Hedging and Net Worth: Evidence from Purchase Obligations*

Alvaro Boitier†
Babson College

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Abstract

Manufacturing firms depend on commodity inputs for their production processes, which leads them to engage in hedging strategies to mitigate the impact of commodity price fluctuations. In particular, they regularly employ supply contracts that feature fixed prices, which are also known as purchase obligations in the literature. This paper documents a weak correlation between financial hedging and net worth for publicly traded companies in the manufacturing sector in the United States. These findings remain robust even when accounting for various firm characteristics, including size and commodity exposure. Notably, this empirical evidence challenges contemporary corporate hedging theories that emphasize collateral as a crucial factor that influences hedging decisions.

Keywords: risk management, net worth, corporate hedging, purchase obligations

JEL Codes: G30, G32, L60

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†aboitier@babson.edu

1 Introduction

Standard theories of risk management rely on collateral as a decisive factor in shaping hedging decisions (Rampini and Viswanathan (2010) and Rampini and Viswanathan (2013)). According to these theories, companies with substantial net worth can pledge it as collateral for both hedging and financing activities. When collateral is scarse, financing tends to take precedence over hedging, since firms prioritize investment. This implies that firms with large net worth should have enough resources to pledge collateral for hedging and financing, and therefore hedging decisions should be increasing in net worth.

However, empirical findings on this relationship are inconclusive. Rampini et al. (2014) (RSV thereafter) find a positive relationship between net worth and fuel hedging for airlines. Conversely, Guest (2021) reveals an absence of correlation between net worth and hedging activities with respect to interest rates and foreign exchange in the financial sector.

In this study, I explore the connection between net worth and financial hedging in the manufacturing sector, using a unique dataset focused on commodity hedging among U.S. manufacturing firms. The measure of hedging I adopt in this context involves purchase obligations, which are forward contracts for acquiring raw materials at fixed prices, in alignment with previous studies (Almeida et al. (2017) and Boitier and Pustilnik (2023)). These contracts serve as a risk-management strategy for manufacturing firms against unpredictable commodity price fluctuations.

In this paper, I leverage the panel data structure of the database to study the correlation between financial hedging and net worth. The database includes all public U.S. manufacturing firms between 2003 and 2018. A common drawback of empirical papers in this literature is the lack of quantitative data on financial hedging that does not rely on categorical variables (for example, hedging or not).

To overcome this issue, I construct a continuous measure of hedging that allows me to isolate the correlation between net worth and hedging. In particular, I normalize 1-year future purchase obligations by the costs of goods sold, which constitutes the expected materials hedged ratio. A large increase in commodity prices will have a more muted effect on firms that use these contracts, because a sizable share of their material purchases are at fixed prices. Furthermore, consistent with the literature, I construct several measures of net worth using accounting statements and market value. I then proceed to estimate a variety of econometric models to test the correlation of net worth and financial hedging. Despite these efforts, the results of my econometric models do not reveal a positive relationship between net worth

and financial hedging.

In the final section of the paper, I examine the differences between airlines and manufacturing companies to uncover the reasons behind this empirical finding. Manufacturing companies, in particular, possess significantly greater net worth than to airlines. My analysis reveals a saturation point regarding the extent to which additional net worth can enhance hedging activities. Once firms achieve sufficient net worth to maintain their optimal investment and risk-management levels, further increases in net worth do not contribute to expanding these activities.

Related Literature. This paper is connected to three strands of the literature. First, empirical studies have found mixed results regarding the relationship between net worth and financial hedging, as I briefly explained in the introduction (see Rampini et al. (2014) and Guest (2021)). In particular, the former relies on hand-collected data on jet fuel forward contracts for airlines in the U.S. The authors leverage the fact that firms report an expected share of future fuel expenditures hedged in their annual reports. Following their econometric estimations, RSV conclude that firms with higher net worth hedge more, consistent with theoretical papers (Rampini and Viswanathan (2010) and Rampini and Viswanathan (2013)). Moreover, Ferriani and Veronese (2022) revisit this relationship for oil producers in the U.S. using hand-collected data on risk-management practices and also find empirical evidence in line with the previous papers.

On the other hand, Guest (2021) uses a similar empirical design for firms in the financial system in the U.S. Using Call Reports from financial institutions, Guest constructs measures of hedging foreign exchange and interest rates shocks and proceeds to estimate several econometric models, in which net worth in this sector is defined as a linear combination of book and market value variables[1]. Unfortunately, the results fail to show a positive relationship between net worth and hedging. In this paper I provide evidence regarding the fact that net worth does not imply more financial hedging, at least for the manufacturing sector. Therefore, this result is closer that of Guest.

Second, this paper leverages a similar database used in recent papers on risk management. The purchase obligations database was first introduced by Almeida et al. (2017) who document that these supply contracts are in fact hedging instruments, because firms replace them with other derivatives when they become available. Boitier and Pustilnik (2023) measure the contribution of the use of these contracts in dampening the negative consequences of commodity price shocks at firm level. They find that a median firm using these contracts has

[1]In particular: Market cap, net income and dividends (all three normalized by assets) and log assets.

a 10% lower exposure to commodity price shocks, compared with non-users. Finally, Moon and Phillips (2020) use this database to study how corporations use purchase obligations to outsource production.

Third, regarding risk management for commodities, Carter et al. (2017) provide a review of commodity hedging. Due to data limitations, most of the literature has focused on commodity producers; for example, oil and gas and gold industries (Tufano (1996); Haushalter (2000); Adam et al. (2017), among others). Only a small number of recent papers have explored risk management for commodity users in oil refineries and airlines (Mackay and Moeller (2007); Rampini et al. (2014) and Giambona and Wang (2020)). This paper provides extensive evidence on the behavior of firms in a wide range of commodity users, since I focus on all industries within manufacturing.

Layout. The paper proceeds as follows. Section 2 briefly describes the setting and how purchase obligations are used as hedging instruments. Section 3 presents the empirical exercises in which I fail to find a positive relationship between hedging and net worth. Section 4 discusses the differences between airlines and manufacturing companies, and Section 5 concludes.

2 Data and Background

After the Sarbanes-Oaxley Act of 2002, the Securities and Exchange Commission required all public firms in the United States to report contractual obligations that could represent future cash commitments not reported in balance sheets. The main motivation was that this off-balance-sheet information could be instrumental for investors. Included in these obligations are *purchase obligations*, which account for future purchases of materials and capital expenditures that entail fixed prices and/or quantities.[2]

Firms in the manufacturing sector rely on these contracts to hedge against commodity price risk due to the fixed-prices component (see Almeida et al. (2017) and Boitier and Pustilnik (2023)). For instance, Valero Energy Corporation in 2015 reports the following table showing their purchase obligations:

[2]See Lee (2018) for more details on the institutional background.

Contractual Obligations

Our contractual obligations as of December 31, 2015 are summarized below (in millions).

	Payments Due by Period						
	2016	2017	2018	2019	2020	Thereafter	Total
Debt and capital lease obligations (a)	$ 134	$ 966	$ 16	$ 766	$ 1,039	$ 4,517	$ 7,438
Operating lease obligations	430	283	200	143	100	311	1,467
Purchase obligations	14,975	3,204	2,458	1,197	985	4,535	27,354
Other long-term liabilities	—	172	134	131	125	1,049	1,611
Total	$ 15,539	$ 4,625	$ 2,808	$ 2,237	$ 2,249	$ 10,412	$ 37,870

(a) Debt obligations exclude amounts related to unamortized discount and fair value adjustments. Capital lease obligations include related interest expense. These items are further described in Note 10 of Notes to Consolidated Financial Statements

Source: https://www.sec.gov/Archives/edgar/data/1035002/000103500216000069/vloform10-kx12312015.htm, page 46

The company also describes the content of their purchase obligations in their annual report:

Purchase Obligations

A purchase obligation is an enforceable and legally binding agreement to purchase goods or services that specifies significant terms, including (i) fixed or minimum quantities to be purchased, (ii) fixed, minimum, or variable price provisions, and (iii) the approximate timing of the transaction. We have various purchase obligations including industrial gas and chemical supply arrangements (such as hydrogen supply arrangements), crude oil and other feedstock supply arrangements, and various throughput and terminalling agreements. We enter into these contracts to ensure an adequate supply of utilities and feedstock and adequate storage capacity to operate our refineries. Substantially all of our purchase obligations are based on market prices or adjustments based on market indices. Certain of these purchase obligations include fixed or minimum volume requirements, while others are based on our usage requirements. The purchase obligation amounts shown in the table above include both short- and long-term obligations and are based on (a) fixed or minimum quantities to be purchased and (b) fixed or estimated prices to be paid based on current market conditions.

Source: https://www.sec.gov/Archives/edgar/data/1035002/000103500216000069/vloform10-kx12312015.htm, page 47

To construct the database, I use a Python script to download all purchase obligation values from companies' annual reports (10-Ks), which I merge with COMPUSTAT data for other firm characteristics.[3]

2.1 Variable Construction

This section describes the variables used in the regressions below. For Net Worth, I follow RSV and construct four measures of net worth, all based on COMPUSTAT variables. The first two are book value net worth (bv), where I include the dollar amount of stockholder's equity and its ratio over book assets. For the two other measures, I compute the market value net worth (mv) by summing book value assets and closing market price times common shares outstanding minus common/ordinary equity minus deferred taxes minus total liabilities. The last net worth measure is the market value net worth divided by total assets (market value).[4]

[3] See Appendix C for details.

[4] The corresponding variables in COMPUSTAT are: book value Assets (AT), Stockholders' Equity (SEQ), closing market price (PRCC_F), common shares outstanding (CSHO), common/ordinary equity (CEQ), deferred taxes (TXDB), and total liabilities (LT). The Market Value of assets is computed:

For hedging, I construct the ratio of dollar purchase obligations (due in 1 year) over the cost of goods sold. Notice that companies report purchase obligations (PO) for next year, so the ratio of PO over cost of goods sold for the same year would be the expected hedging ratio when firms do not expect major changes in their costs. This arises from a situation in which costs can increase or decrease with the same probability. This becomes the ratio of the intensity of hedging activities for each year-company. [5]

Table 2.1 shows summary statistics of the variables used throughout the paper. I divide the sample according to the total value of PO normalized by the cost of goods sold. Along these lines, a High PO/COGS observation is defined when PO/COGS is in the top tercile of the distribution for a given year. Low PO/COGS contains all other observations.[6]

Table 2.1: Summary Statistics

	High PO/COGS		Low PO/COGS		
	Mean	Median	Mean	Median	Mean Difference
PO / COGS	0.214	0.186	0.012	0.000	0.202***
Net Worth (bv) / Assets	0.512	0.548	0.460	0.505	0.053***
Net Worth (mv) / Assets	0.720	0.762	0.688	0.726	0.032***
Net Worth (bv), billions	1.309	0.308	0.844	0.153	0.465***
Net Worth (mv), billions	4.149	0.781	2.684	0.396	1.465***
log Assets (bv)	6.546	6.421	5.876	5.875	0.670***
log Assets (mv)	7.105	7.002	6.445	6.405	0.660***
Market Cap. / Assets (bv)	0.185	0.181	-0.240	0.152	0.424***
Net Income / Assets (bv)	-0.021	0.039	-0.112	0.021	0.091***
Dividends / Assets (bv)	0.011	0.000	0.008	0.000	0.003***
Observations	6,348		12,698		19,046

Notes. This table shows summary statistics separately for two groups of firms: High PO/COGS are firms in the top tercile of PO/COGS for a given year. All variables are winsorized at the top and bottom 1%. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We can see from Table 2.1 that firms with large PO contracts have more net worth and are larger in size (measured by assets). The mean difference in net worth between groups is statistically significant, although small. For instance, comparing market value net worth over

AT+PRCC_F*CSHO-CEQ-TXDB

[5] See Appendix A for all variable definitions.

[6] This decomposition follows Moon and Phillips (2020).

assets, the difference between a median high PO/COGS firm and a median low PO/COGS is only 0.032 (third row). This would suggest a positive correlation between net worth and hedging; however, the empirical analysis below would prove otherwise.

On average, there is substantial difference between hedgers and non-hedgers. Firms in the top tercile of PO usage average 21% purchase obligations over cost of goods sold, compared with only 1.2% for non-users. Another interesting feature of the data is that around one-third of the firms report having large values of purchase obligations, and two-thirds either do not hedge or use a limited amount of purchase obligations.

Sector Heterogeneity. Table 2.2 shows summary statistics by sector within manufacturing. In general, for most of the sectors PO intensity is close to the overall average. Nevertheless, some sectors display a lower hedging intensity. For example, Textile Mills, Furniture and Nonmetallic Mineral Products. On the other hand, Apparel, Leather, and Primary Metals are among the sectors with the highest average.

Column 1 of Table 2.2 reports the number of companies on each category withing industry. In general, two thirds of the firms report low or none levels of hedging, although in some sector this share is more evenly split (e.g. Apparel) or even there are more firms hedging (Leather).

It should not be a surprise that sectors with high volatile inputs hedge more. This is particular important for Petroleum and Primary metals which have large hedging ratios averages. Miscellaneous manufacturing includes companies that demand gold as inputs (e.g. jewelry).

