexity of the transmission channels between the non-financial private sector, banks and sovereign was not sufficiently considered. Hence the analysis of sectoral inter-linkages has gained importance.

Deleveraging in the corporate sector implies an increase in net savings that occurs via some combination of investment reduction and savings increase, with the latter typically implying a squeeze in the wage bill. The reduction in wage costs affects households' behavior and it may influence their deleveraging needs depending on how saving-investment balances react. In turn, household deleveraging may make it more difficult for corporations to deleverage because of an increase of available funds (households savings) for corporate investment. Moreover, if the government deleverages, it is likely to impact on the private sector's saving-investment balance as higher taxes and lower spending reduce households' disposable income and impact on corporates' profitability. The intensity of these linkages between deleveraging of the various sectors depends on several factors, such as the presence of a home bias, whether the private sector is ricardian and the degree of openness of the economy. In an open economy, the inter-linkages are likely to be smaller.

There are several possible scenarios under which deleveraging could take place. The ideal deleveraging scenario is based on underlying real economic growth. Another possible scenario is the absence of strong economic growth when some internal devaluation and negative credit flows occur. Alternatively, inflation may contribute to erode the value of private sector debt. In some last resort cases, debt restructuring might prove to be the only viable solution.

The literature is split on the definition of leverage; in the financial sense, leverage is also defined taking into account capital equity. In this paper, we define deleveraging without taking equity into account. Since a change in equity has considerably less effect on demand than a change in debt or in net lending and borrowing (NLB), this is not a major shortcoming.

Still, more definitions are possible. Deleveraging can be looked at from a flow point of view: a large and persistent increase in net savings that occurs via some combination of investment reduction and savings increase. This paper defines deleveraging as a decrease in the debt-to-GDP ratio and identifies debt reversal episodes as significant changes in debt-to-GDP (stock), as opposed to changes in the saving-investment balance (flow). There are two main reasons for these: first, the financing of a negative NLB position for instance does not need to be financed by debt. Second, debt restructuring is not captured by changes in the saving-investment balance but by changes in the level of debt to GDP. Debt deleveraging and debt reversals are used interchangeably throughout the paper. In the econometric part, regressions will be performed both with debt and with debt-to-GDP dynamics.

2.   LITERATURE REVIEW

High private sector debt takes a heavy toll on the economy. High private debt is generally associated with low medium-term growth, although devising specific debt thresholds may be analytically challenging (see references in Chen *et al*., 2015). Debt has been detrimental to post-crisis economic performance, as deleveraging processes take a toll on both investment and consumption (Bornhorst and Ruiz Arranz 2013; ECB, 2012). High corporate debt raises the sensitivity of borrowers to adverse shocks, reduces the incentives to invest, and thereby reduces medium-term profit opportunities.

The impact of private sector deleveraging on growth is typically assessed through the investment channel. Different financial pressure indicators (including debt, leverage measures, debt servicing burden) are included among the control variables on which investment is regressed. Bernanke *et al*. (1999) and Vermeulen (2000) find evidence for firm investment being adversely affected by weak balance sheets in particular in downturns. Turning to the euro area periphery, Goretti and Souto (2013) find that firms' investment decisions are affected by their balance sheet position, as high corporate investment can put a drag on investment and private sector losses can possibly migrate to the sovereign balance sheet. Using firm level data for Spanish firms, Benito and Hernando (2007) quantify the impact of financial pressure on fixed investment, inventories and employment.

Some economists have started to explore the impact of debt on growth when more sectors of the economy are highly leveraged. Bornhorst and Ruiz Arranz (2013) show that public sector deleveraging alone does not have a negative impact on growth, and that the negative growth impact of deleveraging of various institutional sectors in euro area countries is amplified when more than one sector deleverages simultaneously. Similarly, Jorda et al. (2013) study the joint evolution of public and private debt and find that both large private and public credit booms affect negatively the post-recession output path, with high public debt exacerbating the effects of private sector deleveraging on growth on the way out of recession while making little difference in normal times.

Only more recently, the impact of deleveraging on growth through the income channel has received more attention. This channel illustrates how corporations squeeze the wage bill and other operating costs to free up resources and secure liquidity. Bakker and Zeng (2013) find evidence that deleveraging in the non-financial corporate (NFC) sector affects households via an increase in unemployment needed to restore profitability in the corporate sector. Ruscher and Wolff (2011) look at historical episodes of NFC deleveraging and estimate the probability of corporate deleveraging to occur based on a number of factors. They also state the importance of deleveraging in the nonfinancial corporate sector for households without estimating the inter-linkages between the two sectors. By exploring cross-country, firm-level survey carried out by the Wage Dynamics Network (WDN), a research network of the European System of Central Banks (ESCB), Fabiani *et al.* (2015) have found that cutting costs was the prevailing adjustment strategy, with labour costs being more commonly adjusted than non-labour costs. Labour cost reduction was done through the adjustment of quantities rather than prices.

