Determinants of the adjustment speed of capital structure

Evidence from developing economies

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Abstract

Purpose – The purpose of this paper is to examine the role of institutional, macroeconomic, industry, and firm characteristics on the adjustment speed of corporate capital structure within the context of developing countries.

Design/methodology/approach – The authors considers a sample of 986 firms drawn from nine developing countries in Africa over a period of ten years (1999-2008). The study develops dynamic partial adjustment models that link capital structure adjustment speed and institutional, macroeconomic, and firm characteristics. The analysis is carried out using system Generalized Method of Moments procedure which is robust to data heterogeneity and endogeneity problems.

Findings – The paper finds that firms in developing countries do temporarily deviate from (and partially adjust to) their target capital structures. Our results also indicate that: more profitable firms tend to rapidly adjust their capital structures than less profitable firms; the effects of firm size, growth opportunities, and the gap between observed and target leverage ratios on adjustment speed are functions of how one measures capital structure; and adjustment speed tends to be faster for firms in industries that have relatively higher risk and countries with common law tradition, less developed stock markets, lower income, and weaker creditor rights protection.

Research limitations/implications – Future research should focus on examination of the adjustment speed of debt maturity structure. Identification of industry-specific characteristics that affect the pace with which firms adjust their capital structure to the optimum is another possible avenue for future research.

Practical implications – Our findings have practical implications for corporate managers, governments, legislators, and policymakers.

Originality/value – The study focuses on firms in developing countries for which the literature on adjustment speed of capital structure is virtually non-existent. Furthermore, unlike previous works on capital structure, it explicitly models industry variable as one of the determinants of adjustment speed. Therefore, it contributes to the literature on capital structure and adjustment speed in general and to the literature on developing countries in particular.

Keywords Developing countries, Capital structure, Macroeconomic conditions, Industry, Adjustment speed, Firm characteristics, Instituitions

Paper type Research paper

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1. Introduction

Capital structure research is epitomized by conditional theories that posture contrasting views about the target adjustment behaviour of firms. For instance, traditional trade-off theory stresses various costs and/or benefits of debt, and thus, implies the existence of an optimal capital structure. On the other hand, market timing theory suggests that a firm's capital structure is a cumulative result of its historical efforts to time equity issuances with high market valuations rather than a result of a dynamic optimizing strategy (Baker and Wurgler, 2002). Similarly, inertia theory suggests that equity price shocks have a persistent effect on leverage which it considers as evidence against firms rebalancing their capital structures towards an optimum (Welch, 2004). Likewise, pecking order theory considers capital structure to be primarily a result of firms' historical profitability and investment opportunities and hence firms have no strong tendencies to reverse shocks to capital structure caused by financing needs and earnings growth (Myers, 1984; Myers and Majluf, 1984).

Recent empirical literature documents evidence which show that market imperfections and adjustment costs and/or benefits oblige firms to operate at a debt level that is sub-optimal. It further suggests that, in perfect markets where there is no friction, the adjustment of capital structure towards a target is costless, and thus, a firm can instantly adjust its capital structure towards the optimum. However, in imperfect markets, the adjustment of capital structure towards the optimum is costly, and hence, a firm may not adjust its capital structure instantly, but adjusts partially (see Drobetz and Wanzenried, 2006; Heshmati, 2001; Leary and Roberts, 2005). The literature's attempt to empirically discriminate between trade-off and other competing theories by using dynamic trade-off theory framework and partial adjustment models has rather become promising (Elsas and Florysiak, 2008). The findings, almost invariably, confirm the argument that there is a substantial dynamic component in a firm's capital structure decisions, and that the dynamism depends on firm, industry, macroeconomic, and institutional factors (Drobetz *et al.*, 2007; Drobetz and Wanzenried, 2006; Flannery and Hankins, 2007). Although the institutional and macroeconomic setup of developing countries differs in many ways from those of developed countries, we are not aware of any published work that investigates the dynamic partial adjustment (DPA) of a firm's capital structure within the context of developing countries. This paper aims to fill this void by investigating whether firms in developing countries adjust their capital structures to certain target levels and, if they do, how firm, industry, macroeconomic, and institutional factors influence the adjustment speed.

The contributions of this paper are fourfold. First, it provides an "out-of-sample-test" for the theoretical and empirical research carried out in the context of advanced economies. Second, it explicitly models the industry variable as one of the determinants of capital structure adjustment speed. Third, it helps identify the institutions and macroeconomic policies that are conducive for enhancing the convergence of capital structure of firms in sample countries to optimum levels. Fourth, it helps policymakers and other stakeholders in crafting policies and legislations that enhance firms' ability to adjust to optimal capital structures.

The paper applies DPA models on ten-years (1999-2008) data pertaining to 986 non-financial firms drawn from nine developing economies from Africa that have functioning stock exchanges. Model parameters were estimated using system Generalized Method of Moments (sys-GMM) estimator proposed by Blundell and Bond (1998). The main findings of the study are: capital structures of firms in our sample countries do temporarily deviate from and partially adjust to target; more profitable firms tend to more rapidly adjust their capital structures than less profitable firms; the effects of firm size, growth opportunities, and the gap between observed and target leverage ratios on adjustment speed are functions of how one measures capital structure; and adjustment speed tends to be faster for firms in industries that have relatively higher risk and countries with common law tradition, less developed stock markets, lower income, and weaker creditor rights protection.

The practical implications of our findings are twofold. First, the influence of firm-level variables on adjustment speed suggests that managers have some sway over the speed with which firms adjust their capital structures to the optimum. Second, the influences of institutional and macroeconomic factors imply that governments, legislators, and policymakers could influence the pace at which firms adjust their capital structures to the optimum through regulations and policymaking. The paper proceeds as follows. Section 2 presents a brief review of the literature on the adjustment speed of capital structure. Section 3 proffers the empirical setup for our analysis. Section 4 presents the results and discussions and Section 5 concludes.

2. Literature review

Recent literature criticizes studies on determinants of capital structure by pointing to the fact that researchers do not take into account the typical rebalancing behaviour of firms as far as their capital structure is concerned. It draws on dynamic trade-off theory and develops a theory for dynamic capital structure (Flannery and Hankins, 2007). This literature could be grouped into two succinct clusters: those investigating whether firms adjust towards target capital structures, and those investigating the factors that influence the pace at which firms adjust their capital structure. In what follows, we attempt to briefly review these two clusters of the literature[1].

2.1 On the existence of a target capital structure

The literature alludes that detection of target behaviour in capital structure of a firm is, arguably, central to discriminating between trade-off and alternative theories (Myers, 1984). Trade-off theories imply the existence of target capital structure and assume that firms make financing choices that minimize the cost of deviating from their target (Chang and Dasgupta, 2009). On the other hand, alternative theories mentioned earlier suggest that firms do not have target capital structure. In a rebuttal of the trade-off view, Miller (1977) showed that there would be no optimum capital structure at firm level since bankruptcy costs are "trivial" and tax advantage of debt financing at firm level is exactly offset by the tax disadvantage of debt at personal level[2]. Haugen and Senbet (1978) and Barnea *et al.* (1980) point out that bankruptcy "penalties" are too small to offset the effect of tax advantage of debt. Nonetheless, DeAngelo and Masulis (1980), Kim (1982), and Modigliani (1982) argue that bankruptcy costs are not the only costs against which the tax advantages of debt ought to be weighed – there are other costs of debt such as agency costs, loss of non-debt-related tax-shield, etc., that should be considered in the determination of optimal capital structure.

The literature shows that capital structure decisions reflect not only the optimal leverage ratio but also the rebalancing exercises towards an optimum position for the firm. Myers' (1984) view that trade-off theory suggests a target capital structure was corroborated by Jalilvand and Harris (1984) who reported that a firm's financial behaviour is characterised by partial adjustment to long-run financial targets. However, Jalilvand and Harris's work was criticized for exogenously specifying the long-run financial target to which firms adjust. In all, 17 years later, De Miguel and Pindado (2001) attempted to improve on Jalilvand and Harris's work by endogenizing the target capital structure in their model and concluded that firms adjust their capital structure towards an optimum. At about the same time, in a survey of corporate finance practice, Graham and Harvey (2001) reported that 81 per cent of the CFOs in their sample had either a target range of debt ratio or a "strict" target debt ratio.

In a similar vein, Fama and French (2002) note that firms slowly adjust their debt ratios towards a target. This observation is consistent with the suggestion by Myers (1984) that firm's may take long time to return to their target capital structures in the presence of costs of adjustment. In a rebuttal of the works of Baker and Wurgler (2002) and Welch (2004), Leary and Roberts (2005) show that firms actively rebalance their capital structure to stay within the optimal range. In a further push, more recent literature, employing models and procedures that are more robust, confirms not only that firms adjust their capital structure but also that adjustment costs and/or benefits enhance or mitigate the speed at which firms adjust their capital structures towards the optimum (Faulkender *et al.*, 2012; Banerjee *et al.*, 2004; Drobetz and Wanzenried, 2006; Flannery and Rangan, 2006; Gaud *et al.*, 2005; Huang and Ritter, 2009; Frank and Goyal, 2009).

Although copious empirical studies endeavour to investigate adjustment speed of capital structure, Shyam-Sunder and Myers (1999) and Chen and Zhao (2007) caution against overly interpreting adjustment coefficients by pointing to the possibility that "firm's leverage ratios tend to *mechanically* revert to the mean regardless of the firm's financing preferences". However, a number of other widely employed tests are also susceptible to mechanical effects that could arise when firms do not follow target behaviour (e.g. Chang and Dasgupta, 2009).

2.2 On the determinants of adjustment speed of capital structure

In a recent paper, Faulkender *et al.* (2012) re-iterate a contemporary question in capital structure research: whether firms have a target capital structure, and if so, what factors enhance (or hinder) the speed of adjustment towards a target? Various research endeavours suggest that the speed at which firms adjust their capital structures towards target varies from study to study. Part of the dissention has to do with the econometric procedures employed and part of it could be ascribed to differences in adjustment costs and/or benefits. The latter view was reflected in Flannery and Hankins (2007) who remark that capital structure decisions reflect not only the level of the optimal leverage ratio but also both the costs of deviating from the target and the costs of adjusting towards that target. According to these authors, whilst adjustment costs hinge on external financing expenses, stock price movements and financial constraints, adjustment benefits depend on potential costs of distress and the value of tax shields. In what follows, we present a synthesis of the influence of firm, industry, and country characteristics on adjustment costs and/or benefits, and thereby, on adjustment speed.

2.2.1 Inter-firm heterogeneity in adjustment speed of capital structure. As the adjustment costs and/or benefits are likely to vary from firm to firm, so does the optimal capital structure adjustment process (e.g. Flannery and Hankins, 2007). Studies as early as Fischer *et al.* (1989) propose a model of dynamic capital structure choice in the presence of adjustment costs and show that the swings in capital structure are functions of firm-specific factors. In the following paragraphs, we present a synthesis of the relationship between firm characteristics and adjustment speed by using adjustment costs and/or benefits as a framework.

