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What determines leverage in Pakistan? A panel data analysis

Muhammad Azeem Qureshi^{1*}, Muhammad Imdadullah² and Tanveer Ahsan²

¹School of Business, Oslo and Akershus University College of Applied Sciences, Oslo, Norway.

²Institute of Management Sciences, Bahauddin Zakariya University, Multan, Pakistan.

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Most of the chemical sector firms in Pakistan have foreign ownership or collaboration with foreign companies. It may be hypothesized that the leverage behavior of such firms is likely to be in line with the results of international studies of leverage generally carried out in developed economies. But there are a number of factors which differentiate developed economies from the developing ones. Hence, we identify an interesting conjunction for our research to add to the existing body of literature empirical evidence as to what determines leverage in chemical sector firms of Pakistan which have generally foreign ownership/collaboration. For this purpose we use the data of all listed firms of chemical sector of Pakistan for the period 1988 to 2006 (19 years). We use the framework provided by two competing theories, trade-off theory (TOT) and pecking order theory (POT), to identify the determinants of capital structure in the sector by using panel data models to identify the determinants of leverage and nature of their relationship. We find a significant direct relationship between profitability, business risk and leverage. This finding is consistent with TOT and negates the findings of some of the earlier studies in Pakistani context. Further, we find an inverse relationship between size, growth and leverage which is consistent with POT. These findings suggest that most of the chemical sector firms of Pakistan, having foreign ownership/collaboration, use a mix of local and international strategies for their leverage formation in Pakistan.

Key words: Pecking order theory, trade-off theory, capital structure, chemical sector, foreign ownership, Pakistan.

INTRODUCTION

Since the advent of the modern theory of capital structure (Modigliani and Miller, 1958), we observe numerous theoretical and empirical studies that put forward a variety of factors as its determinants. Some of them pledge to trade-off theory (TOT) and observe that the firms pursue an optimal capital structure and their decision of such a debt-equity mix is based on risk-return trade-off. While others support pecking order theory (POT) and find a hierarchy of financing choices based on asymmetric information. The two competing theories; see (Frank and Goyal, 2007) for a comprehensive review; are broad organizing frameworks (Myers, 1984) and encompasses different implications for leverage behavior

of the firms (Qureshi, 2009), but it is difficult to adequately distinguish between the two (Fama and French, 2002). However, this hot debate in corporate finance literature provides a number of determinants of the strategic decision of firm's leverage. Nevertheless, addressing the spatial dimension of the issue the empirical studies in different settings for example developed countries (Rajan and Zingales, 1995) and so-called developing countries (Booth et al., 2001) find comparable and conflicting impact of these determinants on leverage in possibly two different contexts due to a variety of differentiating macro factors such as GDP growth rate, interest rate, inflation rate, regulatory framework and level of capital market development. As such we find an interesting concurrence for this study. The chemical sector firms in Pakistan have either foreign ownership or collaboration with foreign companies mostly of developed countries. The corporate governance mechanism of

*Corresponding author. E-mail: muhammad-azeem.qureshi@sam.hioa.no. Tel: +47 22 45 36 36.

these firms is expected to be in line with their counterparts operating in developed countries. Moreover, their macro business environment in Pakistan is also likely to influence their corporate policies. But considering the underdevelopment of the capital market in Pakistan it is our hypothesis that these firms might follow corporate leverage policy of their counterparts operating in developed countries. As such the relationship between the leverage and its determinants of these firms is likely to be in line with the results of studies carried out in developed countries. If so these studies may also be of relevance to the foreign companies in Pakistan to help shape their leverage policy. With this rationale, the objective of this study is to identify the variables and the nature of their relationship to determine the leverage of listed firms in chemical sector of Pakistan.

Apart from introduction in this section we arrange this paper as follows: review of some of the empirical and theoretical literature about determinants of leverage; data and methodology; results; conclusions and policy implications and at the end we provide the references.

LITERATURE REVIEW

With perfect market assumptions MM in their classic paper (Modigliani and Miller, 1958) argued that the firm value was independent of its debt equity mix. Soon they were refuted but the debate initiated by them resulted into a rich array of corporate finance literature. We review some of the relevant literature in the following paragraphs, which provides many explanations of corporate financing choices and helps develop the theoretical framework for this study.