This paper aims at contributing to the debate on private sector deleveraging by assessing how the dynamics of household sector debt are interconnected with the dynamics of debt of the nonfinancial corporate and government sectors. To do so, it first tests for the transmission through the income channel: a squeeze in the wage bill in favour of restoring or enhancing profitability. It then looks at how the debt dynamics' in the households' sector (which is associated with higher or lower consumption and more or less favourable perspectives) influences debt dynamics in the non-financial corporate sector. A distinction between countries depending on their labour intensity is made, to analyse the relative magnitude of the transmission channels.

In the following part, the database used is described, and some stylized facts based of these data are displayed, to characterise for example deleveraging episodes. Econometric results are then displayed, with robustness checks in the appendix. The final part concludes.

3.   DATA DESCRIPTION AND STYLIZED FACTS

The database uses as a main input for debt the data collected by the Bank for International Settlements, covering 27 countries from the OECD and the period 1981-2013 (at most, because several countries do not cover this entire period, and some control variables may be missing). The dataset is quarterly. When some data such as the non-financial corporations' tax rate are annual, we report the same values for the four quarters of the related year. Data for other series, in particular for control variables, are collected from other sources, among other OECD (for example for GDP, wages or tax rates) or Fred (Fed Saint-Louis, mainly for financial variables other than debt).

The method used for the identification of debt reversals is very similar to the one used in IMF (2013). Hence, a NFC debt-to-GDP reversal episode is a sequence of at least four years of declining debt ratios, allowing for one exception year; additionally, if the total debt-to-GDP reduction is smaller than 1 % of GDP, the episode is dismissed. This ensures a good balance between over signalling and missing deleveraging episodes, as confirmed when analysing country specific cases.

Tables 1 and 2 give an overview of deleveraging episodes: 22 episodes of household debt and 34 episodes of non-financial corporate debt deleveraging are identified for a sample of 27 countries for the period 1981-2013. The average duration of a deleveraging episode is just over 5 years for both households and non-financial corporations, whereas the average magnitude of deleveraging by non-financial corporations is stronger: about 10 percent of GDP for households and over 15 percent of GDP for non-financial corporations. By the same token, deleveraging episodes in the nonfinancial corporate sector tend to be more numerous than episodes of deleveraging for households. This has to do with that households cannot deleverage as easily as non-financial corporations for several reasons. First, as the counterpart of households' debt liabilities is at large constituted by real estate for personal use, it is more difficult for households to sell and pay back debt. Second, the corporate sector may incur liabilities in other forms than debt, such as by increasing capital. Third, this may also have to do with the existence of better insolvency frameworks in the case of non-financial corporations.

A closer look at the episodes of HH and NFC debt reversals shows that deleveraging happens through a combination of negative net credit flows (paying back debt) and an increase of GDP ("growth out of debt"). We label as "active" the deleveraging that occurs through negative net credit flows, hence a reduction in the numerator and as "passive" the deleveraging that occurs through growth of the GDP i.e. of the denominator. Several episodes are mixed, where debt to GDP is reduced via a combination of negative net credit flows and an increase in GDP. As expected, the strongest episodes of deleveraging are "active or mixed".

Table 1: Episodes of household debt deleveraging ranked by total debt to GDP reduction (decreasing)

	Period	Duration in years	Total debt to GDP reduction	Average reduction per year	Starting point in % of GDP	Type of deleveraging
Ireland	2010-2013	4	-24.2	-6	113.5	active or mixed
Norway	1989-2000	12	-19.8	-1.7	72.4	active or mixed
Sweden	1989-1995	7	-18.8	-2.4	61.3	active or mixed
United States	2008-2013	6	-17.1	-2.9	94.1	active or mixed
Germany	2001-2013	13	-16.3	-1.3	72.3	active or mixed
Finland	1992-1998	7	-15.4	-2.2	45.4	active or mixed
Denmark	2010-2013	4	-14.5	-3.6	141.2	active or mixed
Hungary	2011-2013	3	-11.3	-3.8	38.3	active or mixed
United Kingdom	2010-2013	4	-10.1	-2.5	97	passive
Spain	2010-2013	4	-9.4	-2.4	86.4	active or mixed
Japan	2000-2012	13	-8.6	-0.7	73.3	active or mixed
Portugal	2010-2013	4	-8.6	-2.1	94	active or mixed
Switzerland	2004-2008	5	-7.2	-1.4	116.9	passive
Mexico	1996-2000	5	-4.4	-0.9	11.3	passive
Canada	1982-1984	3	-3.8	-1.3	40.4	passive
United Kingdom	1993-1997	5	-3.8	-0.8	66.2	passive
Austria	2011-2013	3	-3.6	-1.2	55.5	passive
Belgium	1982-1985	4	-3.3	-0.8	30.7	passive
Hungary	1996-1998	3	-2.2	-0.7	4.7	active or mixed
Sweden	1983-1985	3	-2.1	-0.7	50.8	passive
Italy	1993-1995	3	-2	-0.7	20	passive
Canada	1993-1995	3	-1.8	-0.6	58.3	passive
Average		**5.4**	**-9.5**	**-1.9**	**65.6**	