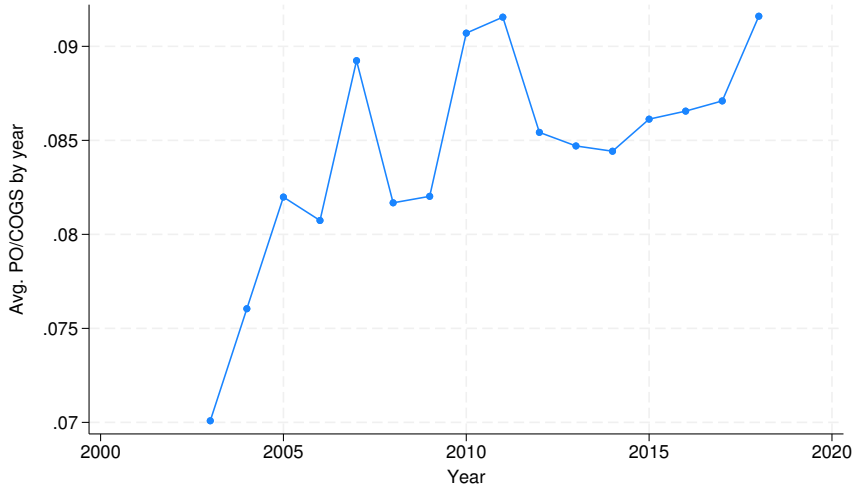
Table 2.2: Sector Statistics - PO/COGS

	# firms - High PO/COGS	Mean High PO/COGS	# firms - low PO/COGS	Mean - low PO/COGS
311-Food Manufacturing	52	.209	80	.018
312-Beverage and Tobacco Manufacturing	23	.179	37	.019
313-Textile Mills	4	.134	11	.007
314-Textile Product Mills	0	.	3	.022
315-Apparel Manufacturing	30	.232	43	.002
316-Leather and Allied Product Manufacturing	16	.27	13	.002
321-Wood Products	7	.16	23	.013
322-Paper Products	19	.173	40	.017
323-Printing and Related Support Activities	6	.121	24	.017
324-Petroleum and Coal Products	19	.221	36	.012
325-Chemical Products	301	.229	763	.01
326-Plastics and Rubber Products	18	.169	52	.009
327-Nonmetallic Mineral Products	8	.15	26	.025
331-Primary Metals	32	.211	63	.016
332-Fabricated Metal Products	32	.204	69	.011
333-Machinery	87	.185	187	.013
334-Computer and Electronic Products	392	.219	598	.013
335-Electrical Equipment, Appliances, and Components	41	.213	95	.014
336-Transportation Equipment Manufacturing	48	.203	143	.011
337-Furniture and Related Products	6	.155	21	.01
339-Miscellaneous Manufacturing	101	.218	175	.011

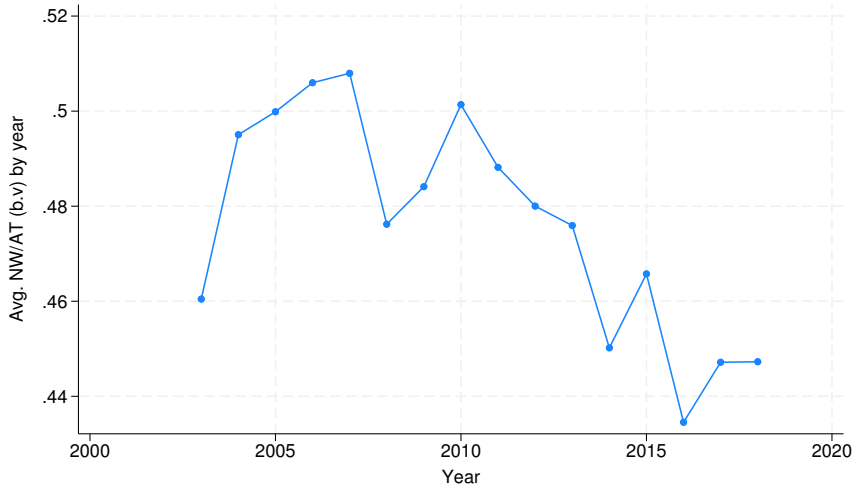
Notes. This table shows within-sector summary statistics for PO intensity separately for two groups of firms: High PO/COGS are firms in the top tercile of PO/COGS for a given year. Columns 2 and 4 report mean values of PO/COGS, winsorized at the top 1%.

Across-time variation. The following plots summarize the evolution of hedging and net worth over time (averaged across firms). In particular, Figure 2.1 plots the average hedging ratio (Panel 2.1a) and book value net worth over assets (Panel B.2a). These figures show substantial variation over time for these ratios, ranging from 0.07 to 0.09 for PO/COGS and 0.44 to 0.51 for net worth. Also, Figure B.1 in the Appendix extends the previous plots to explore the within-sector heterogeneity of year averages for these variables. Figure B.2 repeats the plots for market value net worth.

Figure 2.1: Purchase Obligations Net Worth averages over time



(a) PO/COGS



(b) NW/AT (book value)

Notes. This figure shows year averages for the hedging ratio and net worth over assets (book value) across firms. Observations are winsorized at the top and bottom 1%.

3 Empirical Findings

In this section, I study empirically the relationship between hedging and net worth. In particular, I leverage the purchase obligations dataset to estimate a variety of empirical models. My results fail to find a positive relationship between net worth and hedging.

3.1 Cross-sectional Evidence

The first set of results focus on the cross-sectional relationship between net worth and hedging. I average all year observations to obtain one data point for each company and then regress an empirical model:

$$\bar{H}_i = \alpha + \beta \bar{NW}_i + \varepsilon_i \tag{1}$$

where i stands for company, H for hedging and NW for net worth. Table 3.1 shows the results. Following RSV, I also include Weighted Least Squares (WLS) using the inverse square root of assets due to its efficiency gains in Table B.1. Only market value coefficients under the Ordinary Least Squares (OLS) and WLS estimations are significant, although they imply an economically weak correlation.

For example, in Table 3.1 Column (2), a 0.1 unit increase (10 percentage points) increase in market value net worth over assets is correlated with a 0.045 unit increase (0.45 percentage points) increase in hedging ratio. If we consider median values from Table 2.1, this back-of-the-envelope calculation would imply that increasing net worth over assets (mv) from 0.76 to 0.86 is correlated with a substancially limited increase in the hedging ratio, from 0.19 to 0.1945. Therefore, the correlation in the cross-section is shown to be economically weak.

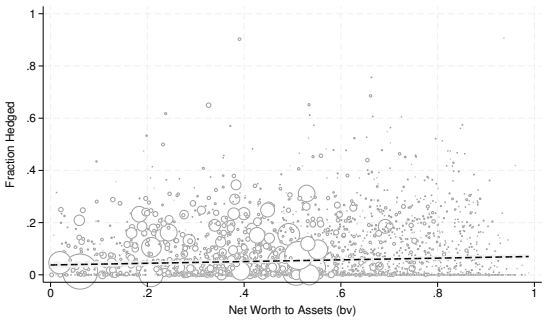
Figure 3.1 graphically displays the same findings. I follow RSV by including scatter plots with regression line coefficients where observations are scaled by total assets (WLS). Although the regression line looks strongly positive for dollar measures of net worth (3.1c and 3.1d), this relationship disappears when we divide by assets. These coefficients are capturing the correlation between size and hedging and not necessarily net worth. Remember also that this exercise examines the correlation between averages. We will consider within-firm variation next.

Table 3.1: Purchase Obligations and Net Worth in the Cross-section (OLS)

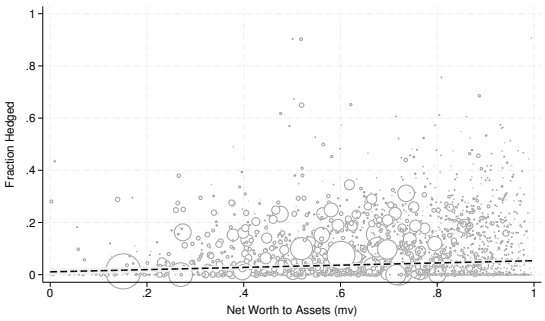
	(1) PO / COGS (avg)	(2) PO / COGS (avg)	(3) PO / COGS (avg)	(4) PO / COGS (avg)
Net Worth / Assets (bv, avg)	0.0000404			
	(0.0000389)			
Net Worth / Assets (mv, avg)		0.0450***		
		(0.0101)		
Net Worth (bv, billions, avg)			0.000828*	
			(0.000376)	
Net Worth (mv, billions, avg)				0.000415**
				(0.000136)
Constant	0.0736***	0.0431***	0.0727***	0.0731***
	(0.00209)	(0.00735)	(0.00212)	(0.00221)
R^2	0.000	0.007	0.002	0.003
Observations	2,902	2,754	2,902	2,754

Notes. This table shows results of cross-section (firm-mean) regressions between hedging and net worth. Standard errors are in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

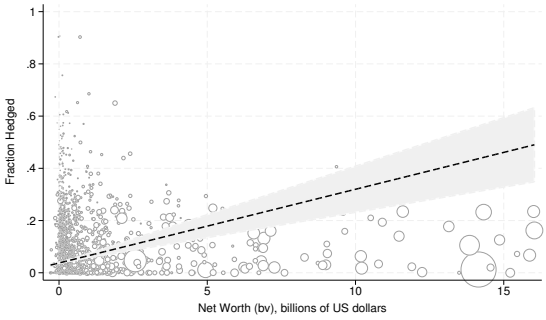
Figure 3.1: Commodity Hedging and Net Worth: Cross-sectional Evidence



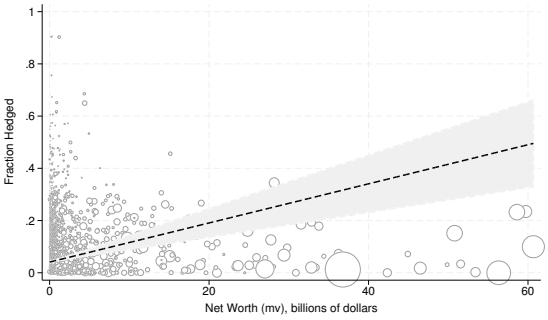
(a) Book Value over Assets



(b) Market Value over Assets



(c) Book Value (dollars)



(d) Market Value (dollars)

Notes. This figure shows scatter plots of hedging and net worth for the purchase obligations dataset. Variables are expressed as firm-year averages. Circle size denotes total assets. Regression lines are based on equation (1), weighting observations by the inverse square root of total assets (weighted least squares).

3.2 Panel Regressions

Taking advantage of the panel characteristics of the dataset, I replicate RSV's empirical approach. This entails estimating the following empirical model:

$$H_{it} = \alpha + \beta NW_{it} + \lambda_i + \lambda_t + \varepsilon_{it} \tag{2}$$

where λ_i and λ_t are company and time fixed effects and H_{it} and NW_{it} hedging and net worth for company i at time t. The hedging ratio is measured using purchase obligations over the costs of goods sold, and net worth using book and market values in dollars and relative to assets.

Benchmark. Results are shown in Table 3.2 for OLS. The estimated coefficients suggest a positive relationship between net worth scaled by assets and hedging. However, it is economically insignificant. Even a large increase in net worth does not correlate with a substantial increase in the hedging ratio. A back-of-the-envelope calculation using the coefficients implies that a 10 percentage points (p.p.) increase in net worth (market value) over assets is correlated with a 0.163 p.p. increase in the hedging ratio. Using median values from Table 2.1 shows that an increase from a 0.762 to a 0.862 ratio of net worth to assets is correlated with an approximate increase in purchase obligations to cost of goods sold from 0.186 to 0.188.

All other estimates are not economically significant. For WLS, which weights observations using the inverse square root of assets, results are shown in Table B.2. All the estimated coefficients are close to zero. Pooled results without fixed effects are included in Tables B.3 for OLS and B.4 for WLS. Although I find coefficients statistically significantly larger than zero, their economical interpretation attributes a weak correlation of net worth and hedging: a 10 p.p. increase in net worth (mv) over assets is correlated with a 0.53 p.p. increase in hedging ratio.

A skeptical reader might argue that these results are in line with previous studies that find a positive role of collateral in determining hedging decisions (RSV and Ferriani and Veronese (2022)).This is not accurate, because these papers find a stronger relationship. For instance, RSV's main results in Table 4 for a firm fixed-effects model weighted by assets (WLS) show that a 10 p.p. increase in net worth is correlated with a 6.73 p.p. increase in the hedging ratio, which is substantially larger than the coefficients found in this paper.

Table 3.2: Purchase Obligations and Net Worth: Panel Regressions (OLS) - Fixed Effects

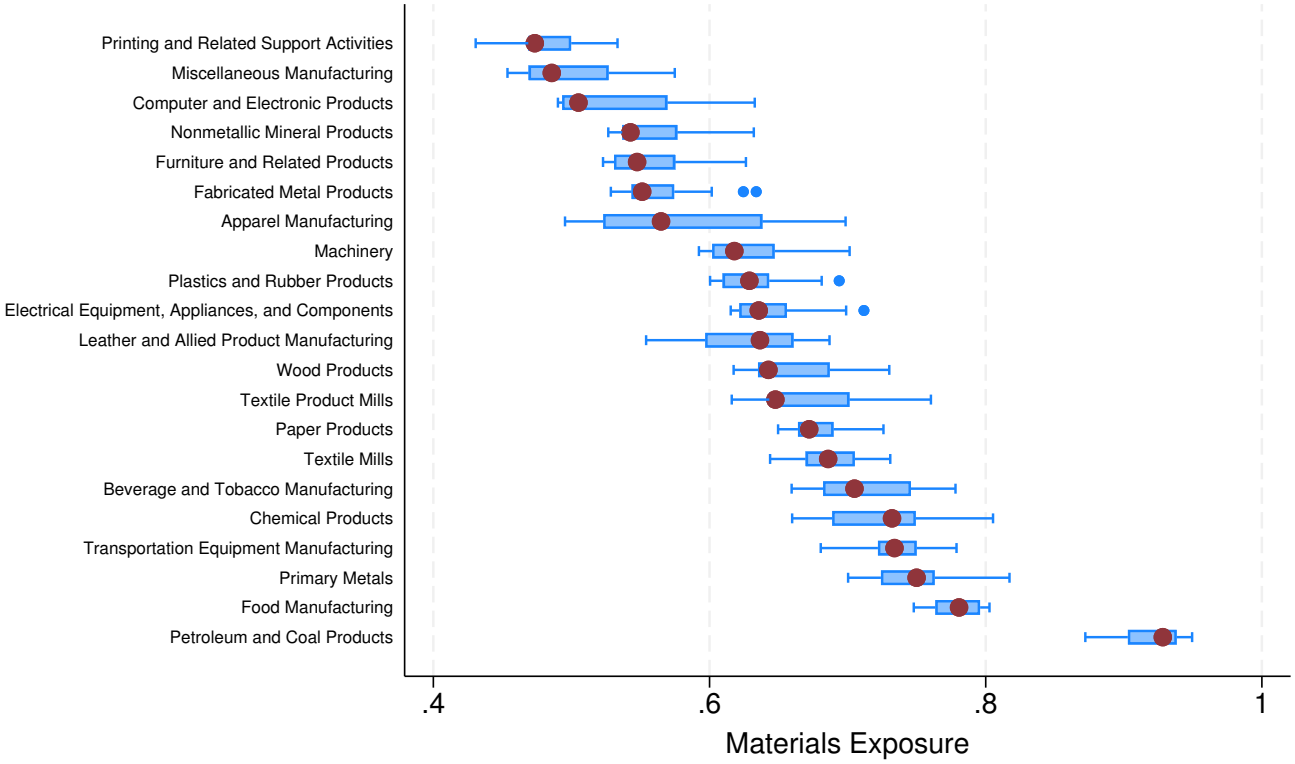
	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0119*			
	(0.00585)			
Net Worth (mv) / Assets		0.0163^{+}		
		(0.00868)		
Net Worth (bv), billions			0.00000800	
			(0.00142)	
Net Worth (mv), billions				-0.000160
				(0.000362)
Constant	0.0809***	0.0756***	0.0855***	0.0868***
	(0.00281)	(0.00607)	(0.00144)	(0.00116)
Adjusted R^2	0.600	0.607	0.602	0.607
Observations	18,267	16,701	18,258	16,705

Notes. This table shows results of the panel regressions between hedging and net worth. Firm and year fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are in parentheses.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Materials Exposure. A possible concern could be that firms that are more exposed to commodity prices hedge more, and this could confound the estimates. Accordingly, I control for a measure of exposure to commodity price risk. To define raw materials exposure, I construct the ratio of materials expenditures to all business expenditures by sector (3-digit NAICS) from the Annual Survey of Manufactures for each year between 2003 and 2018. This allows me to control for changes in materials prices that could drive changes in hedging. Figure 3.2 plots the distribution over time. Primary Metals, Food Manufacturing, and Petroleum and Coal Products have the largest shares, ranging from 70% to 95% approximately. On the other hand, the least exposed sectors are Printing, Miscellaneous and Computer and Electronics, with shares around 50%.

