

STRUCTURE OF ASSETS AND CAPITAL STRUCTURE. WHAT ARE THE RELATIONS WITH EACH OTHER? AN EMPIRICAL ANALYSIS OF A SAMPLE OF ITALY.

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ABSTRACT

U sing a panel of 4,000 Italian firms (manufacturing SMEs) over the period from 2008 to 2011 we verify the impact and influences of structure of assets on corporate leverage.

Empirically, we find a positive and economically large relation between total inventories and corporate leverage and between credit trade and debts. We also find some evidence that more liquid firms extend more credit to their customers and rely less on credit from their suppliers or banks.

On the other hand the fixed assets index is not associated with leverage. The findings are not consistent with the hypotheses of literature. We found, in fact, that the relation between the total fixed assets and the level of debt is curvilinear.

In addition, the results are consistent with the hypothesis that the solvency increase with asset liquidity.

JEL Classifications: G32, G33

Keywords: Liquidity of assets, leverage, capital structure, firm structure

1. Introduction

In the present sample it has been noticed that 62% of firms without the coverage of short-term debt has got insolvent within three years by a trend quicker than any other financial ratio. The issue just stated here implies that to assess the quality of financial structure the analysis on composition and nature of the assets is inescapably needed. The financial equilibrium, indeed, is the quite exclusive effect of the congruence of maturities between sources and uses (Muscellola, 2010). Before coming to judge the optimal financial structure of firms, then, it will be necessary to evaluate it in light of the trade receivables actually payable and inventories actually liquidated.

The method premise founding the empirical work is about the causality of the firm's asset liquidity compared to the capital structure and not as its consequence. This is a fundamental passage for the study premises to validate the chosen model and to prove the thesis that a link exist and is statistically significant between breakdown of the assets and the capital structure of firms with consequences that are direct and visible on the corporate economic indicators and, at last, on the solvency of firms inserted into the sample of manufacturing firms.

The sample of Italian SMEs is selected because until now there is no research published with the same scope on Italian territory. For calculating interrelation results and leverage impacts, in this study, processed data were those before the crisis period (2008) although the data are good until 2011 and do not show particular differences from year 2008 about interrelations among variables (Muscellola & Modena, 2013). Descriptive analysis, through the examination of 4,000 manufacturing Italian SMEs, points out the effectiveness of using composition of assets to reduce the overall indebtedness of firms. And these data are acceptable values during the crisis.

In general, the management has to consider the impacts on capital structure when it changes the liquidity of assets though in some cases and for some variables this impact is not so evident (Muscellola & Gallo, 2008).

The paper is organized as follow. The research issues and literature review will be covered in next sessions 2. Then, descriptive analysis and conceptual definitions are introduced in session 3. Session 4 describes the data in cluster analysis. Session 5 presents empirical results and findings. Lastly, session 6 shows discussion and conclusion on results achieved.

2. LIBRARY REVIEW

For many years the debate has been focusing on the presence or not of a link, and of which kind, between elasticity of assets and composition of financing sources. The empirical results are not all oriented to the same direction, although the most of experts assert to clearly see a relationship of positive type: greater liquidity of assets - higher debt. It results from the intent in a firm to offset negative effects of a harder rigidity of assets with lower financial debts. The first direct consequence of an undue inflexibility of assets, indeed, is a worsened onerousness of the business management with also higher liquidation costs or transfer costs of assets and indirect costs of failure. Beside these issues there are the rating findings that associate to not enough flexible firms higher probabilities of default, with all the deriving negative implications on the creditworthiness or, almost, on the pricing of loans¹.

Anyhow the relationship between the cost of new debts and the rigidity of assets is rather arguable. Stable assets as well as long - established, rigid and easily quantifiable, are equal to a valid guarantee for the

¹Such aspects especially occur in non – small firms.

financier. In this way then the non - easy liquidability of assets leads to positive approaches to the access to bank lending being itself possible collateral for further borrowings.

Among the prominent studies on this subject, regarding the relationship between the working capital and the capital structure, a remarkable tribute must go to the work conducted by Williamson (1988). He very simply states that less rigid assets recur many times a year and so it can be financed with debts more times in a row.

Shleifer and Vishny (1991), at the same time, see the most rigid firms as the riskier and, thus, fundable to greater cost.

Harris and Raviv (1990) notice that suppliers quantify the possibility (and they assess the duty and the amount) of a firm to create adequate liquidity for the covering of their indebtedness, rather than other details. For such fact the lenders, also virtual/potential ones, are longingly interested to finance firms with a satisfactory propensity to liquidating its assets.

Conversely, Morellec (2001) refuses a substantial link between inflexibility of assets and the grade of corporate leverage emphasizing that assets easy to sell establishes a better comfort for the lenders as well as it constitutes an easy and quick loss of “steady value” for the firm, offsetting likewise the effects.

Even Myers and Rajan (1998) find out that the corporate elasticity is also synonym of better easiness for the management to transform the firm and expropriate its own added value or future potentialities.

Another fundamental aspect to eventually see the links is to quantify the effective cost of conversion in cash of assets. Some studies pointed out that distressed companies sell, as logically expected, their goods or services at a lower sale price and the most of firms prefer to act with greater prudential liquid assets more than the necessary to be efficiently productive.