The literature customarily suggests that larger firms tend to have lower information asymmetry which enables them to have lower financing costs as they are likely to enjoy better access to external finance. The lower the financing cost of a firm is the lower its capital structure adjustment cost. Thus, we expect larger firms to have smaller adjustment costs and, thus, faster adjustment speed (e.g. Banerjee *et al.*, 2004; Drobetz and Wanzenried, 2006; Flannery and Hankins, 2007). On the other hand, one could argue that larger firms tend to have less cash flow volatility, which reduces the potential costs of distress (e.g. Flannery and Rangan, 2006). A reduction in potential cost of distress in turn reduces a firm's benefit of adjusting toward a target capital structure thereby reducing the adjustment speed (e.g. Flannery and Hankins, 2007). Although Flannery and Hankins (2007) report a positive relationship between firm size and adjustment speed, Haas and Peeters (2006) and Banerjee *et al.* (2004) observe an inverse relationship between the two variables.

According to Flannery and Hankins (2007), profitability influences both the costs and/or benefits of capital structure adjustment of a firm. A more profitable firm is likely to have more flexibility (i.e. lesser constraints) in financing decisions and likely to enjoy issuance of securities at more attractive rates (i.e. lower cost of external financing). This signifies that firms that are more profitable are likely to experience lesser costs of rebalancing their capital structure towards a target. In addition, higher profit may also increase the value of debt tax shields or minimize asset substitution concerns (i.e. increase benefits of adjustment); especially if the firm is under-leveraged (see Flannery and Hankins, 2007). Thus, we conjecture that profitability of a firm positively influences the pace at which a firm adjusts its capital structure to a target.

Both Banerjee *et al.* (2004) and Drobetz and Wanzenried (2006) suggest that growing firms tend to have more flexibility in choosing the sources of finance than no-growth firms which can only change their capital structure by swapping debt against equity. This in turn implies that growing firms are likely to enjoy lesser financing constraints and hence are likely to more rapidly rebalance their capital structures towards target levels. Although Drobetz and Wanzenried's (2006) empirical results corroborate this conjecture, Banerjee *et al.*'s (2004) results indicate that firms with higher growth opportunity adjust more slowly towards the optimal capital structure. The inconsistent result obtained by Banerjee *et al.* (2004) could partly be due to the non-linear least square estimation technique (they) used to analyse the data which usually leads to biased and inconsistent estimators (Drobetz and Wanzenried, 2006).

The theoretical predictions regarding the relationship between the magnitude of the distance between target and observed capital structures of a firm (i.e. the distance variable) and adjustment speed are indeterminate. If fixed costs (e.g. legal fees and investment bank fees) constitute a major portion of the rebalancing cost, only firms that moved significantly far away from the optimal capital structure will change their capital structure. Hence, we expect a positive relationship between adjustment speed and the distance variable (e.g. Banerjee *et al.*, 2004, Drobetz and Wanzenried, 2006)[3]. On the other hand, if the fixed costs of adjustment are prohibitively high, firms may avoid using capital markets to raise funds and manipulate their dividend policy to rebalance their capital structure. In this case, cost of adjustment tends to be increasing with increase in the distance variable implying slower adjustment speed. While Drobetz and Wanzenried (2006) found a statistically weak but positive relationship, Banerjee *et al.* (2004) reported mostly insignificant relationship between the two variables. Finally, a recent strand of research also reports links between cash flows and adjustment speed. Both Byoun (2008) and Faulkender *et al.* (2012) note that a firm's financial need is a critical determinant of capital structure adjustment speed.

2.2.2 Inter-industry heterogeneity in adjustment speed of capital structure. Studies that explicitly examine inter-industry heterogeneity in adjustment speeds are scant. However, some studies control for industry effects (e.g. Flannery and Rangan, 2006, Hovakimian *et al.*, 2004) to account for inter-industry differences in adjustment speeds. Roberts (2002) showed that the speed at which firms revert back to their target capital structures varies dramatically across industries suggesting the existence of significant inter-industry variation in adjustment costs and/or benefits. Likewise, Banerjee *et al.* (2004) compared the adjustment speed of firms in various industries and reported that there are substantial differences in adjustment speed across industries in the USA and UK. In a similar vein, Smith *et al.* (2010) estimate adjustment speeds of capital structures of firms in 15 industries in New Zealand and showed that firms in agriculture and fisheries, mining, forestry, media and communications, and investment industries move towards their target capital structures relatively rapidly, in comparison to those in other industries. They suggest that risk characteristics of the industry in which a firm operates might be an underlying factor explaining inter-industry differences in adjustment speed.

In addition, Stoja and Tucker (2007) classify industries into "new economy" group which include biotechnology, IT, and leisure industries and "old economy" group which includes oil and mining, construction, textiles, and real estate industries. These authors propose that adjustment costs for firms in "old economy" industries are likely to be higher as they are fixed-assets-intensive with a low level of service element whereas firms in "new economy" industries are likely to adjust faster since they are R&D-intensive with a high level of service element. Thus, we expect that industry characteristics might influence the costs and/or benefits of adjusting to or deviating from target capital structure.

2.2.3 Cross-country heterogeneity in adjustment speed of capital basic structure. Most prior empirical works were based on single country databases. However, the speeds of adjustment reported vary considerably around the world. While a number of papers find evidence of relatively slow adjustment speeds, others report faster speeds. Studies which report low adjustment speeds include Fama and French (2002) who report that US firms move towards target debt ratios at speeds ranging from 7 to 18 per cent each year. Similarly, Hovakimian and Li (2011) estimate adjustment speeds ranging from 5 to 13 per cent. Consistent with faster speeds reported in earlier studies such as Jalilvand and Harris (1984), Shyam-Sunder and Myers (1999), and Flannery and Rangan (2006) report adjustment speeds of 41 and 34 per cent, respectively, for firms in the USA. According to Ozkan (2001), the adjustment speed of capital structure of UK firms is in the vicinity of 43 per cent. There are also studies (e.g. De Miguel and Pindado, 2001 and Gaud *et al.*, 2005 for Swiss firms and Lemmon *et al.*, 2008 and Huang and Ritter, 2009 for US firms) which report adjustment speeds that lie at the middle of the spectrum. As we alluded to earlier, part of the dissension in the adjustment speeds stems from econometric issues. But econometric issues may not explain all of the variation in the speed of adjustment. This variation in the observed adjustment speeds in different countries opened a further research direction in which many researchers attempted to examine the nexus between country characteristics and capital structure adjustment speed.

La Porta *et al.* (1997, 1998, 1999a, b) extensively document that the quality of law and the extent of its enforcement are important determinants of the shape and complexity of financial contracts. At the heart of their argument is the protection afforded by legal systems to mitigate agency problems between insiders and outsiders. Investors' disposition towards providing funding for firms partly depends on the protection they receive from the legal system. The authors show that legal systems based on the English common law provide a stronger protection to investors (i.e. shareholders and creditors) than those based on the French civil law. The empirical literature confirms this prediction. Thus, firms in countries with legal systems based on the English common law tend to have lesser agency-associated problems compared to those in countries with legal systems based on the French civil law. Therefore, we expect firms in the first group of countries to more quickly adjust their capital structure to a target than those in the latter group. Following Clark *et al.* (2009) and Wanzenried (2006), we also anticipate that firms located in countries with stronger creditor and shareholder rights protection and relatively higher levels of contract enforcement efficiency would adjust their capital structures more quickly than firms located in countries characterized by lower levels of creditor and shareholder rights protection and less efficient means of enforcing contracts.

The literature also attempts to explain variations in adjustment speeds by invoking cross-country divergence in financial systems. Developed stock markets and banking sectors make it easier for firms to raise capital. The likely smaller transaction costs and reduced agency costs associated with developed stock markets and banking sectors would mean that firms find it easier to adjust their capital structures to a target (e.g. Clark *et al.*, 2009; Demirgüç-Kunt and Maksimovic, 1999; Grossman and Stiglitz, 1980; Wanzenried, 2006). Hence, we conjecture that the size and liquidity of stock markets and the size of banking sector have positive effects on the speed at which firms adjust their capital structures to a target.

To test the impact of macroeconomic conditions on the speed of capital structure adjustment, prior empirical literature employs such factors as overall size of the economy, GDP growth rate, inflation rate, and taxation. The GDP growth rate is usually considered as an indicator of financing needs of firms (e.g. Demirgüç-Kunt and Maksimovic, 1999). Thus, in line with Cook and Tang (2010), Drobetz and Wanzenried (2006), and Wanzenried (2006), we expect firms to adjust their capital structure to a target at a faster rate as the economy goes through higher GDP growth.

According to Mills (1996), higher inflation rates lead to higher costs of capital and changes in the cost of capital are paid closer attention by firms so that they can optimize their capital structure. Hence, consistent with Wanzenried (2006), we expect higher inflation rates to have positive influence on adjustment speed. The dynamic trade-off theory predicts that adjustment speed is positively related to benefits of being at a target capital structure. Thus, the higher the benefit resulting from untapped tax benefits, the faster the pace at which a firm adjusts its capital structure (Clark *et al.*, 2009). As in the legal institutions, we examine the effect of macroeconomic conditions on the speed of adjustment in two stages. We first examine if there are variation in adjustment speeds across broadly defined income groups (i.e. upper-middle-income, lower-middle-income, and low-income countries) to which the country belongs. Second, we examine the effect of more-narrowly defined macroeconomic variables (i.e. taxation, inflation, size of economy, and growth rate of GDP) on adjustment speed.

3. The empirical framework

Until recently, empirical work on capital structure imposes the implicit, but unrealistic, assumption that firms are always at their target capital structure. In an imperfect environment where there are a set of adjustment costs and/or benefits, a firm's capital structure may not necessarily be at the target level. In an effort to properly account for the dynamic nature of capital structure, recent literature adopted a DPA capital structure model that allows target capital structure to vary across firms and over time (Drobetz and Wanzenried, 2006; Fischer *et al.*, 1989; Hovakimian *et al.*, 2001).

As we noted earlier, measures of adjustment speed are very sensitive to the econometric design. The econometric challenges include, among others, problems of model specification, unobservable variables, heterogeneous panel data, short panel biases, autocorrelation, and unbalanced panels (e.g. Zhao and Susmel, 2008). Two distinct strands of econometric modelling approaches stand out in the study of adjustment speed of capital structure: the two-stage and integrated DPA capital structure models (e.g. Cook and Tang, 2010). Although both approaches are widely used, Flannery and Rangan (2006) convincingly show that the two-stage dynamic panel adjustment model results in abnormally smaller estimates of adjustment speed than theory would predict. Further, this approach does not allow us to examine the determinants of adjustment speed while the integrated approach enables us to jointly determine the adjustment speed along with its determinants. Hence, this study adopts the integrated DPA model.

3.1 Model specification

In line with De Miguel and Pindado (2001) and Hovakimian *et al.* (2001), we define target capital structure as a leverage ratio that a firm would desire to have in a frictionless environment. To analyse the impact of firm, industry, and country characteristics, pursuant to Drobetz and Wanzenried (2006) and Öztekin and Flannery (2012), we specify target capital structure by using a dynamic capital structure model. Let the optimal or target capital structure of firm i in period t, labelled as $Lev^{*}_{i,t}$, be a linear function of a set of N explanatory variables, $K_{j,i,t}$ (where $j = 1, 2, 3, \ldots N$) that have been used in past cross-sectional studies of capital structure:

$$Lev^{*}_{i,t} = \sum\nolimits_{j=1}^{N} \theta_j K_{j,i,t} \tag{1}$$

where θ_j denotes a column vector containing the coefficients of explanatory variables.