Figure 3.2: Materials Exposure by Sector (NAICS 3)



Notes. This figure shows the distribution across sectors of the share of materials to total business expenditures from the Annual Survey of Manufactures.

Regression results are shown in Tables 3.3 (OLS) and B.5 (WLS). Since manufacturing firms have a relatively constant share of materials over time, this coefficient is captured in the firm fixed effects and renders it insignificant. Nevertheless, the coefficients for net worth do not change when I controlling for materials exposure.

Table 3.3: Purchase Obligations and Net Worth: Panel Regressions (OLS) - Fixed Effects and Materials Exposure

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0119*			
	(0.00585)			
Net Worth (mv) / Assets		0.0161^{+}		
		(0.00872)		
Net Worth (bv), billions			-0.00000216	
			(0.00142)	
Net Worth (mv), billions				-0.000163
				(0.000362)
Materials Exposure	0.0277	0.0172	0.0277	0.0226
	(0.0582)	(0.0607)	(0.0584)	(0.0608)
Constant	0.0634^{+}	0.0648^{+}	0.0680^{+}	0.0725^{+}
	(0.0367)	(0.0383)	(0.0368)	(0.0386)
Adjusted R^2	0.600	0.607	0.602	0.607
Observations	18,267	16,701	18,258	16,705

Notes. This table shows the results of panel regressions between hedging and net worth controlling for sector exposure to materials. Exposure is defined as the ratio of total materials expenditures over all other business expenditures from the Annual Survey of Manufactures. Firm and year fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Firms Controls. I address possible endogeneity concerns by controlling for standard distress measures used in the literature. In particular, I repeat the panel regressions including log assets and components of the Z-score.[7] The underlying issue is that some omitted variables with a negative correlation with net worth can potentially mask a positive effect of net worth on hedging.

Results are included in Tables 3.4 for OLS and B.6 for WLS. In summary, these controls do not change the original hypothesis: Net worth and hedging are not empirically correlated. Regarding the controls, only size (log assets) has a positive but limited impact on hedging. All other controls do not have a strong effect on hedging.

Sectorial Heterogeneity. Another concern is that potentially, the relationship is present only in some sectors. In Tables 3.5 (OLS) and B.7 (WLS), I repeat the panel regressions while allowing for differential correlations for each sector within manufacturing (3-digit NAICS).

In particular, I estimate the following statistical model:

$$H_{it} = \alpha + \sum_{s} \beta_s NW_{it}\, \mathbb{I}_{i \in s} + \lambda_i + \lambda_t + \varepsilon_{it} \tag{3}$$

where $\mathbb{I}_{i \in s}$ represents an indicator that takes unit value when firm i belongs to sector s. The coefficient of interest, β_s, captures the correlation of net worth and hedging only for sector s. Firm and time fixed effects are also included.

Unfortunately, none of these sectors show a statistically or economically significant positive relationship. All estimated coefficients are either not statistically significant or have a weak correlation. In fact, the largest coefficient is for Primary Metals in the first column, which is significant at 90% confidence. It shows that a 10 p.p. increase in net worth is correlated with an increase of 1 percentage points in hedging for firms in this sector, which is still quite weak. This result, along with all previous evidence, is still consistent with the lack of support for a strong positive relationship of net worth and hedging in manufacturing.

[7] Working Capital / Total Assets, Retained Earnings / Total Assets, EBIT / Total Assets, Market Value of Equity / Book Value of Liabilities and Sales / Total Assets.

Table 3.4: Purchase Obligations and Net Worth: Panel Rregressions (OLS) - Adding Controls

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	-0.00459			
	(0.00692)			
Net Worth (mv) / Assets		0.0214*		
		(0.00887)		
Net Worth (bv), billions			-0.00205	
			(0.00151)	
Net Worth (mv), billions				-0.000525
				(0.000383)
log Assets (bv)	0.0115***	0.0128***	0.0135***	0.0142***
	(0.00343)	(0.00312)	(0.00297)	(0.00304)
Working Capital / Total Assets	0.0104	0.000307*	0.000267*	0.000522*
	(0.00803)	(0.000121)	(0.000119)	(0.000241)
Retained Earnings / Total Assets	0.000198	-0.0000291	-0.0000233	-0.00000361
	(0.000283)	(0.0000232)	(0.0000216)	(0.0000252)
EBIT / Total Assets	-0.00279	-0.00152**	-0.00133*	-0.00316*
	(0.00469)	(0.000582)	(0.000556)	(0.00145)
Market Value of Equity / Book value of Liabilities	0.00000124	-0.000158	-0.0000549	-0.0000529
	(0.0000881)	(0.000226)	(0.0000635)	(0.0000657)
Sales / Total Assets	-0.00561	-0.00693*	-0.00552+	-0.00544+
	(0.00384)	(0.00326)	(0.00288)	(0.00284)
Constant	0.0207	0.00195	0.0125	0.00734
	(0.0237)	(0.0220)	(0.0190)	(0.0194)
Adjusted R^2	0.610	0.611	0.611	0.611
Observations	17,404	16,490	17,460	16,484

Notes. This table shows results of panel regressions between hedging and net worth. Firm and year fixed effects are included. Standards errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.5: Purchase Obligations and Net Worth: Panel Regressions (OLS) - Sectoral Differences

	(1) Net Worth (bv)/AT	(2) Net Worth (mv)/AT	(3) Net Worth (bv), billions	(4) Net Worth (mv), billions
Food Manufacturing x Net Worth	0.00562	-0.0271	0.00395^{+}	0.000300
	(0.0217)	(0.0277)	(0.00218)	(0.00243)
Beverage and Tobacco x Net Worth	0.0778	0.0265	-0.00446	-0.000928
	(0.0714)	(0.0950)	(0.00333)	(0.000615)
Textile Mills x Net Worth	-0.0193	-0.0351	0.0544	0.00779
	(0.0893)	(0.0924)	(0.0360)	(0.0217)
Textile Product Mills x Net Worth	0.0419	-0.00209	-0.00633***	-0.00190***
	(0.0752)	(0.0411)	(0.00101)	(0.000281)
Apparel x Net Worth	0.0411	0.0573	0.0320*	0.00871
	(0.0293)	(0.0457)	(0.0145)	(0.00635)
Leather and Allied x Net Worth	0.0113	-0.0116	0.0172	0.00879
	(0.0915)	(0.0480)	(0.0183)	(0.0142)
Wood Products x Net Worth	-0.117^{+}	0.000355	0.00539***	-0.00221^{+}
	(0.0650)	(0.0287)	(0.00118)	(0.00123)
Paper Products x Net Worth	-0.00214	0.0150	-0.00471**	0.0000611
	(0.0249)	(0.0329)	(0.00161)	(0.000570)
Printing Product x Net Worth	-0.0444	0.00607	-0.00423	-0.00165
	(0.0408)	(0.0212)	(0.00925)	(0.00359)
Petroleum and Coal x Net Worth	0.0995	0.0569	0.000516	-0.000165
	(0.0692)	(0.0711)	(0.00108)	(0.000109)
Chemicals x Net Worth	0.0124	-0.00409	-0.00440	-0.00101^{+}
	(0.00940)	(0.0196)	(0.00589)	(0.000560)
Plastics and Rubber x Net Worth	0.00678	0.0292	-0.00215	0.000302
	(0.0109)	(0.0243)	(0.00206)	(0.00185)
Nonmetallic Minerals x Net Worth	0.0268	0.0321	-0.0109	0.000460
	(0.0332)	(0.0241)	(0.00760)	(0.00166)
Primary Metals x Net Worth	0.0993^{+}	0.0627	-0.00131	0.00269
	(0.0561)	(0.0583)	(0.00742)	(0.00292)
Fabricated Metals x Net Worth	-0.0573	0.00522	-0.00498	-0.000992
	(0.0487)	(0.0264)	(0.00399)	(0.00344)
Machinery x Net Worth	0.0306	0.0279	0.00510	0.000455
	(0.0200)	(0.0292)	(0.00322)	(0.000702)
Computer and Electronics x Net Worth	0.00167	0.0339^{+}	-0.000395	0.00000131
	(0.0108)	(0.0190)	(0.00173)	(0.0000383)
Electrical Equipment x Net Worth	0.0138	0.0177	-0.00267	0.000256
	(0.0144)	(0.0143)	(0.00344)	(0.00126)
Transportation Equipment x Net Worth	0.0105	0.00127	0.00592	0.0000516
	(0.0201)	(0.0168)	(0.00392)	(0.000625)
Furniture x Net Worth	0.0186	0.0243	0.0228	-0.00965
	(0.0136)	(0.0149)	(0.0173)	(0.00977)
Miscellaneous x Net Worth	0.00226	0.0276	-0.000222	-0.00101
	(0.0179)	(0.0273)	(0.00228)	(0.00162)
Constant	0.0816***	0.0751***	0.0851***	0.0872***
	(0.00270)	(0.00627)	(0.00143)	(0.00115)
Adjusted R^2	0.601	0.607	0.603	0.606
Observations	18,267	16,701	18,258	17,017

Notes. This table shows results of the panel regressions between hedging and net worth allowing for different coefficients by sector (NAICS 3). The outcome variable is the share of purchase obligations over costs of goods sold. Regressors are the product of each measure of net worth and an indicator representing the sector within manufacturing. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Zero Hedging. Since a large share of firms do not hedge at all, I estimate a Tobit model with cut off at zero to address this issue. Results are reported in Table 3.6. Although the coefficients are statistically significant, their economic magnitudes imply a weak correlation between net worth and hedging. For example, for the coefficient that corresponds to Net Worth (mv) / Assets (column 2), a 10 p.p. increase in net worth is correlated with an increase in the hedging ratio of 26 basis points.

Table 3.6: Purchase Obligations and net worth: Tobit regressions

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0197***			
	(0.00549)			
Net Worth (mv) / Assets		0.0264**		
		(0.00914)		
Net Worth (bv), billions			0.00486***	
			(0.000742)	
Net Worth (mv), billions				0.00128***
				(0.000199)
Observations	18,663	17,099	18,664	17,100
Pseudo R^2	0.014	0.009	0.039	0.033

Notes. This table shows results of Tobit regressions between hedging and net worth. Coefficients show marginal effects conditional on an outcome variable greater than zero. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regression. Standard errors clustered at firm level are in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Also, I address the zero hedging concern by re-estimating the previous models and restricting the sample to observations with positive purchase obligations. Results are reported in Tables B.8 (WLS) and B.9 (OLS). Both exercises fail to provide evidence of a positive relationship between net worth and hedging for the subsample of firms that hedge positive amounts.

Decline in commodity prices. I also test this relationship when commodity prices decline. It is possible that after a decline in input costs, firms decide to increase their hedging because they expect a positive increase in these prices in the future and limit this cost increase. To measure commodity prices used in manufacturing, I construct an input price index for each industry (NAICS-3) using quantities of raw materials used from the Economic Census 2012 and prices from World Bank and Bureau of Labor Statistics[8]. Tables 3.7 for OLS, B.10 for WLS, and B.11 for Tobit show the results. None of these exercises find a strong positive correlation between hedging and net worth.

Table 3.7: Purchase Obligations and Net Worth: Decline in Commodity Prices - OLS

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.00334			
	(0.00889)			
Net Worth (mv) / Assets		0.0104		
		(0.0146)		
Net Worth (bv), billions			-0.000665	
			(0.00231)	
Net Worth (mv), billions				0.000204
				(0.000503)
Constant	0.0965***	0.0902***	0.0974***	0.0964***
	(0.00456)	(0.0103)	(0.00278)	(0.00187)
Adjusted R^2	0.647	0.648	0.652	0.654
Observations	5,737	5,276	5,723	5,249

Notes. This table shows results of OLS regressions between hedging and net worth when commodity prices decline. Time and firm fixed effects are included in all regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[8]See Appendix C for more details.

First Differences. Another possible concern is that permanent effects across time can confound the estimates. To address this issue, I estimate a first-differences model to study the correlation between changes in hedging and net worth. Results are reported in Tables 3.8 (OLS) and B.12 (WLS). Unfortunately, the estimated coefficients do not provide evidence of a positive relationship.

