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Corporate Debt: Where is the Danger?

Elham Saeidinezhad, UCLA

The IMF's April 2019, World Economic Outlook has highlighted concerns about the sustainability of the world's non-financial corporate debt burden and its sustainability in the event of a major financial shock. The IMF's warning comes on the heels of dramatic growth in corporate leverage in major global economies, with the United States and China especially vulnerable to debt-driven deleveraging in the corporate sector in the event of a major slowdown. Indeed, in the United States, the corporate debt to GDP level is well above 100% while in China and Europe it is above 150%.¹

While private debt to GDP ratios are an important indicator of financial stability, it cannot paint a full picture of the risks to a system. What is required is an alternative set of evaluations that presents us with a granular picture of sectoral indebtedness and can provide regulators a deeper understanding of systemic vulnerabilities created by overleveraging. Such a set of metrics would not simply look at debt to GDP as ex-post net variables but examine the gross flows that impact debt sustainability. More specifically, the analysis undertaken by most of the literature on corporate debt depends on a measure of the sustainability of the debt – or the ability of the firm to pay down its debt rather than the leverage embedded in the debt structure – or the immediate need for liquidity in the event of a downturn. This latter measurement is especially important as

¹ IMF (2019)

the 2008 financial crisis has shown us that over-dependence on net measures can blind regulators to global risks associated with particularly systemically important sectors.

This paper will attempt to take a first step toward building such a granular framework by examining the sustainability of American corporate debt through sustainability analysis of nonfinancial corporate sectors. This it argues does not displace but rather compliments traditional measures used by analysts that rely on aggregated and netted metrics. By examining sectoral debt composition based on both dimensions of corporate indebtedness, a mixed picture emerges. While some sectors show more resiliency to a downturn than standard analysis implies, other sectors, particularly within the utilities sector, show far greater exposure to profitability and interest rate shocks than commonly understood. It is important to note that while this paper evaluates the liquidity of non-financial corporate debt sectors in response to adverse events, it does not examine the ultimate holders of this debt and their liquidity requirements. Therefore, it does not provide us with a complete picture of the systemic vulnerabilities presented by these instruments.

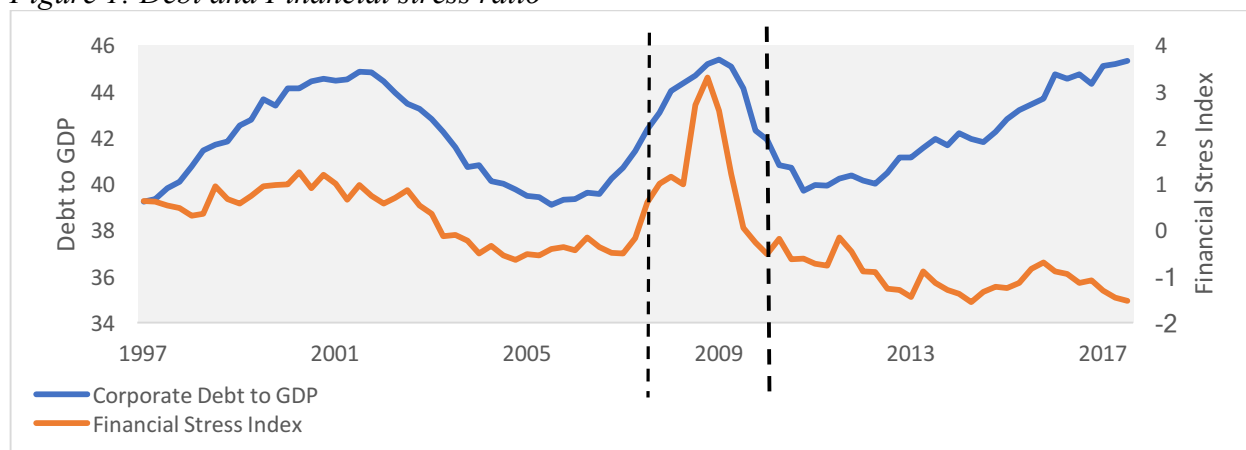
This paper will proceed as follows. First, it will present the stylized facts around the global growth of nonfinancial corporate debt and how it has been treated in the literature. Then it will proceed to examine the image of corporate debt levels are evaluated from this service capacity lens. After undertaking this analysis, it will undertake a sustainability analysis to examine how particular sectors might be more, or less vulnerable to liquidity shocks than service capacity might indicate.

I. Non-Financial Corporate Debt: Some Stylized Facts

Since the end of 2007, the debt-to-GDP ratio of non-financial corporate institutions has grown by 22 percent to reach a historic level of forty-five percent while, in the same period, the financial stress index has moved downward (see Figure 1). This has paved the way for a self-re-enforcing cycle in which corporates to borrow in favorable conditions while increasing corporations'

reliance on U.S. monetary policy and financing conditions.² As a result, many worries about resulting corporate balance sheets' vulnerabilities such as increased interest expenses or a negative shock to corporates' earnings due to a potential macroeconomic downturn.³

Figure 1: Debt and Financial stress ratio



Note: "How to Interpret the Financial Stress Index: The average value of the index, which begins in late 1993, is designed to be zero. Thus, zero is viewed as representing normal financial market conditions. Values below zero suggest below-average financial market stress, while values above zero suggest above-average financial market stress."

Source: Federal Reserve Bank of St. Louis, St. Louis Fed Financial Stress Index [STLFSI], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/STLFSI>, February 13, 2018.

Nonfinancial corporates started shifting the composition of their debt from loans towards debt securities after the financial crisis (see Figure 2 a and b).⁴ However, unlike bank loans, which are mostly issued with floating rates, most corporate bonds have fixed coupons and are not vulnerable to changes in interest rates. Thus, certain changes in the composition of corporate debts- such as increased reliance on long-term debt and switching to fixed rate debt instruments – would reduce the balance sheet vulnerability.

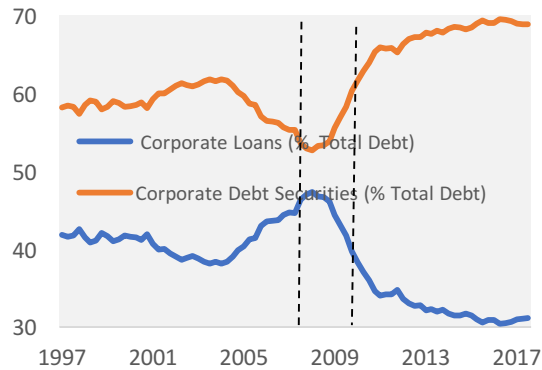
² The financial stress index measures the degree of financial stress in the markets. It is constructed from 18 weekly data series: seven interest rate series, six yield spreads and five other indicators. Each of these variables captures some aspect of financial stress. Accordingly, as the level of financial stress in the economy changes, the data series are likely to move together.

³ IMF (2017).

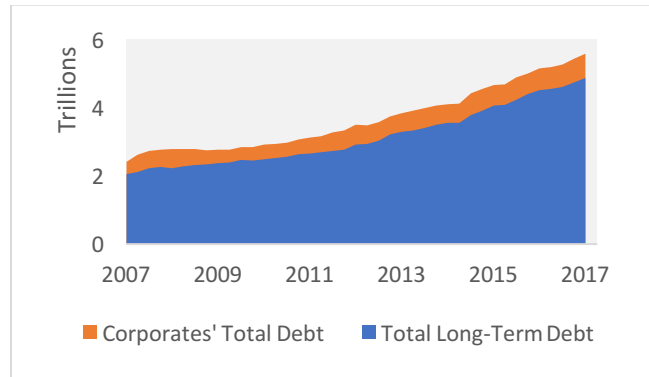
⁴ Since 2009, a considerable portion of the total debt accumulated is in corporate bonds and as of December 2017 corporate bonds make up more than 80 percent of overall corporates' long-term debt, compared to 60 percent pre-crisis.