Shleifer and Vishny (1992) find in the costs of conversion of assets into cash the most evident justification that makes a firm more efficient and then financeable.

About the empirical analysis we must recommend the significant study conducted by Sibilkov (2004). He attempted, with a sample of American firms, to test scientifically the reaction in terms of degree of indebtedness to the variations of liquidity of the business activities. With a *time frame* of two following years he statistically classified as positive and significant the effects on the leverage of the liquidity ratios. That thesis, broadly shared by the most of American economists, also says that the configuration of corporate assets is the cause of the capital structure of firms and not its effect and, by deduction, the changes of the liquidity give a positive effect on the optimal leverage.

3. DESCRIPTIVE ANALYSIS

3.1 Dataset

The sample consists of Italian manufacturing SMEs during the period 2008 to 2011. In addition, we exclude firms that belong to financial, service and utility industries. The final sample is composed of 16,000 firm-year observations² that span 4,000 individual companies. We eliminate firm - years for which the value of capital stock is less than five million euro, those displaying real asset or sales growth exceeding 50%, and those with negative net worth or with large jumps in business fundamentals (total assets, financial debts and firm's earnings).

Concerning those firms turned insolvent (bad firms), not to spoil the time frame, the analysis does not cover all the firms which got insolvent in 2008, in 2009 and in 2010, but only the firms that became insolvent in 2011 beyond, naturally, firms with no insolvencies through the entire period under this study (good firms). In the adopted model, a firm has been considered as default - grade during year 2011 (bad firms) if in that year the Central Credit Register reports the existence of credit overdue for more than three months³ (Muscettola & Naccarato, 2012a).

As follows, on Table 1, there is a description of fundamental parameters for the sample used in the essay:

Table 1: *Characteristics of the sample used in the research.* The data refer to the official financial statements of 2008 (bad firms have become insolvent during the year 2011).

DATASET	Whole Sample		Bad Firms		Good Firms	
	NR	%	NR	%	NR	%
Manufacturing Firms	4,000	100,00	250	6.25	3,750	93.75
Structural parameters						
Sales (x 1,000 €)	15,474		16,574		15,405	
Total Assets (x 1,000 €)	14,946		22,448		14,471	
Net Worth (x 1,000 €)	4,952		5,806		4,898	
EBITDA (x 1,000 €)	1,217		776		1,245	
Cash Flow (x 1,000 €)	714		-175		770	

Prior to apply the empirical analysis, the featured differences had been emphasised while creating assets between firms healthy along the entire period of this study, and firms going in default during 2011 (after three years), conversely.

It results in a chart showing how bad firms, compared to good firms, keep more inventories (23.04% against 19.90% of good firms) and less trade receivables (32.23% against 36.65% of good firms) referring to total assets and, significantly, how bad firms result burdened by a major number of fixed assets (35.64% against 30.73% of good firms).

²The yearly statements are provided by FourFinance Sas, which assembled, cleaned, regulated and reclassified financial statements collected from multiple databases as, above all, Cerved Group Spa and Crif Spa. As for the creation of the statistical model, the preliminary operations on the data, the choice of the outliers and the creation of financial ratios, the reader ought to refer exclusively to the authors.

³This definition is narrower than the one generally applied in bank rating models, as these consider default to be the onset of serious financial distress which borrowers cannot solve if unaided, and through which the credit and loans granted may be lost.

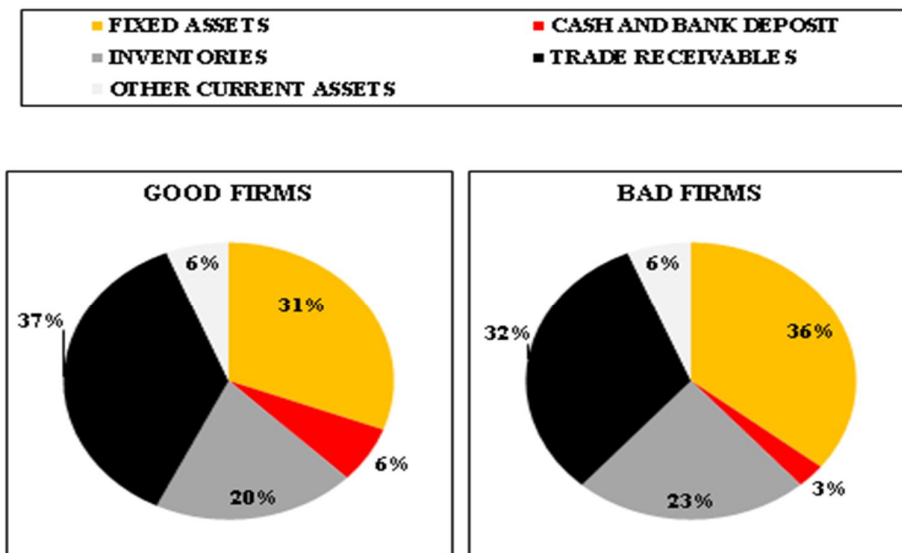


Figure 1: Distribution of corporate assets in our sample of analysis.