Table 3.8: Purchase Obligations and Net Worth: First Differences (OLS)

	(1) D.PO / COGS	(2) D.PO / COGS	(3) D.PO / COGS	(4) D.PO / COGS
D.Net Worth (bv) / Assets	0.00000747			
	(0.00000654)			
D.Net Worth (mv) / Assets		0.0136		
		(0.00869)		
D.Net Worth (bv), billions			-0.000365	
			(0.000690)	
D.Net Worth (mv), billions				-0.0000933
				(0.0000912)
Constant	0.00159**	0.00142**	0.00162**	0.00131*
	(0.000490)	(0.000524)	(0.000494)	(0.000528)
Adjusted R^2	0.001	0.001	0.001	0.001
Observations	15,215	13,731	15,215	13,731

Notes. This table shows results of first-differences regressions between hedging and net worth. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fractional Regressions. The regression outcome variable is a fraction belonging to the interval $[0, 1]$. To properly address this data structure, I estimate a fractional regression model because it provides clear advantages over OLS for modeling proportions or fractional data. The main idea is to estimate via maximum likelihood a linear model in which the outcome variable is transformed using a probit or logit specification. In particular:

A) $\text{Probit}(\text{PO/Cogs}_{it}) = \Phi^{-1}(\text{PO/Cogs}_{it})$ where Φ^{-1} is the inverse of the standard normal CDF.

B) $\text{Logit}(\text{PO/Cogs}_{it}) \quad = \ln\left(\dfrac{\text{PO/Cogs}_{it}}{1 + \text{PO/Cogs}_{it}}\right)$

Results are reported in Table 3.9 for both probit and logit specifications. The estimated coefficients show a weak correlation between hedging and net worth. For instance, in examining at the marginal effect of 10 p.p. increase in net worth only for observations with positive hedging, I find an increase in hedging of only around 58 basis points (column 2).

Table 3.9: Purchase Obligations and Net Worth: Fractional Regressions

Panel A - Probit				
	(1)	(2)	(3)	(4)
	PO / COGS	PO / COGS	PO / COGS	PO / COGS
Net Worth (bv) / Assets	0.0325***			
	(0.00640)			
Net Worth (mv) / Assets		0.0576***		
		(0.0104)		
Net Worth (bv), billions			0.00308***	
			(0.000703)	
Net Worth (mv), billions				0.000806***
				(0.000184)
Observations	18,663	17,099	18,664	17,100
Pseudo R^2	.003	.003	.002	.002
Panel B - Logit				
Net Worth (bv) / Assets	0.0330***			
	(0.00665)			
Net Worth (mv) / Assets		0.0578***		
		(0.0106)		
Net Worth (bv), billions			0.00288***	
			(0.000634)	
Net Worth (mv), billions				0.000755***
				(0.000165)
Observations	18,663	17,099	18,664	17,100
Pseudo R^2	.003	.003	.002	.002

Notes. This table shows results of the fractional regressions between hedging and net worth. Only year fixed effects are included. Standard errors clustered at firm level are included in parentheses. Coefficients show marginal effects conditional on outcome variable greater than zero. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.3 Other measures of net worth

Guest (2021) constructs two additional measures of net worth using balance sheet and market information from firms. These are constructed using the first principal component of market capitalization over total assets, size (log total assets), net income over total assets, and dividends over assets. To construct the index, I adopt a linear regression approach to compute predicted values using the variables employed in the principal component analysis, standardized using their mean and standard deviation.[9]

compute predicted values following

In particular,

$$\begin{aligned}\text{Net Worth Index} = 0.235 \times \frac{\text{Market Cap.}}{\text{Assets}} + 0.460 \times \log(\text{Assets}) \\ + 0.451 \times \frac{\text{Net Income}}{\text{Assets}} + 0.327 \times \frac{\text{Dividends}}{\text{Assets}}\end{aligned} \tag{4}$$

Size could be a confounding factor; therefore, the second net worth index removes log(Assets). Specifically:

$$\begin{aligned}\text{Net Worth Index - ex size} = 0.434 \times \frac{\text{Market Cap.}}{\text{Assets}} + 0.596 \times \frac{\text{Net Income}}{\text{Assets}} \\ + 0.454 \times \frac{\text{Dividends}}{\text{Assets}}\end{aligned} \tag{5}$$

I replicate the regressions using these measures. However, there is weak correlation between these measures and hedging. Table 3.10 shows results for the Tobit and Within regressions. All variables are scaled by their standard deviations to interpret coefficients in standard deviation terms.

The Tobit regressions in Panel A show a positive, but weak, relationship between Net Worth Index and hedging. For instance, the coefficients for columns 2 and 4 (first line) of Table 3.10 can be interpreted as showing that a 1-standard deviation increase in Net Worth Index is correlated with an increase of about one-fifth and one-sixth of a standard deviation in hedging.

[9] Specifically, standardized $x = \frac{x - \text{mean}(x)}{\text{std dev.}(x)}$

Panel B shows the results for OLS using fixed effects (within). The estimated coefficients once more show a weak relationship between net worth and hedging. For instance, the coefficients in column 4 show that a 1-standard deviation increase in the Net Worth Index (ex assets) is correlated with only a one-thirtieth of a standard deviation increase in the hedging ratio.

Also, regressions using individual components of the index are shown in Table B.13. Only size (log assets) shows a positive statistically and economically significant correlation. This suggests that firm size is the driver of hedging activities and not net worth.

Table 3.10: Purchase Obligations and Net Worth: Other Net Worth Measures

Panel A - Tobit				
	(1)	(2)	(3)	(4)
	PO/COGS - sd adj	PO/COGS - sd adj	PO/COGS - sd adj	PO/COGS - sd adj
Net Worth Index - sd adj	0.0688***	0.201***		
	(0.0137)	(0.0157)		
Net Worth Index - ex Assets - sd adj			0.0488***	0.161***
			(0.0107)	(0.0149)
Observations	17,312	17,312	17,530	17,530
Pseudo R^2	.004	.017	.003	.01
Panel B - Within				
Net Worth Index - sd adj	0.0719***	0.0723***		
	(0.0190)	(0.0188)		
Net Worth Index - ex Assets - sd adj			0.0397**	0.0393**
			(0.0130)	(0.0133)
Constant	0.609***	0.665***	0.571***	0.665***
	(0.0145)	(0.000366)	(0.00757)	(0.000255)
Adjusted R^2	0.604	0.613	0.603	0.612
Observations	16,940	16,940	17,151	17,151

Notes. This table shows results of panel regressions between hedging and net worth indexes. Panels A and B display results for Tobit and Within specifications. For panel A, coefficients show marginal effects conditional on outcome variables greater than zero. Year fixed effects are included in both panels, but only panel B also includes firm fixed effects. Standard errors clustered at firm level are included in parentheses. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Variables are scaled by their standard deviation to reinterpret estimated coefficients in standard deviation terms. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In line with previous sections, I repeat the robustness checks controlling for materials exposure (Table B.14 for OLS and B.15 for WLS), firm controls (Table B.16 for OLS and B.17 for WLS and B.18 for Tobit), sectoral heterogeneity (Table B.19 for OLS, B.20 for WLS), zero hedging (B.21 and B.22.), and a decline in commodity prices decline (B.23, B.24 and B.25). None of these estimates display an economically significant positive relationship between net

worth indexes and hedging.

Size Terciles. To further test the effect of size as a possible confounding factor, I control for size terciles. I divide all observations according to their relative size using log assets and create dummy variables for each tercile. Results are shown in Table B.26 for OLS, B.27 for Within, and B.28 for Tobit. The results are still consistent with a lack of economically significant evidence of a positive correlation between net worth and purchase obligations.

3.4 Instrumental Variables

Omitted variables or measurement error, among other issues, could generate estimation bias in the coefficients. This section uses an instrumental variables approach to address this endogeneity concern.

First, RSV use operating income over lagged assets as instrument for net worth. The rationale is that productivity shocks measured using operating income can change net worth orthogonally from hedging decisions. For example, a positive productivity shock measured by an increase in operating income could potentially increase net worth exogenously and therefore hedging. I replicate the regressions in Tables 3.11 and 3.12, but find no positive correlation between net worth and hedging. Unfortunately, operating income turns out to be a weak instrument.

Table 3.11: Purchase Obligations and Net Worth: Instrumental Variables - Fixed Effects (Net Worth Ratios)

	(1) Net Worth (bv) / Assets	(2) Net Worth (mv) / Assets	(3) PO / COGS	(4) PO / COGS
Op. Income / lag Assets	0.113***	0.0221^{+}		
	(0.0292)	(0.0120)		
Net Worth (bv) / Assets			-0.0500	
			(0.0519)	
Net Worth (mv) / Assets				-0.102
				(0.0810)
Adjusted R^2			-0.015	-0.026
Observations			14,602	13,422

Notes. This table shows results of instrumental variables regressions between hedging and net worth ratios using operating income over lagged assets as an instrument for net worth. Firm and time fixed effects are included. Standard errors clustered at firm level are included in parentheses. Columns (1) and (2) show first-stage estimates and (3) and (4) second-stage estimates.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.12: Purchase Obligations and Net Worth: Instrumental Variables - Fixed Effects (Net Worth Indexes)

	(1) Net Worth Index - sd adj	(2) Net Worth Index - ex Assets - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Op. Income / lag Assets - sd adj	0.191***	0.221***		
	(0.0279)	(0.0377)		
Net Worth Index - sd adj			-0.0518	
			(0.0822)	
Net Worth Index - ex Assets - sd adj				-0.0441
				(0.0718)
Adjusted R^2			-0.004	-0.004
Observations			13,735	13,914

Notes. This table shows results of instrumental variables regressions between hedging and net worth indexes using operating income over lagged assets as an instrument for net worth. Firm and time fixed effects are included. Standard errors clustered at firm level are included in parentheses. Columns (1) and (2) show first-stage estimates and (3) and (4) the second-stage estimates.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Another plausible instrument is the change in depreciation. If firms experience a sizable change in the value of their fixed assets and report it as a change in depreciation, this is likely to affect net worth orthogonally to hedging. Following this logic, I estimate an instrumental variable two-stage model model using depreciation change as an instrument for net worth. The results shown below fail to find a positive correlation between net worth and

hedging, although I find that the change in depreciation has a strong negative effect on net worth (see column (1) in the tables below).

Table 3.13: Purchase Obligations and Net Worth: Instrumental Variables using Depreciation - Fixed Effects (Net Worth Ratios)

	(1) Net Worth (bv) / Assets	(2) Net Worth (mv) / Assets	(3) PO / COGS	(4) PO / COGS
Change in Depreciation / AT	-0.498**	-0.282***		
	(0.169)	(0.0817)		
Net Worth (bv) / Assets			0.0277	
			(0.0915)	
Net Worth (mv) / Assets				-0.0176
				(0.0791)
Adjusted R^2			-0.005	-0.002
Observations			14,600	13,419

Notes. This table shows results of instrumental variables regressions between hedging and net worth ratios using the change in depreciation as an instrument for net worth. Firm and time fixed effects are included. Standard errors clustered at firm level are included in parentheses. Columns (1)-(2) show first-stage estimates and (3)-(4) second stage estimates.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.14: Purchase Obligations and Net Worth: Instrumental Variables using Depreciation - Fixed Effects (Net Worth Indexes)

	(1) Net Worth Index - sd adj	(2) Net Worth Index - ex Assets - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Change in Depreciation / AT - sd adj	-0.0360***	-0.0481***		
	(0.00870)	(0.0119)		
Net Worth Index - sd adj			-0.0396	
			(0.114)	
Net Worth Index - ex Assets - sd adj				-0.0408
				(0.0861)
Adjusted R^2			-0.003	-0.004
Observations			13,732	13,911

Notes. This table shows results of instrumental variables regressions between hedging and net worth indexes using the change in depreciation as an instrument for net worth. Firm and time fixed effects are included. Standard errors clustered at firm level are included in parentheses. Columns (1)-(2) show first-stage estimates and (3)-(4) second-stage estimates.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

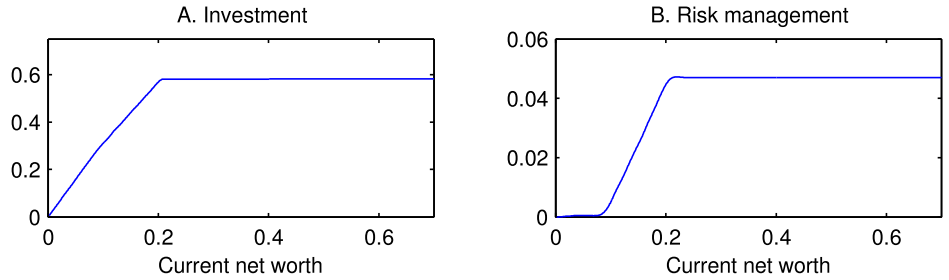
4 Reconciling Theory and Evidence

The main conclusion of the previous sections is that net worth and hedging are not positively correlated in manufacturing industries. To reconcile theory and evidence I study the

differences between airlines and manufacturing, because RSV find a positive relationship in the airline industry.

The main theoretical hypothesis regarding collateral and hedging is established by Rampini and Viswanathan (2013). In their paper, the authors develop and simulate a risk management model with contingent debt to show that hedging is increasing in net worth, since firms have more resources to pledge that otherwise would be used for investment. Figure 4.1 shows the main intuition regarding the relationship between net worth and hedging.

Figure 4.1: Investment, Hedging, and Net Worth



Notes This figure shows the simulated relationship between hedging, investment and net worth. Source: Rampini and Viswanathan (2013) Figure 2.

In the model, firms borrow funds with a collateral constraint. This means that they can only borrow up to a function of total capital. Given these constraints, the firm must prioritize how it allocates its limited resources between investment and hedging. Investment enhances the firm's productive capacity, which leads to higher future cash flows. Hedging in the model is captured by the purchase of financial asset that allows the firm to change the distribution of resources across states of the world and reduce the volatility of cash flows.

Therefore, firms face a trade-off between investing in new capital and engaging in hedging activities. This is because the return on investment is typically higher than the return on hedging activities, since investment drives growth and value creation. While hedging reduces risk, it also consumes resources that could otherwise be used for investment. Given the collateral constraints, firms must prioritize investments that yield higher returns and contribute to growth.

Firms with limited collateral will choose to invest over hedging, since the rate of return is higher. As collateral increases and the firm can access a larger pool of resources, the firm will start hedging to stabilize cash flows and allow a more stable flow of income to invest. This reflects the firm's priority od allocating available resources to investment first, and only then to hedging if resources permit.

However, once the firm has enough collateral, net worth does not change their investment and risk- management decisions. The flat region represents a saturation point where the firm's hedging needs are fully met. Beyond this point, the incremental risk reduction from additional hedging is negligible. In the model, after this saturation point, increases in net worth will only generate a proportional increase in dividends paid to shareholders, as investment is also at its optimal unconstrained value.