Figure 2:

a. Debt Structure of All Nonfinancial Corporations:
nonfinancial firms
% of total debt



b. Corporate debt for
NFC debt (in millions of dollars)



However, an assessment of particular vulnerabilities presented by these conditions requires a granular examination of factors affecting sustainability e.g., debt composition, capital structure, and firms' asset risk. Considering the developments documented above, sectoral profiles of corporate debt take on particular importance for the assessment of systemic vulnerability. To do this, this study goes beyond most previous studies by drawing on an expanded data to provide an in-depth analysis of debt sustainability on the sectoral level rather than relying on a distorted aggregate picture.⁵ The central role that housing sector played as a catalyst to the crisis was a bitter reminder that these sector-specific vulnerabilities, if not identified probably, increase both the likelihood and severity of the crisis. Also, with a macroeconomic condition characterized by ultra-low interest rate and abundance of the bond-purchasing program by Federal Reserve, policymakers have been concerned whether these external factors have caused a higher level of leverage in some of the non-financial corporate sectors.⁶ Second, standard proxies only reveal the degree of leverage and debt repayment capacity but provide little information on the *causes*

⁵ We compare corporate leverage and the factors that affect its sustainability for 12 different sectors. The cut offs for vulnerable, viable (moderate) and strong sectors are based on their historical distribution. The firms that are in ≥ 95 percentile and 75th- 94th percentile are considered as vulnerable, 55th-74th percentile have moderate risks, and lower than 15 percentiles are strong for the indicators that lower means the better performance. For the indicators that higher indicates a stronger financial position, strong firms are firms are in ≥ 95 percentile and 75th- 94th percentile, moderate means to be between 55th and 74th percentile, and vulnerable means to be lower than 15 percentiles. The aim is to compare each sector's performance relative to other sectors in the economy.

⁶ See IMF and OFR Financial stability reports (2017)

of these vulnerabilities. In contrast, the supplementary indicators provide useful insights into the origins of these vulnerabilities by explicitly studying balance sheet weaknesses and strengths.⁷

II. Standard Measures of Corporate Debt Vulnerability

The standard metrics that are used by most analysts to measure the vulnerability of debt include the share of debt relative to total assets, total equity and EBITDA, as well as debt accumulation, debt servicing capacity, proxied by interest coverage ratio, and costs of issuing new debt proxied by synthetic ratings.⁸

These so-called “supplementary ratios” provide insights on the balance sheets strengths and weaknesses more specifically around four dimensions: the capital structure (with ratios looking at the share of fixed asset, and equity investment), the debt structure (with ratios capturing the share of long-term debt, corporate bond, bond with a maturity less than 2 years, and investment grade bond), the cost of debt (synthetic rating and spread) and the quality of assets (ratios assessing the profitability, the share of cash and tangible assets). Our results indicate that firms in sectors such as accommodation, real estate, utilities, and energy are more levered and often more vulnerable to higher borrowing cost.

Table 1 shows how, supplementary ratios provide insights on the balance sheets strengths and weaknesses more specifically around four dimensions: the capital structure (with ratios looking at the share of fixed asset, and equity investment), the debt structure (with ratios capturing the share of long-term debt, corporate bond, bond with a maturity less than 2 years, and investment grade bond), the cost of debt (synthetic rating and spread) and the quality of assets (ratios assessing the profitability, the share of cash and tangible assets).

⁷ Haughwout et al, (2011).

⁸ See Frank and Goyal (2009) and Goyal and Packer (2016).

Table 1: Summary of the indicators for Indebtedness, leverage and debt service capacities, (Average of 5 years)

The cut-offs are based on the following percentiles of the distribution: dark red >= 95 percentile, red: 75th - 94th percentile, dark green: 0th-14th percentile.

Vulnerabilities	Financial Structure	Variable	Accommodation	Construction	Energy	Health	Information	Manufacturing	Real Estate	Retail	Technical and professional services	Transportation	Utilities	Wholesale Trade
Leverage and indebtedness	Debt Structure	Debt Accumulation	38	27	131	93	179	60	114	177	164	138	100	168
		Debt Ratio	58	27	29	31	35	32	50	30	29	37	45	19
		Leverage	1.6	0.5	0.5	0.9	0.8	0.7	1	0.8	0.5	0.8	1.2	0.6
		Debt Overhang	3	2.7	2.6	2.1	2.5	2.6	6.4	1.9	2.3	3	4.6	2.9
	Debt Structure	Total Long-Term Debt to Total Debt	98	95	93	96	91	84	84	84	90	92	88	95
		Corporate Bond to Total Long-Term Debt	59	61	69	60	79	76	33	75	58	40	21	33
		Bond With Maturity of less than 2 Years to Total Bonds	5	24	6.7	23.8	32.2	30	12	14	23	21.3	32.2	5
		Investment Grade to Total Bond	88	28	87	88	90	96	84	94	86	89	82	18
	Capital Structure	Fixed Asset to Equity Ratio	4.8	0.4	1.5	1.2	1.4	1.3	2.7	1.5	0.8	2.5	3.2	1.4
	Debt Servicing Capacity	Cost of Debt	Interest Coverage Ratio ⁹	4.2	20	3.9	4.6	5.1	8.8	2.1	9.6	7.6	5.3	3.7
Synthetic Rating			A2/A	Aaa/AA A	A3/A -	A2/A	Aa2/AA	Aaa/AA A	Ba2/BB	Aaa/AA A	Aa2/AA	A2/A	A3/A-	Aaa/AA A
Spread			0.99%	0.54%	1.13 %	0.99%	0.72 %	0.54%	2.38 %	0.54%	0.72%	0.99 %	1.13 %	0.54%
Capital Structure		Equity Reinvestment Ratio	9.4	11.1	-4.5	13	10	12	-2.8	15.9	-3.2	9.2	3.5	10
Asset Quality		Profitability	15	7	2.4	5.9	7.8	7.8	3.7	10	9.3	7.6	3.9	4.4
		Quick Ratio	0.83	1.7**	1.1	1.3	1.5	1.3	1.8**	0.4	1	0.6	0.3	1

⁹ The interest coverage ratio is median of the industry.

	Tangible Asset Ratio	42	10	60	28	19	23	68	36	6	68	15	20
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Note: * For large non-financial service companies with market cap > \$ 5 billion. This is a table that relates the interest coverage ratio of a firm to a "synthetic" rating and a default spread that goes with that rating. The link between interest coverage ratios and ratings was developed by looking at all rated companies in the United States. The default spreads are obtained from traded bonds. Adding that number to a risk-free rate should yield the pre-tax cost of borrowing for a firm. Based on the table provided by NYU stern http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm

** Due to lack of data availability for construction and real estate, although it is reported here, the quick ratio is built based on the data from only a few firms in these industries.

(Stronger Tail of the corporate sector to the weaker tail of the corporate sector)

Indebtedness range guide:

Range								
<i>Debt Ratio (Net Debt to Total Capital)</i>								
Min	50	45	27	15				
Max	58	49	44	26				
<i>Debt Accumulation- Change in net debt (%; 2007q4-2017q4)</i>								
Min	176	165	30	20				
Max	200	175	164	29				

Leverage range guide:

Leverage range								
<i>Debt-to-equity</i>								
Min	1.4	1	0.6	0.1				
Max	1.6	1.3	0.9	0.5				
<i>Debt-to-income</i>								
Min	4.6	2.6	2.1	1				
Max	7	4.5	2.5	2				

Debt Structure Guide:

Range								
<i>Outstanding bonds with less than the 2-year maturity date</i>								
Min	31	27	6.6	1				
Max	35	30	26	6.5				
<i>Long-term debt to Total Debt</i>								
Min	80	85	90	96				
Max	84	89	95	100				
<i>Investment grade as a share of total outstanding bonds</i>								
Min	1	20	30	93				
Max	19	29	92	97				
<i>Outstanding Bond (Fixed Rate) to Total Long-Term Debt</i>								
Min	1	23	40	76				
Max	22	39	75	95				

Debt Repayment Capacity Guide:

<i>Interest Coverage Ratio</i>								
Min	1	3	4.1	15				
Max	2.9	4	14.9	65				
<i>Debt service Ratio</i>								

Min	0.5	0.3	0.2	0.1
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Capital Structure Guide:

Range				
<i>Equity Reinvestment Ratio</i>				
Min	-5	0	0.1	14.1
Max	-3	-2.9	14	17
<i>Capital Ratio (Fixed Asset to Shareholders' equity)</i>				
Min	3.2	2.7	1	0.1
Max	3.5	3.1	2.6	0.9

Solvency Guide:

Range				
<i>Profitability</i>				
Min	1	3	4	10
Max	2.9	3.9	9	16
<i>Quick Ratio</i>				
Min	0	0.4	0.8	1.4
Max	0.5	0.7	1.3	1.6
<i>Tangible Asset Ratio</i>				
Min	5	10	22	65
Max	9	21	64	70

The heat map in Table 1 groups sectors in three channels of financial fragility: leverage and indebtedness issue, debt servicing or a combination of both. Extrapolating from these sustainability ratios, we surveyed sectors along the following dimensions:

- **Debt Accumulation:** We turn in this section to examine the development of debt vulnerabilities. Since 2007, the total debt level of the nonfinancial corporates continued to increase by at least 140 percentage points for the firms in our sample (Figure 3, panel a). Among the sectors, firms in industries such as information and retail have accumulated debt with the fastest pace (Table 1).¹⁰

¹⁰ To identify sectors in this analysis, as vulnerable or viable, we rely on their respective quantile in the factor's distribution. We have three major categories that describe the performance of each sector regarding an indicator: vulnerable, moderate and strong. The categories are based on the percentile of the distributions (>=75th is considered as vulnerable, 55th-74th percentile indicates moderate risks, and <15th percentile is considered strong).