Chart 2 shows the link existing between the rigidity of assets and the corporate capitalization level in account of the averages of the four quartiles of each of the two distributions (fixed assets and net worth). Manufacturing firms compelled to adopt outstanding facilities to develop their own business ought to find adequate sources of funding, considering quality and duration. Because of that, manufacturing firms with more fixed assets have got even higher consolidated liabilities (shareholders' equity and long-term debts). There is an evident direct and positive link between rigidity of assets and corporate net worth. Chart does not illustrate very linearly how the growing ratio of the equity as fixed assets increase as well as it is not really clear the ratio of fixed assets as the net worth leavens. For this very reason the rigidity of assets is supposed to be an important factor that inevitably leads to a capitalization increase and not, instead, a consequence of major infrastructure investments made. This way, the part uncovered by the equity may be offset by long-term loans in order to achieve the financial balance.

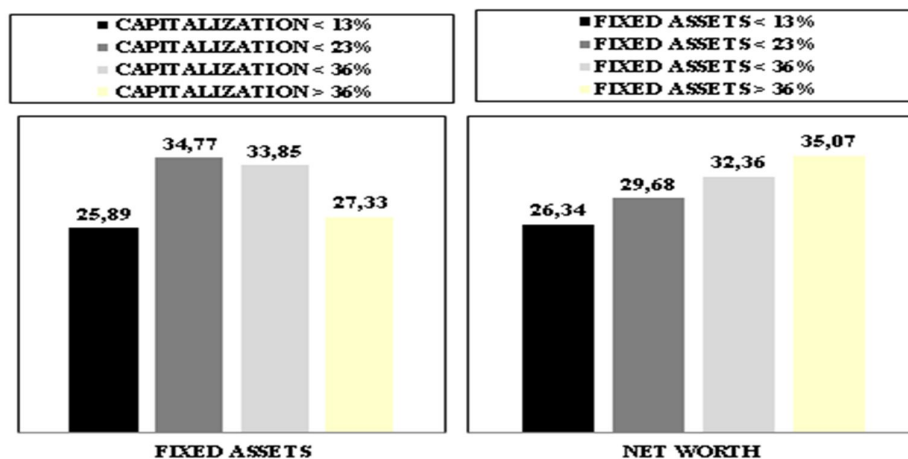


Figure 2: the percentage of fixed assets on total assets as corporate capitalization varies and the percentage of net worth on total equity and liabilities as rigidity of assets varies.

3.2. Explanatory variables and dependent variable

The explanatory variables taken in account in the present study are eight and concern the cash conversion cycle, and its factorization, as well as the distribution of the assets. The dependent variables, conversely, detect the corporate leverage and their capital structure. In such way it is possible to study the effects of the asset liquidity on the organization of indebtedness. As follows the eight explanatory variables to which, for the purpose of testing the correct trend of the indicators, must be added two more ratios (control variables): "Equity / Total assets" and "Financial debts / Total assets".

Explanatory variables:

1. No. of days accounts receivable (receivables conversion period): $\text{Accounts receivables} / \text{Annual sales} \times 365$;
2. No. of days inventories (inventory conversion period): $\text{Inventories} / \text{Cost of sales} \times 365$;
3. No. of days account payable (account payable turnover): $\text{Accounts payables} / \text{Purchases} \times 365$;
4. Cash conversion cycle: $\text{No. of days account receivable} + \text{No. of day inventories} - \text{No. days account payable}$;
5. Total fixed assets / Total assets (rigidity of assets): $\text{Property, plant, equipment, long-term investments, credits with built-in over a year}^4 \text{ and intangible long-term assets} / \text{Total Assets}$;
6. Cash and bank deposits / Total assets (cash): $\text{Immediate liquidity} / \text{Total Assets}$;
7. Inventory / Total assets: $\text{The raw materials, work-in-process goods and completely finished goods} / \text{Total Assets}$;
8. Trade receivables / Total assets: $\text{Total trade receivables} / \text{Total Assets}$;

Control variables:

9. Equity / Total assets (corporate capitalization): $\text{Net worth} / \text{Total Assets}$;
10. Financial debts / Total assets (borrowed capital): $\text{Total borrower capital} / \text{Total Assets}$;

Dependent variable:

11. Leverage (financial indebtedness): $\text{Total financial debts} / \text{Net worth}$.

Table 2 reports the descriptive statistics relative to 4,000 manufacturing firms during the year 2008.

Table 2: Summary Statistics

	Quartile 1	Median	Mean	Quartile 3	Standard Deviation	Asymmetry
No. of Days Accounts Receivable	82.053	112.373	118.000	145.667	58.523	1,502
No. of Days Inventories	28.078	54.371	71.459	96.182	64.036	2,103
No. of Days Account Payable	106.793	151.191	173.295	207.717	110.714	1,851
Cash Conversion Cycle	-34.401	23.761	16.326	83.631	127.160	-0,935
Total fixed assets / Total assets	14.852	28.531	30.458	43.826	18.841	0,469
Cash and bank deposits/ Total assets	0.338	2.208	6.539	8.187	10.097	2,571
Inventory/ Total assets	9.411	17.622	20.045	28.232	13.757	0,881
Trade receivables/ Total assets	24.290	35.433	36.768	47.791	17.363	0,439
Equity / Total Assets	16.066	27.588	30.869	43.495	19.129	0,597
Financial debts / Total Assets	7.574	25.086	25.266	39.993	18.814	0,262
Leverage	0.179	0.859	2.859	2.192	43.283	12,484

⁴ Any asset that the firm does not expect to sell for at least a year or not readily convertible to cash that is used in the normal course of business.