Manufacturing vs Airlines. Tto compare the theoretical results with the empirical findings in this paper, I will study the differences between manufacturing and airline firms. Table 4.1 computes summary statistics for net worth for the two sectors. The main difference is that manufacturing companies, on average, have larger values for net worth (for all measures). Given this difference, this opens the possibility that, when net worth is abundant, firms will not increase their hedging if their net worth increases, and hence empirically demonstrate a flat relationship between the two.

Table 4.1: Summary Statistics: Net Worth in Manufacturing vs Airlines

Panel A

	N	Mean	Std Deviation	10th Percentile	50th Percentile	90th Percentile
Net Worth (bv), billions	18664	.998	2.597	.007	.197	2.179
Net Worth (bv) over AT	18663	.478	.337	.116	.521	.838
Net Worth (mv), billions	17100	3.17	9.112	.035	.51	7.051
Net Worth (mv) over AT	17099	.699	.211	.386	.739	.941

Panel B

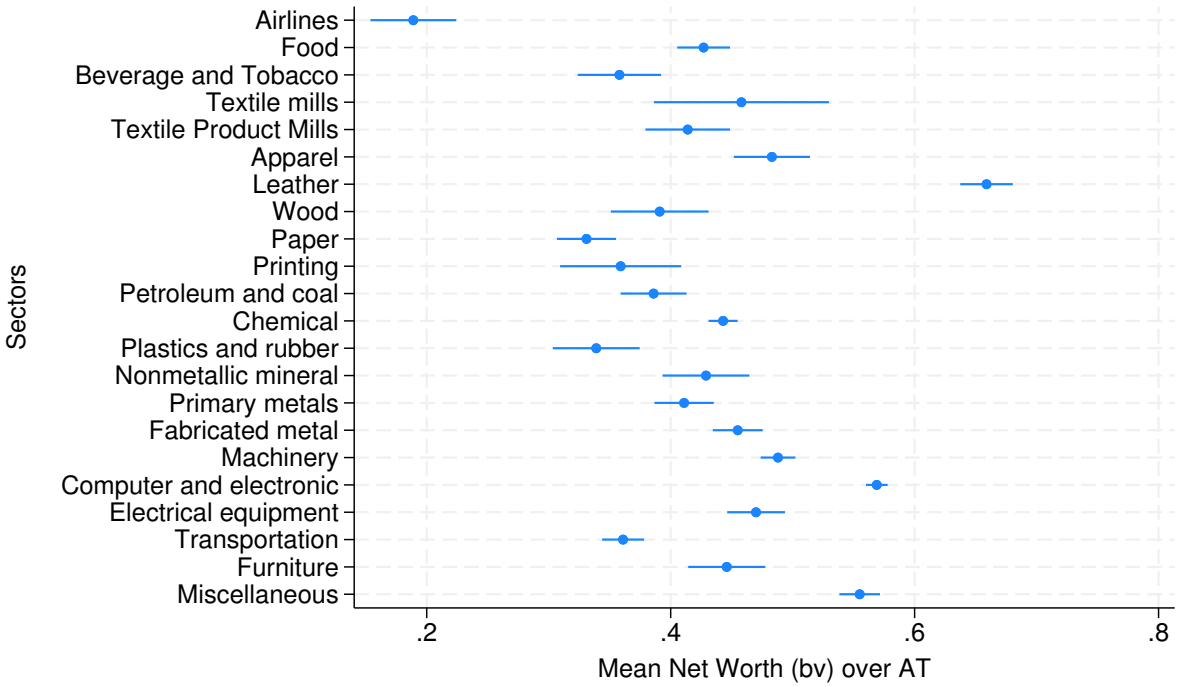
	N	Mean	Std Deviation	10th Percentile	50th Percentile	90th Percentile
Net Worth (bv), billions	270	.458	2.837	-.309	.177	2.973
Net Worth (bv) over AT	265	.189	.291	-.112	.209	.502
Net Worth (mv), billions	260	1.583	2.574	.032	.531	4.83
Net Worth (mv) over AT	260	.324	.245	.041	.26	.706

Notes. This table shows summary statistics for net worth. Panel A is for the manufacturing firms used in this paper. Panel B is for airlines (Table 2 in RSV). Observations are winsorized at the top and bottom 1% for Panel A.

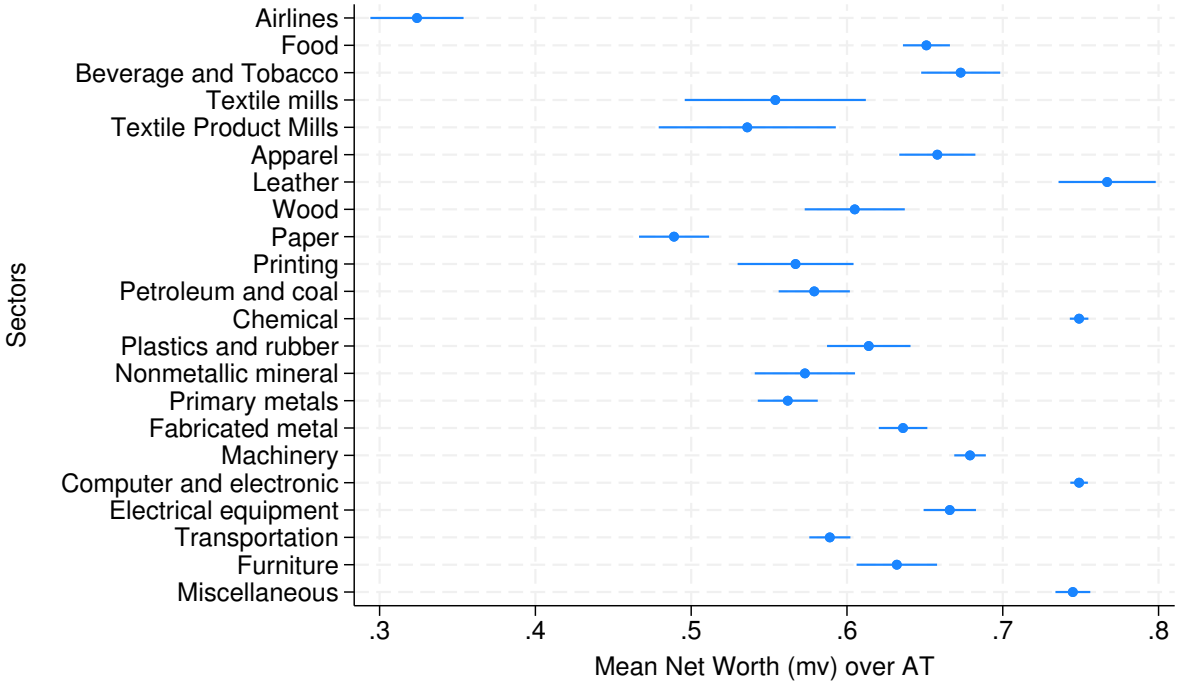
This relationship holds for all manufacturing sectors, as Figure 4.2 shows. The figure plots confidence intervals for net worth ratios for each sector within manufacturing industries and for airlines, taken from RSV. The main empirical finding is that all sectors in manufacturing have larger net worth ratios than airlines. This implies that firms in these industries seem to have enough collateral to hedge and invest. Therefore, changes in net worth would not provide additional resources to increase these activities.

Figure 4.2: Comparing Net Worth across Sectors

Panel A



Panel B



Notes. This figure shows confidence intervals for mean net worth over assets across sectors. Panel A defines net worth using book value and Panel B uses market value. For Airlines, numbers are from RSV. The remainder are computed for manufacturing industries using the database in this paper. Observations are winsorized at the top and bottom 1% for manufacturing firms.

Investment. In manufacturing industries, the data show a constant relationship between capital expenditures (investment) and net worth (see Table 4.2). Therefore, firms in this sectors are within the range of values of net worth in which hedging is constant. The main reason for this finding is that firms do not require additional collateral to equalize the marginal value of cash flows across states of the world. Hence, this is consistent with the evidence in this paper, whereby purchase obligations are constant relative to net worth.

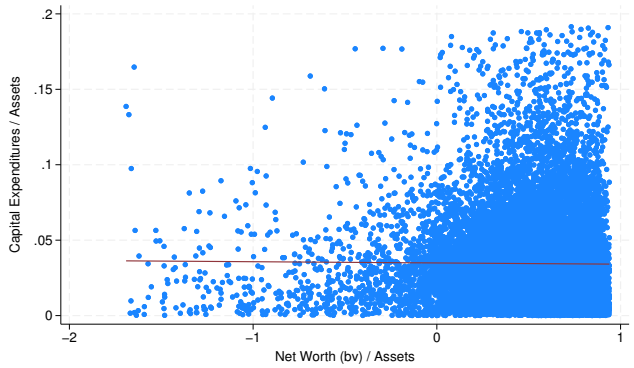
Figure 4.4 provides further evidence on the joint relationship between net worth, capital expenditures, and hedging. The plot consists of scatter plots and regression lines for capital expenditures and hedging as a function of net worth. The most striking pattern is that changes in net worth do not affect investment or net worth, consistent with all of the empirical evidence presented throughout the paper.

Table 4.2: Capital Expenditures and Net Worth

	(1) Capital Expenditures / Assets	(2) Capital Expenditures / Assets
Net Worth (bv) / Assets	0.00501*	
	(0.00222)	
Net Worth (mv) / Assets		0.0234***
		(0.00312)
Constant	0.0341***	0.0201***
	(0.00106)	(0.00218)
Adjusted R^2	0.481	0.484
Observations	18,258	16,693

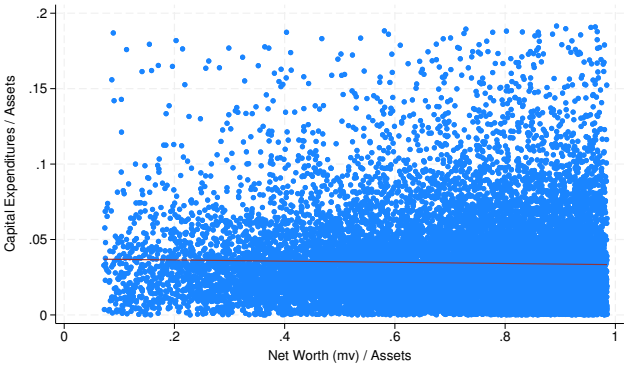
Notes. This tables shows the empirical correlation between capital expenditures and net worth in the manufacturing sector. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1%.$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 4.4: Net Worth, Capital Expenditures, and Hedging

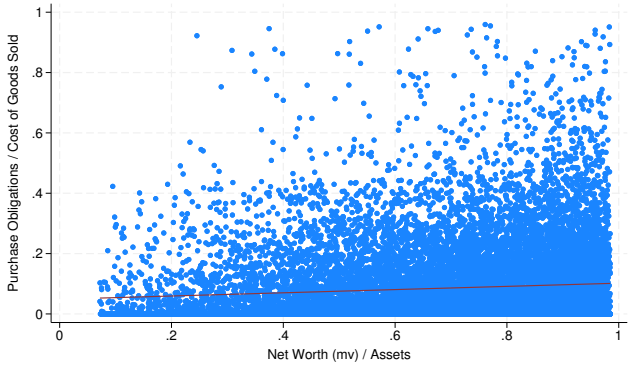


(a) Net Worth over Assets (bv)

(b) PO/COGS



(c) Net Worth over Assets (mv)



(d) PO/COGS

Notes. This figure presents scatter plots (blue) and regression lines (red) for the relationship between net worth and capital expenditures (Panels a and c) and purchase obligations (Panels b and d). Observations are winsorized at the top and bottom 1%.

5 Concluding Remarks

In this article, I study the correlation between net worth and hedging following recent hedging theories that rely on collateral as one of the main drivers of risk management. I leverage a database on supply contracts for the future purchase of raw materials (purchase obligations) at fixed prices, which firms use to hedge against commodity price shocks. Overall, this paper shows a weak correlation between hedging decisions and net worth among public firms in the manufacturing sector in the U.S.

Comparing with the literature, I show that manufacturing firms are well capitalized and that further increases in net worth do not change their hedging strategies. This highlights a saturation point in terms of collateral for risk-management.