- Debt Level (leverage or debt ratio):** Yet, the most indebted sectors are real estate and accommodation in which debt has risen markedly, from already elevated levels to almost 50 percent of their total assets (Figure 3, panel b). Most of this increase in corporate debt is accounted for by the rise in long-term debt. Short-term and long-term debt increased by 60 and 150 percentage points respectively.¹¹ This reliance on long-term borrowing is consistent for every sector in our sample. As of December 2017, long-term debt constitutes at least 80 percent of nonfinancial total corporate debt in all sectors (Table 2).¹²
- Debt Overhang:** The negative consequences of excessive leverage for economic growth and financial stability are well documented in the literature of private debt.¹³ So far, the default rates for firms in different sectors are low, and the favorable impact of economic growth outweighed the adverse effects of interest obligations (thanks partly to the near-zero interest rate).¹⁴ In the meantime, these standardized measures indicate that the real estate and utilities debt sustainability is in the vulnerable territory while accommodation and transportation sectors are following them. High leverage makes corporates in different sectors exposed to higher borrowing costs and negative shocks to earnings in the future. This could underscore the need for private sector deleveraging in some sectors.¹⁵ The concern is that the current low growth macroeconomic environment if persists could make the adjustment very difficult. This would set the stage for a feedback loop in which lower growth impedes deleveraging, and the debt overhang worsens the economic slowdown.¹⁶

¹¹ To estimate the portion of debt exposed to changes in interest rates, this paper uses data from corporates regulatory filings on the total amount of outstanding debt, its breakdown into fixed and variable-rate, and its maturity structure.

¹² We group debt instruments into two categories based on their maturity: long-term and short-term debts. Short-term debt, maturing in less than one year, includes short-term loans and commercial papers. Long-term debts include bonds and long-term loans. This is based on BIS classification of financial instruments: <http://www.tffs.org/pdf/edsg/edsgcha3.pdf>.

¹³ Bernanke and Gertler (1989), Carlstrom and Fuerst (1997), Kiyotaki and Moore (1997) and Bernanke et al (1999)).

¹⁴ IMF Financial Stability Report (2017).

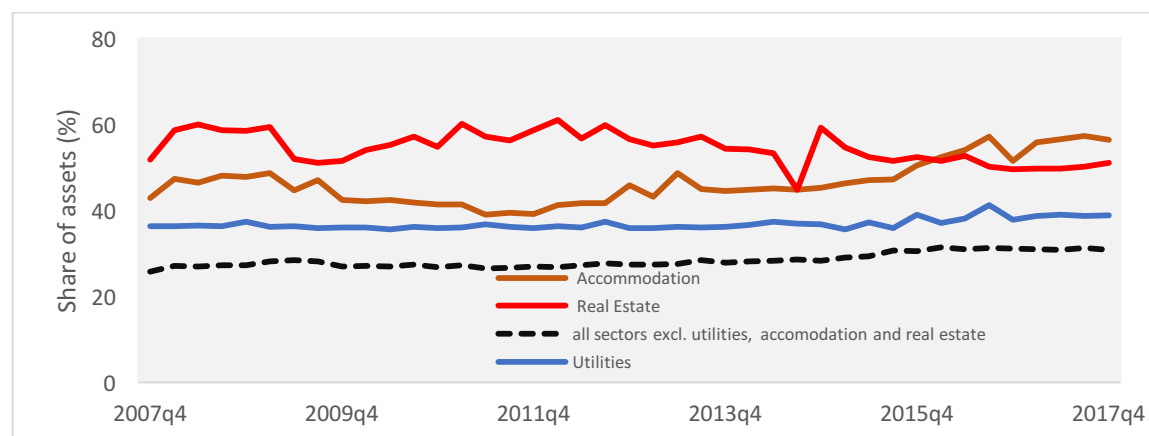
¹⁵ IMF (2016).

¹⁶ Buttiglione and others 2014; McKinsey Global Institute 2015; Gaspar, Obstfeld, and Sahay 2016.

We find that firms in the utilities, real estate, and utilities are especially vulnerable under these circumstances (figure 3).

Figure 3: corporate debt for nonfinancial firms in our sample (1000 U.S. firms with the largest market capitalization)

Debt ratio (1000 largest NFCs; percentage)



The rising leverage discussed above has been reflected in an increased debt burden in many sectors as captured by an interest coverage ratio. The interest coverage ratio (ICR) delivers a more comprehensive measurement of the ability to service debt payments with earnings.¹⁷ A highly levered sector could conveniently service its debt if it has high profitability or low-interest expenses. On the contrary, a firm with moderate leverage could face financial problems if it generates low earnings from its activities, or if it pays high-interest. Although there is no consensus about how much is too low, the IMF used an ICR threshold of 2 to classify at-risk borrowers.¹⁸ Using the IMF threshold for the ICR, real estate is the only sector in our sample that is in the vulnerable territory to service its debt.¹⁹ Real estate sector's low-interest coverage ratio, coupled with its high leverage, make this sector amongst the most fragile sectors in this study.

¹⁷ The historical values of the interest rate coverage ratio for the 2000–2016 period are obtained by aggregating EBIT and interest expense at the industry level on an annual basis. Firm-level observations in which either EBIT or interest expense are missing are discarded for consistency.

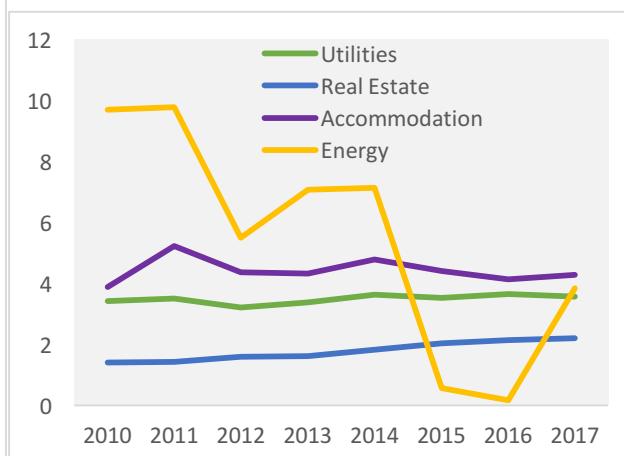
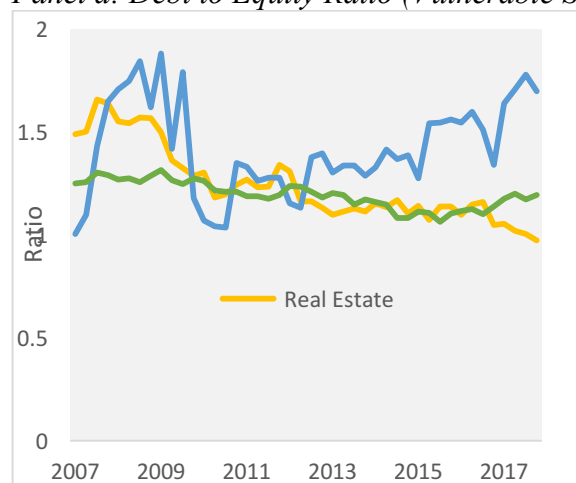
¹⁸ Global Financial Stability Report, April (2014).

¹⁹ It is important to note that in our analysis, the cut off for vulnerable, moderate and strong sectors are based on the cut offs for their historical distribution. The firms that are in ≥ 95 percentile, Notable: 75th-94th percentile are considered as vulnerable, 55th-74th percentile have moderate risks, and lower than 17 percentile are strong. The aim is to compare each sector's performance relative to other sectors in the economy.

Also, although the energy sector does not have high leverage, its interest coverage ratio and earning patterns indicate some vulnerabilities that are not captured by the leverage ratio alone. Figure 4.b plots the historical path of the interest rate coverage ratios following the crisis for the levered sectors and the energy sector. We included the energy sector as its debt has raised by more than 100 percentage points after the crisis while its debt servicing capacity decreased sharply from 2014 although it has recovered recently. This low-interest coverage ratio for firms in the energy sector is accompanied by a considerable reduction in earnings since 2014 (Figure 4, panel b and c). This implies that change in the interest rate coverage ratio in recent years is partly caused by the weak and volatile earnings of the sector. In contrast, the earnings for other sectors with low ICR, and also the ones with moderate ICR, has remained fairly stable since the financial crisis (Figure 4, panel c and d).