Interest tax shield

Researchers argue that a firm borrows until tax shield benefit balances the costs associated with it such as bankruptcy suggesting a U-shaped relationship between interest tax shield and leverage (Miller, 1977). But empirical studies observed that such a relationship is either relatively weak (Booth et al., 2001; Rajan and Zingales, 1995), or positive and significant (Givoly and Hayn 1992; Graham, 1996a, 1996b; Wu and Yue, 2009).

Non-debt tax shield

The non-debt tax shield, which includes depreciation and investment tax credits, may act as a substitute to interest tax shield and as such the firms with higher level of non-debt tax shield may use less debt financing (DeAngelo and Masulis, 1980) indicating an inverse relationship between non-debt tax shield and leverage of a firm.

Empirical results are inconclusive (Deesomsak et al.,

2004; Delcours, 2007) and some suggest a direct relationship (Wu and Yue, 2009) while others indicate an insignificant relationship between non-debt tax shield and leverage (Mazur, 2007) which is also observed in Pakistan (Sheikh and Wang, 2011).

Agency costs

The researchers use notion of agency conflict (Jensen and Meckling, 1976) as probability of non-productive use of firm's resources by managers and/or owners and consequent costs to explain leverage behavior of a firm. Theorists suggest that increased debt reduces amount of free cash available for non-productive uses that may help reduce such a counterproductive behavior. The non-productive use of firm's resources such as perquisites that inflate expenses with expenses/net revenue as its proxy, and/or inflated cost of production and sales with cost of sales/net revenue as its proxy. As such, a direct relationship between debt and agency costs is expected (Mazur, 2007). Further, the equity holders having limited liability in the firm may invest in high risk projects. Success increases their wealth and the debt holders bear the consequences of failure. This suggests a direct relationship between debt and shareholders-debtholders agency conflict, firm's growth being its proxy.

Another line of argument is that the growing firms have more opportunities to invest in risky projects at the expense of creditors so a negative relationship is also expected between growth and leverage of firms. Empirical evidences indicate an inverse relationship between growth and leverage (Eriotis et al., 2007; Rajan and Zingales, 1995; Titman and Wessels, 1988), while others find a positive relationship (Baskin, 1989; Allen, 1993), but a study finds this relationship to be insignificant in Pakistan (Sheikh and Wang, 2011).

Information asymmetry

Information asymmetry, wherein investors and creditors have less information as compared to the insiders, may be another determinant of firm leverage. Some of the researchers observe that the management uses profitability to reduce information asymmetry and issues new shares only when they perceive that their stock is not undervalued. Following this strand of argument, we anticipate an inverse relationship between profitability and leverage (Myers, 1984). Others however, argue that more profitable firms can issue debt at lower interest rates as these are perceived less risky by the lenders (Titman and Wessels, 1988) and as such they expect a direct relationship between profitability and debt of a firm. Results obtained from empirical studies explain both inverse (Mazur, 2007; Rajan and Zingales, 1995) as well as direct (Abor, 2005) relationships between profitability

and leverage. Recent studies carried out for the entire manufacturing sector of Pakistan suggest an inverse relationship and dominance of POT (Qureshi, 2009; Sheikh and Wang, 2011). Moreover, the firms also use dividends as a signal to the market to reduce asymmetric information while issuing equity. Consequently an inverse relationship is expected between dividends and leverage (John and Williams, 1985). Empirical results suggest an inverse relationship (Tong and Green, 2005) while results obtained from the developing economies show no influence of dividend payments on the leverage (Al-Najjar and Taylor, 2008; Mazur, 2007). On the other hand, some studies support POT and suggest a direct relationship in developed economy (Allen, 1993) as well as in Pakistani context (Qureshi, 2009).

Business risk

The firms with higher volatility in their earnings are considered as highly risky firms and for these firms debt will be available at relatively higher interest rates. Further, as debt involves a commitment of periodic payments that is why firms with high earnings volatility raise lesser debt. And as such business risk is likely to have a negative relationship with leverage (Titman and Wessels, 1988). Empirical results from developed and developing economies show a significant inverse impact of earning volatility upon leverage (Booth et al., 2001; Fama and French, 2002) but some others find that in developed economies volatility do not have any effect on leverage (Titman and Wessels, 1988).