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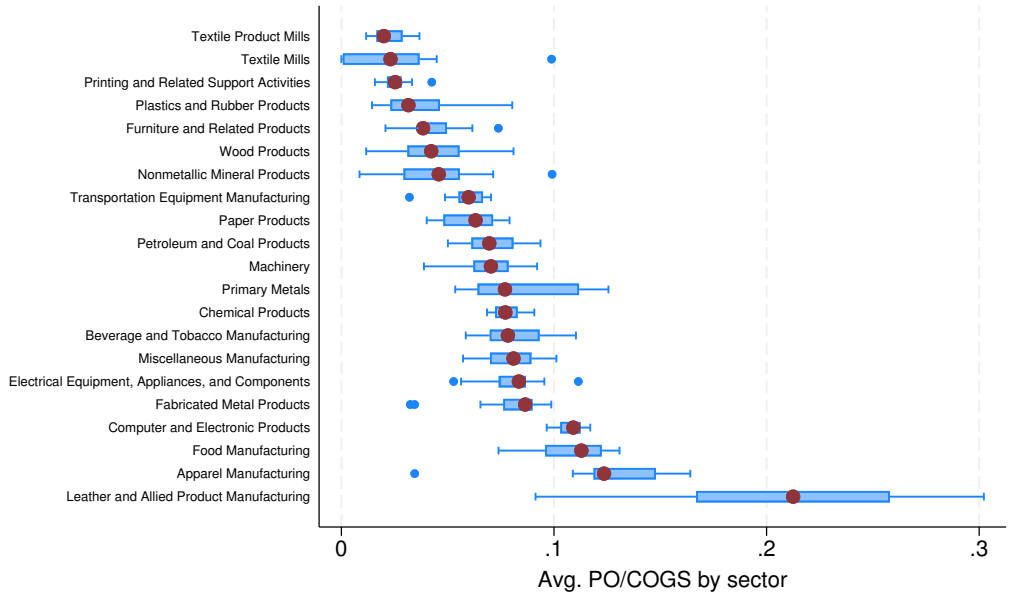
A Variable Definitions

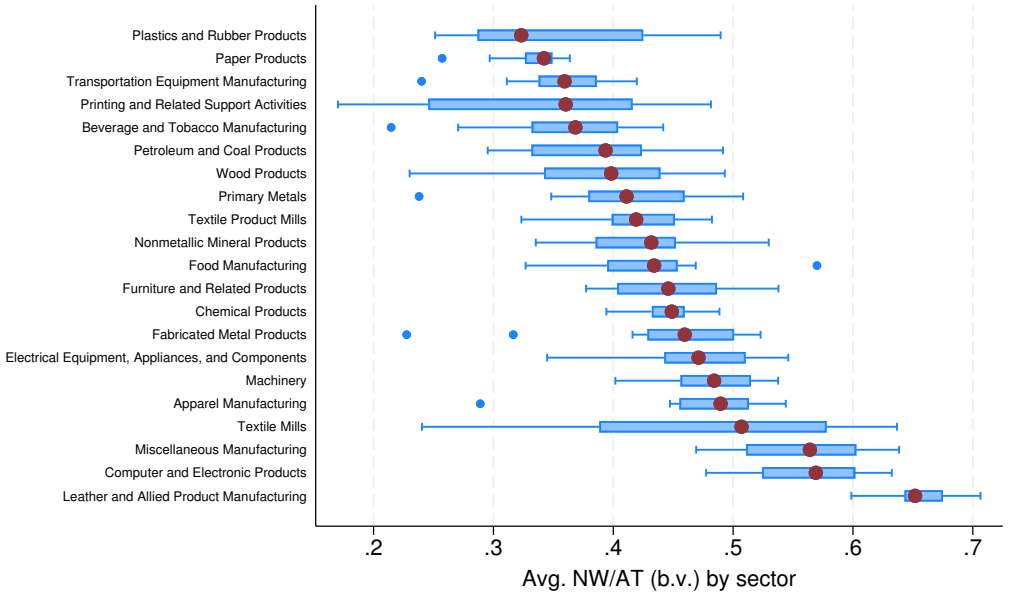
Variable	Definition
PO	Purchase Obligations due in one year (SEC)
COGS	Cost of Goods Sold (COGS, COMPUSTAT)
PO/COGS	Purchase Obligations due in one year normalized by current Cost of Goods Sold
Assets (book value)	Total book assets Assets (AT, COMPUSTAT)
Stockholders'Equity	Common and preferred shareholders' interest in the company (SEQ, COMPUSTAT)
Closing market price	Price Close, Annual, Fiscal (PRCC_F , COMPUSTAT)
Common shares outstanding	Net number of all common shares outstanding at year-end, excluding treasury shares and scrip (CSHO, COMPUSTAT)
Common/ordinary equity	Total Common or Ordinary Equity (CEQ, COMPUSTAT)
Deferred taxes	Accumulated tax deferrals due to timing differences between the reporting of revenues and expenses (TXDB, COMPUSTAT)
Total liabilities	Total book Liabilities (LT, COMPUSTAT)
Assets (market value)	Market Value of assets is computed as: AT+PRCC_F*CSHO-CEQ-TXDB
Net Worth (book value)	Stockholders' Equity
Net Worth (market value)	Assets (market value) minus Total liabilities
Net Worth over assets (book value)	Ratio of Stockholders' Equity to Assets (book value)
Net Worth over assets (market value)	Ratio of Net Worth (market value) to Assets (market value)
Market Cap	Total dollar market value of a company's outstanding shares of stock (Common shares outstanding * Closing market price)
Net Income	Income or loss reported by a company for the fiscal period (NI, COMPUSTAT)
Dividends	Total amount of cash dividends paid for common/ordinary capital and other share capital (DV, COMPUSTAT)
Materials Exposure	Ratio of total material expenditures over all other business expenditures from the Annual Survey of Manufactures
Working Capital	Difference between total current assets minus total current liabilities as reported on a company's Balance Sheet (WCAP, COMPUSTAT)
Retained Earnings	Cumulative earnings of the company less total dividend distributions to shareholders (RE, COMPUSTAT)
EBIT	Earnings Before Interest and Taxes (EBIT, COMPUSTAT)
Market Value of Equity	Market Value, Total, Fiscal Year (MKVALT, COMPUSTAT)
Sales	Sales or Turnover (Net) (SALE, COMPUSTAT)
Net Worth Index	Principal component of market capitalization over total assets, size (log total assets), net income over total assets, and dividends over assets
Net Worth Index - ex Assets	Principal component of market capitalization over total assets, net income over total assets, and dividends over assets
Net Worth Index - sd adj	Net Worth Index scaled by its standard deviation
Net Worth Index - ex Assets - sd adj	Net Worth Index (ex assets) scaled by its standard deviation
MedSize	Indicator variable taking value of one if log assets is in mid-tercile of distribution
LargeSize	Indicator variable taking value of one if firm log assets belongs to top tercile of distribution
Op. Income	Operating Income Before Depreciation (OIBDP, COMPUSTAT)
Depreciation	Depreciation and Amortization (DP, COMPUSTAT)
Capital Expenditures	Capital Expenditures (CAPX, COMPUSTAT)

B Additional Tables and Figures

Figure B.1: Purchase Obligations Net Worth Averages over Time



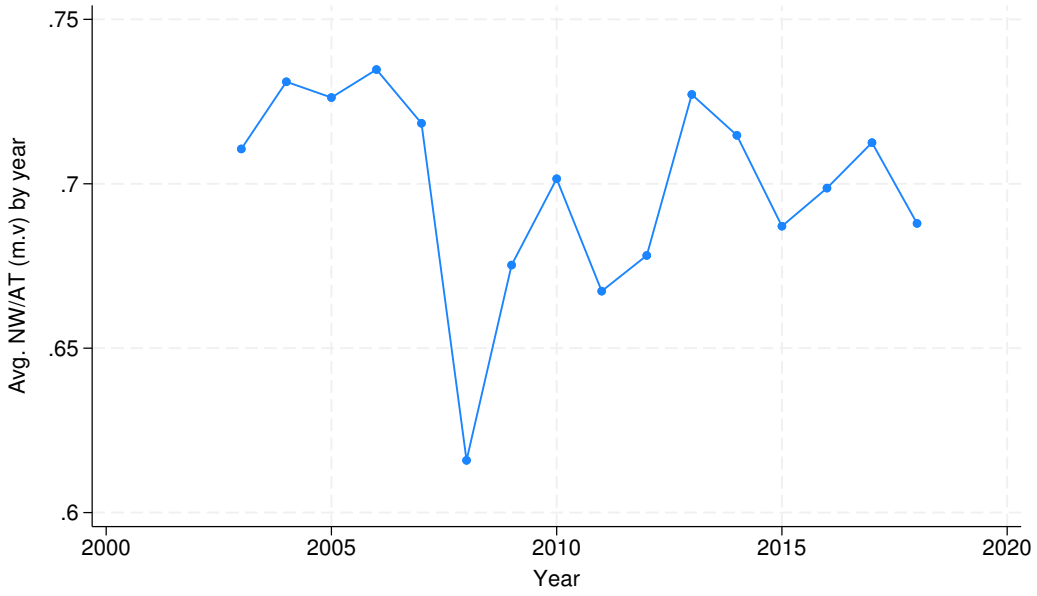
(a) PO/COGS



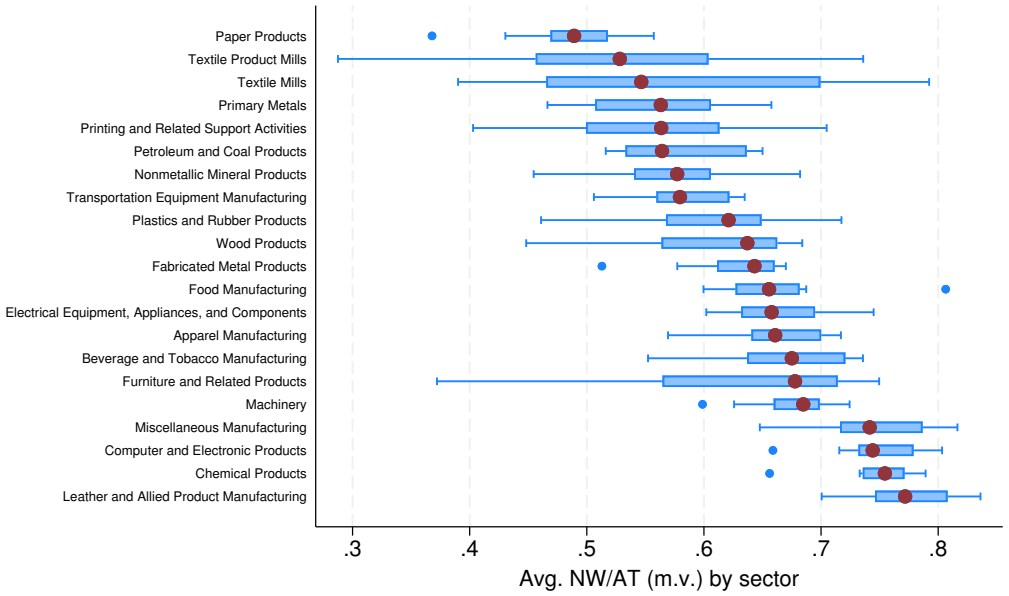
(b) NW/AT (book value)

Notes. This figure shows year averages for the hedging ratio and net worth over assets (book value) across firms, but within sector (NAICS 3). Observations are winsorized at the top and bottom 1% before computing averages.

Figure B.2: Market Value Net Worth Averages by Time and Sector



(a) NW/AT (market value), year averages



(b) NW/AT (market value), year averages by sector

Notes. This figure shows year and sector (NAICS-3) averages for net worth over assets (market value) across firms. Observations are winsorized at the top and bottom 1% before computing averages.

Table B.1: Purchase Obligations and Net Worth in the Cross-section (WLS)

	(1) PO / COGS (avg)	(2) PO / COGS (avg)	(3) PO / COGS (avg)	(4) PO / COGS (avg)
Net Worth / Assets (bv, avg)	0.0000157***			
	(0.00000355)			
Net Worth / Assets (mv, avg)		0.0419***		
		(0.00758)		
Net Worth (bv, billions, avg)			0.0282***	
			(0.00454)	
Net Worth (mv, billions, avg)				0.00749***
				(0.00140)
Constant	0.0412***	0.0114*	0.0375***	0.0410***
	(0.00183)	(0.00562)	(0.00184)	(0.00198)
R^2	0.007	0.011	0.013	0.010
Observations	2,902	2,754	2,842	2,698

Notes. This table shows results of cross-section (firm-mean) regressions between hedging and net worth where observations are weighted by total assets. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.2: Purchase Obligations and Net Worth: Panel Regressions (WLS) - Fixed Effects

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.00387			
	(0.00545)			
Net Worth (mv) / Assets		0.0182*		
		(0.00909)		
Net Worth (bv), billions			0.00502**	
			(0.00188)	
Net Worth (mv), billions				0.00106*
				(0.000530)
Constant	0.0651***	0.0508***	0.0600***	0.0649***
	(0.00244)	(0.00649)	(0.000317)	(0.000304)
Adjusted R^2	0.583	0.620	0.602	0.607
Observations	18,267	16,701	18,258	16,705

Notes. This table shows results of panel regressions between hedging and net worth. Firm and year fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.3: Purchase Obligations and Net Worth: Panel Regressions (OLS) - Pooled

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0294***			
	(0.00542)			
Net Worth (mv) / Assets		0.0533***		
		(0.00938)		
Net Worth (bv), billions			0.00364***	
			(0.000936)	
Net Worth (mv), billions				0.000945***
				(0.000246)
Constant	0.0717***	0.0488***	0.0811***	0.0824***
	(0.00319)	(0.00658)	(0.00254)	(0.00263)
R^2	0.006	0.007	0.005	0.004
Observations	18,663	17,099	18,664	17,100

Notes. This table shows results of panel regressions between hedging and net worth. No fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.4: Purchase Obligations and Net Worth: Panel Regressions (WLS) - Pooled

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0279***			
	(0.00384)			
Net Worth (mv) / Assets		0.0601***		
		(0.00913)		
Net Worth (bv), billions			0.0134***	
			(0.00165)	
Net Worth (mv), billions				0.00319***
				(0.000434)
Constant	0.0525***	0.0173**	0.0551***	0.0598***
	(0.00284)	(0.00609)	(0.00324)	(0.00347)
R^2	0.011	0.011	0.006	0.004
Observations	18,663	17,099	18,664	17,100

Notes. This table shows results of panel regressions between hedging and net worth. No fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.5: Purchase Obligations and Net Worth: Panel Regressions (WLS) - Fixed Effects and Materials Exposure

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.00368			
	(0.00546)			
Net Worth (mv) / Assets		0.0175^{+}		
		(0.00902)		
Net Worth (bv), billions			0.00494^{**}	
			(0.00189)	
Net Worth (mv), billions				0.00103^{+}
				(0.000533)
Materials Exposure	0.104	0.0976	0.112	0.0963
	(0.0758)	(0.0764)	(0.0732)	(0.0797)
Constant	-0.00000896	-0.0101	-0.0108	0.00420
	(0.0477)	(0.0492)	(0.0461)	(0.0502)
Adjusted R^2	0.583	0.620	0.602	0.607
Observations	18,267	16,701	18,258	16,705

Notes. This table shows results of panel regressions between hedging and net worth controlling for sector exposure to materials. Exposure is defined as the ratio of total materials expenditures over all other business expenditures from the Annual Survey of Manufactures. Firm and year fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ *Notes.* This table shows results of panel regressions between hedging and net worth controlling for sector exposure to materials. Exposure is defined as the ratio of total materials expenditures over all other business expenditures from the Annual Survey of Manufactures. Firm and year fixed effects are included. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.6: Purchase Obligations and Net Worth: Panel Regressions (WLS) - Adding Controls