Source: Commission own calculations

Table 2: Episodes of nonfinancial corporate debt deleveraging ranked by total debt to GDP reduction (decreasing)

	Period	Duration in years	Total debt to GDP reduction	Average reduction per year	Starting point in % of GDP	Type of deleveraging
Luxembourg	2010-2012	3	-103.6	-34.5	339.4	active or mixed
Japan	1994-2007	14	-50.9	-3.6	149.2	active or mixed
Finland	1993-1995	3	-37.6	-12.5	106.9	active or mixed
Czech Republic	1998-2007	10	-32.7	-3.3	62.9	active or mixed
Mexico	1995-2005	11	-23.4	-2.1	28.7	active or mixed
Spain	1983-1987	5	-19.1	-3.8	81.1	passive
Turkey	1998-2003	6	-16.9	-2.8	22.4	passive
Australia	1989-1996	8.0	-16.8	-2.1	75.3	passive
Sweden	1993-1996	4	-16.4	-4.1	108.7	active or mixed
Spain	2011-2013	3	-14.8	-4.9	142.3	active or mixed
Australia	2009-2011	3	-14.7	-4.9	77.1	active or mixed
Sweden	2010-2013	4	-13.4	-3.4	168.8	active or mixed
Canada	1999-2005	7	-11.9	-1.7	89.4	passive
Denmark	1995-1998	4	-11.8	-2.9	72.1	active or mixed
United Kingdom	2009-2013	5	-11.6	-2.3	104	active or mixed
Korea	2001-2005	4	-11.1	-2.2	85.3	passive
Canada	1982-1984	3	-10.9	-3.6	81.2	passive
Belgium	1982-1986	5.0	-10.5	-2.1	69.4	passive
Hungary	2010-2013	4	-10.5	-2.6	96.8	active or mixed
Sweden	2002-2004	3	-10.2	-3.4	124.5	passive
United States	1989-1994	6	-9.9	-1.6	64.4	active or mixed
Netherlands	2001-2011	11	-9.6	-0.9	101.3	passive
Italy	1994-1998	4	-9.5	-1.9	57.6	passive
Spain	1994-1996	3	-8.4	-2.8	64.6	passive
Poland	2003-2005	3	-7.7	-2.6	34.6	active or mixed
United Kingdom	1991-1997	7	-7.4	-1.1	66.5	active or mixed
Portugal	2002-2004	3	-4.9	-1.6	120.5	passive
Finland	2001-2004	4	-3.5	-0.9	90	passive
France	1993-1998	4	-3.5	-0.6	71.9	passive
Finland	2011-2013	3	-2.9	-1	114.5	passive
Austria	2002-2006	5.0	-2.2	-0.4	90.5	passive
Norway	1990-1996	7	-2.1	-15	90.7	active or mixed
Germany	1992-1995	4	-1.7	-0.4	53.3	active or mixed
Germany	2010-2013	4	-1.2	-4.9	58.7	passive
Average		**5.2**	**-15.4**	**-4.1**	**93.1**	

Source: Commission own calculations.

4.   ECONOMETRIC RESULTS

Strictly speaking, the deleveraging concept rather refers to evolutions of ratios such as debt over GDP. Yet, using such ratios for dependent and main explanatory variables would induce some endogeneity bias due to a common denominator.

To avoid it, evolutions of households' and non-financial corporations' debt as growth rates are used. This corresponds to active leveraging/deleveraging, depending on debt (and not GDP) developments. Households' developments in gross disposable income are controlled for, since it may be an important explanatory variable.

Two main sets of regressions are performed. First, the impact of the evolutions of NFC's debt over households' debt is analysed. In the second set of regressions, the reverse impact is studied, namely the impact of households' debt growth over NFC's debt growth.

We expect the signs of these main variables to be positive in both cases:

1/ When looking at the influence of NFCs' debt over households' debt: if NFCs are in a period of deleveraging, for example, this will often take place by restricting salaries, and by raising unemployment, to improve margins, at the expenses of households, who will have to adjust in turn their indebtedness.