Liquidity

The firm's possession of high level of current assets and its ability to generate high cash inflows may help the firm to internally finance their investment and operating activities and as a result an inverse relationship is expected between liquidity and leverage (Myers, 1984). Alternatively firms having high liquid assets and high cash flow generation may have high debt ratio due to their greater ability to meet periodic installments of debt financing (Ross, 1977). Following this line of argument a direct relationship is also expected between liquidity and leverage of a firm. But majority of the studies explain an inverse relationship between liquidity and leverage (Al-Najjar and Taylor, 2008; Eriotis et al., 2007; Rajan and Zingales, 1995; Sheikh and Wang, 2011; Titman and Wessels, 1988).

Firm size and tangibility

The theories argue that firms with large amount of fixed assets are perceived as less risky by the creditors, because these firms have more collateralized assets

which restrict opportunistic behavior. Second, these firms can provide collateral to the creditors more easily (Jensen, 1976). Moreover, large size firms can borrow easily at lower interest rates because their more diversified portfolios and lesser chances of bankruptcy make them less risky for the creditors (Rajan and Zingales, 1995). Thus a direct relationship is expected between tangibility of assets and leverage and between size and leverage. Results obtained from different studies in developed economies confirm a direct relationship (Allen, 1993; Rajan and Zingales, 1995; Titman and Wessels, 1988). However, tangible assets in developing countries provide poor collateral values due to under-developed and inefficient legal and regulatory system as well as secondary market that is why an inverse relationship is also expected and results obtained from different studies confirm it too (Mazur, 2007). For Pakistan some studies show that firm size has an inverse impact on leverage (Sheikh and Wang, 2011), while others show a mix of inverse and direct impact for different sectors (Qureshi, 2009).

Age

Initially the private firms generally have heavy reliance on the personal finances of their owners. As a result of these substantial amounts of equity investments by the owners they are exposed to the idiosyncratic risk and this risk substantially increases the cost of equity. That is why over time these firms increase their demand for loan to decrease their cost of capital. Empirical results from developed economies explain this relationship as well (Mueller, 2008). Moreover, according to TOT age of the business is an important indicator of corporate credibility and older firms may establish good reputation so they can borrow easily at lower interest rates. Following this direct relationship is expected between age and leverage of a firm. Empirical results suggest a direct relationship between the age of a business and leverage (Chen and Strange, 2005). However, POT predicts an inverse relationship between age of a business and the leverage as older firms are relatively stable and experienced firms and have higher internally generated funds and as such require less external financing (Myers, 1984).

DATA DESCRIPTION, METHODOLOGY AND MODEL SPECIFICATION

For the purpose of this study, we use the data of all 22 firms of chemical sector listed on Karachi Stock Exchange (KSE) taken from the State Bank of Pakistan publications for the period 1988 to 2006 (SBP, 1988 to 2006) to examine the variations in leverage among these firms and as such this study assumes the inherent limitations of the dataset. The time and space (firms) dimensions make it a panel dataset and as such we consider panel data analysis as an appropriate method which is also used in similar studies (Chen, 2004; Serrasqueiro and Nunes, 2010).

We use three different proxies of leverage: Model 1 uses

Table 1. Variables, their definitions and expected relationship with leverage.

Variable	Model name	Proxy	Expected relationship
Tax shield	TS	Tax payments/gross profit	+/?
Non debt tax shield	NDTS	Total depreciation/total assets	-
Agency cost	AC	Cost of Sales/net revenue	- / +
Growth	GR	% change in total assets	- / +
Profitability	PR	Earnings after tax/sales	+
Dividends	DI	Dividends/net profit	-
Business risk	BR	SD (Return on total assets)	- / +
Liquidity	LQ	Current assets/current liabilities	- / +
Asset structure	AS	Fixed assets/total assets	+
Business size	BZ	Ln (total assets)	+
Age of business	AG	No. of years listed	+
Leverage	L ₁	LT debt/equity	
	L ₂	LT debt/(LT debt + equity)	
	L ₃	Total debt/total assets	

long-termdebt/equity (L₁), Model 2 uses long-term debt/(long-term debt + equity) (L₂) and Model 3 uses total debt/total assets (L₃). In view of the theoretical framework aforementioned, we specify three estimators of leverage: Equation 1: pooled ordinary least square (OLS) ignoring time and cross section, Equation 2: fixed effects (FE) with constant slope coefficients but varying intercept across

cross section, and Equation 3: random effects (RE).