In a frictionless environment where information asymmetries, transaction costs, and other adjustment costs and/or benefits are absent, firms may instantly adjust their capital structure to a target. Hence, in such an environment, observed capital structure ($Lev_{i,t}$) is expected to be the same as target capital structure ($Lev^{*}_{i,t}$) . In other words, in a perfect environment, the difference between the current and the previous periods' observed capital structure should be the same as the difference between target capital structure and the pervious period's capital structure. That is, $Lev_{i,t} - Lev_{i,t-1}$ should be equal to $Lev^{*}_{i,t} - Lev_{i,t-1}$. However, in the presence of all sorts of adjustment costs and/or benefits (which is more likely in the real world), $Lev_{i,t}$ is not necessarily the same as $Lev^{*}_{i,t}$. That is, firms may not fully adjust their capital structure to the target capital structure. They may rather adjust partially. Thus, the equality is disrupted and a more realistic partial adjustment model may be specified as:

$$(Lev_{i,t} - Lev_{i,t-1}) = \gamma_{i,t}(Lev^{*}_{i,t} - Lev_{i,t-1}) + \varepsilon_{i,t}, \text{ where } 0 < |\gamma_{i,t}| < 1 \tag{2}$$

where $\gamma_{i,t}$ denotes the adjustment parameter representing the magnitude of adjustment towards a target capital structure between two consecutive periods, $Lev_{i,t-1}$ represents capital structure of firm *i,* in period $t-1$, and $\varepsilon_{i,t}$ denotes the idiosyncratic error term. Rearranging the terms in Equation (2), we obtain:

$$Lev_{i,t} = (1-\gamma_{i,t})Lev_{i,t-1} + \gamma_{i,t}(Lev^{*}_{i,t}) + \varepsilon_{i,t}, \text{ where } 0<|\gamma_{i,t}|rm<1 \quad (3)$$

Our model follows Drobetz and Wanzenried (2006) and Hovakimian *et al.* (2001), where firms adjust to a target capital strucure to an endoegenously determined capital structure as specified in Equation (1). Following prior empirical work, we specify adjustment speed ($\gamma_{i,t}$) as a linear function of factors affecting the costs and/or benefits of adjustment and the unobserved firms-specific effects as follows:

$$\gamma_{i,t} = \omega_0 + \omega_1 X_{i,t} \quad (4)$$

When firm-specific variables are used to explain the speed of adjustment, $X_{i,t}$ has both time and cross-sectional dimensions. In contrast, in the case of country-level variables, $X_{i,t}$ has only time dimension as country-level variables do not vary across firms. Substituting Equations (4) and (1) in Equation (3), we obtain:

$$Lev_{i,t} = [1-(\omega_0-\omega_1 X_{i,t})Lev_{i,t-1} + (\omega_0-\omega_1 X_{i,t})(\textstyle\sum_{j=1}^{N}\theta_j K_{j,i,t} + \varepsilon_{i,t})] \quad (5)$$

Partly multiplying Equation (5) out, we obtain:

$$Lev_{i,t} = (1-\omega_0)Lev_{i,t-1} - \omega_1 X_{i,t}Lev_{i,t-1} + \omega_0 \textstyle\sum_{j=1}^{N}\theta_j K_{j,i,t} + \omega_1 \textstyle\sum_{j=1}^{N}\theta_j K_{j,i,t} + \varepsilon_{i,t}] \quad (6)$$

When Equation (6) is estimated, interest is mainly in ω_1 which is the coefficient of the interaction term between the determinant variable of adjustment speed, $X_{i,t}$, and the lagged leverage, $Lev_{i,t-1}$. Thus, we formulate the null hypothesis that $\omega_1 = 0$, i.e. the speed of adjustment is independent from firm, industry, and/or country characteristics.

We observe, in the econometrics literature, that varying econometric procedures could be used to estimate Equation (6) and results are non-robust. However, after comparing the results from estimation procedures ranging from OLS to fixed and random effects, from Instrument Variables to GMM, Antoniou *et al.* (2008) and Deesomsak *et al.* (2009) demonstrate that sys-GMM is the most appropriate method to estimate Equation (6). Hence, this study uses sys-GMM for the purpose of estimation. We check presence (or absence) of second-order serial correlation in the first differences of the error term as the consistency of the sys-GMM estimator requires that this condition be satisfied. Further, we verify the validity of instruments using the Sargan test of over identifying restrictions.

3.2 Measuring capital structure

Similar to the competing theories, there is no universally accepted definition of capital structure in the literature. Researchers agree that measures of capital structure should vary depending on the purpose of analysis (e.g. Bevan and Danbolt, 2002; Rajan and Zingales, 1995; Lemma and Negash, 2011, 2013a). In addition, empirical studies show that different measures of capital structure produce different results, hence, can affect the interpretation of results (Harris and Raviv, 1991). Further, competing theories have different implications for capital structure depending on how it is defined (e.g. Bhaduri, 2002a, b; Frank and Goyal, 2009; Titman and Wessels, 1988). Hence, the literature emphasizes the importance of considering: both short-term and long-term; and market-based and book-based measures of capital structure.

Ostensibly, most studies do not use market-based measures of capital structure since: most theoretical predictions apply to book values (see Fama and French, 2002); book-based measures may better reflect management's target capital structure since market values of equity depend on a number of factors that often cannot be controlled by the firm; information obtained from financial statements is more credible; and market values of debt are often not available (see Thies and Klock, 1992). Many researchers report that the use of book value delivers similar results to market value as the two, as Bowman (1980) demonstrates, are highly correlated. Further, Welch (2010) shows how the common use of financial-debt-to-asset ratio as a measure of leverage is fundamentally flawed. In cognizance of all these, the present study employs three book-based measures of basic capital structure: short-term leverage (STL); long-term leverage (LTL); and total leverage (TL)[4]. The specific definition of each measure of capital structure is indicated in the explanatory notes accompanying the various tables.

3.3 The sample and data

This study focused on firms drawn from nine developing economies in Africa – Botswana, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria, South Africa, and Tunisia. The choice of these countries was motivated by several factors. First, they are all in Africa where the literature on the role of firm, industry, institutional, and macroeconomic factors on capital structure adjustment speed is sparse. Second, these countries have different institutional setups, such as financial markets, legal traditions, and level of economic development. In particular, Botswana, Ghana, Kenya, Nigeria, and South Africa are members of the British Commonwealth, and thus, have some common attributes in corporate governance and corporate control whereas Egypt, Mauritius, Morocco, and Tunisia are civil law based countries. In addition, while the stock exchanges in Botswana, Ghana, Kenya, Nigeria, Mauritius, Morocco, and Tunisia are recently emerging exchanges those in South Africa and Egypt are more established markets. Furthermore, although not as wide, there is considerable difference in the level of economic development of these countries. This diversity offered the opportunity to assess the effects of different institutional and macroeconomic environments on capital structure adjustment speeds.

Firm-specific data used in this study were extracted from financial statements of listed firms in sample countries. The financial statements were sourced from OSIRIS database of Bureau DIJK that maintains a comprehensive financial database of over 70,000 firms across the globe. We started with all the firms listed in all of the functioning stock exchanges of 17 developing economies in Africa that had data in the OSIRIS database as at 31 December 2009. Following precedence in similar studies (De Jong *et al.*, 2008), we require that firms in our sample should have at least three years of available data over the study period and countries should have at least ten firms. We dropped firms in the financial industry (US SIC code 6000 ~) as their capital structure is subject to different set of regulations. The final dataset comprised of ten-years (1999-2008) data pertaining to 986 non-financial firms. The sampled firms represent ca. 56 per cent of the average number of firms listed in sample countries over the sample period (see Table I). We adjusted differences in fiscal years of firms to

Table I.
Composition of the sample

Industry	Egypt	South Africa	Botswana	Ghana	Kenya	Mauritius	Morocco	Nigeria	Tunisia	All firms	All firms (%)
	Country										
Non-durables	107	26	1	3	8	9	8	14	3	179	18
Durables	18	9	1	0	1	1	0	1	1	32	3
Manufacturing	114	31	0	2	4	1	7	11	3	173	18
Oil and Gas	7	41	0	0	3	1	4	2	1	59	6
Chem. and Constriction	75	16	0	1	1	0	3	5	4	105	11
Business equipment	11	35	0	1	0	0	5	2	2	56	6
Regulated	23	15	0	0	5	2	2	1	2	50	5
Wholesale and Retail	51	38	6	2	4	7	6	10	3	127	13
Health	38	5	0	1	0	0	1	6	2	53	5
Service and other	80	36	3	0	6	4	3	19	3	153	16
Firms in the sample	522	252	11	10	32	25	39	71	24	986	100
% of sample	53	26	1	1	3	3	4	7	2	100	–
Average number of firms listed	828	470	18	27	53	50	60	203	46	1,754	–
% of listed firms	63	54	63	37	61	50	66	35	52	56	–

Notes: Percentage of sample refers to the percentage of the number of firms drawn from each country in the sample considered for the study. Average number of firms listed refers to the average of the number of firms listed in the stock exchanges of the individual countries as reported in the World Development Indicators database on the World Bank. The table provides a country-by-country and industry-by-industry composition of the sampled firms. Non-durables (IND1) include industries which fall within the following US SIC classifications: 0100-0999, 2000-2399, 2700-2799, 3100-3199, and 3940-3989. Durables (IND2) include industries which fall within the following US SIC classifications: 2400*, 2500-2519, 2590-2599, 3630-3659, 3710-3711, 3714-3714, 3716-3716, 3750-3751, 3792-3792, 3900-3939, and 3990-3999. Manufacturing (IND3) includes industries which fall within the following US SIC classifications: 2520-2589, 2600-2699, 2750-2769, 3000-3099, 3200-3569, 3580-3629, 3700-3709, 3712-3713, 3715-3715, 3717-3749, 3752-3791, 3793-3799, 3830-3839, and 3860-3899. Oil and Gas industry (IND4) includes industries which fall within the following US SIC classifications: 1000*, 1400*, 1200-1399, and 2900-2999. Chemical and Construction industries (IND5) include industries which fall within the following US SIC classifications: 1500*, 1600*, 1700*, 2800-2829, 2840-2899. Business equipment industry (IND6) includes industries which fall within the following US SIC classifications: 3570-3579, 3660-3692, 3694-3699, 3810-3829, 7370-7379. Regulatory industries (IND7) include industries which fall within the following US SIC classifications: 4000*, 4400*, 4500*, 4600*, 4800-4899, 4900-4949. Wholesale and Retail industries (IND8) include industries which fall within the following US SIC classifications: 5000-5999, 7200-7299, 7600-7699. Health industries (IND9) include industries which fall within the following US SIC classifications: 2830-2839, 3693-3693, 3840-3859, 8000-8099. Service and, etc., industries (IND10) include all others

provide a more accurate empirical work. That is, if the date of preparation of financial statements for a firm is on or before 30 June, its year was stamped as one-year prior to its fiscal year and if a firm's fiscal year is after 30 June, that same year was stamped as the firm's fiscal year.

Data on country specific variables were collected from various sources. Data on legal variables, except for rule of law data, were downloaded from the web page of Andrei Shelifer[5]. The rule of law data were taken from Kaufmann *et al.* (2009). All the data on country's macroeconomic and market conditions were taken either from World Development Indicators or Financial Structure Database of the World Bank. Additional country-level data were obtained from previous studies including Berkowitz *et al.* (2003).