From Table 3, it is clear how the most of variables it is not strongly self – related. Excluding those indicators composed from the same accounting items, scilicet “No. of days inventories” and “Inventories / Total assets”, for example, the best correlations (positively related) to point out are among the financial leverage and the “No. of days inventories”.

It is also quite intuitive the inverse relationship between cash and bank deposit and financial debts and for what may concern the rigidity of the assets it is to underline the strong positive interrelation between cash conversion cycle and “no. of days inventories” and negative between “cash conversion cycle” and “no. of days account payable”.

Table 3: Pearson correlation table for the variables that will be included in regression model.

	No of Days Accounts Receivable	No. of Days Inventories	No. of Days Account Payable	Conversion Cycle	Cash assets / Total assets	Total fixed assets / Total assets	Cash and bank deposits/ Total assets	Inventory/ Total assets	Trade receivables/ Total assets	Equity / Total Assets	Financial debts / Total Assets	Leverage
No of Days Accounts Receivable		0.071	0.281	0.248	-0.136	-0.197	-0.176	0.535	-0.102	0.172	0.022	
No. of Days Inventories			0.018	0.518	-0.080	-0.201	0.789	-0.363	-0.086	0.248	0.089	
No. of Days Account Payable				-0.726	0.058	0.021	-0.140	0.022	-0.136	-0.063	0.061	
Cash Conversion Cycle					-0.152	-0.210	0.436	0.043	0.028	0.258	0.002	
Total fixed assets / Total assets						-0.258	-0.366	-0.567	0.184	0.142	-0.016	
Cash and bank deposits/ Total assets							-0.193	-0.137	0.324	-0.407	-0.015	
Inventory/ Total assets								-0.232	-0.182	0.190	0.067	
Trade receivables/ Total assets									-0.252	-0.007	-0.014	
Equity / Total Assets										-0.602	-0.051	
Financial debts / Total Assets											0.022	
Leverage												

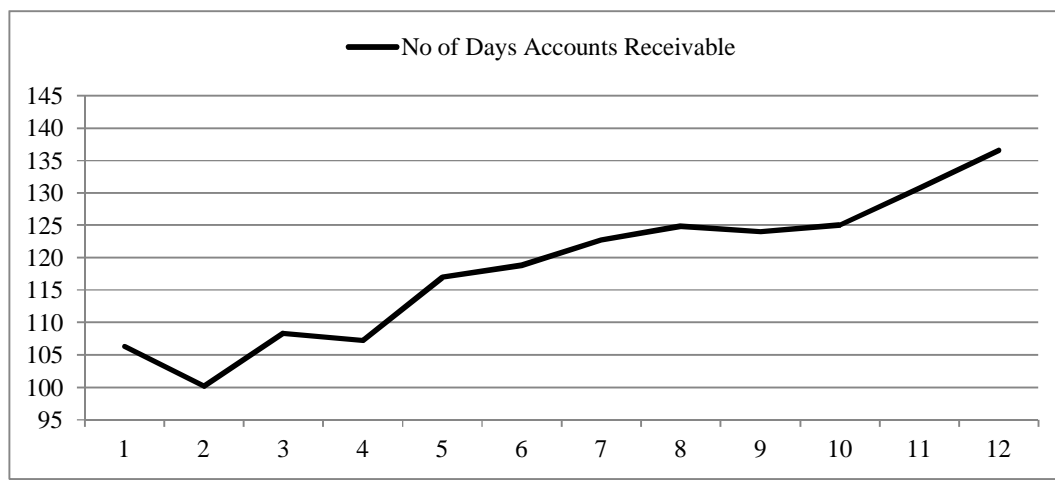
The leverage is positively correlated with the inventory conversion period, with the same incidence of the inventories on total assets, with the duration of the cash conversion cycle and with the number of days account receivables. The leverage however has a negative link, as expected, with cash (Muscuttola & Pietroito, 2012a). The other correlations are slender and negligible.

The correlation between the ratio “Equity / Total Assets” and all the variables of this survey is always very low except the negative correlation due to the total of the trade receivables and the inventories, kindled, as mentioned, by a major hypothetical corporate indebtedness, and a positive link, as anticipated, with the instant liquidity as a symptom that the firm may reduce support by external source in sight of suitable corporate liquidity.

4. CLUSTER ANALYSIS

Here are shown some graphs portraying the cluster analysis (Muscettola & Pietrovito, 2012b). In follows figures there are the trends of means of the explanatory variables having distinction by cluster considering the corporate leverage. The sample analysis has been subdivided into twelve clusters according to the distribution of the dependent variables (Leverage = Financial debts / Net worth), let us see the trend of the averages of the other explanatory variables.