$$Y_{it} = \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + \dots + \varepsilon_{it} \dots \dots \dots (1)$$

$$Y_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \dots + \varepsilon_{it} \dots \dots \dots (2)$$

$$Y_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \dots + w_{it} \quad \text{where } w_{it} = \varepsilon_i + \mu_{it} \dots \dots \dots (3)$$

where *i* and *t* are indices for the firm and time respectively *w_{it}* accounts for any unobservable individual-specific effect which is not included in the regression model, *μ_{it}* represents the remaining disturbance term that varies with the individual firms and time.

We use value of R² to judge statistical significance of the estimated coefficients. Moreover, we also use the Akaike Criterion (AIC) (Akaike, 1974) as an estimator selection criterion to rank competing estimators according to their AIC and select the estimator with lowest AIC as a better representation.

With the help of literature review we identify and present, in Table 1, the determinants as well as their probable relationships with the leverage.

EMPIRICAL RESULTS AND DISCUSSION

Subsequently, we present and discuss the empirical results of each of the three models using three different proxies of leverage.

Model 1

Table 2 presents pooled OLS, FE and RE results for Model 1 which considers long-term debt/equity as a proxy of leverage (L₁). The results of pooled OLS, which explain 46.1% of the variations in leverage behavior of chemical

sector of Pakistan, indicate that growth, agency cost and business size have significant direct relationship with leverage. On the other hand, asset structure, profitability, liquidity and age of business have significant negative relationship with leverage. The FE on L₁ not only better explains, 60.3%, the variations in the leverage behavior of chemical sector of Pakistan but also identifies dividend as additional determinant of leverage. The results suggest significant negative relationship of profitability, liquidity, dividend and age of business with leverage, and a significant positive relationship of business size with leverage. Using dummy coefficients we observe that two of the firms have debt as their preferred mode of financing, on the other hand five firms prefer equity (possibly internal). Moreover, the RE on L₁ explains 45% of the variations in the leverage behavior and implies that asset structure, profitability, liquidity, dividend and age of business have significant negative relationship, while business size and growth have positive relationship with leverage.

The aforementioned results suggest that large firms having lesser information asymmetry are likely to have better and cheaper access to credit market and hence could finance their growth through debt. The results suggest that the firms having higher composition of fixed assets have higher depreciation (having negative coefficient even though insignificant) which provides an

Table 2. Pooled OLS, FE and RE results for L₁.

Variable	Pooled OLS			Fixed effects			Random effects		
	Coff	SE	t	Coff	SE	t	Coff	SE	t
Intercept	0.722	0.069	10.42***	0.700	0.0972	7.201***	0.750	0.083	9.055***
AS	-0.181	0.041	-4.443***	-0.087	0.0622	-1.401	-0.118	0.052	-2.263**
BZ	0.021	0.005	3.610***	0.0300	0.0138	2.167**	0.020	0.009	2.157**
GR	0.0005	0.0002	1.913*	0.0003	0.0002	1.596	0.0004	0.0002	1.827*
PR	-0.018	0.0046	-3.797***	-0.0115	0.0041	-2.796***	-0.012	0.004	-3.052***
BR	0.008	0.539	0.0156	-0.689	0.499	-1.381	-0.588	0.493	-1.193
NDS	-0.068	0.293	0.2329	0.153	0.297	0.5152	0.0494	0.286	0.172
LQ	-0.141	0.011	-12.77***	-0.129	0.0116	-11.08***	-0.129	0.011	-11.47***
TS	-0.027	0.028	-0.953	-0.0292	0.025	-1.146	-0.031	0.025	-1.244
AC	0.062	0.037	1.657*	0.051	0.0382	1.335	0.0518	0.0367	1.409
DI	-0.032	0.0201	-1.599	-0.0408	0.0192	-2.124**	-0.038	0.0189	-2.027**
AG	-0.002	0.0007	-3.485***	-0.0045	0.0016	-2.843***	-0.003	0.0011	-2.976***
	$R^2 = 0.48$		$R^2_{adj} = 0.461$	$R^2 = 0.644$		$R^2_{adj} = 0.603$	$R^2 = 0.47$		$R^2_{adj} = 0.45$
	AIC = -318.046			AIC = -438.65			AIC = -355.43		