2/ When looking at the influence of households' debt over NFC's debt, when households deleverage, they will get less consumption and/or mortgage credits, which will sustain less their consumption and the economic perspectives of NFCs, which will be incited to deleverage. Indeed, according to Bacchetta & Gerlach (1997), reviewing several developed countries, credit predicts future consumption in several cases, including that of mortgage credit in the United States. And since NFCs care about anticipated demand for their investment, this should indeed influence their indebtedness.

Several control variables are included:

- The level of general government's debt (general government's growth rates have also been considered in regressions whose results have not been reported, but the related coefficients seem to be less significant). High public debt may indeed induce some neo-ricardian or some crowding-out effects and incite private agents to get less indebted.

- GDP deflator (other inflation variables may have been used, but this indicator is most commonly available and over a longer period of time), since inflation usually favours debtors rather than creditors and, hence, incites, all things being equal, to increase debt. Besides, since debt growth rates are calculated with nominal values, it enables to control for a potential drift induced by inflation.

- Long-term and short-term interest rates evolutions (levels have also been tested in regressions whose results have not been reported, but the related coefficients seem to be less significant than those with growth rates): the cost of newly contracted debt should indeed influence the dynamics of private agents' debt. Since the variables of debt for households and NFCs are not split into long-term and short-term debt, the two variables of interest rates' growth rates are included.

- Share prices, in levels and in growth rates, for domestic shares or using the ones of the United States (since it should play a leading role over other countries, without being too much influenced by shares indices evolutions of any other individual country of the sample) when the dependent variable is NFCs' debt, due to potential endogeneity problems otherwise. For households, share prices evolutions impact their wealth and the collateral they can bring to get new credit. It is the same for NFCs, which can have shares in their assets (an increase in shares' value will increase their wealth and their collateral and will smooth credit granting). Yet, the impact of an increase in shares' value may also be negative since it may be more interesting for NFCs to issue new shares (if a share is worth more, the NFC will need

fewer issuances to get the same amount of own funds) rather than getting more credit. For NFCs, the overall impact of shares prices is thus undetermined *a priori*.

- Property prices, which is an important factor for households (and possibly also for NFCs, but offices prices are less available than property prices, and one of the specifications to explain NFCs' debt evolutions uses property prices as an instrument for households' debt. Yet, we make robustness checks by adding property prices, as a proxy for offices' prices, as explanatory variables for NFCs). Indeed, it may, as is the case for shares, induce some wealth effects for home-owners, and increase their collateral to get more credit (for housing or any other purpose). For households who are not home-owners, an increase in housing prices should oblige to get more credit (with possible credit constraints due to information asymmetry or more stringent limits linked to debt servicing to income ratios) to make a buy.

- Gross disposable income of households, which is an important determinant for households' debt: more income gives more guarantees to the creditors, and enables to abide by interest servicing to income ratios more easily, but on the other hand, having more income lowers the need for an external source of funding. As regards NFCs, more income for households should induce more sales and more profit, but if the rise in households' incomes and anticipated demand is perceived as durable, it may incite NFCs to invest and then to recourse to credit. In both cases, the overall effect is undetermined *a priori*.

Besides the specifications that are displayed hereafter, other regressions have been performed, whose results have not been shown, testing for the optimal lag of the main explanatory variables, between 0 and 6 quarters. The optimal specification, when looking at R^2 or RMSE, is the contemporaneous one (lag=0).

In all cases, the main explanatory variables are instrumented to avoid endogeneity problems, using different instruments.

IMPACT OF NFC'S DEBT EVOLUTIONS OVER HOUSEHOLDS' DEBT GROWTH

To assess the impact of NFC's debt growth rate over households' debt dynamics, the first instrument that is used is the level of NFC tax rate (tax on benefits), which should not be influenced by households' debt, and should be largely exogenous, while impacting NFCs' decisions, among other things their indebtedness policies.

The corresponding results are displayed in table 3 hereafter:

- The coefficients of the variable linked to NFCs' debt dynamics are positive and significant, but only column (IV) displays a Fisher coefficient that meets the "rule-of-thumb" threshold of 10. This latter column corresponds to the case when wages represent more than two-thirds of GDP: in this case, adjustments on wages made by NFCs when (de)leveraging are indeed more likely to impact households than when wages represent a smaller part of GDP.

- In this column, it is also found that general government debt has a negative impact over the dynamics of households' debt.

- The impact of property prices is always positive, and significant in three columns (for all the sample, and when the sample is split depending on the part of wages in GDP).

- The main result, namely the positive and significant influence of NFCs' debt dynamics over households' debt is robust when using lagged control variables (column (II)) or a lagged instrument (column (III)), but instruments are weak.