Figure 3: trend of the means of the number of days account receivables according to the distribution of leverage.



Charts show a significant and positive relationship between the "No. of days Accounts Receivable" (Figure 3), or the "No. of Days Inventories" (Figure 4), and the level of financial indebtedness. As the trade receivables conversion period, or the inventory conversion period, lasts longer, firms proportionally increase their borrowed capital level.

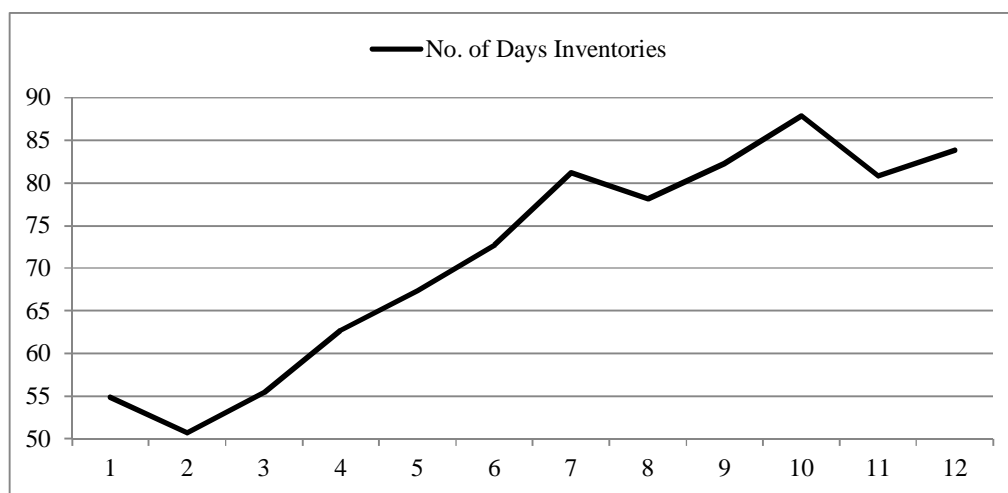


Figure 4: trend of the means of the number of days inventories according to the distribution of leverage.

Not so meaningful is the connection between the account payable turnover and corporate leverage, as seen on third shelf of the Figure 5.

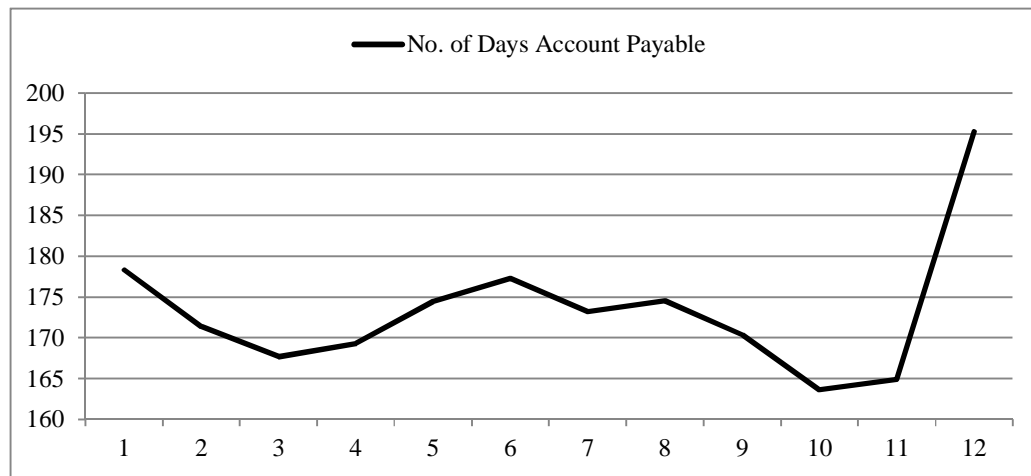


Figure 5: trend of the means of the number of days account payables according to the distribution of leverage.

It is significative and directly proportional the link between the cash conversion cycle and the financial debts (figure 6). Firms with a longer cash conversion period to support get better funded by external funding aimed at a higher support of the working capital indeed. Only the last cluster shows a trend going different from the previous ones. That is uniquely due to the trend curve of the debtors' turnover days, as seen on previous chart, where, in the last cluster, it is evident an elevate increase of the number of days account payable to suppliers related to those firms that display a high degree of bank debt. This issue, since it may concern the cluster in chart 5, determinates an average decrease of the length of the cash cycle (Figure 6).