*P < 0.10, **P < 0.05, ***P < 0.01.

alternate tax shield source to interest tax shield of debt. Moreover, we find support to the internationally widespread phenomenon, a negative relationship of profitability and liquidity with debt and observe that profitable and liquid firms internally finance their needs. One interesting finding is that of negative relationship of age with leverage, that is, older firms have lesser debt. Even though older firms are likely to have lesser information asymmetry and better access to the credit market but it seems that such firms are either profitable and liquid and internally finance themselves or have limited investment opportunity set and growth potential which may not require them to resort to external finance. Observed negative relationship of profitability with leverage is consistent with POT as well as the findings of some earlier studies in Pakistani context (Qureshi, 2009). Generally, we observe that due to foreign ownership and/or collaboration the leverage behavior of chemical sector firms in Pakistan is in line with leverage behavior found in international studies and contradictory to their domestic counterparts. Further a direct and significant relationship between business risk and leverage, which is contradictory to the findings of an earlier study (Sheikh and Wang, 2011), suggests that the firms having high business risk tend to pass it on to the creditors. The socio-economic networks of owners of such firms along with poor governance structures of creditors mired by political interferences may help provide them easy access to credit market resulting into high debt level.

Considering the superiority of AIC, we observe that FE which has the lowest AIC value is an appropriate choice to represent firms' leverage behavior in Pakistan.

Model

We present in Table 3 the results for Model 2 which uses long-term debt/(long-term debt + equity) as proxy for leverage to provide some useful insights into the determinants of leverage in chemical sector of Pakistan. The pooled OLS explains approximately 49.8% of the variations in the leverage behavior of chemical sector of Pakistan and indicates that profitability, non-debt tax shield and age of business have significant inverse relationship with leverage, while asset structure, business size, growth, and liquidity have significant direct relationship with leverage. The FE on L₂ explains approximately 59.7% of the variations in the leverage behavior of chemical sector of Pakistan and suggests that asset structure, business size, growth, profitability, business risk, liquidity, dividend, age of business are significant determinants of leverage, and also suggests that profitability, business risk and age of business have indirect relationship, while asset structure, business size, growth, and liquidity have direct relations with leverage. Moreover, the RE on L₂ explains 48.9% of the variations in the leverage behavior of chemical sector of Pakistan and suggests that asset structure, business size, growth, profitability, business risk, liquidity, non debt tax shield, liquidity and age of business are significant determinants of leverage, it also suggests that profitability, business risk, non debt tax shield and age of business have indirect relationship, while asset structure, business size, growth and liquidity have direct relations with leverage. Compared to Model 1, Model 2 is a relatively better fit as it explains approximately 60% of the variations in debt

Table 3. Pooled OLS, FE, RE results for L₂.