Tables 4 (using as an instrument the lagged general government debt that may influence the indebtedness strategy of NFCs, without being influenced by the households' debt dynamics) and 5 (using the lagged growth rate of NFCs' debt as an instrument) use other instruments, to confirm the robustness of the main findings of table 3:

- The coefficients of the variable linked to NFCs' debt dynamics are positive in all cases for all the sample, but these coefficients are either no longer significant and/or the instruments are weak for sub-samples, depending on the part of wages in GDP.

- In table 5, general government debt has a negative and significant impact over the dynamics of households' debt in most cases (it is not tested in table 4, since it is used as an instrument).

- Property prices have a positive and most often significant coefficient.

- When significant, the impact of gross disposable income and GDP deflator are positive.

Table 3

Impact of NFC debt evolutions over households' debt
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(households' debt))	(I) Instrument: NFC tax rate	(II) Instrument: NFC tax rate Lagged controls	(III) Instrument: NFC tax rate(-1)	(IV) Instrument: NFC tax rate	(V) Instrument: NFC tax rate
	All sample	All sample	All sample	Wages/GDP>0.65	Wages/GDP<0.65
d(log(NFCs' debt))	1.676** (0.660)			0.956*** (0.237)	2.825 (3.230)
d(log(NFCs' debt(-1)))		1.455*** (0.544)	1.623** (0.746)		
log(general government's debt)	0.010 (0.009)		0.009 (0.010)	-0.008** (0.004)	0.047 (0.059)
log(general government's debt)(-1)		0.007 (0.007)			
GDP deflator	-0.0003 (0.0007)		-0.0004 (0.0007)	0.0006 (0.0004)	-0.0006 (0.0017)
GDP deflator(-1)		-0.0002 (0.0005)			
d(log(LT interest rate))	-0.017 (0.013)		-0.015 (0.014)	-0.021** (0.010)	0.005 (0.037)
d(log(LT interest rate))(-1)		-0.007 (0.011)			
d(log(ST interest rate))	0.001 (0.004)		0.002 (0.004)	-0.007 (0.005)	0.016 (0.020)
d(log(ST interest rate))(-1)		-0.002 (0.004)			
d(log(share price))	0.012 (0.015)		0.016 (0.017)	0.014 (0.011)	-0.035 (0.051)
d(log(share price))(-1)		0.040** (0.016)			
d(log(property price))	0.122* (0.072)		0.107 (0.085)	0.167*** (0.040)	0.372** (0.173)
d(log(property price))(-1)		0.081 (0.078)			
d(log(gross disposable income))	-0.043 (0.073)		-0.056 (0.086)	-0.020 (0.063)	0.053 (0.162)
d(log(gross disposable income))(-1)		0.089* (0.052)			
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
# of observations	1819	1824	1811	1196	623
R-squared				0.058	
RMSE	0.030	0.026	0.032	0.017	0.052
Fisher test (first stage)	5.663	6.327	4.907	16.923	0.551

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government

Table 4

Impact of NFC debt evolutions over households' debt
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(households' debt))	(VI) Instrument: GG debt(-1) All sample	(VII) Instrument: GG debt(-1) Lagged controls All sample	(VIII) Instrument: GG debt(-1) Wages/GDP>0.65	(IX) Instrument: GG debt(-1) Wages/GDP<0.65
d(log(NFCs' debt))	0.892***	0.845***	2.030***	0.186
	(0.184)	(0.177)	(0.702)	(0.131)
GDP deflator	0.0003		0.0003	0.0005**
	(0.0003)		(0.0008)	(0.0002)
GDP deflator(-1)		0.0003		
		(0.0003)		
d(log(LT interest rate))	-0.012		-0.030	0.001
	(0.008)		(0.019)	(0.008)
d(log(LT interest rate))(-1)		-0.009		
		(0.007)		
d(log(ST interest rate))	0.001		-0.019	0.001
	(0.002)		(0.012)	(0.002)
d(log(ST interest rate))(-1)		-0.000		
		(0.002)		
d(log(share price))	0.007		0.019	-0.012
	(0.009)		(0.022)	0.010
d(log(share price))(-1)		0.030***		
		(0.009)		
d(log(property price))	0.187***		0.061	0.303***
	(0.032)		(0.090)	(0.034)
d(log(property price))(-1)		0.157***		
		(0.035)		
d(log(gross disposable income))	0.009		-0.201	-0.007
	(0.038)		(0.159)	(0.033)
d(log(gross disposable income))(-1)		0.101***		
		(0.033)		
Country fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
# of observations	1820	1826	1199	621
R-squared	0.008	0.077		0.617
RMSE	0.018	0.017	0.032	0.012
Fisher test (first stage)	25.593	24.923	6.887	17.082

Note: standard errors in parenthesis under the coefficients; * $p<0.1$; ** $p<0.05$; *** $p<0.01$; NFC= non-financial corporations; GG= general government