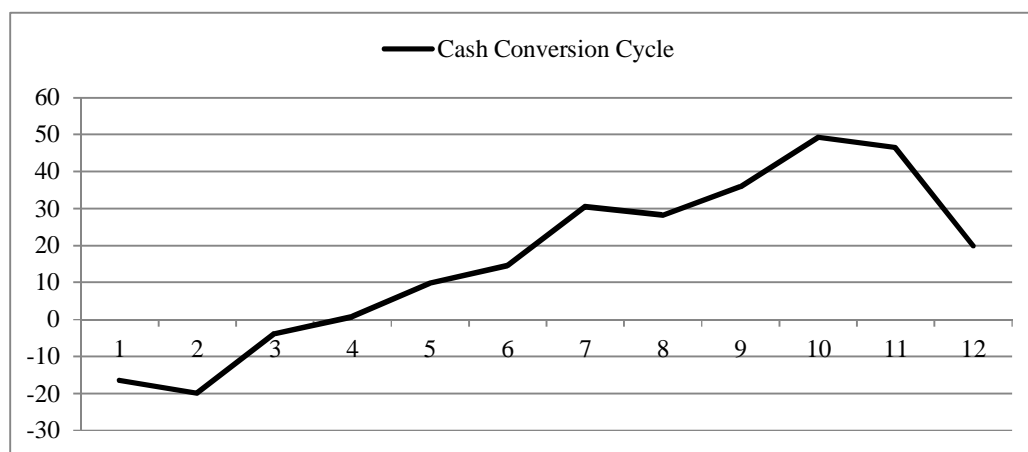


Figure 6: trend of the means of cash conversion cycle according to the distribution of leverage.

While the connection between borrowings and cash (Figure 8) looks ascertained and statistically significant, although, after a certain level of debt, the percentage of instant liquidity on total assets ceases to grow, there is the evidence that the fixed assets to total assets do not produce a linear connection (Figure 7). When firms are able to pledge their assets as collateral, investment and borrowing become endogenous but until a certain point. Beyond a certain level of pledgable assets replaces the need for the company to increase the portion of the equity on debts. Fixed assets, with their perfect curvilinear trend, support more borrowings, that in turn allow for further investment has an important impact on corporate leverage but not linear. Figure 7 report the central findings of this paper. Based on the results from cluster analysis we note that corporate leverage sensitivities are increasing in asset tangibility until the middle of the graph and then descends rapidly, in opposite direction, to the initial levels.

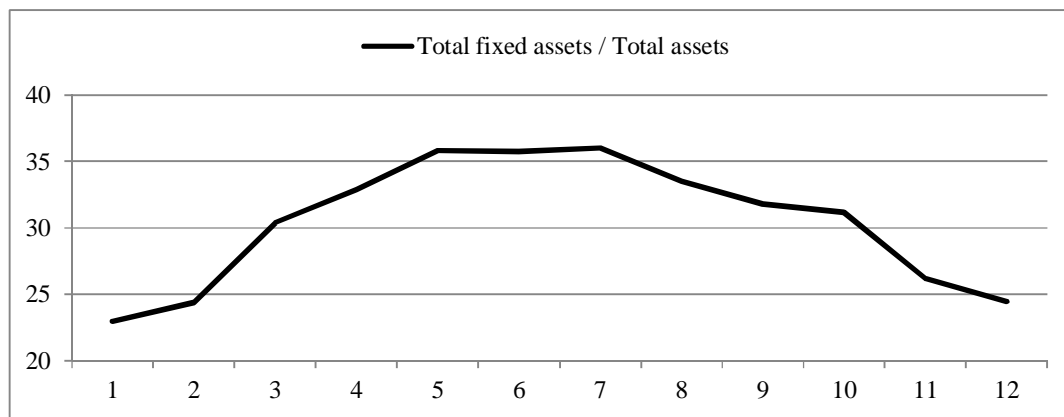


Figure 7: trend of the means of total fixed assets on total assets according to the distribution of leverage.

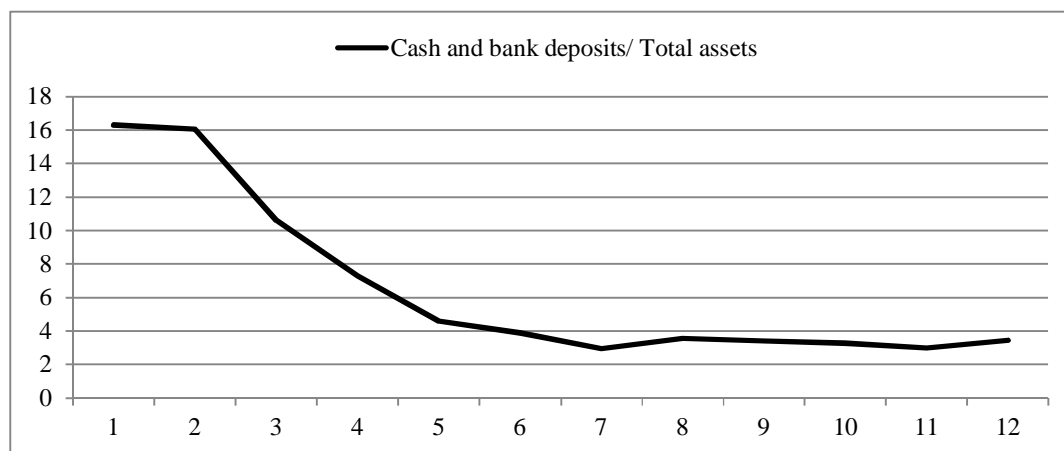


Figure 8: trend of the means of cash and bank deposit according to the distribution of leverage.