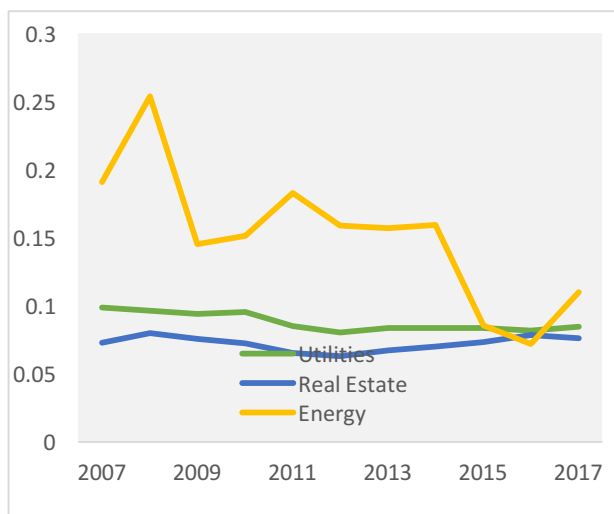
Figure 4: Interest coverage ratio, leverage and earning dynamics

Panel a: Debt to Equity Ratio (Vulnerable Sectors)

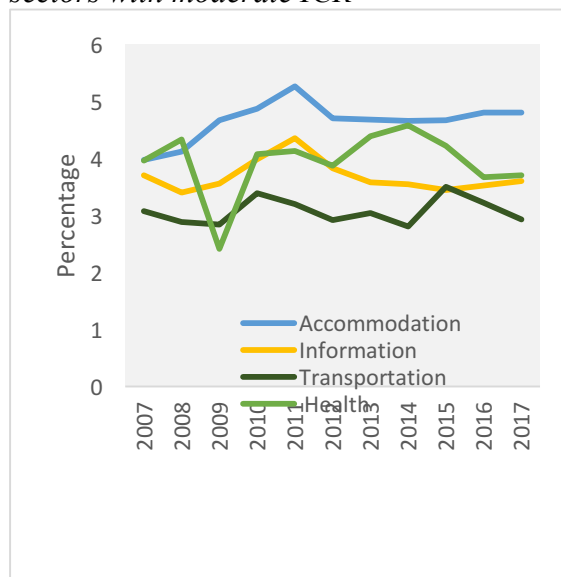


Panel b: interest coverage ratio (EBIT/Interest Expenses) for highly leveraged sectors

Panel c: Earning (as the ratio of assets) for sectors with low ICR



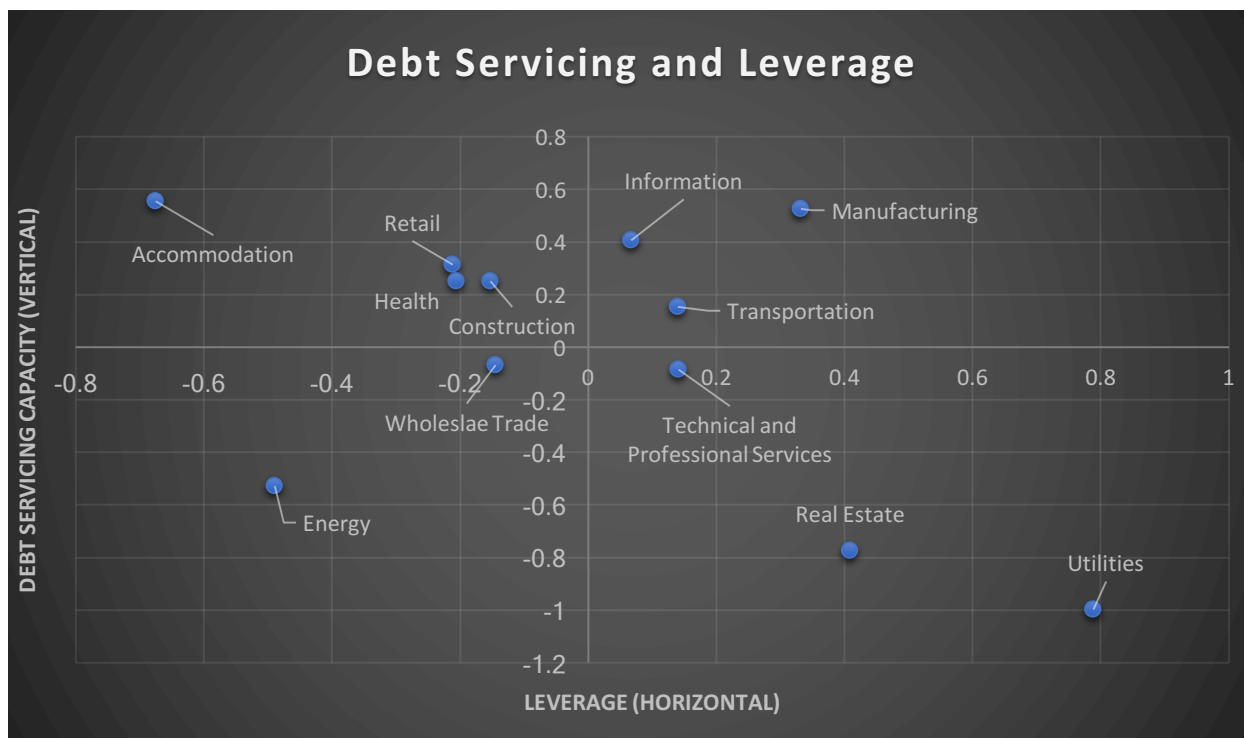
Panel d: Earning (as the ratio of assets) for sectors with moderate ICR



To sum up, developments in corporate leverage and debt servicing capacity have attracted considerable attention by regulators, particularly in light of the financial market’s dramatic restructuring in the aftermath of the introduction of the Dodd-Frank Act. Figure 5 compares the levels of leverage (measured as debt to equity) and debt repayment ability (measured by interest coverage ratio) the sectors in our sample. The data suggest that the high leverage ratios of firms in real estate, and utilities relative to other industries have made them more exposed to an increase in borrowing costs. In the literature, there is no universal agreement on the implications of leverage on financial positions of corporates.²⁰ However, there are fears that the sheer size of corporate leverage- if accompanied with impaired ability to service the debt- could set the stage for an unprecedented deleveraging process.

Figure 5: Interest coverage ratio and Leverage, 2017: Q4

²⁰ In the literature, there is no universal agreement on the implications of leverage on financial positions of corporates. Houston and James (1996), Johnson (1997), Krishnaswami et al. (1999), Cantillo and Wright (2000) and Denis and Mihov (2003) interpret high leverage as a reputational factor; highlighting the ability of the corporate borrowers to attract external lenders successfully. Esho et al. (2001), however, argues that higher leverage signals financial distress and there is a negative relationship between the issuance of debt and corporates’ financial position.



Understanding Macro-Financial Linkages and Debt Sustainability: Corporate Balance Sheet Weaknesses and Strengths Matter

The interaction between the financial position of corporates and macroeconomic fluctuations is an important channel through which a financial crisis transmits into the real economy.²¹ Thus, if the corporate sector enters a financial crisis with high leverage, it will intensify both the depth and duration of the subsequent recession.²² However, understanding the sustainability of corporate leverage is complex as there are many kinds of debt, asset, and capital structure. A corporate-specific balance sheet approach provides a useful analytical framework for exploring how balance sheet dynamics contribute to macro-financial vulnerabilities. In the case of nonfinancial corporates, a sector's ability to repay its debt in times of financial depends on mismatches on several dimensions:

²¹ Claessens and Kose (2018).

²² Claessens and Kose (2018).

Debt structure, which encompasses different features such as interest rate, liquidity (investment grade versus high yield) and maturity mismatches of different debt instruments.²³ For instance, a high level of short-term debt can make external investors reassess their willingness to lend to a corporate sector. This could lead to a sector unable to service its debt commitments if creditors decline to roll over debt. It also makes the sector more vulnerable to rise in the interest rates.

Capital structure, which highlights the differences in the use of debt and equity financing.

Traditionally, a heavy reliance on debt rather than equity financing could expose the sectors to the risks from revenue shocks.

And solvency mismatches are where assets, including the present value of revenue streams, are insufficient to cover liabilities.

By examining balance sheet stresses along these dimensions, this paper supplements the measures are taken above to examine the systemic risk that sectors' financing profiles might carry.