Table 5

Impact of NFC debt evolutions over households' debt
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(households' debt))	(X) Instrument: d(log(NFCs' debt))(-1)	(XI) Instrument: d(log(NFCs' debt))(-1) Lagged controls	(XII) Instrument: d(log(NFCs' debt))(-1)	(XIII) Instrument: d(log(NFCs' debt))(-1)
	All sample	All sample	Wages/GDP>0.65	Wages/GDP<0.65
d(log(NFCs' debt))	0.318** (0.156)	0.411*** (0.141)	0.335 (0.224)	0.104 (0.272)
d(log(NFCs' debt(-1)))				
log(general government's debt)	-0.008*** (0.002)		-0.014*** (0.003)	-0.002 (0.005)
log(general government's debt)(-1)		-0.005** (0.002)		
GDP deflator	0.0007*** (0.0002)		0.0008*** (0.0003)	0.0006** (0.0003)
GDP deflator(-1)		0.0006*** (0.0002)		
d(log(LT interest rate))	-0.008 (0.005)		-0.017 (0.007)	0.000 (0.008)
d(log(LT interest rate))(-1)		-0.011** (0.005)		
d(log(ST interest rate))	0.001 (0.002)		0.000 (0.004)	0.000 (0.002)
d(log(ST interest rate))(-1)		0.001 (0.002)		
d(log(share price))	0.002 (0.006)		0.009 (0.008)	-0.011 (0.010)
d(log(share price))(-1)		0.022*** (0.007)		
d(log(property price))	0.238*** (0.023)		0.228*** (0.031)	0.300*** (0.035)
d(log(property price))(-1)		0.211*** (0.026)		
d(log(gross disposable income))	0.053** (0.026)		0.092* (0.050)	-0.010 (0.033)
d(log(gross disposable income))(-1)		0.107*** (0.025)		
Country fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
# of observations	1815	1822	1195	620
R-squared	0.539	0.502	0.58	0.617
RMSE	0.012	0.013	0.011	0.012
Fisher test (first stage)	16.592	21.584	8.399	4.014

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government

IMPACT OF HOUSEHOLDS' DEBT EVOLUTIONS OVER NFCS' DEBT GROWTH

To instrument households' debt growth rate, apart from the lagged value which is used as robustness check in table 5, two main instruments are used, namely lagged property prices (indeed, the influence of NFCs' debt dynamics on past property prices dynamics should be all the more limited as it should first impact current or future offices prices, which have only an indirect and lagged impact on property prices) and lagged general government debt, which should not be directly impacted by the dynamics of debt of NFCs (if there is to be an impact, it would be indirect and lagged, once again, since an overburden of private debt may be solved by general government by injecting funds either in the non-financial or the financial private sectors, and issuing debt as a counterpart, but it should take several quarters of several years to do so).

Tables 6 and 7 enable to exhibit two main findings:

- The coefficient of households' debt growth rate is always positive and significant, with strong instruments: the positive influence of households' debt thus seems to be confirmed whatever the regression used.

- The influence of public debt (see columns (I) and (II) of table 6 and (VI) to (VIII) of table 7, this variable being not used by itself in columns (III) to (V) because it is used, lagged, as an instrument) is always significantly negative, with approximately the same magnitude. Neo-ricardian or "crowding-out" effects, among other mechanisms, which both support this result, may be at play, depending on countries and periods that are concerned.

ROBUSTNESS CHECKS USING VARIABLES AS RATIOS TO GDP

In the tables 8 and 9, in the appendix, robustness checks have been performed, using growth rates of debt stocks to GDP. The main findings, namely the positive influence of NFC debt dynamics over households' debt evolution and vice-versa, and the negative influence of general government debt over these, are confirmed in the whole.