To provide further insights about the sample, we present an overview of the number of firms available in the final data set by country and industry (see Table I). In terms of country distribution, we note that firms from Egypt and South Africa may heavily influence the sample; they constitute ca. 79 per cent of firms included in the sample. On the other hand, those from Botswana and Ghana have little influence on the sample as they constitute only 2 per cent of firms included in the sample. Nonetheless, the fact that our sample (except for Ghana and Nigeria) consists of more than 50 per cent of firms listed in each of the individual countries permits us to have a reasonable picture of the capital structure decisions of firms in those countries (see Table I).

From an industry perspective, we observe that firms in non-durable, manufacturing, and service industries may dominate the results with participation of 18, 18, and 11 per cent, respectively. Firms from durables and health industries are at the other end of the spectrum, with only 3 and 5 per cent participation, respectively.

4. Results and discussions

4.1 Descriptive statistics

Prior cross-country studies on capital structure report that firms in developing countries exhibit lower levels of gearing compared to those in developed countries (e.g. De Jong *et al.*, 2008). Thus, we assess whether the gearing levels in our sample countries are comparable with those for developed and other developing economies[6] reported in Cheng and Shiu (2007)[7]. Table II – panel A shows that the overall mean ratios of sample firms is 49.3, 11.8, and 37.5 per cent for TL, LTL, and STL, respectively. We also note from the same table (panel C) that the average TL-ratios for our sample firms vary from a low of 44.1 per cent in Morocco to a high of 64.9 per cent in Nigeria[8]. On the other hand, Cheng and Shiu (2007) report the average TL-ratios vary from a low of ca. 41.9 per cent in Taiwan to a high of 66.9 per cent in Indonesia for developed countries and from a low of 31.8 per cent in Venezuela to a high of ca. 62.9 per cent in Pakistan for other developing countries. Thus, unlike the allusions in other studies, the level of leverage-ratios of our sample firms is more or less similar to those in other developing and developed economies.

We further observe three salient features of capital structure of sample firms. First, all measures of capital structure were varying over time (see Table II – panel A). This could be an initial indication that firms might be attempting to adjust their capital structure towards a target. Second, we observe an overall upward trend in all the three measures of capital structure throughout the sample period. TL-ratio, for example, increased from 41.3 per cent in 1999 to 47.6 per cent in 2008 while LTL-ratio went from 9.9 to 13.9 per cent over the same period. This might, arguably, be ascribed to a confluence of increasing size and growth rate of the economies of sample countries (e.g. Booth *et al.*, 2001; De Jong *et al.*, 2008); increasing size and liquidity of stock markets (Demirgüç-Kunt and Maksimovic, 1999; Wanzenried, 2006); and increasing inflationary situations (e.g. Frank and Goyal, 2009; Taggart, 1985) over the same period (see Table II – panel A). This phenomenon may also be due to the steady increase in profitability, growth opportunities, and dividend payout variables that we noted in unreported results (Antoniou *et al.*, 2008; Barclay and Smith, 1999; Benito, 2003; Deesomsak *et al.*, 2004; Mazur, 2007).

Third, STL-ratio was on the decline over the second half of the sample period which suggests that firms in developing African countries are gradually moving towards long-term finance and away from the traditionally dominant short-term finance. This phenomenon could be due to the increase in the size and liquidity of stock markets over the sample period which may have enticed quoted firms to switch to using more long-term than short-term debt (e.g. Deesomsak *et al.*, 2009). It could well be due to the hike in firm size, profitability, and growth opportunities that we observed in

Table II.
Capital structure and country characteristics over the sample period

Panel A: descriptive statistics of institutional and macroeconomics characteristics[a]

Year	Total leverage	Long-term leverage	Short-term leverage	Taxation	Inflation	Size of economy	Growth of economy	Size of stock market	Liquidity of stock market	Size of banking sector	Creditor rights	Shareholder rights	Rule of law
1999	0.413	0.099	0.314	35.108	4.098	3.188	2.332	73.484	26.960	0.660	2.384	3.550	–
2000	0.448	0.100	0.348	34.985	4.213	3.199	2.621	58.206	28.824	0.657	2.384	3.550	−0.077
2001	0.488	0.121	0.367	34.985	4.821	3.206	1.677	46.577	18.948	0.691	2.384	3.550	–
2002	0.501	0.115	0.386	34.985	5.363	3.210	1.034	61.606	30.713	0.702	2.384	3.550	−0.102
2003	0.500	0.109	0.392	34.863	5.797	3.220	2.206	62.971	20.428	0.699	2.384	3.550	−0.125
2004	0.500	0.112	0.388	34.863	8.252	3.233	3.202	85.285	23.278	0.705	2.384	3.550	−0.036
2005	0.499	0.115	0.384	34.863	5.530	3.246	2.980	112.525	35.167	0.709	2.384	3.550	−0.030
2006	0.498	0.121	0.377	34.531	7.001	3.266	4.609	125.792	44.854	0.691	2.384	3.550	−0.099
2007	0.490	0.131	0.359	23.404	8.021	3.285	4.592	144.504	42.829	0.679	2.384	3.550	−0.119
2008	0.476	0.139	0.337	23.404	NA	NA	NA	NA	51.166	–	2.384	3.550	−0.100
Overall	0.493	0.118	0.375	32.599	5.899	3.228	2.806	85.661	32.317	0.688	2.384	3.550	−0.086

Panel B: summary of country characteristics[b]

Country	Taxa.	Inflat.	Size of overall economy	Growth rate of real GDP	Income group	Stock market size	Stock market liquidity	Size of banking sector	Creditor rights	Share-holder rights	Rule of law	Origin
Egypt	36.00	5.38	3.20	2.91	LMI	53.74	32.97	0.78	2.00	3.00	−0.04	0.00
South Africa	29.50	5.31	3.51	2.53	UMI	201.47	48.02	0.73	3.00	5.00	0.12	1.00
Botswana	15.00	8.26	3.60	4.40	UMI	27.01	3.21	0.18	3.00	3.50	0.62	1.00
Ghana	29.90	17.93	2.43	2.82	LI	16.56	3.07	0.24	1.00	5.00	−0.10	1.00
Kenya	30.30	8.82	2.62	1.15	LI	25.79	7.35	0.33	4.00	2.00	−0.95	1.00
Mauritius	23.00	6.03	3.62	3.36	UMI	42.15	6.65	0.84	2.25	3.50	0.85	0.00
Morocco	35.00	1.66	3.17	2.93	LMI	44.57	18.76	0.64	1.00	2.00	−0.03	0.00
Nigeria	25.00	11.76	2.61	2.92	LI	17.88	14.05	0.18	4.00	4.00	−1.31	1.00
Tunisia	31.34	2.92	3.35	3.93	LMI	12.00	17.44	0.62	0.00	3.00	0.20	0.00
	21.06	6.38	2.38	2.39	NA	20.66	7.84	0.34	1.56	2.48	−0.08	NA

Panel C: summary of firm characteristics by country[c]

Country	Total leverage	Long-term leverage	Short-term leverage	Firm size	Earnings volatility	Profitability	Growth opport.	Asset tangibility	Dividend payout	Tax shield
Egypt	0.471	0.083	0.377	4.912	0.220	0.095	0.055	0.362	0.714	0.030
	(0.296)	(0.149)	(0.235)	(0.816)	(0.246)	(0.189)	(0.191)	(0.254)	(0.898)	(0.027)
South Africa	0.523	0.167	0.349	5.343	0.241	0.123	0.072	0.278	0.462	0.037
	(0.261)	(0.176)	(0.199)	(1.187)	(0.238)	(0.569)	(0.233)	(0.232)	(0.981)	(0.029)
Botswana	0.442	0.151	0.291	5.112	0.235	0.171	0.070	0.248	0.665	0.035
	(0.167)	(0.167)	(0.173)	(0.678)	(0.265)	(0.163)	(0.213)	(0.178)	(0.805)	(0.030)
Ghana	0.608	0.085	0.483	4.428	0.229	0.099	0.120	0.428	0.258	0.036
	(0.418)	(0.169)	(0.249)	(1.513)	(0.203)	(0.181)	(0.086)	(0.256)	(0.303)	(0.037)

(*continued*)

Kenya	0.509	0.200	0.309	5.322	0.184	0.121	0.054	0.410	0.487	0.036
	(0.202)	(0.157)	(0.186)	(1.060)	(0.194)	(0.140)	(0.142)	(0.220)	(0.634)	(0.025)
Mauritius	0.467	0.181	0.286	5.514	0.203	0.081	0.040	0.490	0.554	0.040
	(0.211)	(0.113)	(0.188)	(1.021)	(0.223)	(0.076)	(0.092)	(0.187)	(0.560)	(0.035)
Morocco	0.441	0.085	0.356	5.405	0.204	0.104	0.047	0.271	0.587	0.044
	(0.221)	(0.121)	(0.182)	(0.943)	(0.238)	(0.093)	(0.140)	(0.205)	(0.587)	(0.032)
Nigeria	0.649	0.098	0.504	5.449	0.234	0.206	0.056	0.600	0.248	0.018
	(0.298)	(0.155)	(0.256)	(0.971)	(0.230)	(0.629)	(0.201)	(0.354)	(0.597)	(0.026)
Tunisia	0.475	0.155	0.319	4.566	0.188	0.077	0.040	0.327	0.693	0.054
	(0.241)	(0.147)	(0.182)	(0.532)	(0.213)	(0.066)	(0.092)	(0.154)	(0.677)	(0.028)

Notes: [a]Total leverage refers to the average of the ratio of total liabilities total assets. Long-term leverage refers to the average of the ratio of non-current liabilities to total assets. Short-term leverage denotes the average of the ratio of current liabilities to total assets. Taxation refers to the average of the highest corporate marginal tax rate (%). Inflation refers to the average of the consumer price index which is the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Size of economy is measured by the average of the logarithm of GDP per capita (constant 2,000 US$). Growth of economy denotes the average of the logarithm of GDP per capita growth (constant 2,000 US$). Size of stock market refers to the average of the value of listed shares to GDP, calculated using the following deflation method: (0.5) × [*Ft*/*P_et* + *Ft*-1/*P_et*-1]/[*GDPt*/*P_at*] where *F* is stock market capitalization, *P_e* is end-of period CPI, and *P_a* is average annual CPI. Liquidity of stock market refers to the average of ratio of the value of total shares traded to average real market capitalization, the denominator is deflated using the following method: *Tt*/*P_at*/(0.5) × [*Mt*/*P_et* + *Mt*-1/*P_et*-1] where *T* is total value traded, *M* is stock market capitalization, *P_e* is end-of period *CPI*. *P_a* is average annual CPI. Size of banking sector denotes the average of claims on domestic real non-financial sector by deposit money banks as a share of *GDP*, calculated using the following deflation method: (0.5) × [*Ft*/*P_et* + *Ft*-1/*P_et*-1]/[*GDPt*/*P*_at] where *F* is deposit money bank claims, *P_e* is end-of period *CPI*, and P_a is average annual CPI. Creditor rights protection index refers to an index aggregating creditor rights, following La Porta *et al.* (1998). A score of one is assigned when each of the following rights of secured lenders is defined in laws and regulations: first, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved, i.e. there is no "automatic stay" or "asset freeze". Third, secured creditors are paid first out of the proceeds of liquidating a bankrupt firm, as opposed to other creditors such as government or workers. Finally, if management does not retain administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights) and is constructed as at January for every year from 1978 to 2003. Shareholder rights protection index refers to an index of Anti-director rights is formed by adding one when: the country allows shareholders to mail their proxy vote; shareholders are not required to deposit their shares prior to the General Shareholders = Meeting; cumulative voting or proportional representation of minorities on the board of directors is allowed; an oppressed minorities mechanism is in place; the minimum percentage of share capital that entitles a shareholder to call for an Extraordinary Shareholders = Meeting is less than or equal to 10 per cent (the sample median); or when shareholders have pre-emptive rights that can only be waived by a shareholders meeting. The range for the index is from 0 to 6; [b]the table presents average values for country level characteristics. All variables are averaged over the period 1999-2008. In the Income group column, LMI refers to lower middle income group, UMI refers to upper middle income group, and LI refers to low-income group. The exact definition of the other variables is as in panel A; [c]the table presents mean (standard deviation in parenthesis) values for firm characteristics. All variables are averaged over the period 1999-2008, in which data are required to be available at least for three years. Firm size refers to the average of the natural logarithm total sales. Earnings volatility refers to the average of absolute value of first difference of the natural logarithm of profit after tax. Profitability refers to the average of the ratio of earnings before interest and taxes to total assets. Growth opportunities refer to the average of the first difference of the natural logarithm of sales. Asset tangibility refers to the average of the ratio of tangible fixed assets to total assets. Dividend payout refers to the average of the ratio of cash dividend paid to profit after tax. Tax shield refers to the average of the ratio of depreciation, amortization, and depletion to total assets. The definitions of the other variables is as indicated in panel A