Variable	Pooled OLS			Fixed effects*			Random effects		
	Coff	SE	t	Coff	SE	t	Coff	SE	t
Intercept	-0.108	0.054	-1.99**	-0.136	0.0798	-1.711*	-0.086	0.067	-1.279
AS	0.402	0.032	12.55***	0.381	0.0511	7.45***	0.393	0.042	9.23***
BZ	0.0255	0.005	5.667***	0.037	0.011	3.284***	0.0239	0.0075	3.174***
GR	0.0005	0.0002	2.611***	0.0004	0.0002	2.341**	0.0005	0.0002	2.705***
PR	-0.013	0.0036	-3.518***	-0.010	0.003	-3.055***	-0.011	0.0033	-3.254***
BR	-0.683	0.424	-1.611	-0.953	0.409	-2.33**	-0.885	0.40	-2.181**
NDTS	-0.745	0.230	-3.23***	-0.230	0.244	-0.944	-0.411	0.235	-1.748*
LQ	0.018	0.008	2.12**	0.018	0.0095	1.910*	0.0200	0.0093	2.154**
TS	0.0016	0.0222	0.075	0.0014	0.021	0.0694	-0.0002	0.0207	-0.0073
AC	-0.016	0.029	-0.541	0.0024	0.0313	0.0770	-0.0059	0.0302	-0.196
DI	-0.009	0.015	-0.611	-0.019	0.015	-1.26	-0.016	0.0155	-1.044
AG	-0.002	0.0006	-4.038***	-0.0051	0.001	-3.838***	-0.0033	0.0009	-3.452***
	R ² = 0.516	R _{adj} ² = 0.498		R ² = 0.638	R _{adj} ² = 0.597		R ² = 0.507	R _{adj} ² = 0.489	
	AIC = -512.65			AIC = -561.09			AIC = -505.95		

*P < 0.10, **P < 0.05, ***P < 0.01. *dummies are excluded by software due to existence of multicollinearity problem.

ratio of chemical sector of Pakistan.

The inverse relationship of size and leverage is consistent with POT. However, inverse relationship between growth and leverage supports TOT. This leads to two observations: first, as the firms' size increases, their supply and reliance on internal sources increases; and second, these firms may have limited growth opportunities for which they have sufficient internal sources and may not require debt. Supplementing this with the finding of Model 1, we observe that generally the firms in chemical sector of Pakistan do not finance their growth through debt, but the firms having high business risk tend to pass it on to the creditors.

With lowest value AIC, we consider FE a better representation of corporate leverage behavior in Pakistan for L₂.

Model 3

We use total debt/total assets (L₃) as a proxy of leverage for Model 3 and present the results in Table 4. The pooled OLS model explains 18.9% variations in the leverage behavior of chemical sector of Pakistan. The results depict that profitability and business risk have significant direct relationship with leverage. The FE explains 16.9% variations and suggests that profitability and business risk are significant factors and have direct relationship with leverage. Similarly, RE explains 19.2% variations and suggests that profitability and business risk have significant and direct relationship with leverage of chemical sector of Pakistan. This finding suggests that internal cash generation helps reduce firms' debt dependence which is consistent with POT and is also in

conformity of some of the earlier international studies (Eriotis et al., 2007; Mazur, 2007) as well as studies in Pakistani context (Qureshi, 2009; Sheikh and Wang, 2011). Moreover, direct relationship of the business risk with leverage suggests that the firms try to pass on their risk to the creditors, which is in contradiction to an earlier study in Pakistani context (Sheikh and Wang, 2011).

Using L₃ as leverage proxy, the AIC suggests that RE is appropriate choice for this dataset as it has lowest AIC value compared to other estimators.

Conclusion

For the purpose of this study we investigate determinants of leverage of chemical sector of Pakistan. In the process we also explore which of the two competing theories, that is, POT or TOT better explains the leverage behavior of chemical sector of Pakistan. Another objective of this study is to examine whether the leverage behavior of chemical sector firms of Pakistan is likely to be in line with the results of international studies of leverage, as most of the chemical firms have foreign ownership and/or collaboration and whether our results support or negate the results of latest studies carried out in Pakistan (Qureshi, 2009; Sheikh and Wang, 2011).

We use three proxies of leverage. Taking long-term debt/equity (L₁) as a proxy of leverage, we find two direct and significant relationships. First, significant direct relationship is between profitability and leverage. This finding is consistent with TOT and negates the findings of earlier studies (Qureshi, 2009; Sheikh and Wang, 2011). This finding substantiates our reasoning to choose chemical sector as our sample which is characteristically

Table 4. Pooled OLS, FE, RE results for L_3 .