Table 6

Impact of households' debt evolutions over NFCs' debt
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(NFCs' debt))	(I) Instrument: d(log(property prices))(-1) All sample	(II) Instrument: d(log(property prices))(-1) lagged controls All sample	(III) Instrument: GG debt(-1) All sample	(IV) Instrument: GG debt(-1) Lagged controls All sample	(V) Instrument: GG debt(-1) Property price added All sample
d(log(households' debt))	0.433*** (0.098)	0.485*** (0.096)	1.100*** (0.210)	1.165*** (0.218)	1.162*** (0.227)
log(NFCs' tax rate)	0.004 (0.004)		-0.008 (0.006)		-0.012* (0.007)
log(NFCs' tax rate)(-1)		0.005 (0.004)		-0.003 (0.006)	
log(general government's debt)	-0.007*** (0.002)				
log(general government's debt)(-1)		-0.008*** (0.002)			
GDP deflator	0.0003 (0.0003)		-0.0005 0.0004		-0.0003 (0.0004)
GDP deflator(-1)		0.0002 (0.0003)		-0.0006 (0.0004)	
d(log(LT interest rate))	0.009 (0.007)		0.011 0.008		0.013 (0.008)
d(log(LT interest rate))(-1)		0.007 (0.007)		0.015* (0.009)	
d(log(ST interest rate))	-0.000 (0.002)		-0.001 (0.003)		-0.001 (0.003)
d(log(ST interest rate))(-1)		0.001 (0.002)		0.000 (0.003)	
d(log(share price US))	0.270** (0.129)		0.323** (0.149)		0.306** (0.148)
d(log(share price US))(-1)		0.048 (0.132)		-0.004 (0.151)	
log(share price US)	0.070 (0.055)		0.071 (0.062)		0.078 (0.063)
log(share price US)(-1)		-0.107* (0.056)		-0.123* (0.064)	
d(log(property price))					-0.239*** (0.071)
d(log(gross disposable income))	0.041 (0.035)		-0.025 (0.045)		-0.005 (0.043)
d(log(gross disposable income))(-1)		-0.035 (0.037)		-0.131* (0.052)	
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
# of observations	1832	1844	1838	1844	1838
R-squared	0.380	0.375	0.201	0.188	0.198
RMSE	0.018	0.018	0.020	0.020	0.020
Fisher test (first stage)	199.411	212.987	50.198	47.807	48.749

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government; HH=households

Table 7

Impact of households' debt evolutions over NFCs' debt
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(NFCs' debt))	(VI) Instrument: d(log(HH's debt))(-1) All sample	(VII) Instrument: d(log(HH's debt))(-1) lagged controls All sample	(VIII) Instrument: d(log(HH's debt))(-1) Property price added All sample
d(log(households' debt))	0.347***	0.419***	0.365***
	(0.089)	(-0.081)	(0.118)
log(NFCs' tax rate)	0.005		0.004
	(0.004)		(0.005)
log(NFCs' tax rate)(-1)		0.006	
		(0.004)	
log(general government's debt)	-0.009***		-0.008***
	(0.002)		(0.003)
log(general government's debt)(-1)		-0.008***	
		(0.002)	
GDP deflator	0.0004		0.0004
	0.0003		(0.0003)
GDP deflator(-1)		0.0003	
		(0.0003)	
d(log(LT interest rate))	0.010		0.010
	(0.007)		(0.007)
d(log(LT interest rate))(-1)		0.006	
		(0.007)	
d(log(ST interest rate))	-0.000		-0.000
	(0.002)		(0.002)
d(log(ST interest rate))(-1)		0.001	
		(0.002)	
d(log(share price US))	0.252*		0.252*
	(0.130)		(0.130)
d(log(share price US))(-1)		0.053	
		(0.131)	
log(share price US)	0.075		0.075
	(0.055)		(0.055)
log(share price US)(-1)		-0.105*	
		(0.056)	
d(log(property price))			-0.018
			(0.042)
d(log(gross disposable income))	0.041		0.041
	(0.035)		(0.035)
d(log(gross disposable income))(-1)		-0.021	
		(0.036)	
Country fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
# of observations	1832	1840	1832
R-squared	0.381	0.377	0.382
RMSE	0.018	0.018	0.018
Fisher test (first stage)	249.070	310.913	150.819

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government; HH=households

5.   CONCLUSION

This paper finds that the dynamics of household sector debt are impacted by the dynamics of debt of the nonfinancial corporate and debt of the general government sectors. One important transmission channel is the income channel according to which the corporations squeeze the wage bill to build up profitability. The analysis on the part of the sample covering countries which are relatively more labour intensive provides additional evidence for the income channel.

At the same time, it finds that debt dynamics' in the households' sector (which is associated with higher or lower consumption and more or less favourable perspectives) and debt in the general government sector (due to neo-ricardian, "crowding-out" or any other relevant effects) influence debt dynamics in the non-financial corporate sector.

This paper may be complemented in several directions, such as by looking for other instruments or analysing if deleveraging episodes are different from leveraging ones. The link with the external sector may be made depending on the (financial) openness of countries, which may alleviate some constraints and influence the magnitude of interlinkages. One may go one step further and also look at the influence of debt developments of the non-financial private sector on growth (by distinguishing between the households and the non-financial corporations sectors).