Table II.

unreported results (e.g. Antoniou *et al.*, 2006; Barclay and Smith, 1995; Chen *et al.*, 1999; Deesomsak *et al.*, 2009; Ozkan, 2002; Smith and Warner, 1979). Overall, the three salient features identified signify that the capital structure of sample firms exhibited a dynamic behaviour during the period under study.

Firm-specific determinants of adjustment speed of capital structure were picked based on those often suggested in the literature (e.g. Drobetz *et al.*, 2007; Song and Philippatos, 2004). A perusal of Table II – panel C indicates that there is between and within country variation in firm-specific variables. Whether these differences in observed firm-characteristics have led to differences in adjustment speed is discussed in a later section. Table II – panel C also shows that firms in developing African countries on average are relatively smaller and yet more profitable compared to those reported in Drobetz *et al.* (2007) for firms in France, Germany, Italy, and UK. Compared to firms investigated in Cheng and Shiu (2007), the average profitability of firms in developing African countries was somehow higher. As the theoretical prediction about the influence of firm size on adjustment speed is inconclusive, what role has the relatively smaller size of firms in developing countries played on their capital structure adjustment speed is covered in a latter section. On the other hand, we anticipate that the higher profitability of sample firms should lead to a relatively more rapid adjustment.

A review of Table II – panel B reveals that sample countries varied considerably in terms of their macroeconomic conditions. Furthermore, in unreported results based on the World Development Indicators database, we observe that the size of overall economy of sample countries was much smaller than the G-7 countries commonly covered in capital structure studies while their GDP growth rates and inflation were remarkably higher. We also note from this same table that there were considerable variations in shareholder and creditor rights protection and the rule of law indices and the sample countries exhibited comparatively lower levels of shareholder and creditor rights protection and rule of law compared to the G-7 countries.

In Table III, we present Pearson's pairwise correlation coefficients of variables along with their statistical significance. We note that firm size is positively and significantly associated with capital structure independent of how the latter is defined. While earnings volatility is positively and significantly correlated, dividend payout ratio is negatively and significantly associated with all the three measures of capital structure. Also apparent is the inverse and statistically significant association between profitability and all the three measures of capital structure. Not surprisingly, the association between asset tangibility and capital structure is sensitive to how the latter is defined; it is positively related with LTL-ratio and inversely related with STL-ratio.

Our results also indicate that the association between most of the macroeconomic and institutional variables and capital structure is dependent on which measure is used in the analysis. For example, the highest marginal corporate tax rate, size of the overall economy, and rule of law are negatively and significantly related with TL- and STL-ratios while they are positively and significantly associated with LTL-ratios. We also observe that creditor and shareholder rights protection indices are positively associated with TL and LTL-ratios. The correlation matrices also show that the relative size of a country's banking sector is negatively and significantly associated with all the three measures of capital structure. On the other hand, we note that the association between measures of stock market development (i.e. its size and liquidity) and capital structure is sensitive to how the latter is measured. Specifically, both measures of stock

Table III. Correlation matrices

Panel A: leverage and firm characteristics[a]

	Total leverage	Long-term leverage	Short-term leverage	Firm size	Earnings volatility	Profit.	Growth opprtun.	Asset tangibility	Div. pay	Tax shield
Total leverage	1.000 ***	0.436 ***	0.744 ***	0.104 ***	0.030 *	−0.085 ***	−0.002	−0.085 ***	−0.095 ***	−0.009
Long-term leverage	0.436 ***	1.000 ***	−0.181 ***	0.023 *	0.061 ***	−0.052 ***	0.055 ***	0.230 ***	−0.099 ***	0.130 ***
Short-term leverage	0.744 ***	−0.181 ***	1.000 ***	0.120 ***	−0.008	−0.039 ***	−0.019	−0.309 ***	−0.039 *	−0.096 ***

Panel B: leverage and macroeconomic variables[b]

	Taxation	Inflation	Size of economy	Grwth of economy	Size of stk mkt	Liq. of stk mkt	Size of bnk′g	Creditor rights	Sharehol rights	Rule of law
Total leverage	−0.026*	0.043***	−0.033**	0.019	0.049***	0.000	−0.081***	0.100***	0.097***	−0.075***
Long-term leverage	0.052***	−0.037***	0.122***	0.045***	0.155***	0.068***	−0.032**	0.123***	0.168***	0.049***
Short-term leverage	−0.130***	0.068***	−0.114***	−0.019	−0.050***	−0.049***	−0.042***	0.012	−0.011	−0.111***

Panel C: pairwise correlation analysis of independent variables[c]

	Firm size [1]	Earnings volatility [2]	Profit [3]	Growth opprt. [4]	Asset tang. [5]	Div. pay [6]	Tax shield [7]	Taxation [8]	Inflation [9]	Size of economy [10]	Grwth of economy [11]	Size of stk mkt [12]	Liq. of stk mkt [13]	Size of bnk′g [14]	Creditor rights [15]	Shareholder rights [16]	Rule of law [17]
[1]	1.000***																
[2]	−0.044***	1.000***															
[3]	0.077***	−0.011	1.000***														
[4]	0.111***	0.077***	0.124***	1.000 ***													
[5]	−0.020	−0.009	0.016	0.018	1.000 ***												
[6]	−0.031	0.134***	−0.040**	−0.121 ***	−0.015 **	1.000 ***											
[7]	0.029**	−0.020	−0.010	0.003	0.288 ***	0.045 **	1.000 ***										

(*continued*)

Table III.

[8]	−0.186***	0.006	−0.050***	−0.039 ***	−0.042 ***	0.090 ***	−0.005	1.000 ***									
[9]	0.023*	−0.011	0.034**	0.048 ***	0.169 ***	−0.115 ***	−0.117 ***	−0.394 ***	1.000 ***								
[10]	0.034**	0.022	−0.031**	0.018	−0.258 ***	0.127 ***	0.128 ***	−0.070 ***	−0.398 ***	1.000 ***							
[11]	0.081***	−0.024	0.008	0.041 ***	−0.072 ***	−0.008	0.006	−0.235 ***	0.150 ***	0.106 ***	1.000 ***						
[12]	0.145***	0.041**	0.029**	0.057 ***	−0.196 ***	−0.019	0.023	−0.347 ***	−0.051 ***	0.649 ***	0.161 ***	1.000 ***					
[13]	0.092***	0.022	0.008	0.029 **	−0.152 ***	0.034 *	0.010	−0.213 ***	−0.026 **	0.513 ***	0.363 ***	0.696 ***	1.000 ***				
[14]	−0.096***	0.011	−0.068***	0.001	−0.188 ***	0.157 ***	0.042 ***	0.533 ***	−0.475 ***	0.669 ***	−0.053 ***	0.245 ***	0.330 ***	1.000 ***			
[15]	0.178***	0.034**	0.061***	0.026 *	0.078 ***	−0.124 ***	−0.101 ***	−0.384 ***	0.350 ***	−0.200 ***	−0.135 ***	0.325 ***	0.062 ***	−0.532 ***	1.000 ***		
[16]	0.127***	0.052***	0.033 **	0.044 ***	−0.084 ***	−0.111 ***	0.028 **	−0.346 ***	0.125 ***	0.435 ***	−0.041 ***	0.747 ***	0.388 ***	−0.073 ***	0.515 ***	1.000 ***	
[17]	−0.035**	0.021	−0.011	0.005	−0.176 ***	0.097 ***	0.096 ***	0.129 ***	−0.457 ***	0.852 ***	−0.080 ***	0.338 ***	0.217 ***	0.769 ***	−0.516 ***	0.144 ***	1.000 ***

Notes: The exact definition of the variables is as presented in Table II.[a]The table reports the correlation coefficients between the three measures of leverage and firm-specific variables; [b]the table reports the correlation coefficients between the three measures of leverage and macroeconomic and institutional variables. [c]The table reports the Pairwise correlation coefficients between the independent variables. ***,**,* Correlation coefficients that are significantly different from 0 at the 1, 5, and 10 per cent levels respectively market development are inversely related with STL-ratio while they have the opposite association with the other two leverage-ratios.

Finally, we note that the correlation coefficients between country-level determinants of capital structure are very high. To keep the estimation problem tractable and avoid problems of multicollinearity when estimating Equation (6) in the presence of high correlations, we develop slightly different specifications of Equation (6) by excluding highly correlated variables.

4.2 Determinants of target capital structure

Reasonable estimation of the dynamic model in Equation (6) crucially hinges on the correct specification of the model for target capital structure. Hence, we estimate Equation (1) using a two-way fixed effect (FE) regression procedure to examine if the model is accurately specified. We also estimate Equation (1) using Seemingly Unrelated Regression (SUR) for robustness check. Estimation results are presented in Table IV[9].

Table IV shows that firm size is positively related with leverage and most coefficients are significant at the 1 per cent level of significance. We also note that the relationship between asset tangibility and capital structure is a function of the measure of capital structure used in the analysis. Furthermore, the results indicate that firm profitability, dividend payout ratio, and tax-shield are inversely related with capital structure. Broadly, these findings are in tandem with main stream capital structure theories. They also sit well in the club of many other efforts within the context of developed and developing countries.