Variable	Pooled OLS			Fixed Effects*			Random Effects		
	Coff	SE	t	Coff	SE	t	Coff	SE	t
Intercept	-15.67	4.959	-3.16***	-17.15	8.219	-2.087**	-15.675	4.959	-3.16***
AS	1.75	2.921	0.601	3.386	5.264	0.643	1.757	2.921	0.603
BZ	0.236	0.411	0.573	0.335	1.172	0.285	0.236	0.411	0.574
GR	0.0016	0.0195	0.085	0.0001	0.0208	0.0072	0.0016	0.0195	0.085
PR	2.723	0.336	8.094***	2.642	0.350	7.542***	2.723	0.336	8.094***
BR	145.36	38.65	3.761***	143.208	42.193	3.394***	145.36	38.652	3.76***
NDTS	-7.42	21.02	-0.353	-10.767	25.124	-0.428	-7.42	21.0285	-0.353
LQ	-0.57	0.79	-0.719	-0.6099	0.986	-0.618	-0.570	0.7919	-0.719
TS	1.146	2.029	0.56	0.679	2.153	0.315	1.146	2.029	0.564
AC	2.489	2.679	0.929	0.941	3.229	0.291	2.489	2.6795	0.929
DI	-0.904	1.445	-0.629	0.282	1.625	0.174	-0.904	1.445	-0.625
AG	-0.009	0.056	-0.159	0.078	0.136	0.574	-0.009	0.0565	-0.159
	$R^2 = 0.218$	$R^2_{adj} = 0.189$		$R^2 = 0.255$	$R^2_{adj} = 0.169$		$R^2 = 0.221$	$R^2_{adj} = 0.192$	
	AIC = 2285.17			AIC = 2312.15			AIC = -2285.171		

*P < 0.10, **P < 0.05, ***P < 0.01. *dummies are excluded by software due to existence of multicollinearity problem.

distinct from other listed sectors, whereas earlier studies have used the data of all non-financial sectors listed on KSE. Foreign ownership and/or collaboration of chemical sector firms do have an impact on the leverage behavior of these firms which is in line with their international counterparts and conflicts with their domestic counterparts. The use of different proxies to measure the leverage may be another reason. Secondly, we find a significant direct relationship between business risk and leverage, which is also in conflict with an earlier study (Sheikh and Wang, 2011). The firms having high business risk tend pass it on to creditors that may be facilitated through the socio-political networks of owners/managers of such firms and/or the poor governance structure of financial sector may provide an easy access to credit market.

Taking long-term debt/(long-term debt + equity) (L_2) as proxy of leverage we observe two significant and inverse relationships with leverage. The inverse relationship of size and leverage is consistent with POT and supports the results of previous studies carried out in Pakistan (Qureshi, 2009; Sheikh and Wang, 2011). Increase in the firms' size increases the supply and reliance on internal sources. Although these firms have foreign ownership and/or collaboration, they also use local strategies in Pakistan. Further, the significant inverse relationship between growth and leverage supports TOT and negates these studies whereas one suggests growth to be insignificant (Sheikh and Wang, 2011), and other observes a direct relationship (Qureshi, 2009). It seems that these firms may have limited growth opportunities for which they may have sufficient internal sources and may not require debt. But, the firms having high business risk tend to pass it on to the creditors and do raise debt.

Taking total debt/total assets (L_3) as a dependent

variable we find a significant inverse relationship of liquidity with leverage. Consequently, we conclude that these firms tend to reduce their debt dependence by use of internal cash generation. This finding supports the POT as well as earlier studies in Pakistani context (Qureshi, 2009; Sheikh and Wang, 2011). This finding also supports some of the earlier international studies (Eriotis et al., 2007; Mazur, 2007).

Considering the results of three models and using three estimators, we conclude that the chemical sector firms of Pakistan having higher profits and higher business risk prefer higher debt in their capital structure. On the other hand the firms prefer lesser debt in their capital structure as the firm size increases; they become more liquid and have higher growth opportunities. Overall, the chemical sector firms of Pakistan having foreign ownership/collaboration use a mix of local and international strategies for their leverage formation in Pakistan. A similar study for the firms having foreign ownership/collaboration in some other sectors of Pakistani capital market or any other emerging capital market may not only help better understand the leverage behavior of such firms but may also delineate the relevance of such studies carried out in developed world.

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