It is full positive, lastly, the relationship between the corporate leverage and the percentage of stocks related to total assets (Figure 9). The more the inventories, in the end, the higher the financial debts for firms considering equity.

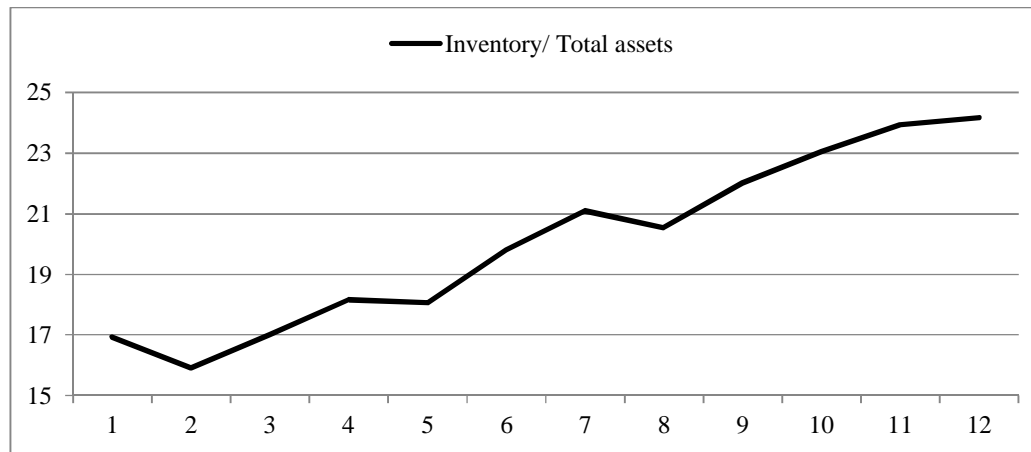


Figure 9: trend of the means of inventory on total assets according to the distribution of leverage.

Last chart explains the relationship between the trend of the perceptual of trade receivables and the financial indebtedness (Figure 10). Firms included in the quartile which underlines the lowest level of leverage do not show an increasing linear ratio of the account receivables quote; it is clearly visible instead the directly proportional trend of the two zones from the second quartile on. It may be asserted that beyond a certain grade of rigidity of assets, as seen in chart 7, banks would rather substitute their own investments into firms, with less fixed assets and more account receivables, in spite of the indirect warranty they constitute for lenders, because of quite higher levels of rigidity and risk.

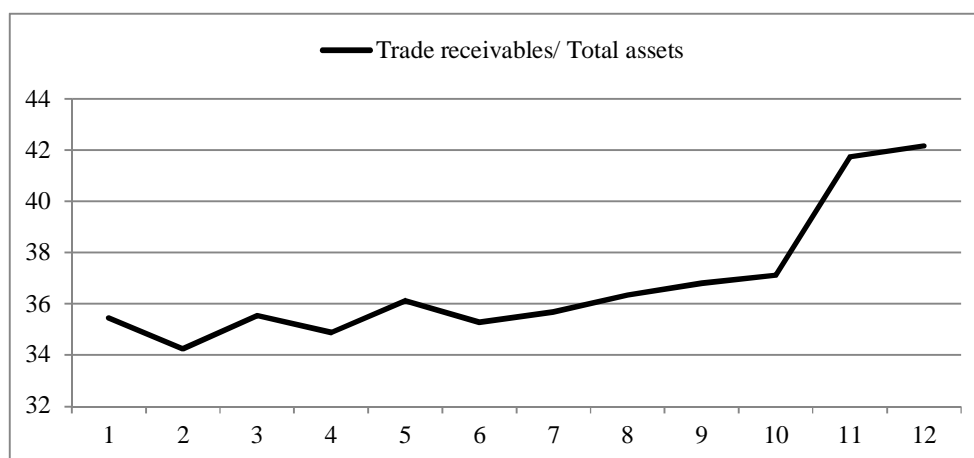


Figure 10: trend of the means of trade receivables on total assets according to the distribution of leverage.

5. EMPIRICAL ANALYSIS

The regression analysis finds out the influence and connection of explanatory variables with corporate leverage. Borrowed capital on net worth, therefore, is regressed with independent variables to get the outcomes of the predicted relationships. To examine the association an ordinal regression analysis⁵ has been performed on the level of dependent variable on the explanatory variables. Instead of considering the probability of an individual event, we consider the probability of that event and all events that are ordered before it. Because the relationship between all pairs of groups is the same, there is only one set of coefficients (only one model)⁶.

That means that the outcome of the independent variable is the same for different logit functions. In this logic, unlike the binary regression, because there isn't a linear function between the elements of analysis, it is possible to interpret only the sign and the statistical "p-value" of the coefficients but not the size. The terms, called the "threshold" values, do not depend on the standards of the independent variable. They are similar to the intercept in a direct regression, with the omission that each logit has its own. The estimates marked as "location" are the coefficients for the predictor variables. The Wald statistic is the square of the ratio of the coefficient to its standard error.

The results in Table 5 indicate that the overall model is statistically significant, as are each of the predictor variables. We also see that the test of the proportional odds assumption is significant with the exclusion of first decile, that shows a high p-value (0.193). Based on the small observed significance level, you can reject the null hypothesis that it is zero. There appears to be a relationship between the composition of assets and financial indebtedness.