What is more, all the F-statistic and χ^2-statistic reject the null hypothesis that all explanatory variables are simultaneously equal to zero. Also, the Hausman test rejects the null hypothesis that the fixed effects estimator and the random effects estimator are equivalent. We interpret this as favouring the fixed effects estimator. Overall, our

	Short-term leverage		Total leverage		Long-term leverage	
	FE	SUR	FE	SUR	FE	SUR
Earnings vol.	−0.0140	−0.0217	0.0002	0.0270	0.0109	0.0489***
Firm size	0.1030***	0.0371***	0.1360 ***	0.0457***	0.0112	0.0057
Profit.	−0.1780***	−0.1260**	−0.3170 ***	−0.2170 ***	−0.1350***	−0.1100***
Growth oppt.	−0.0095	0.0381	−0.0275	0.0413	−0.0024	0.0086
Asset tang.	−0.0544	−0.2820***	0.0794	−0.0894 **	0.0907**	0.1750***
Div. payout	0.0039	−0.0068	−0.0032	−0.0266 ***	−0.0065**	−0.0198***
Tax shield	−0.4950**	−0.1930	−0.7900***	0.0228	−0.2380	0.2950
Constant	−0.157	0.2470***	−0.2600	0.2520***	0.0221	0.0279
F-statistic	3.54***	–	3.2 ***	–	2.04***	–
χ^2	–	339.45***	–	121.67***	–	340.12***
Hausman test	58.28***	–	21.94	–	12.13	–
n	1,695	1,695	1,696	1,696	1,743	1,743

Notes: The table reports the results from fixed effects (FE) regressions (two way error component) and seemingly unrelated regressions (SUR) of leverage ratio on firm-specific capital structure determinants. F-test statistic for FE and χ^2 statistic for SUR are reported. ***,**,* Coefficients that are significantly different from 0 at the 1, 5, and 10 per cent levels are marked respectively

Table IV.
Fixed effects and seemingly unrelated regressions for capital structure determinants

results are comparable to those in other similar studies and they indicate that the explanatory variables are appropriate to model a time varying target capital structure in a dynamic adjustment model.

4.3 Determinants of adjustment speed of capital structure

In this section, we report dynamic panel estimation results from Equation (6). Dynamic panel estimation using sys-GMM allows estimation of all coefficients in Equation (6) simultaneously. We begin our analysis by perusing the results for our baseline regression model (Model 1) which specifies only firm-specific factors as the independent variables. Table V presents estimates of Model 1.

As indicated in an earlier section, our focus is on the estimates of $(1-\omega_1)$ and ω_1. While $(1-\omega_1)$ shows the movement of leverage-ratio to its target, ω_1 indicates whether the speed of adjustment is independent of firm-specific characteristics included in Model 1. The estimates of $(1-\omega_1)$ for STL, LTL, and TL-ratios were 0.461, 0.410, and 0.606, respectively. This implies that firms in sample countries close by 53.9, 59.0, and 39.4 per cent the gap between current and target STL, LTL, and TL ratios, respectively, within one year. This means that a firm takes somehow less than two years to reach its optimal STL (100 per cent divided by 53.9 per cent) and LTL (100 per cent divided by 59.0 per cent) while it takes ca. two and half years (100 per cent divided by 39.4 per cent) to reach it optimal TL. The difference in adjustment speeds is perhaps

Dependent variable	Short-term leverage	Long-term leverage	Total leverage
$LV_{i,t-1}$	0.461***	0.410***	0.606 ***
	(0.086)	(0.097)	(0.086)
$LV_{i,t-1} \times Size_{i,t}$	0.033	−0.116*	0.062**
	(0.022)	(0.062)	(0.025)
$LV_{i,t-1} \times Profit_{i,t}$	−0.810**	−0.453	−0.767**
	(0.403)	(0.944)	(0.359)
$LV_{i,t-1} \times Grwtht_{i,t}$	0.164	−0.257	0.048
	(0.185)	(0.528)	(0.231)
$LV_{i,t-1} \times Dist_{i,t}$	−0.128	8.038***	−0.814**
	(0.361)	(1.231)	(0.354)
Constant	0.150**	0.042	0.095
	(0.062)	(0.031)	(0.062)
Wald test	49.21***	317.18***	386.16***
Z^2	1.148	−0.974	0.753
Sargan test	96.738(107)	127.715(113)	100.641(107)
n	1,067	1,130	1,070

Notes: The table reports the results of estimating Equation (6) using sys-GMM estimator proposed by Blundell and Bond (1998). Variations in sample size are due to data limitations. The table shows the coefficients on the lagged leverage ratio and on the interaction term of the determinant of adjustment speed with the lagged leverage ratio. Robust standard errors are in brackets. The Wald test statistic refers to the null hypothesis that all coefficients on the determinants of target leverage ratio are jointly equal to zero. The test statistic Z^2 tests the null hypothesis of no second-order correlation in the residuals. The Sargan test statistic refers to the null hypothesis that the overidentifying restrictions are valid and uses the Blundell and Bond (1998) sys-GMM estimator. In parenthesis are the χ^2. $Size_{i,t}$ refers to size of firm *i* at time *t*. $Profit_{i,t}$ refers to profitability of firm *i* at time *t*. $Grwtht_{i,t}$ refers to growth opportunities of firm *i* at time *t*. $Dist_{i,t}$ refers to the value of the distance variable of frim *i* at time *t*. The exact definition of the variables is as presented in Table II. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 levels are marked respectively

Table V.
Firm-specific factors and capital structure adjustment – Model 1

due to the fact that TL includes STL and LTL. Such a rapid adjustment towards a target capital structure suggests the dominance of trade-off theory over rival theories proposed by Baker and Wurgler (2002) and Welch (2004). It also suggests the presence of costly and non-instantaneous adjustment towards target capital structure (e.g. Flannery and Hankins, 2007; Leary and Roberts, 2005).

The relatively fast adjustment speed reported in Table V is consistent with the comparatively higher profitability and growth that epitomized sample firms. It is also consistent with the relatively high economic growth and inflation that characterized the macroeconomic condition of sample countries. It is also in tandem with the relatively faster adjustment speeds reported in Shyam-Sunder and Myers (1999) and Flannery and Rangan (2006) for firms in the USA and Mukherjee and Mahakud (2010) for Indian companies. Nonetheless, such an adjustment speed is in contrast with what we would have expected given the relatively weaker legal institutions and less developed financial institutions that characterized sample countries. Our interpretation of this phenomenon is that the influence of macroeconomic conditions has, perhaps, overwhelmed that of legal and financial institutions.

4.3.1 Firm-specific determinants of adjustment speed of capital structure. A perusal of the estimates of ω_1 in Table V indicates that the nexus between distance variable ($Dist_{i,t}$) and speed of adjustment is dependent on how capital structure is defined. The further the observed STL and TL-ratios are from the target, the faster is the speed of adjustment. This suggests that firm's cost of maintaining a sub-optimal STL and TL is higher than the cost of adjustment and the fixed costs of adjustment are not significant. On the other hand, the negative relationship between adjustment speed of LTL-ratio and the $Dist_{i,t}$ variable suggests that adjustment costs (i.e. cost of external financing, transaction cost, etc.) for long-term financing were prohibitively high for sample firms. In situations where firms sidestep capital markets to adjust their capital structure, they may take "extended excursions away from the optimal capital structure" and only adjust their capital structures slowly as part of their normal operations while larger adjustments require new issues of securities (Loof, 2004)[10]. This finding is consistent with our preliminary result which suggested that firm financing in sample countries was dominated by short-term sources. Our result corroborates the findings reported in Drobetz and Wanzenried (2006) and Mukherjee and Mahakud (2010).

Furthermore, the estimated coefficients of profitability (see Table V) are all negative, indicating a positive association between firm profitability and the pace at which sample firms adjust their capital structure to the optimum. This is consistent with the conjecture that more profitable firms have the flexibility and better access to raising external finance and hence adjust their capital structure more rapidly than less profitable firms. Similar results were reported in Flannery and Rangan (2006) and Song and Philippatos (2004).

We observe that the nexus between firm size and adjustment speed is sensitive to how we measure capital structure. The results indicate that firm size enhances adjustment speed of LTL-ratio while it deters those of STL and TL-ratios. This suggests that the potential cost of distress that is likely to be lesser in larger firms is an important factor in the adjustment decisions of sample firms. As larger firms tend to have lesser cost of financial distress, they tend to be reluctant to adjust their long-term capital structure. On the other hand, the lower transaction costs seem to play a dominant role in the adjustment decision of short-term, and thereby total, leverage of sample firms. Also evident in Table V is that the growth opportunities variable has a statistically weak and definitionally sensitive relationship with adjustment speed. This result is in contrast with what was reported in Drobetz and Wanzenried (2006). Specifically, the finding in Drobetz and Wanzenried (2006) and Mukherjee and Mahakud (2010) that growing firms adjust faster than no-growth firms could not be confirmed.

4.3.2 Inter-industry heterogeneity of adjustment speed of capital structure. We now attempt to examine whether the adjustment speeds reported in Table V persist when we estimate Model 1 on an industry-by-industry basis. Estimation results for each industry are reported in Table VI – panel A. For reasons of brevity, we report only coefficients of lagged leverage-ratios along with the corresponding robust standard errors and number of observations.

The results of industry-by-industry analysis for ten industries indicate that adjustment speeds vary across industries. On a STL-ratio basis, firms within the Durables and Chemicals and Construction industries move towards their target capital structures relatively rapidly than those in other industries. The adjustment speed of short-term capital structure for these industries is about 57.5 per cent per year. On a LTL-ratio basis, firms within the Health, Oil and Gas, and Regulated industries move towards their target capital structures relatively rapidly than those in other industries. The adjustment speeds of long-term capital structure for these industries are between 66.7 and 91.6 per cent per year. These industries generally had high levels of leverage-ratios, which may indicate that they were comparatively riskier than other industries (see Table VI-Panel B). When firms in these industries deviate from their target capital structure, in particular take on additional debt, they might increase their risk even further. Consequently, they might try to adjust back towards their target capital structure faster than firms in comparatively less risky industries (Smith *et al.*, 2010).

In contrast, on a STL-ratio basis, firms within the Business Equipment, Wholesale and Retail, and Health industries adjust their capital structures relatively slowly towards their target (Table VI – panel A). On a LTL-ratio basis, on the other hand, firms within the Durables, Service, and Wholesale and Retail industries adjust their capital structures relatively slowly towards their target. While firms within the Health industry have low short-term leverage-ratios, those in Wholesale and Retail industry have low LTL-ratios (Table VI – panel B). This might point that these industries are relatively less risky. Therefore, when firms in these industries deviate from their target capital structure, and in particular take on additional debt, they might feel less pressure to adjust back to the target quickly (Smith *et al.*, 2010).

Broadly speaking, we observe that a majority of the industries in our sample exhibited an inverse relationship between level of leverage-ratios (i.e. financial risk) and speed of adjustment. Taking a cue from Smith *et al.* (2010), our evidence indicates that industry's financial risk may be the underlying factor determining adjustment speed. That is, firms in industries that have relatively high financial risk tend to revert more quickly to their target capital structure than those in industries that have relatively low risk. Nonetheless, this conclusion should not be taken as anything more than a pointer since only a proper modelling of more specific measure of industry risk and its relationship with adjustment speed can better establish the influence of the former on the latter.