Debt structure: Interest rate, maturity, and liquidity structure

Overall, changes in the composition of debt instruments in recent years has reduced the risks of facing debt service problems in our sample. In particular, two outstanding trends occurred after the crisis. First, corporates significantly shifted their financing towards corporate bond issuance – instruments with mostly fixed coupon- from banks loan- which mostly have floating rates. Second, the share of long-term debt has increased. Higher borrowing at longer maturities lowered refinancing risk - the risk of not being able to replace maturing debt- and the plunge in the share of variable interest rate debt reduces duration and interest rate exposure –the risk that the average interest rate on outstanding debt increases. Yet, this aggregate analysis masks some of the risks isolated in some sectors. Corporates in utilities, real estate, transportation, and wholesale trade sectors have the most risk structure due to their reliance on loans with variable rates. Information and manufacturing sectors are also vulnerable because of their share of maturing debts in the next two years. The construction sector follows them due to its reliance on high yield bonds.

²³ Maturity mismatch refers to a gap between liabilities due in the short term and the long term.

Results of our survey are presented below in Table 3:

Table 3 Amount Outstanding of Nonfinancial Corporate Bonds As of March 2018

Sectors	Investment Grade	Fixed Rate	Maturity Structure			
			(2028+)	(2023-2027)	(2020-2023)	(2018-2019)
Accommodation	88.9%	100.0%	18.6%	67.3%	9.1%	5%
Construction	29.6%	100.0%	17.5%	21.8%	36.7%	24%
Energy	89.9%	96.8%	53%	21.4%	18.9%	6.7%
Health	88.2%	99.9%	39.0%	22.7%	14.5%	23.8%
Information	92.3%	88.9%	33.7%	20.0%	10.6%	35.7%
Manufacturing	96.9%	95.1%	32.0%	22.2%	15.8%	30%
Real Estate	84.5%	99.4%	29.2%	44.2%	13.6%	13%
Retail Trade	96.4%	99.2%	38.8%	23.1%	23.8%	14.3%
Technical and Professional	86.8%	95.3%	16.0%	46.9%	14.6%	22.5%
Transportation	87.9%	94.2%	45.9%	25.1%	7.7%	21.3%
Utilities	83.4%	98.8%	31.4%	25.5%	11.3%	31.8%
Wholesale Trade	18.2%	99.8%	6.2%	6.5%	83.3%	4%
All Sectors	78.6%	97.3%	31.5%	24.1%	18.9%	25.4%

This shift in the composition of corporate happened at the start of the 2008 financial crisis, characterized by the low cost of debt financing and central banks' quantitative easing. As of 2018, corporate bond made up at least 60 percentage points of all outstanding long-term debt raised by most sectors in our sample (Table 3). Yet, increased dependence on bond issuance made corporates more vulnerable to creditors' willingness to allow borrowers to roll over their debt during the period of the credit crunch. As Chui et al. (2014) noticed, "If investors were to suffer a significant loss of appetite, issuing firms might face difficulty in rolling over their outstanding debts, particularly if shifts in risk appetite coincide with a fall-off in projected earnings."

The state of borrowers' balance sheet affects firms' access to the capital market and external financing.²⁴ A few empirical studies are examined why some corporates choose to borrow from public debt markets- such as bonds- while other firms rely on loans.²⁵ The typical risk from an excessive level of any debt- be private and public - is the exposure to fluctuations in short-term interest rates. After the crisis, corporates shifted the composition of their debt towards bond financing. However, this shift from loan financing to bond financing implies that most of the potential exposures would be due to rolling over maturing debts, rather than from changes in short-term rates, as about 98 percentage points of outstanding corporate bonds have a fixed coupon (Table 3).^{26,27} The observed shift in the composition of corporate debt and the evolution of the reliance on corporate bonds relative to bank loans implies that these firms probably may not experience difficulties in the face of increasing rates.

This aggregate analysis comes with caveats. First, the share and amount of outstanding bonds to loans and fixed- to floating-rate debt are assumed not to be affected by the changes in the federal funds rate.²⁸ Second, it provides no insights on sectoral differences. There is considerable heterogeneity among sectors, as not all sectors are in the same position to issue debt, nor do they face the same risks or cash flows. We find that firms in the utilities, wholesale trade, and real estate and to some extent transportation sectors seem to be vulnerable to changes in interest rates as loans constitute a significant part of their debt (Table 3). Bank loan constitutes around 80 percent, 70 percent and 60 percent of their total long-term debt respectively. About 85 percent of loans issued by these corporations have floating rates.²⁹ This implies that their interest expenses would rise in tandem with changes in short-term interest rates. The modest vulnerability found in the aggregate level masked essential exposures isolated in some industries.

²⁴ Claessens and Kose (2018).

²⁵ This is in contrast with the extensive literature on corporates capital structure (See for instance Tirole (2006)).

²⁶ Here the assumption is that assuming corporates maintain the same debt composition.

²⁷ Based on authors estimations and data from Thomson Reuters.

²⁸ This is a well-documented assumption in the assessment of potential increase in corporate debt interest rates from changes in short term rates. See for instance Correa et al. (2017), among others.

²⁹ Based on authors estimations and data from Thomson Reuters.

As mentioned earlier, most of the potential exposures would be due to rolling over maturing debts, rather than from changes in short-term rates. Against this backdrop, a key priority for identifying the interest rate exposure is to assess factors such as maturity and liquidity (investment grade versus high yield) structure of the outstanding debt. Once taking different maturity into accounts, not all sectors with substantial reliance on bond financing are equally vulnerable to roll-over their debt. Such potential vulnerabilities appear to be relevant for firms in the information and manufacturing sectors. These sectors are more exposed to changes in interest rates in the next two years as more than 30 percent of all outstanding bonds, investment grade, and high yield, held by these sectors mature in less than two years.^{30,31} In contrast, sectors such as accommodation, energy, and wholesale trade have less than 10 percent of their bonds maturing in the next two years. This implies that, in aggregate, only a moderate portion of the outstanding corporate bonds for these sectors would be directly exposed to the increase in interest expenses in the next two years. This sectoral heterogeneity has important consequences for the supply of external financing to these sectors and hence the real economy.³²

The liquidity of the bonds- investment grade vis-a-vis high yield- affects the exposure of the creditors to the changes in macroeconomic condition. We examine the liquidity risks of sectors by measuring the size of the high-yield bond and investment grade bond against the amounts of total debt outstanding.³³ The holders of high-yield bonds are more exposed to a rise in interest rates as any such increase affects the capacity of the issuers of high-yield to repay their interest burden more than investment grade.³⁴

The market share of high-yield bonds in the overall corporate bond market in the U.S. is considerably smaller than the investment grade bond market. Nearly 80 percent of bonds in most sectors are liquid, investment grade bonds. However, illiquid, high yield bonds constitute around

³⁰ The data is as of March, 2018.

³¹ More than 30 percent of the corporate bonds in utilities sector also will mature in less than two years. However, corporate bond in total only constitutes 10 percent of firms' long-term debt in this sector.

³² De Fiore and Uhlig (2015).

³³ The diffusion of debt securities, and therefore also high-yield bonds, can be measured in a few ways, including the amounts outstanding, gross or net issuance, the number of issuers, and the number of banks or other investors taking part in the public debt market.

³⁴ The investment grade bonds in general have lower coupons than high yields. They are also more liquid and more easily tradable in the market.

70 and 80 percent of the corporate bonds issued by construction and wholesale trade sectors respectively. The heavy reliance on the issuance of below-investment-grade rated, illiquid securities in these sectors implies that creditors that are holding the debt issued by construction and wholesale trade sectors are more exposed to the changes in financial conditions of these sectors. Creditors' exposures to corporate leverage have significant consequences for the whole financial system as debt repayment by the borrowers is vital for the survival of the creditors- mostly banks and other financial market participants.³⁵

Taking all different characteristics of debt composition- fixed versus floating rate, maturity, and quality of issued debt- into account, the data suggest that overall, firms in utilities, real estate, transportation and wholesale trade sectors- for their reliance on loans with floating rates- and information and manufacturing sectors- for their share of maturing debts in the next two years- are the most exposed sectors to changes in interest rate while construction and wholesale sector- for their reliance on high yield bonds- follow them. The sharp reliance on bond financing of construction sector following the crisis, as well as its high share of below-investment-grade rated bonds, makes construction sector of particular interest. However, the existence of this avenue of corporate finance funding is particularly common for sectors - such as construction - with a large number of small and medium-sized firms that are not able to lend from banks or borrow on flexible condition.³⁶

Capital Structure: external and internal financing

The evolution of a firm's capital structure provides some insights into assessing corporate debt vulnerability. Thus far, there is no widespread agreement on how capital structure affects leverage.³⁷ When corporations adopt a financing strategy based on the use of debt finance, they are reallocating some expected future earnings away from equity holders in return for cash up

³⁵ De Bondt and Ibáñez (2005).

³⁶ De Bondt and Ibáñez (2005).