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	-0.0137			
	(0.00864)			
Net Worth (mv) / Assets		0.0183^{+}		
		(0.00973)		
Net Worth (bv), billions			-0.000427	
			(0.00183)	
Net Worth (mv), billions				0.0000877
				(0.000522)
log Assets (bv)	0.0172***	0.0149***	0.0140***	0.0149***
	(0.00330)	(0.00261)	(0.00259)	(0.00286)
Working Capital / Total Assets	0.0125	0.000252*	0.000181*	0.000526*
	(0.00861)	(0.000103)	(0.0000708)	(0.000240)
Retained Earnings / Total Assets	-0.0000521	-0.0000351*	-0.0000331*	-0.0000168
	(0.000145)	(0.0000136)	(0.0000129)	(0.0000147)
EBIT / Total Assets	-0.00468	-0.00110*	-0.000692*	-0.00290*
	(0.00363)	(0.000522)	(0.000342)	(0.00141)
Market Value of Equity / Book value of Liabilities	-0.0000846	-0.000326	-0.000155^{+}	-0.000153
	(0.0000577)	(0.000215)	(0.0000857)	(0.0000936)
Sales / Total Assets	-0.00570	-0.00448	-0.00229	-0.00542^{+}
	(0.00391)	(0.00283)	(0.00182)	(0.00283)
Constant	0.00336	0.00127	0.0160	0.0146
	(0.0155)	(0.0123)	(0.0102)	(0.0117)
Adjusted R^2	0.598	0.625	0.616	0.612
Observations	17,404	16,490	17,460	16,484

Notes. This table shows results of panel regressions between hedging and net worth. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses. Additional controls include: Working Capital / Total Assets; Retained Earnings / Total Assets; EBIT / Total Assets; Market Value of Equity / Book value of Liabilities; Sales / Total Assets. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.7: Purchase Obligations and Net Worth: Panel Regressions (WLS) - Sectoral differences

	(1) Net Worth (bv)/AT	(2) Net Worth (mv)/AT	(3) Net Worth (bv), billions	(4) Net Worth (mv), billions
Food Manufacturing x Net Worth	-0.00332	-0.0240	0.00894**	0.00120
	(0.00694)	(0.0261)	(0.00330)	(0.00383)
Beverage and Tobacco x Net Worth	0.171	0.0353	-0.00523	-0.00166
	(0.106)	(0.0574)	(0.00378)	(0.00113)
Textile Mills x Net Worth	-0.0873	-0.0981	0.0163	0.0154
	(0.0908)	(0.0948)	(0.0626)	(0.0297)
Textile Product Mills x Net Worth	0.0735*	0.0306	-0.00437*	-0.000932
	(0.0322)	(0.0225)	(0.00174)	(0.000710)
Apparel x Net Worth	0.0433**	0.0566	0.0646*	0.0135+
	(0.0137)	(0.0414)	(0.0286)	(0.00733)
Leather and Allied x Net Worth	0.146	0.00948	0.0689	0.0182
	(0.145)	(0.0459)	(0.0546)	(0.0200)
Wood Products x Net Worth	-0.156+	-0.0417	0.00351	0.00277
	(0.0844)	(0.0435)	(0.00276)	(0.00451)
Paper Products x Net Worth	0.0218	0.0234	-0.00410	0.00154
	(0.0483)	(0.0420)	(0.00296)	(0.00121)
Printing Product x Net Worth	-0.0385	-0.00580	-0.0114	-0.00172
	(0.0323)	(0.0196)	(0.0146)	(0.00246)
Petroleum and Coal x Net Worth	0.0922	0.277*	0.00153	-0.00139
	(0.0624)	(0.127)	(0.00149)	(0.00126)
Chemicals x Net Worth	-0.00376	-0.00171	0.00639	-0.000459
	(0.00896)	(0.0152)	(0.00722)	(0.000772)
Plastics and Rubber x Net Worth	0.00709	-0.0332	0.00194	-0.00487
	(0.0119)	(0.0778)	(0.00383)	(0.00790)
Nonmetallic Minerals x Net Worth	0.0251	-0.0165	-0.0112	0.00195
	(0.0243)	(0.0365)	(0.00924)	(0.00196)
Primary Metals x Net Worth	0.154**	0.121+	0.00397	0.00543
	(0.0521)	(0.0700)	(0.0120)	(0.00391)
Fabricated Metals x Net Worth	-0.0196	0.00284	0.00601	0.00923
	(0.0443)	(0.0193)	(0.0102)	(0.00820)
Machinery x Net Worth	0.0150	-0.00442	0.00832+	0.00304*
	(0.0120)	(0.0434)	(0.00451)	(0.00128)
Computer and Electronics x Net Worth	0.00160	0.0428*	0.00210	0.00184**
	(0.00754)	(0.0186)	(0.00280)	(0.000695)
Electrical Equipment x Net Worth	-0.00597	-0.0146	0.00820	0.00153
	(0.00966)	(0.0152)	(0.0101)	(0.00242)
Transportation Equipment x Net Worth	0.0108	0.00561	0.00735	0.00199
	(0.00804)	(0.0118)	(0.00530)	(0.00147)
Furniture x Net Worth	-0.00360	0.00346	0.0123	-0.0217
	(0.0155)	(0.0163)	(0.0353)	(0.0224)
Miscellaneous x Net Worth	0.00353	0.0308	0.00541	0.00136
	(0.0162)	(0.0353)	(0.00491)	(0.00230)
Constant	0.0640***	0.0514***	0.0597***	0.0647***
	(0.00207)	(0.00635)	(0.000370)	(0.000346)
Adjusted R^2	0.586	0.621	0.602	0.607
Observations	18,267	16,701	18,258	16,705

Notes. This table shows results of panel regressions between hedging and net worth allowing for different coefficients by sector (NAICS 3). The outcome variable is the share of purchase obligations over costs of goods sold. The regressors are the product of each measure of net worth and an indicator representing the sector within manufacturing. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.8: Purchase Obligations and net worth: Positive PO - WLS

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.00222			
	(0.0103)			
Net Worth (mv) / Assets		0.0321		
		(0.0252)		
Net Worth (bv), billions			0.000167	
			(0.000583)	
Net Worth (mv), billions				-0.0000650
				(0.000201)
Constant	0.164***	0.143***	0.165***	0.167***
	(0.00439)	(0.0184)	(0.000223)	(0.000244)
Adjusted R^2	0.588	0.599	0.588	0.599
Observations	11,067	10,038	11,067	10,038

Notes. This table shows the results of panel regressions (asset weighted) between hedging and net worth for observations with positive purchase obligations. Time and firm fixed effects are included in all regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.9: Purchase Obligations and net worth: Positive PO - OLS

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0114^{+}			
	(0.00680)			
Net Worth (mv) / Assets		0.0272*		
		(0.0126)		
Net Worth (bv), billions			-0.000315	
			(0.000348)	
Net Worth (mv), billions				-0.0000848
				(0.000134)
Constant	0.137***	0.125***	0.143***	0.144***
	(0.00320)	(0.00868)	(0.000790)	(0.000971)
Adjusted R^2	0.597	0.605	0.597	0.605
Observations	11,067	10,038	11,067	10,038

Notes. This table shows the results of panel regressions between hedging and net worth for observations with positive purchase obligations. Time and firm fixed effects are included in all regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.10: Purchase Obligations and Net Worth: Decline in Commodity Prices - WLS

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.00722			
	(0.00645)			
Net Worth (mv) / Assets		0.0216		
		(0.0140)		
Net Worth (bv), billions			0.00163	
			(0.00281)	
Net Worth (mv), billions				0.000164
				(0.000859)
Constant	0.0763***	0.0570***	0.0713***	0.0768***
	(0.00333)	(0.00995)	(0.000597)	(0.000599)
Adjusted R^2	0.644	0.643	0.645	0.637
Observations	5,737	5,276	5,723	5,249

Notes. This table shows results of WLS regressions between hedging and net worth when commodity prices decline. Time and firm fixed effects are included in all regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.11: Purchase Obligations and Net Worth: Decline in Commodity Prices - Tobit

	(1) PO / COGS	(2) PO / COGS	(3) PO / COGS	(4) PO / COGS
Net Worth (bv) / Assets	0.0179*			
	(0.00788)			
Net Worth (mv) / Assets		0.0287*		
		(0.0130)		
Net Worth (bv), billions			0.00406***	
			(0.000878)	
Net Worth (mv), billions				0.00117***
				(0.000237)
Observations	6,235	5,765	6,228	5,745
Pseudo R^2	0.031	0.032	0.058	0.058

Notes. This table shows results of Tobit regressions between hedging and net worth when commodity prices decline. Column (1) excludes the bottom tercile and Column (2) includes size dummies. Time fixed effects are included in all regressions. Coefficients show marginal effects conditional on outcome variables greater than zero. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.12: Purchase Obligations and Net Worth: First Differences (WLS)

	(1) D.PO / COGS	(2) D.PO / COGS	(3) D.PO / COGS	(4) D.PO / COGS
D.Net Worth (bv) / Assets	0.000000548			
	(0.00000404)			
D.Net Worth (mv) / Assets		0.0152		
		(0.0128)		
D.Net Worth (bv), billions			0.000201	
			(0.000973)	
D.Net Worth (mv), billions				0.000268
				(0.000223)
Constant	0.000314	0.000372	0.000307	-0.0000165
	(0.00109)	(0.00115)	(0.00108)	(0.00114)
Adjusted R^2	0.003	0.004	0.003	0.003
Observations	15,215	13,731	15,215	13,731

Notes. This table shows results of first-differences regressions between hedging and net worth. Year fixed effects are included. Standard errors clustered at firm level are included in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.13: Purchase Obligations and Net Worth: Cross-sectional and Within Evidence

	(1) Pooled	(2) Tobit	(3) Within
NI/AT - sd adj	0.0899***	0.168***	0.0330*
	(0.0119)	(0.0159)	(0.0136)
Observations	18663	18663	18278
Time FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Observations	18,663	18,663	18,278
R^2 / Pseudo R^2	0.009	0.011	0.603
MktCap/AT - sd adj	0.0622***	0.150***	0.0311**
	(0.00603)	(0.0252)	(0.0119)
Observations	18074	18074	17689
Time FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Observations	18,074	18,074	17,689
R^2 / Pseudo R^2	.004	.005	0.609
div/AT - sd adj	0.0689**	0.0613**	0.00120
	(0.0246)	(0.0209)	(0.0192)
Observations	6465	6465	6268
Time FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Observations	6,465	6,465	6,268
R^2 / Pseudo R^2	0.009	0.005	0.675
log AT - sd adj	0.119***	0.211***	0.237***
	(0.0167)	(0.0153)	(0.0426)
Observations	18663	18663	18281
Time FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Observations	18,663	18,663	18,281
R^2 / Pseudo R^2	0.015	0.021	0.603

Notes. This table shows results of panel regressions between hedging and net worth using alternative measures of net worth. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. Standard errors clustered at firm level are included in parentheses.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.14: Other Net Worth Measures - Materials Exposure - OLS

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0722^{***}	
	(0.0188)	
Net Worth Index - ex Assets - sd adj		0.0393^{**}
		(0.0133)
Materials Exposure	0.258	0.293
	(0.460)	(0.452)
Constant	0.503^{+}	0.480^{+}
	(0.290)	(0.285)
Adjusted R^2	0.613	0.612
Observations	16,940	17,151

Notes. This table shows results of panel regressions between hedging and net worth indexes controlling for sector exposure to materials. Exposure is defined as the ratio of total materials expenditures over all other business expenditures from the Annual Survey of Manufactures. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.15: Other Net Worth Measures - Materials Exposure - WLS

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0678**	
	(0.0209)	
Net Worth Index - ex Assets - sd adj		0.0357*
		(0.0152)
Materials Exposure	0.671	0.734
	(0.612)	(0.613)
Constant	0.187	0.113
	(0.383)	(0.383)
Adjusted R^2	0.608	0.605
Observations	16,295	16,913

Notes. This table shows results of panel regressions between hedging and net worth indexes controlling for sector exposure to materials. Exposure is defined as the ratio of total materials expenditures over all other business expenditures from the Annual Survey of Manufactures. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.16: Other Net Worth Measures - Firm Controls - OLS

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0527*	
	(0.0266)	
Net Worth Index - ex Assets - sd adj		0.0332^{+}
		(0.0178)
log Assets (bv)	0.0755**	0.0837**
	(0.0279)	(0.0266)
Working Capital / Total Assets	0.0604	0.0605
	(0.0501)	(0.0459)
Retained Earnings / Total Assets	-0.00142	-0.000678
	(0.00560)	(0.00460)
EBIT / Total Assets	-0.0905	-0.0718
	(0.0828)	(0.0774)
Market Value of Equity / Book value of Liabilities	-0.000273	-0.000262
	(0.000826)	(0.000827)
Sales / Total Assets	-0.0418	-0.0411
	(0.0334)	(0.0325)
Constant	0.218	0.163
	(0.194)	(0.186)
Adjusted R^2	0.616	0.615
Observations	16,717	16,915

Notes. This table shows results of panel regressions between hedging and net worth indexes. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.17: Other Net Worth Measures - Firm Controls - WLS

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0824*	
	(0.0343)	
Net Worth Index - ex Assets - sd adj		0.0352^{+}
		(0.0185)
log Assets (bv)	0.115***	0.122***
	(0.0318)	(0.0306)
Working Capital / Total Assets	0.0348	0.0442
	(0.0412)	(0.0337)
Retained Earnings / Total Assets	-0.00567	-0.00161
	(0.00527)	(0.00402)
EBIT / Total Assets	-0.183^{+}	-0.125
	(0.104)	(0.0867)
Market Value of Equity / Book value of Liabilities	-0.00149	-0.00147
	(0.00104)	(0.00103)
Sales / Total Assets	-0.0444	-0.0468
	(0.0390)	(0.0376)
Constant	0.102	0.0466
	(0.174)	(0.164)
Adjusted R^2	0.608	0.607
Observations	16,717	16,915

Notes. This table shows results of panel regressions between hedging and net worth indexes. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.18: Other Net Worth Measures - Firm Controls - Tobit

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0620^{+}	
	(0.0320)	
Net Worth Index - ex Assets - sd adj		0.0468*
		(0.0217)
log Assets (bv)	0.0777***	0.0848***
	(0.0154)	(0.0107)
Working Capital / Total Assets	0.186*	0.171^{+}
	(0.0944)	(0.0890)
Retained Earnings / Total Assets	-0.0169**	-0.0134**
	(0.00525)	(0.00476)
EBIT / Total Assets	0.273**	0.256**
	(0.0926)	(0.0901)
Market Value of Equity / Book value of Liabilities	-0.000249	-0.000206
	(0.00122)	(0.00120)
Sales / Total Assets	-0.0475^{+}	-0.0456
	(0.0282)	(0.0282)
Observations	17081	17286
Observations	17,081	17,286
Pseudo R^2	.022	.021