⁵Ordered logistic regression is used when the dependent variable is ordered, but not continuous.

⁶The dependent variable has been sectioned into ten ordinal clusters considering the decile reference to the distribution, starting from minimum to maximum value: any one of values dividing the distribution of the dependent variables in the series into ten groups of equal frequency.

The results from the level regressions are reported in the table 5 for the leverage.

Table 4: ordinal logistic regression

	LEVERAGE	Sign	Estimate	Std. Error	Wald	P Value	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[leverage = 1]		-0.396	0.304	1.697	0.193	-0.991	0.200
	[leverage = 2]		0.585	0.302	3.751	0.053	-0.007	1.177
	[leverage = 3]		1.266	0.302	17.554	0.000	0.674	1.858
	[leverage = 4]		1.810	0.303	35.742	0.000	1.216	2.403
	[leverage = 5]		2.288	0.303	56.874	0.000	1.694	2.883
	[leverage = 6]		2.747	0.304	81.550	0.000	2.151	3.344
	[leverage = 7]		3.232	0.305	112.152	0.000	2.634	3.830
	[leverage = 8]		3.809	0.306	154.518	0.000	3.209	4.410
	[leverage = 9]		4.655	0.309	226.870	0.000	4.049	5.260
Location	No. of Days Accounts Receivable	+	0.013	0.007	2.952	0.086	-0.002	0.027
	No. of Days Inventories	+	0.010	0.008	1.821	0.177	-0.005	0.025
	No. of Days Account Payable	-	-0.010	0.007	1.886	0.170	-0.025	0.004
	Cash Conversion Cycle	-	-0.011	0.007	2.104	0.147	-0.026	0.004
	Total fixed assets / Total assets	+	0.019	0.003	33.059	0.000	0.013	0.026
	Cash and bank deposits/ Total assets	-	-0.060	0.004	186.381	0.000	-0.068	-0.051
	Inventory/ Total assets	+	0.042	0.005	71.251	0.000	0.032	0.052
	Trade receivables/ Total assets	+	0.023	0.004	37.812	0.000	0.016	0.031

In line with the Pearson correlation and with the cluster analysis, the coefficients on the receivables conversion period and on inventory conversion period in the static effects regression are positives while the effects of account payable turnover are negative. The coefficients of cash conversion cycle and its factorization are quite doubtful and in an economic view barely intelligible. In this sense, in fact, there is a low significance of these variables in a regression model.

On the other hand, the coefficient of fixed assets on the leverage index is positive and statistically significant in the ordinal regression. Firms with greater asset rigidity, as measured by the asset fixed on total assets, enjoy higher leverage. In line with previous studies, the results indicate that firms with more fixed assets should have higher leverage.

As already shown on previous descriptive analysis there are both coefficient of inventories and coefficient of trade receivables on total assets as positive and statistically significant in the ordinal regression.

6. CONCLUSIONS

Empirically, we find a positive and economically large relation between total inventories and corporate leverage. Our results are consistent with the hypotheses of prevalent literature regarding the inventories and the present model shows the positive relation on leverage for firms with largest inventory conversion period. This provides strong evidence that the expected costs of inventory management are economically significant. Inventories, therefore, have a positive effect on debt and on burden of debt.

We also find some evidence that more liquid firms (i.e. those with high cash stock or cash flow) extend more credit to their customers and rely less on credit from their suppliers or banks.

On the other hand the fixed assets index is not associated with leverage. The findings are not consistent with the hypotheses of literature (Williamson, Shleifer and Vishny or Myers and Rajan). We found that the relation between the total fixed assets and the level of debt is curvilinear.

This paper adds to existing literature that the effect of composition of assets on leverage depends on a combination of its effects on debts. More complex is the analysis on single effects of each corporate variable. The turnover ratios, as stated over and over again by the literature on the subject of bankruptcy prediction (Muscettola and Pietrovito 2012), are not statistically significant and, also inside this study, indeed, low significance shines through the model of ordinal logistic regression. This is true both for the cash conversion cycle and for its factorization. In this case, indeed, the turnover ratios are often affected by opposing forces: on one side the financial liquidity, on the other side the economic flows of sales. The rigidity of assets may of course depend on productive investments or also on difficulty in selling or cashing receivables.

Like all things, anyhow, a positive judgement is possible on fixed assets that make firms look creditworthy to lenders but this does not fit always. Firms with a high quote of fixed assets, indeed, bring a negative aspect: they won't be sufficiently supple for their own debts. This suggests that stock liquidity may have a positive component as one among many cause that affect financial leverage and corporate profitability instead of, vice versa, as a consequence of some corporate decisions regarding the distribution of the capital structure.

Our analysis linking corporate finance to stock liquidity, therefore, has further implications, the empirical study of which is beyond the scope of this paper. What is possible to affirm with this paper is that the relation between asset liquidity and stock liquidity depends strongly on investment opportunities and the interaction between capital structure and structure of assets can be considered as a circle, in which good financial development causes economic growth and vice versa.

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