³⁷ One of the most popular views suggest that issuing debt, instead of equity, to finance new investment projects would communicate the information to the market about the quality of the new projects. This new information increases the quality of the new debt and effectively reduces relative costs of issuing new debts. This reduction in the asymmetric information about the new investments has important implications for capital structure and firms' leverage. For more details, see Grenadier and Malenko (2011).

front.³⁸ The factors that drive this choice remain obscure regardless of a vast literature and decades of empirical studies. External financing – a choice between debt and equity- and internal financing- use of firms’ resources such as retained earnings- are essential components of the capital structure. In this study, at least three sectors- real estate, utilities, and accommodation- are identified as extensively relying on debt financing compared to the economy as a whole. Firms in real estate and energy sectors seem to also have a very low appetite to reinvest for their future growth– a measure of using internal funding.

Corporates’ decision to become levered engages in a tradeoff between the costs and benefits of debt financing relative to other options such as internal financing. In this study, the use of internal financing strategies – such as growth option- is captured by the equity reinvestment ratio.³⁹ The equity reinvestment ratio measures the proportion of earnings reinvested for future growth instead of paying the shareholders. The sectors with higher ratio – retail, manufacturing, and health- are projected to have more stable growth and return on equity in the future (Table 3). According to classic capital structure theories, corporates become less risky and reduces the expected bankruptcy costs if they exercise the growth (reinvestment) option.⁴⁰ This would lead to the reduction in the costs of debt issuance and as a result the corporate’s leverage ratio would also decline in the future. In addition, from the perspective of managers, retained earnings are a better source of financing that external financing unless it is a low-quality firm.⁴¹

In contrast, firms in the real estate, energy, and technical and professional sectors have negative reinvestment ratio. As companies grow and mature, they tend to shrink their net new investment in operating capital. Yet, a negative rate still could imply that these industries have downsized the size of their working asset over time. This is particularly problematic if negative reinvestment ratio coupled with a high level of indebtedness as is the case for real estate and technical and professional sectors. As Jensen and Meckling (1976) and Myers (1977) argue, corporate managers have incentives to underinvest in future growth opportunities when corporate

³⁸ Goyal and Frank (2009)

³⁹ Equity reinvestment ratio is calculated as ((Capital Expenditures - Depreciation) - Change in non-cash Working Capital - (Principal repaid - New Debt Issued))/ Net Income. It can be greater than 100% (for corporates that are issuing new stocks and investing it back into the business) and negative.

⁴⁰ See Trade-off model of capital structure.

⁴¹ See Pecking Order Theory.

treasurers know that firms hold risky debt outstanding. In this scenario, managers act to maximize present equity value rather than investing in future growth. The decrease in the size of industry assets attributable to these sub-optimal investment decisions is an important component of the agency cost of debt.⁴² This has critical negative implications for the future repayment capacity of the firms in real estate and energy sectors.

To understand the extent of external finance, a fixed asset to shareholders' equity ratio is employed.⁴³ This ratio is used to capture the relative exposure of debt holders and shareholders to the performance and profitability of the corporates. In general, for most sectors, this ratio is above one.⁴⁴ This implies that stockholders' equity is lower than the corporates' fixed assets and firms in these sectors rely on debt to finance their activities (See Table 3, appendix). Yet, compared to other industries, firms in real estate, utilities, and accommodation industries are more reliant on debt issuance to finance their assets.⁴⁵ This is not surprising as these sectors are among the most indebted sectors under the standardized metrics.

There is no unified model of leverage currently available that can assess the ultimate effect of capital structure on debt. Many models of capital structure have been put forward. Still, the literature has not come up with a concrete empirical basis to differentiate the strengths and weaknesses of the main theories. Yet, only a number of theories have a lot of supporters. Notably, most corporate finance textbooks mention the "trade-off theory" in which tax policy and bankruptcy costs are fundamental determinants of capital structure. Myers (1984) suggested the "pecking order theory." In this theory, there is a financing hierarchy of retained earnings, debt, and then equity. More recently, the idea that firms involved in "market timing," or choosing

⁴² Billett, King, and Mauer (2007).

⁴³ A company's fixed assets are the long-term, tangible, component that is used to generate income; the return on fixed asset is a firm's profitability.

⁴⁴ The ratio of fixed asset to shareholder's equity measures the contribution of stockholders and the contribution of debt issuance in the fixed assets of the corporate. The inverse of this ratio shows the proportion of assets that is funded by debt. If the ratio is more than 1, it means that stockholders' equity is less than the fixed assets and the firm is relying on debt financing as a portion of fixed assets. If the ratio is less than 1, it means that stockholders' equity is more than the fixed assets and the equity financing is used not only for the fixed assets but also a part of the working capital.

⁴⁵ "There is an implicit assumption that the number of shares outstanding has remained unchanged. This is because the ratio measures the total amount of equity. The total amount of equity can be increased by issuing shares at lower prices to the public or to the promoters. However, this may not be a desirable scenario since more shares means a loss to individual shareholders."

to finance their debts externally based on perceived market conditions, has become widespread. Finally, agency costs, which arise when there is a conflict of interest between the needs of the principal and that of the agent, lurk in the background of much of the debate in the literature. These theories often work better with the trade-off model; when broadly interpreted.⁴⁶

The cost of financial distress generated by excessive debt levels depends on firms' asset structure- the types of assets that a firm has.⁴⁷ The two major risks corresponding to firms' asset composition are low return and illiquidity. In this paper, the return on asset is captured by profitability- a measure of income dynamics- while the quick ratio and asset tangibility ratio are used to capture the scale of asset liquidity. Further, debt is high even when assets are accounted for- an indication of possible pressure to deleverage. Profitable and liquid assets can reduce the risks of a disorderly adjustment during the deleveraging process. The data suggest that firms in utilities sectors are the most exposed to asset risk as they have less liquid and low profitable asset structure. Real estate and energy sectors also show signs of vulnerabilities as they are among the least profitable sectors despite possessing a high share of tangible assets. The nature or quality of assets held by firms could either strengthen or weaken corporates' resilience against external shocks to service their debt.⁴⁸

Asset structure, such as its liquidity and profitability, is a major determinant of the leverage ratio and the ability to repay.⁴⁹ Measures of asset liquidity that are used in this paper are quick ratio and asset tangibility ratio. The quick ratio measures short-term solvency - the ability of the firm to meet its debt requirements as they come due. Utilities, transportation, and retail have the lowest quick ratio. Low quick ratios often indicate the weak position in holding liquid assets. Yet, a too high quick ratio may indicate that the firms' treasurer is holding too much cash in reserves.⁵⁰ In this analysis, the sectors with the highest quick ratio, namely information,

⁴⁶ Goyal and Frank (2009).

⁴⁷ If a firm retains large investments in tangible assets, it will have smaller costs of financial distress than firms that rely on intangible assets (Daskalakis and Psillaki, 2009).

⁴⁸ Chui, Fender and Sushko (2014).

⁴⁹ For instance, Berg and Gider (2016) find that one single factor- asset risk- is able to explain up to 90% of the difference in leverage ratios between banks and non-banks over the 1965-2013 period. They also run the same experiments for the non-financial corporates in different sectors.

⁵⁰ It may also mean that the company has a high accounts receivables, indicating that the company may be having problems collecting on its account receivables.

manufacturing, and health also hold the highest cash as a share of their total assets (Table 3 and Figure 6). Amongst these sectors, information and health also have the highest growth in their cash holding in the period following the crisis (Figure 6, panel b). This is important as corporate cash holding is one indicator that some corporate treasurers may have tempted into more speculative activities, rather than raising business investment, due to low volatilities.⁵¹ Nevertheless, the overall scale of increase in cash holding is difficult to judge. Even normal operations by the treasurers could significantly lead to a substantial rise in deposits at banks (e.g., as a result of time-to-build and similar constraints). To better understand the ability to repay, it is essential to consider asset characteristics such as liquidity.

Tangible assets are equally valuable in understanding the risks associated with corporate leverage. In particular, they are essential to assess debt service capacity as these assets are easier to collateralize and suffer a smaller loss of value when firms go into distress.⁵² Our results in most cases confirm a well-documented prediction by trade-off theory that tangible assets are positively related to corporate leverage.⁵³ Consistent with this literature, sectors such as the technical and professional industries that have low leverage are also the sector with the lowest share of tangible assets.⁵⁴ The only exception is utilities- this sector has high leverage and low tangible asset ratio. These theories suggest that corporates with more tangible assets have higher optimal leverage ratio as tangible assets can be reused as collateral, which mitigates both financial distress costs and agency costs of debt (e.g., Stulz and Johnson, 1985). Further, as firms tend to match the maturity of assets with a maturity of liabilities, tangibility would be positively related to leverage (Koksal et al., 2013).