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APPENDIX: ROBUSTNESS CHECKS WITH DEBT-TO-GDP RATIOS

Impact of NFC debt/GDP evolutions over households' debt/GDP
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(households' debt/GDP))	(I) Instrument: NFC tax rate All sample	(II) Instrument: NFC tax rate Wages/GDP>0.65	(III) Instrument: GG debt/GDP(-1) All sample	(IV) Instrument: d(log(NFCs' debt/GDP))(-1) All sample
d(log(NFCs' debt/GDP))	1.801**	0.906***	0.837***	0.213
	(0.910)	(0.269)	(0.221)	(0.142)
d(log(NFCs' debt/GDP(-1)))				
log(general government's debt/GDP)	0.008	-0.005*		-0.005
	(0.008)	(0.003)		(0.002)
log(general government's debtGDP)(-1)				
GDP deflator	0.0008	0.0005	0.0000	-0.0004**
	(0.0008)	(0.0005)	(0.0003)	(0.0002)
GDP deflator(-1)				
d(log(LT interest rate))	-0.014	-0.018*	-0.009	-0.006
	(0.014)	(0.009)	(0.007)	(0.005)
d(log(LT interest rate))(-1)				
d(log(ST interest rate))	0.003	-0.006	0.001	-0.001
	(0.005)	(0.005)	(0.002)	(0.002)
d(log(ST interest rate))(-1)				
d(log(share price))	0.009	0.011	0.004	0.001
	(0.017)	(0.011)	(0.009)	(0.006)
d(log(share price))(-1)				
d(log(property price))	0.170***	0.154***	0.171***	0.175
	(0.049)	(0.033)	(0.026)	(0.017)
d(log(property price))(-1)				
d(log(gross disposable income))	-0.013	-0.001	0.012	0.030
	(0.067)	(0.054)	(0.034)	(0.023)
d(log(gross disposable income))(-1)				
Country fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
# of observations	1800	1179	1802	1793
R-squared				0.43
RMSE	0.032	0.016	0.017	0.012
Fisher test (first stage)	3.418	11.987	16.08	18.532

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government

Table 9

Impact of households' debt/GDP evolutions over NFCs' debt/GDP
Method used: 2 stage least-squares, instrumented variable regressions

Dependent variable : d(log(NFCs' debt/GDP))	(I) Instrument: d(log(property prices))(-1) All sample	(II) Instrument: d(log(property prices))(-1) lagged controls All sample	(III) Instrument: GG debt/GDP(-1) All sample	(IV) Instrument: GG debt/GDP(-1) Lagged controls All sample	(V) Instrument: GG debt/GDP(-1) Property price added All sample	(VI) Instrument: d(log(HH's debt))(-1) All sample
d(log(households' debt/GDP))	0.207 (0.145)	0.277* (0.142)	1.221*** (0.323)	1.310*** (0.313)	1.291*** (0.344)	0.293** (0.123)
log(NFCs' tax rate)	0.006 (0.005)		-0.009 (0.007)		-0.013* (0.008)	0.005 (0.005)
log(NFCs' tax rate)(-1)		0.007 (0.005)		-0.006 (0.007)		
log(general government's debt/GDP)	-0.006*** (0.002)					-0.007*** (0.002)
log(general government's debt/GDP)(-1)		-0.007*** (0.002)				
GDP deflator	-0.0007 (0.0003)		-0.0002 (0.0003)		0.0000 (0.0003)	-0.0006** (0.0003)
GDP deflator(-1)		-0.001*** (0.000)		-0.0002 (0.0003)		
d(log(LT interest rate))	0.006 (0.007)		0.009 (0.009)		0.010 (0.009)	0.007 (0.007)
d(log(LT interest rate))(-1)		0.004 (0.008)		0.016* (0.009)		
d(log(ST interest rate))	-0.002 (0.002)		-0.001 (0.003)		-0.001 (0.003)	-0.002 (0.002)
d(log(ST interest rate))(-1)		0.000 (0.002)		0.001 (0.003)		
d(log(share price US))	-0.280** (0.130)		0.336** (0.153)		0.318** (0.153)	0.278** (0.130)
d(log(share price US))(-1)		0.082 (0.132)		-0.019 (0.158)		
log(share price US)	0.077 (0.055)		0.069 (0.064)		0.075 (0.065)	0.080 (0.055)
log(share price US)(-1)		-0.109* (0.056)		-0.126* (0.066)		
d(log(property price))					-0.242*** (0.074)	
d(log(gross disposable income))	0.023 (0.035)		-0.034 (0.045)		-0.011 (0.042)	0.015 (0.035)
d(log(gross disposable income))(-1)		-0.034 (0.037)		-0.130** (0.052)		
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
# of observations	1814	1829	1817	1829	1817	1807
R-squared	0.263	0.265	0.009			0.270
RMSE	0.018	0.018	0.021	0.021	0.021	0.018
Fisher test (first stage)	96.792	103.058	24.784	27.980	23.503	136.897

Note: standard errors in parenthesis under the coefficients; * p<0.1; ** p<0.05; *** p<0.01; NFC= non-financial corporations; GG= general government; HH=households

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