4.3.3 Cross-country heterogeneity of adjustment speed of capital structure. To gain an idea about cross-country variation in adjustment speeds, we estimate Model 1 for each country included in our sample. For reasons of brevity, we report only coefficients of lagged leverage-ratios[11]. On a STL-ratio basis, our results (Table VII – panel A) show

Table VI. Capital structure and its adjustment speed by industry

Panel A: inter-industry heterogeneity in adjustment speeds of capital structure[a]

Dependent variable	Short-term leverage	Long-term leverage	Total leverage
Non-durable industry	0.616 ***	0.549 **	0.725 ***
	(0.165)	(0.259)	(0.141)
	1,006	1,055	1,011
Durable industry	0.424 *	0.929 **	0.686 ***
	(0.284)	(0.408)	(0.192)
	167	170	167
Manufacturing industry	0.563 ***	0.564 ***	0.662 ***
	(0.134)	(0.162)	(0.102)
	921	958	922
Oil and Gas industry	0.523	0.255	0.208
	(0.386)	(1.414)	(1.302)
	385	383	386
Chemicals and Construction industry	0.426	0.370 ***	0.550 ***
	(0.852)	(0.131)	(0.174)
	523	536	523
Business Equipment industry	0.902 **	0.537	0.865 ***
	(0.387)	(0.894)	(0.223)
	346	350	346
Regulated industry	0.728	0.333 **	0.839
	(2.279)	(0.152)	(1.494)
	304	310	305
Wholesale and Retail industry	0.764	0.592 ***	0.841
	(0.882)	(0.138)	(0.819)
	697	748	705
Health industry	0.739	0.084	0.467
	(0.503)	(3.134)	(0.791)
	283	294	283
Service industry	0.453 ***	0.643 ***	0.649 ***
	(0.199)	(0.208)	(0.156)
	814	862	814

Panel B: summary statistics of leverage by industry

	Short-term leverage			Long-term leverage			Total leverage		
	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs
Non-durables	0.345	0.209	1006	0.109	0.159	1055	0.467	0.288	1011
Durables	0.342	0.178	167	0.088	0.115	170	0.432	0.212	167
Manufacturing	0.357	0.194	921	0.124	0.176	958	0.482	0.245	922
Oil and Gas	0.265	0.233	385	0.197	0.206	383	0.477	0.321	386
Chem. and Construction	0.445	0.224	523	0.108	0.164	536	0.555	0.230	523
Business Equipment	0.429	0.243	346	0.078	0.105	350	0.526	0.316	346
Regulated	0.367	0.200	304	0.182	0.194	310	0.546	0.226	305
Wholesale and Retail	0.428	0.229	697	0.095	0.119	748	0.545	0.309	705
Health	0.352	0.189	283	0.074	0.138	294	0.435	0.232	283
Service and others	0.318	0.226	814	0.132	0.160	862	0.462	0.293	814

Notes: SD, standard deviation; Obs, number of observations. The exact definition of the industries is as reported in Table I. [a]The table reports the parameter estimates of the one-period lagged dependent variable and the corresponding robust standard errors and number of observations. Equation (6) was estimated using sys-GMM estimator proposed by Blundell and Bond (1998) for each industry in the sample. For reasons of brevity, we do not report parameter estimates and related details of firm-specific variables included in the model. Robust standard errors are in brackets. And the figure in a third raw is the number of observations. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent levels are marked respectively

Dependent variable	Short-term leverage	Long-term leverage	Total leverage
Egypt	0.531***	0.442***	0.658***
	(0.096)	(0.098)	(0.133)
	2,685	2,702	2,697
South Africa	0.816	0.178	0.773***
	(0.853)	(0.645)	(0.136)
	1,664	1,663	1,665
Kenya	0.349***	0.178***	0.022
	(0.135)	(0.056)	(0.092)
	150	163	151
Morocco	0.750	0.949***	0.647***
	(0.833)	(0.141)	(0.318)
	288	289	288
Tunisia	0.539***	0.131	0.360
	(0.179)	(0.181)	(0.452)
	176	177	176

Notes: The table reports parameter estimates of the one-period lagged dependent variable and the corresponding robust standard errors and number of observations. Equation (6) was estimated using sys-GMM estimator proposed by Blundell and Bond (1998) for each country in the sample. The results of four countries including Botswana, Ghana, Mauritius, and Nigeria were not included owing to sample size issues. For reasons of brevity, we do not report parameter estimates and related details of firm-specific variables included in the model. Robust standard errors are in parentheses. And the figure in a third raw is the number of observations. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent levels are marked respectively

Table VII. Cross-country heterogeneity in adjustment speed of capital structure

that firms in Kenya adjust at the fastest rate (1− 0.349 = 0.651) while those in South Africa adjust at the slowest rate (1−0.816 = 0.184). On a LTL-ratio basis, firms in Kenya adjust at the fastest rate (1−0.178 = 0.822) while those in Morocco adjust at the slowest rate (1−0.949 = 0.051)[12]. These results suggest two important points. First, they suggest that there is, indeed, a cross-country variation in capital structure adjustment speeds. Second, it appears that the positive influence of inflation on capital structure adjustment speed dominates that of other macroeconomic and institutional variables. A joint consideration of results in Table VII and Table II – panel B reveals that firms in countries with higher inflation tend to more rapidly adjust their capital structure to the optimum than those in a less inflationary situation regardless of the influence of other country- and firm-specific factors.

Earlier, we hypothesized that legal institutions should determine the adjustment speed of firm's capital structure. To this end, we examine the dynamics by splitting the sample into firms from countries with common law and civil law traditions[13]. We estimate Model 1 for firms in each sub-sample. Table VIII reports the adjustment speeds for each sub-sample. As in the previous analyses, we report only coefficients of lagged leverage-ratios.

Consistent with our expectation, we observe that firms in the common law sub-sample adjust to target capital structures at a relatively faster speed than is the case with the civil law sub-sample (see Table VIII). The difference in the adjustment speeds is sharper when one considers STL and LTL-ratios separately than TL-ratio. Similar results were reported in other studies (e.g. Öztekin and Flannery, 2012). This variation in adjustment speeds does strengthen the hypothesis that legal institutions influence the adjustment costs and/or benefits, and hence, the adjustment speed of capital structure of firms.

Dependent variable	Short-term leverage	Long-term leverage	Total leverage
Common Law	0.430 ***	0.282	0.619 **
	(0.151)	(1.309)	(0.291)
	3,322	3,341	3,334
French Law	0.527 ***	0.469 ***	0.641 ***
	(0.086)	(0.100)	(0.080)
	2,122	2,325	2,128

Notes: The table reports parameter estimates of the one-period lagged dependent variable and the corresponding robust standard errors and number of observations. Equation (6) was estimated using sys-GMM estimator proposed by Blundell and Bond (1998) for each legal family. For reasons of brevity, we do not report parameter estimates and related details of firm-specific variables included in the model. Robust standard errors are in parentheses. And the figure in a third raw is the number of observations. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent levels are marked respectively

Table VIII.
Heterogeneity in adjustment speeds across legal origin

We further examine capital structure adjustment speeds by trifurcating our sample into sub-samples of income groups: upper-middle-income; lower-middle-income; and low-income countries. We consider these sub-samples because the results might help us uncover the influence that economic development has on capital structure dynamics that we could not capture through other variables. We carry out separate estimates of Model 1 for each sub-sample. Table IX reports the variation in adjustment speeds of capital structure of firms in all the three sub-samples. Again, only coefficients of the lagged leverage-ratio variable are reported.

Consistent with the hypothesis that the level of development of a country influences adjustment speed of capital structure of firms, our results show that adjustment speeds vary across income groups. Specifically, on a STL-ratio basis, firms in richer countries tend to have a slower adjustment speed than is the case in poorer countries. We observe similar results for TL-ratio (see Table IX). This variation in speeds of adjustment is consistent with the view that the relative costs and/or benefits of deviating from target

Dependent variable	Short-term leverage	Long-term leverage	Total leverage
Upper middle income countries	0.802	0.099	0.775***
	(0.618)	(0.221)	(1.379)
	1,911	1,910	1,912
Lower middle income countries	0.539***	0.471***	0.648***
	(0.136)	(0.105)	(0.081)
	3,149	3,168	3,161
Low income countries	0.190	0.310***	0.533
	(0.432)	(0.080)	(0.597)
	388	588	389

Notes: The table reports parameter estimates of the one-period lagged dependent variable and the corresponding robust standard errors and number of observations. Equation (6) was estimated using sys-GMM estimator proposed by Blundell and Bond (1998) for each income group family. For reasons of brevity, we do not report parameter estimates and related details of firm-specific variables included in the model. Robust standard errors are in parentheses. And the figure in a third raw is the number of observations. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent levels are marked respectively

Table IX.
Heterogeneity in adjustment speeds across income groups

capital structure vary across income levels. Hence, the (net) adjustment cost, based on Table IX, is highest for upper-middle-income countries, followed by lower-middle-income countries and low-income countries. This result strengthens the notion that macroeconomic factors influence the speed of adjustment (Hackbarth *et al.*, 2006; Wanzenried, 2006). However, it is not consistent with the proposition that firms in less developed countries actually adjust their capital structure at a slower rate than those in developed countries.

We now proceed to examine the influence of more-narrowly-defined aspects of macroeconomic and institutional environment on adjustment speed by introducing a set of more specific set of legal, financial, and macroeconomic variables into Equation (6) – Model 2. Specifically, we include such variables as size of the overall economy, growth rate of the economy, corporate tax rate, inflation, stock market size, stock market liquidity, size of banking sector, creditor rights protection, shareholder rights protection and rule of law. As has been pointed out earlier, most of these country-level variables were severely correlated. Thus, putting all of them into one model would result in multicollinearity problem (see Table III – panel C). To avoid the multicollinearity problem, we develop variants of Model 2 (i.e. Model 2a-Model 2g) each of which encompass only less severely correlated independent variables. Table X presents model estimates for each measure of capital structure.

The estimated coefficient on the interaction term with the highest marginal corporate tax rate indicates that firms in countries with higher marginal corporate tax rates adjust faster towards their target leverage-ratio implying that higher untapped tax benefits enhance the pace at which firms adjust to their target capital structure. Empirical works by Öztekin and Flannery (2012) and Clark *et al.* (2009) report similar results. In line with predictions by Mills (1996), our results indicate a statistically weak but positive relationship between inflation and speed of capital structure (see Table X). This confirms the hypothesis that inflationary situations lead to increased cost of capital for sub-optimal capital structure, and hence, lead to higher adjustment speed towards optimal capital structure. This result is in sync with the findings reported in Wanzenried (2006).

Our results show that the nexus between the overall size of the economy and its growth rate, on the one hand, and capital structure, on the other, is a function of how the latter is measured. In particular, we observe a negative but weak relationship between GDP per capita growth rate and adjustment speed of STL-ratio and a positive relationship for LTL and TL-ratios (see Table X). This partially confirms Hackbarth *et al.*'s (2006) argument that lower restructuring thresholds during periods of high GDP per capita growth lead to faster capital structure adjustment speeds. In a study of firms drawn from four European countries, Wanzenried (2006) reports similar results. What is more, we note that overall size of the economy and adjustment speed of short-term leverage-ratio are negatively related while the former positively influences the adjustment speed of LTL-ratio (see Table X).

Dependable legal systems, which assure investors that they receive promised cash flows, enhance capital market transactions (e.g. Öztekin and Flannery, 2012). Although statistically weak, we find that adjustment speeds of both STL and LTL-ratio are faster in countries with stronger shareholder rights protection. However, an opposite relationship emerges when TL-ratio is considered (see Table X). These partially confirm the hypothesis that firms in countries with better protection to shareholder rights exhibit faster capital structure adjustment speed than is the case in countries with poor shareholder rights protection.