⁵¹ Chui, Fender and Sushko (2014).

⁵² However, using tangible asset ratio has its accounting limitations. There are inconsistent accounting for investment made in intangible assets. For instance, accountants seem to take the distinction between capital expense and operating expense into account when accounting for tangible assets for manufacturing. They generally put investment in plant, equipment and buildings in the capital expense and allocate labor and raw material as operating expense. Any expense that generates benefits over several years is considered as a capital expense while expenses that create benefits only in a specific current year are operating expenses. However, most of the capital investments by firms in information and health sector are in R&D that accountants account as operating expenses rather than capital expenses.

⁵³ Titman and Wessels (1988).

⁵⁴ In contrast, firms in construction, information and technical and professional services sectors that have low tangible asset ratios in our sample have low debt ratio.

Profitability- an indicator of return on asset- is an essential determinant of firms' leverage as is reflected in debt to income ratio.⁵⁵ Profitability is calculated as the ratio of earnings to a firm's total assets. Not surprisingly, the sectors with the lowest profitability- utilities, energy, and real estate- are amongst the most levered sectors too. Still, there are vulnerabilities that are isolated in firms in the utilities sector that are not reflected in standard ratios. This sector seems to have the riskiest asset structure- compared to other levered sectors- as it has both poor liquidity and profitability measures. This vulnerability could undermine utilities' sector ability to refinance its debt- even compared to other leveraged sectors- and put further pressure on its debt repayment capacity. Prior empirical studies document the relationship between debt financing and firms' asset structure.⁵⁶ Their findings confirm that from a lender's perspective, a corporates' ability to service its debt is positively related to its ability to generate profit and owning assets that can be used as collateral during financial distress. A poor asset structure changes creditors' willingness to renew their lending or lend new funds, to those firms.

There is no consensus on the threshold at which debt levels start to trigger deleveraging. Yet, an extensive literature has established that highly indebted borrowers will sooner or later decrease their leverage as they are unable to service their debt and can no longer borrow.⁵⁷ Profitable and liquid assets can reduce the risks of a disorderly adjustment and help corporates to conduct a smooth deleveraging process.⁵⁸ Our study finds that firms in utilities, real estate, and energy are the least profitable sectors. In addition, firms in the utilities sector seem to have riskiest asset structure, compared to other sectors, by having low tangible asset ratio as well as low profitability. This implies that firms in the utilities sector probably face higher risks of a disorderly adjustment during the deleveraging process.

⁵⁵ Debt to income ratio is a popular measure of leverage.

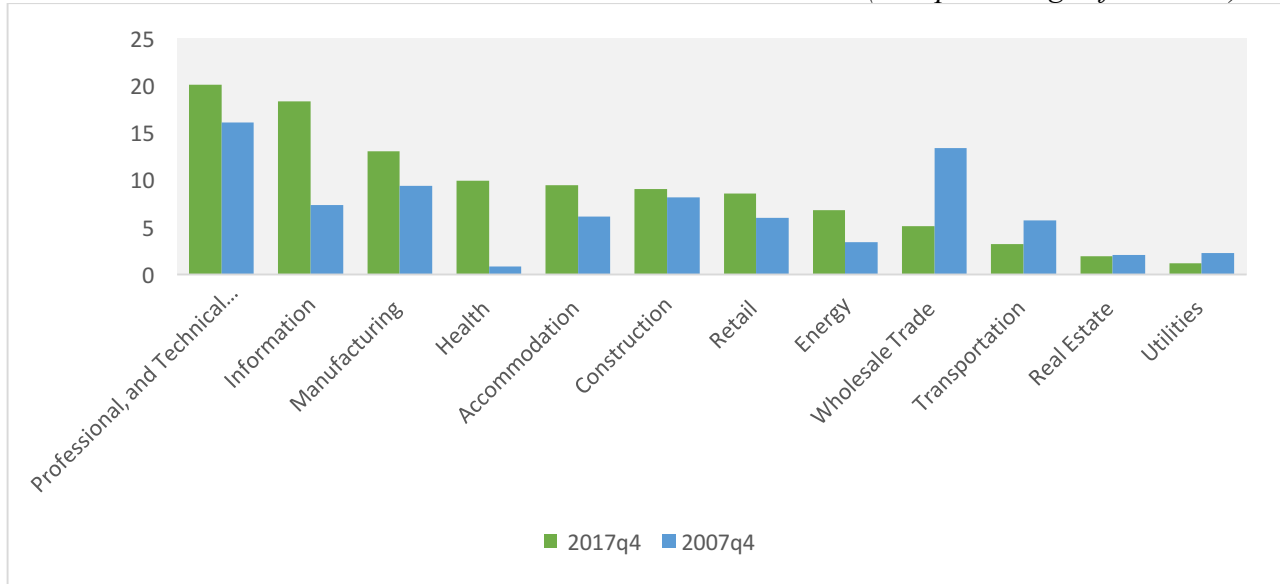
⁵⁶ Houston and James (1996), Johnson (1997), Krishnaswami et al. (1998), Cantillo and Wright (2000) and Denis and Mihov (2003).

⁵⁷ Researches have studied the impact on growth not only for private, but also for public, debt (see, for example, Krugman 1988; Sachs 1989; Cecchetti, Mohanty, and Zampolli 2011; Baum, Checherita-Westphal, and Rother 2013; and Reinhart and Rogoff 2010).

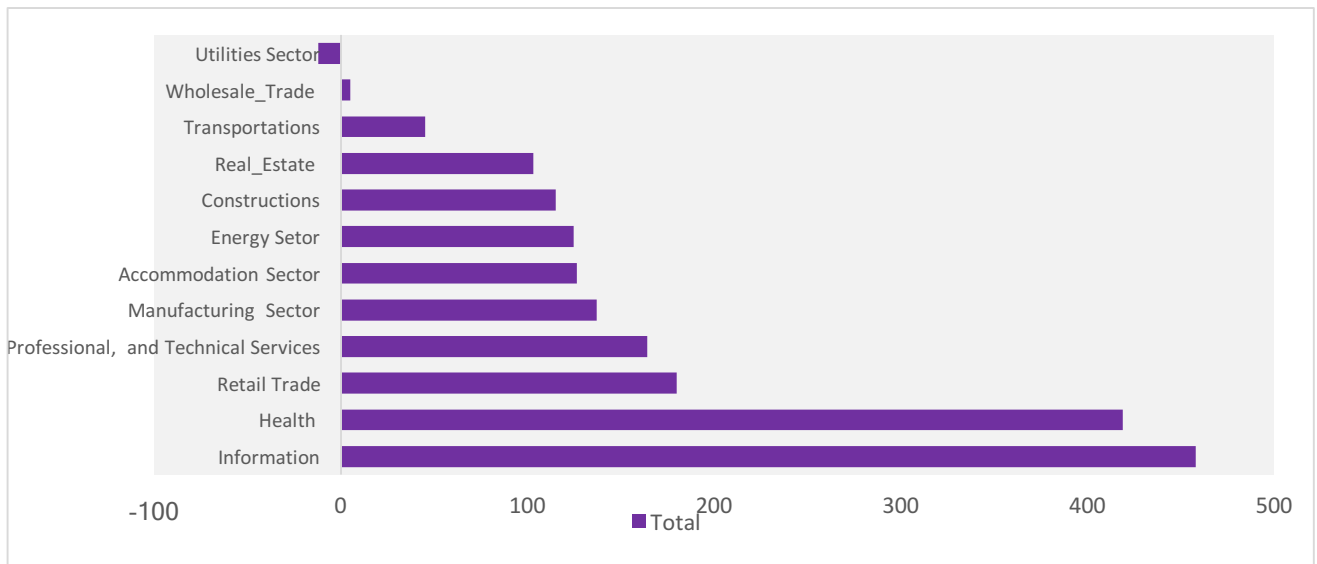
⁵⁸ Rajan and Zingales (1995).

Figure 6: corporate cash holding

Panel 1: accounts receivable and cash and short-term investments (as a percentage of the asset)



Panel 2: Change in cash holding (%; 2007q4-2017q4)



Some Sector Specific Features

Given the prevailing role that housing played as a catalyst to the crisis, it is important to better understand the determinants of the debt dynamics and leverage in the recent cycle. In this study, real estate is amongst the most leveraged sectors as is reflected in its volatile debt repayment

capacity. The supplementary indicators reveal additional vulnerabilities in the composition of debts it holds, its choice of capital structure and quality of its assets. Most of the sector's debt is composed of loans with floating rates. Further, it has negative equity reinvestment ratio- an indicator that shows the firms in this sector are not reinvesting for their future growth. The return on its assets – captured by profitability – is amongst the poorest.