Notes. This table shows results of Tobit regressions between hedging and net worth, including firm controls. Coefficients show marginal effects conditional on outcome variables greater than zero. Year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.19: Other Net Worth Measures - Sectoral Differences - OLS

	(1) Net Worth Index - sd adj	(2) Net Worth Index - ex Assets - sd adj
Food Manufacturing x Net Worth	-0.0555	-0.115
	(0.133)	(0.0941)
Beverage and Tobacco x Net Worth	0.183	0.191^{+}
	(0.177)	(0.115)
Textile Mills x Net Worth	-0.0203	-0.0176
	(0.0299)	(0.0272)
Textile Product Mills x Net Worth	-0.0260	0.0124
	(0.161)	(0.129)
Apparel x Net Worth	0.173	-0.00930
	(0.139)	(0.107)
Leather and Allied x Net Worth	0.454*	0.176^{+}
	(0.193)	(0.103)
Wood Products x Net Worth	0.0160	-0.00820
	(0.0787)	(0.0862)
Paper Products x Net Worth	0.157	0.132
	(0.233)	(0.173)
Printing Products x Net Worth	0.160	0.156
	(0.105)	(0.111)
Petroleum and Coal	0.183	0.126
	(0.116)	(0.0813)
Chemicals x Net Worth	0.0391	0.0152
	(0.0298)	(0.0176)
Plastics and Rubber x Net Worth	0.00806	0.00171
	(0.0303)	(0.0163)
Nonmetallic Minerals x Net Worth	0.0287	0.0583
	(0.0511)	(0.0451)
Primary Metals x Net Worth	0.0616	-0.00569
	(0.264)	(0.200)
Fabricated Metals x Net Worth	0.306^{+}	0.223^{+}
	(0.170)	(0.132)
Machinery x Net Worth	0.147^{+}	0.0337
	(0.0754)	(0.0474)
Computer and Electronics x Net Worth	0.0901*	0.0603*
	(0.0402)	(0.0285)
Electrical Equipment x Net Worth	0.126*	0.0910*
	(0.0549)	(0.0400)
Transportation Equipment x Net Worth	0.0626	0.0123
	(0.0709)	(0.0266)
Furniture x Net Worth	-0.0340	-0.00445
	(0.0474)	(0.0405)
Miscellaneous x Net Worth	0.00361	0.0110
	(0.0761)	(0.0648)
Constant	0.657***	0.661***
	(0.00642)	(0.00347)
Adjusted R^2	0.613	0.612
Observations	16,940	17,151

Notes. This table shows results of panel regressions between hedging and net worth indexes allowing for different coefficients by sector (NAICS 3). The outcome variable is the share of purchase obligations over costs of goods sold. Regressors are the product of each measure of net worth and an indicator representing the sector within manufacturing. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.20: Other Net Worth Measures - Sectoral Differences - WLS

	(1) Net Worth Index - sd adj	(2) Net Worth Index - ex Assets - sd adj
Food Manufacturing x Net Worth	0.0446	-0.0211
	(0.0771)	(0.0540)
Beverage and Tobacco x Net Worth	0.485***	0.370***
	(0.116)	(0.0875)
Textile Mills x Net Worth	-0.0176	-0.0220
	(0.0267)	(0.0261)
Textile Product Mills x Net Worth	0.138	0.143^{+}
	(0.0938)	(0.0800)
Apparel x Net Worth	0.167	0.0377
	(0.160)	(0.119)
Leather and Allied x Net Worth	0.406*	0.205*
	(0.167)	(0.0926)
Wood Products x Net Worth	0.295**	0.229^{+}
	(0.109)	(0.121)
Paper Products x Net Worth	0.394	0.310
	(0.241)	(0.190)
Printing Product x Net Worth	0.0849^{+}	0.0532
	(0.0509)	(0.0471)
Petroleum and Coal	0.161	0.0999
	(0.145)	(0.0908)
Chemicals x Net Worth	0.0537*	0.0259*
	(0.0210)	(0.0111)
Plastics and Rubber x Net Worth	-0.000916	-0.000406
	(0.00978)	(0.00529)
Nonmetallic Minerals x Net Worth	-0.00226	0.00808
	(0.0365)	(0.0329)
Primary Metals x Net Worth	-0.332	-0.249*
	(0.217)	(0.101)
Fabricated Metals x Net Worth	0.491^{+}	0.360^{+}
	(0.276)	(0.210)
Machinery x Net Worth	0.0959	0.0156
	(0.0651)	(0.0393)
Computer and Electronics x Net Worth	0.0698^{+}	0.0456
	(0.0393)	(0.0301)
Electrical Equipment x Net Worth	0.0850^{+}	0.0591
	(0.0497)	(0.0367)
Transportation Equipment x Net Worth	0.0834	0.0207
	(0.0538)	(0.0134)
Furniture x Net Worth	-0.0504	-0.00627
	(0.0522)	(0.0470)
Miscellaneous x Net Worth	0.0515	0.0500
	(0.102)	(0.0804)
Constant	0.605***	0.568***
	(0.0159)	(0.00818)
Adjusted R^2	0.606	0.604
Observations	16,940	17,151

Notes. This table shows results of panel regressions between hedging and net worth indexes allowing for different coefficients by sector (NAICS 3). The outcome variable is the share of purchase obligations over costs of goods sold. Reregressors are the product of each measure of net worth and an indicator representing the sector within manufacturing. Firm and year fixed effects are included. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.21: Purchase Obligations and Net Worth Index: Positive PO - Pooled

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Net Worth Index - sd adj	-0.175***	-0.165***		
	(0.0388)	(0.0273)		
Net Worth Index - ex Assets - sd adj			-0.0699^{+}	-0.120***
			(0.0420)	(0.0276)
Constant	1.182***	1.134***	1.225***	1.107***
	(0.0317)	(0.0267)	(0.0363)	(0.0265)
R^2	0.020	0.016	0.005	0.007
Observations	10,489	10,489	10,659	10,659

Notes. This table shows the results of panel regressions between hedging and net worth for observations with positive purchase obligations. No fixed effects are included. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Variables are scaled by their standard deviation to reinterpret estimated coefficients in standard deviation terms. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.22: Purchase Obligations and Net Worth Index: Positive PO - Within

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Net Worth Index - sd adj	0.108*	0.0610^{+}		
	(0.0535)	(0.0355)		
Net Worth Index - ex Assets - sd adj			0.0637*	0.0385
			(0.0306)	(0.0240)
Constant	1.278***	1.074***	1.249***	1.077***
	(0.0164)	(0.00997)	(0.00442)	(0.00490)
Adjusted R^2	0.596	0.608	0.597	0.608
Observations	10,233	10,233	10,402	10,402

Notes. This table shows the results of panel regressions between hedging and net worth for observations with positive purchase obligations. Time and firm fixed effects are included in all regressions. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Variables are scaled by their standard deviation to reinterpret estimated coefficients in standard deviation terms. Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.23: Purchase Obligations and Net Worth Index: Decline in Commodity Prices - Pooled

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Net Worth Index - sd adj	0.118***	0.0965***		
	(0.0180)	(0.0202)		
Net Worth Index - ex Assets - sd adj			0.0817***	0.0791***
			(0.0124)	(0.0168)
Constant	0.713***	0.735***	0.663***	0.736***
	(0.0312)	(0.0255)	(0.0319)	(0.0253)
R^2	0.022	0.009	0.019	0.006
Observations	5,904	5,904	5,989	5,989

Notes. This table shows the results of pooled regressions between hedging and net worth when commodity prices decline. No fixed effects are included in all regressions. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.24: Purchase Obligations and Net Worth Index: Decline in Commodity Prices - Fixed Effects

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Net Worth Index - sd adj	0.0326	0.0487^{+}		
	(0.0281)	(0.0286)		
Net Worth Index - ex Assets - sd adj			0.0232	0.0258
			(0.0143)	(0.0190)
Constant	0.666***	0.746***	0.651***	0.747***
	(0.0194)	(0.00174)	(0.00753)	(0.000675)
Adjusted R^2	0.648	0.654	0.648	0.653
Observations	5,426	5,426	5,505	5,505

Notes. This table shows results of within regressions between hedging and net worth when commodity prices decline. Time and firm fixed effects are included in all regressions. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.25: Purchase Obligations and Net Worth: Decline in Commodity Prices - Tobit

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj	(3) PO/COGS - sd adj	(4) PO/COGS - sd adj
Net Worth Index - sd adj	0.0826***	0.188***		
	(0.0195)	(0.0218)		
Net Worth Index - ex Assets - sd adj			0.0510**	0.147***
			(0.0165)	(0.0213)
Observations	5904	5904	5989	5989
Observations	5,904	5,904	5,989	5,989
Pseudo R^2	.009	.015	.008	.01

Notes. This table shows results of Tobit regressions between hedging and net worth when commodity prices decline. Time fixed effects are included in all regressions. Coefficients show marginal effects conditional on outcome variables greater than zero. Columns (1) and (3) weight observations by the inverse square root of total assets (weighted least squares). Standard errors clustered at firm level are included in parentheses.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.26: Purchase Obligations and Net Worth: Size Tercile Regressions - OLS

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0397	
	(0.0322)	
Net Worth Index - ex Assets - sd adj		0.0515***
		(0.0130)
MedSize		0.184***
		(0.0394)
LargeSize		0.168***
		(0.0459)
Adjusted R^2	0.002	0.013
Observations	11,746	17,530

Notes. This table shows results of OLS regressions between hedging and net worth controlling for size terciles defined using log assets. Column (1) excludes the bottom tercile and Column (2) includes size dummies. Time fixed effects are included in both regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.27: Purchase Obligations and Net Worth: Size Tercile Regressions - Within

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.0529	
	(0.0337)	
Net Worth Index - ex Assets - sd adj		0.0369**
		(0.0132)
MedSize		0.0969^{+}
		(0.0503)
LargeSize		0.171**
		(0.0643)
Constant	0.709***	0.573***
	(0.0149)	(0.0372)
Adjusted R^2	0.647	0.612
Observations	11,515	17,151

Notes. This table shows results of OLS regressions between hedging and net worth controlling for size terciles defined using log assets. Column (1) excludes the bottom tercile and Column (2) includes size dummies. Time and Firm fixed effects are included in both regressions. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.28: Purchase Obligations and Net Worth: Size Tercile Regressions - Tobit

	(1) PO/COGS - sd adj	(2) PO/COGS - sd adj
Net Worth Index - sd adj	0.109***	
	(0.0277)	
Net Worth Index - ex Assets - sd adj		0.0918***
		(0.0151)
MedSize		0.302***
		(0.0392)
LargeSize		0.362***
		(0.0430)
Observations	11746	17530
Observations	11,746	17,530
Pseudo R^2	0.003	0.019

Notes. This table shows results of tobit regressions between hedging and net worth controlling for size terciles defined using log assets. Column (1) excludes the bottom tercile and Column (2) includes size dummies. Time fixed effects are included in both regressions. Coefficients show marginal effects conditional on outcome variables greater than zero. Standard errors clustered at firm level are included in parentheses. Observations are winsorized at the top and bottom 1% for each net worth measure before estimating the regressions. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

C Data Collection

The dataset used in this paper is a combination of firm balance sheet, industry, and text-based characteristics. I constructed the dataset in four steps:

1. **Scope.** Using COMPUSTAT, I downloaded the CIK (SEC identifier) for all public firms in the manufacturing sector (NAICS 31-33). The Securities and Exchange Commission mantains an online repository of all filings starting in 1993. These can be accessed through the Ibsite https://www.sec.gov/Archives/edgar/full-index/. I downloaded the header of all reports filed betIen 2003 and 2019 for companies with CIKs found on COMPUSTAT and belonging to the manufacturing sector. I kept only company-year observations with a 10-K report in the EDGAR repository.

2. **Firm Characteristics.** I used COMPUSTAT to obtain earnings and cost measures used throughout the paper.

3. **Purchase Obligations.** I constructed the purchase obligations dataset in three steps, following Almeida et al. (2017) and Moon and Phillips (2020).

   For each company-year in the scope, I downloaded the purchase obligation table using a scraping algorithm in Python. For each 10-K in **Scope**, the algorithm reads through the 10-K and finds the table with the purchase obligation amount. The keywords used Ire `Purchase Obligations`, `Purchase Commitments`, `Purchase Orders`, and `Contractual Obligations`.[10]

   Companies do not follow a strict reporting procedure, and therefore some adjustments are needed. First, the unit of account for PO is problematic. Some companies report explicitly the unit (dollars, thousands or millions), but others fail to do so. I solve this issue by extracting the unit of account from the table if it is available. If the unit is missing, I compute the ratio PO/Cost of Goods Sold and define the unit of measure based on three thresholds.

Unit	Threshold PO/COGS
Millions	< 0.45
Thousands	< 2.7 & > 0.45
Dollars	$> 10,200$

   I verify that this process correctly accounts for the unit of measure by manually checking the annual reports of about 1% of the sample. Finally, I dropped all observations with $PO/COGS > 1$ as this firms are likely reporting a large share of capital expenditures in purchase obligations that are unrelated to commodity hedging.

4. **Input Price Index.** I constructed a Laspeyres price index from materials used by sector using the Economics Census 2012 and the BLS or World Bank.[11] I first assign

[10] Also letter-case variations such as `Purchase obligations`, `purchase obligations`, etc.

[11] The Economic Census can be accessed on https://www.census.gov/data/datasets/2012/econ/census/2012-manufacturing.html.

the closest price index to each commodity using BLS data based on the industry code using price indexes by industry.[12] If there is no price, I manually assign the closest commodity based on the name on the Economic Census.[13] Finally, for some commodities, only World Bank Commodity Data have a relevant price. [14]

The last step is to construct expenditure shares of each sector (NAICS-3) on all other sectors using the Economic Census Materials Consumed by Kind of Industry. For each 3-digit manufacturing sector, the input price index is the sum of the product of the price index of each commodity and its share in that sector.

[12] https://download.bls.gov/pub/time.series/pc/.

[13] See https://download.bls.gov/pub/time.series/wp/

[14] See https://www.worldbank.org/en/research/commodity-markets. However, only 0.45% of the commodity prices I used are from the World Bank.