Some sector-specific characteristics help explain these observations. For example, real estate investments, by their nature, have low liquidity and high tangibility. Real estate is tangible, and the firms can have a certain degree of physical control over their assets. Therefore, the assets can be used as collateral during financial distress. In contrast, except for real estate securities, there is no public exchange for trading the real estate. This makes real estate sector investments less liquid by nature.

Further, the real estate industry is on an accelerating disruption curve in recent years highlighted by rapid shifts in tenant dynamics, customer demographic and technological changes. These developments deteriorated the performance of the industry as business productivity has not caught up with these technological improvements and tenant dynamics yet.⁵⁹ These ecosystem developments have adversely impacted the financial position of firms in this industry in recent years.⁶⁰ This is because income return from real estate is directly associated with the capacity to rent the properties as well as the ability of firms to reduce the operating costs.⁶¹ Firms' ability to generate a higher return, therefore, depends on its ability to meet demand. In weaker markets characterized by an oversupply of vacancies or low demand- firms will struggle to raise their profitability.

Further, our data suggests, investment in the industry has been decreased in recent years despite some improvements in the industry's fundamentals such as positive rent growth and net absorption and stable vacancy rates across different types.⁶² At least three factors could contribute to this phenomenon: first, the market could be discounting these improvements in the

⁵⁹ Josh Bersin, Bill Pelster, Jeff Schwartz, Bernard van der Vyve (2017).

⁶⁰ Deloitte real estate sector outlook (2018).

⁶¹ Real estate return comprises of two elements: returns from capital appreciation and income return.

⁶² Q2 2017 Office and Industrial Market Beat, Cushman & Wakefield; US Retail Outlook Q2 2016 and Q2 2017, JLL.

industry's fundamentals for the broader macroeconomic trends, such as rising interest rates, tightening lending standards, and perceived heated property valuations. Second, reinvestment in the sector is likely being impacted by the influence of market trends that are affecting tenants. And third, the rise in investor activism perhaps created a delay in making important investment decisions. To put this in perspective, Yeatts (2017) estimates that the number of activist investors in the U.S. capital market increased to 23 in 2016 compared with just 3 in 2010.

By several measures, the utilities sector has the most vulnerable financial positions to service their debt. This could be the case as the utilities sector is going through the restructuring period. There has been a shift a mindset among consumers and companies to evolve their energy management practices towards using more green energy. These developments include the use of renewable energy and technology to manage and reduce consumptions.⁶³ As a result, businesses and residential consumers have achieved a more substantial reduction in electricity usage. Residential consumers aimed at reducing their electricity consumption and support green power. Businesses too upheld their commitment to obtaining more energy from renewable energy while at the same time decreasing their energy costs.

The Energy sectors' reinvestment ratio- a measure of future growth- and profitability are lower compared to other sectors. These characteristics are coupled with low earnings for this industry. Two current major trends in this industry can explain our findings: 1) since June 2014, there has been a major extended oil price downturn as a result of supply and demand imbalances. This trend has been reversed recently as the U.S. as falling US production helped narrow the supply-demand gap and cause prices to strengthen.⁶⁴ 2) The falling revenue in this sector has some long-term impacts on the industry's capital allocation. The continued downturn has reduced investors' appetite to invest in complex and capital-intensive projects. This trend has put some shadow on the prospect of growth in this sector. Hence, despite an increase in energy prices and revenue, confidence in big capital projects has not re-established yet. This is reflected in our data through low profitability and low reinvestment in this sector that could significantly undermine the industry's capacity to service its debts.⁶⁵

⁶³ Deloitte energy and utilities management (2017).

⁶⁴ Deloitte, Energy outlook (2016).

⁶⁵ Deloitte, Energy outlook (2017).

Conclusion

Corporate leverage is essential in assessing macro-financial linkages as fluctuations in leverage affects the supply of credit to the real economy.⁶⁶ The concern is that standard debt burden indicators alone might provide an incomplete picture of corporate debt vulnerabilities. The financial structure of corporates- the composition and size of the liabilities and assets on the corporates' financial balance sheet- has been an important factor in determining the sustainability of the debt. This pillar, however, has been missing in most of the analysis of corporate debt by policymakers.

Understanding the evolving composition of corporate debt, its maturity structure, as well as liquidity, is as significant as the total size of the debt.⁶⁷ Corporates with high amounts of floating-rate debt such as loans, or with a high portion of the low-quality debt such as high-yield bonds, are exposed to a dramatic increase in interest rates.⁶⁸ The sharp rise in short-term interest rates could rapidly increase the real cost of debt, especially if a significant share of debt pays interest that is linked to a floating rate. This information, however, cannot be captured through interest coverage ratios. Most of the sectors have increased their reliance on long-term borrowing after the crisis. More importantly, most of the new long-term debt issuance is in the form of issuing investment grade, and fixed rate, corporate bonds. This implies that most sectors are not as vulnerable to changes in the interest rate as is shown by standard measures of leverage.

The standard debt burden indicators are silent on the origins of the vulnerability to debt. However, in examining the vulnerability of the economy to solvency and liquidity risks arising from corporate debt positions a more detailed assessment of the composition of corporate debt and related activity may be necessary. The policy tools that are designed to help prevent the emergence of debt distress in corporate sectors should be built based on three pillars: 1) a standardized, and homogenous, analysis of nonfinancial corporate debt across different sectors, 2) a debt sustainability assessment, including the vulnerability to higher borrowing costs and

⁶⁶ There are several definitions of macro-financial linkages. In this paper, we adopt BIS definition as the two-way interactions between the real economy and the financial sector.

⁶⁷ Debt include both debt securities such as bonds and commercial papers and bank loans.

⁶⁸ Frame and Steiner (2018).

changes in macroeconomic environment and 3) a relevant sector-specific analysis based on sectors' business models. This third pillar is currently missing in most of the analysis of the corporate debt in the U.S. and other major economies. Taking this factor into account would help policymakers to strike a balance between financial stability and economic growth.

Consistent with the standard measures, our data reveals that real estate, energy, and utilities are amongst the most vulnerable sectors when taking a capital structure, debt structure, and asset characteristics into account. However, these complementary sets of measurements give us a more accurate picture of the origins of the vulnerabilities. More importantly, it demonstrates the vulnerabilities hidden in sectors such as construction, information, and wholesale trade. These risks were masked in the more standard assessment of debt sustainability using leverage and ICR ratios as these sectors were amongst the safest industries regarding their financial position.

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Appendix:

Variable Definitions

Vulnerability	Financial Structure	Variable	Description
Indebtedness and Leverage		Debt Accumulation	Percentage change in the cumulated total debt for each sector from 2007 q4 to 2017 q4.
		Debt Ratio	The total debt to total assets (total equity plus total liabilities).
		Leverage	Total debt to total equity.
		Debt Overhang	Total debt to EBITDA. ⁶⁹
	Debt Structure	Long-Term Debt to Total Debt	The ratio of total long-term debt to total debt.
		Corporate Bond to Long-Term Debt	The value of total outstanding corporate bond for the sector to the value of total long-term debt.
		Bond With Maturity of less than 2 Years	The share of total outstanding bonds that matures before March 2020.
		Investment Grade as a Share of the Total Bond	The value of total investment grade bonds to total outstanding bonds.
	Capital Structure	Fixed Asset to Equity Ratio	Total fixed assets to total equity. ⁷⁰
Debt Servicing Capacity		Interest Coverage Ratio	EBITDA to interest expenses.
	Cost of Debt	Synthetic Rating	Synthetic ratings are obtained using firms' financial ratios to estimate the cost of debt. ⁷¹
		Spread	The default spreads are achieved from traded bonds data. Adding that spread to a risk-free rate would produce the pre-tax cost of borrowing for a corporate.
	Capital Structure	Equity Reinvestment Ratio	$(\text{Net Capital Expenditures} + \text{Change in Working Capital}) / \text{EBIT} (1-t)^{72}$
	Asset Quality	Profitability	Operating income to total assets.
		Quick Ratio	Cash and accounts receivables to current liabilities. ⁷³
		Tangible Asset Ratio	Fixed assets to total assets. ⁷⁴

⁶⁹ EBITDA is earnings before interest, taxes, depreciation, and amortization.

⁷⁰ The contribution of equity and debt financing in the fixed assets of the company. It is computed by dividing the fixed assets by the stockholders' equity.

⁷¹ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm

⁷² Captures the proportion of net income that is reinvested back into the operating assets of the corporate.

⁷³ Cash also includes cash equivalents and short-term investments.

⁷⁴ Fixed asset includes property, plant, and equipment.