Table X. Determinants of adjustment speed of capital structure – Model 2

Panel A:dependent variable – short-term leverage ratio[a]							
	Model 2 (a)	Model 2 (b)	Model 2 (c)	Model 2 (d)	Model 2 (e)	Model 2 (f)	Model 2 (g)
$LV_{i,t-1}$	0.456*** (0.093)	0.452*** (0.083)	0.521*** (0.100)	0.462*** (0.097)	0.469*** (0.087)	0.498*** (0.112)	0.480*** (0.105)
$LV_{i,t-1} \times Profit_{i,t}$	−0.609* (0.343)	−0.626* (0.337)	−0.906** (404)	−0.458 (0.384)	−0.537 (0.380)	−0.626 (0.411)	−0.455 (0.349)
$LV_{i,t-1} \times Grwtht_{i,t}$	0.251 (0.186)	0.123 (0.178)	0.143 (0.219)	0.129 (0.204)	0.226 (0.209)	0.198 (0213)	0.231 (0.213)
$LV_{i,t-1} \times Dist_{i,t}$	0.440 (0.388)	0.061 (0.286)	0.176 (0.348)	0.213 (0.462)	0.392 (0.421)	0.150 (0.449)	0.432 (0.353)
$LV_{i,t-1} \times GDPG_{i,t}$	0.003 (0.010)						
$LV_{i,t-1} \times SR_{i,t}$							−0.077 (0.052)
$LV_{i,t-1} \times RUL_{i,t}$	−0.055 (0.084)				−0.075 (0.094)		−0.105 (0.090)
$LV_{i,t-1} \times TAX_{i,t}$		−0.001 (0.001)					
$LV_{i,t-1} \times STKLIQ_{i,t}$						0.050 (0.135)	
$LV_{i,t-1} \times INFL_{i,t}$			−0.001 (0.004)			0.001 (0.004)	
$LV_{i,t-1} \times STKSIZ_{i,t}$			0.097** (0.048)				
$LV_{i,t-1} \times BNKSIZ_{i,t}$				−0.169 (0.181)			
$LV_{i,t-1} \times CR_{i,t}$				0.080* (0.048)			
$LV_{i,t-1} \times LOGGDP_{i,t}$					0.015 (0.070)		
Constant	0.170***(0.047)	0.204***(0.046)	0.168*** (0.051)	0.161** (0.063)	0.154* (0.086)	0.174** (0.072)	0.229*** (0.079)
Wald test	42.99***	43.68***	58.28***	41.35***	37.99***	31.21***	54.09***
Z^2	0.155	1.471	0.295	0.483	0.264	0.262	1.184
Sargan test	82.186	103.280	90.687	80.335	85.404	89.233	110.194
n	5,444	5,441	5,435	5,440	5,429	5,437	5,428
Panel B:dependent variable – long-term leverage ratio[b]							
	Model 2 (a)	Model 2 (b)	Model 2 (c)	Model 2 (d)	Model 2 (e)	Model 2 (f)	Model 2 (g)
$LV_{i,t-1}$	0.463*** (0.135)	0.396*** (0.118)	0.476*** (0.152)	0.460* (0.244)	0.428*** (0.124)	0.492*** (0.095)	0.413*** (0.095)
$LV_{i,t-1} \times Profit_{i,t}$	−1.188 (1.197)	−0.551 (0.881)	−1.500* (0.859)	−0.989 (0.244)	−1.220 (1.012)	−1.360* (0.740)	−0.692 (0.834)
$LV_{i,t-1} \times Grwtht_{i,t}$	−0.527 (0.596)	−0.615 (0.391)	−0.471 (0.494)	−0.421 (0.379)	−0.363 (0.407)	−0.331 (0.378)	−0.555 (0.453)
$LV_{i,t-1} \times Dist_{i,t}$	6.460*** (1.461)	8.109*** (1.424)	7.713*** (2.173)	7.153*** (2.318)	7.334*** (1.597)	6.750*** (1.404)	7.690*** (1.347)
$LV_{i,t-1} \times GDPG_{i,t}$	−0.001 (0.021)						
$LV_{i,t-1} \times SR_{i,t}$							−0.095 (0.101)
$LV_{i,t-1} \times RUL_{i,t}$	−0.140 (0.165)				−0.074 (0.145)		−0.104 (0.155)

(*continued*)

Table X.

$LV_{i,t-1} \times TAX_{i,t}$		−0.011*** (0.004)					
$LV_{i,t-1} \times STKLIQ_{i,t}$						−0.071 (0.247)	
$LV_{i,t-1} \times INFL_{i,t}$			−0.013 (0.013)			−0.003 (0.017)	
$LV_{i,t-1} \times STKSIZ_{i,t}$			0.276** (0.133)				
$LV_{i,t-1} \times BNKSIZ_{i,t}$				−0.575 (0.595)			
$LV_{i,t-1} \times CR_{i,t}$				−0.050 (0.160)			
$LV_{i,t-1} \times LOGGDP_{i,t}$					−0.211* (0.131)		
Constant	0.004 (0.026)	0.022 (0.016)	−0.010 (0.011)	0.041* (0.024)	0.059* (0.034)	0.006 (0.020)	0.023 (0.022)
Wald test	294.04***	299.46***	331.24***	237.02***	241.09***	286.83***	371.00***
Z^2	−0.812	−1.171	−0.787	−1.034	−0.833	−0.950	−0.986
Sargan test	97.645	118.615	105.800	96.548	102.111	102.877	132.440
n	5,666	5,662	5,645	5,658	5,661	5,659	5,652
Panel C: dependent variable – total leverage ratio[b]							
$LV_{i,t-1}$	Model 2 (a)	Model 2 (b)	Model 2 (c)	Model 2 (d)	Model 2 (e)	Model 2 (f)	Model 2 (g)
	0.612*** (0.096)	0.634*** (0.101)	0.699*** (0.077)	0.568*** (0.109)	0.586*** (0.090)	0.664*** (0.083)	0.620*** (0.076)
$LV_{i,t-1} \times Profit_{i,t}$	−0.594* (0.309)	−0.553 (0.366)	−0.799** (0.393)	−0.610** (0.300)	−0.766* (0.446)	−0.630* (0.355)	−0.740* (0.434)
$LV_{i,t-1} \times Grwtht_{i,t}$	0.132 (0.179)	0.078 (0.188)	0.064 (0.201)	0.076 (0.132)	0.090 (0.179)	0.083 (0.165)	0.086 (0.162)
$LV_{i,t-1} \times Dist_{i,t}$	−0.180 (0.246)	−0.449* (0.251)	−0.256 (0.236)	−0.320 (0.257)	−0.516* (0.285)	−0.280 (0.206)	−0.435 (0.307)
$LV_{i,t-1} \times GDPG_{i,t}$	−0.003 (0.012)						
$LV_{i,t-1} \times SR_{i,t}$							0.008 (0.031)
$LV_{i,t-1} \times RUL_{i,t}$	−0.089 (0.089)				−0.070 (0.094)		−0.040 (0.083)
$LV_{i,t-1} \times TAX_{i,t}$		−0.001 (0.001)					
$LV_{i,t-1} \times STKLIQ_{i,t}$						−0.016 (0.100)	
$LV_{i,t-1} \times INFL_{i,t}$			−0.001 (0.004)			−0.001 (0.003)	
$LV_{i,t-1} \times STKSIZ_{i,t}$			0.073** (0.030)				
$LV_{i,t-1} \times BNKSIZ_{i,t}$				−0.216 (0.151)			
$LV_{i,t-1} \times CR_{i,t}$				0.124** (0.055)			
$LV_{i,t-1} \times LOGGDP_{i,t}$					0.050 (0.051)		

(*continued*)

Table X.

Constant	0.201*** (0.058)	0.221*** (0.061)	0.167*** (0.050)	0.184*** (0.067)	0.168** (0.083)	0.185*** (0.065)	0.204*** (0.061)
Wald test	105.49***	104.08***	176.15***	196.97***	83.37***	125.91***	118.35***
Z^2	−0.288	1.432	−0.347	−0.102	−0.159	−0.234	1.110
Sargan test	83.319	109.630	85.574	81.504	80.504	82.596	116.237
n	5,462	5,448	5,432	5,455	5,461	5,460	5,441

Notes: [a]$GDPG_{i,t}$ refers to the growth rate of real GDP of the country in which firm i operates at time t. $SR_{i,t}$ refers to the shareholder rights protection index of the country in which firm i operates at time t. $RUL_{i,t}$ refers to the rule of law index of the country in which firm i operates at time t. $TAX_{i,t}$ refers to the highest corporate marginal tax rate of the country in which firm i operates at time t. $STKLIQ_{i,t}$ refers to stock market liquidity of the country in which firm i operates at time t. $INF_{i,t}$ refers to inflation rate of the country in which firm i operates at time t. $STKSIZ_{i,t}$ refers to stock market capitalization of the country in which firm i operates at time t. $BNKSIZ_{i,t}$ refers to the relative size of banking sector of the country in which firm i operates at time t. $CR_{i,t}$ refers to creditor rights index the country in which firm i operates at time t. $LOGGDP_{i,t}$ refers to natural logarithm of the GDP of the country in which firm i operates at time t. The exact definition of the other variables is as presented in Table II. The table reports the results of estimating Equation (6) using sys-GMM estimator proposed by Blundell and Bond (1998). Variations in sample size are due to data limitations. The table shows the coefficients on the lagged leverage ratio and on the interaction term of the determinant of adjustment speed with the lagged leverage ratio. Robust standard errors are in parentheses. The Wald test statistic refers to the null hypothesis that all coefficients on the determinants of target leverage ratio are jointly equal to zero. The test statistic Z^2 tests the null hypothesis of no second-order correlation in the residuals. The Sargan test statistic refers to the null hypothesis that the overidentifying restrictions are valid and uses the Blundell and Bond (1998) sys-GMM estimator. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent levels are marked respectively; [b]the exact definition of the other variables is as presented in Tables II and X – panel A. The table reports the results of estimating Equation (6) using sys-GMM estimator proposed by Blundell and Bond (1998). Variations in sample size are due to data limitations. $Dist_{i,t}$ is constructed as the fitted values from a fixed effects (two way error component) regression of the respective measures of leverage on the eight capital structure determinants. The table shows the coefficients on the lagged leverage ratio and on the interaction term of the determinant of adjustment speed with the lagged leverage ratio. Robust standard errors are in parentheses. The Wald test statistic refers to the null hypothesis that all coefficients on the determinants of target leverage ratio are jointly equal to zero. The test statistic Z^2 tests the null hypothesis of no second-order correlation in the residuals. The Sargan test statistic refers to the null hypothesis that the overidentifying restrictions are valid and uses the Blundell and Bond (1998) sys-GMM estimator. ***,**,* Coefficients significantly different from 0 at 1, 5, and 10 per cent level are marked respectively

In contrast to Öztekin and Flannery (2012) and Clark *et al.* (2009), a negative relationship is revealed between adjustment speeds of STL and TL-ratios and creditor rights protection (see Table X). On the other hand, although statistically weak, we observe that creditor rights protection positively influences the adjustment speed of LTL-ratio. The statistically significant negative relationship does not support our hypothesis that a stronger protection of creditor rights leads to a faster capital structure adjustment speed. In addition, *albeit* statistically weak, we observe that better law enforcement tends to positively impact on the adjustment speed of capital structure (see Table X). This is in harmony with the hypothesis that better law enforcement positively affects adjustment speed and also in agreement with results reported in Öztekin and Flannery (2012) and Clark *et al.* (2009).

We observe that stock market size has a statistically strong but definitionally sensitive influence on adjustment speed. To be exact, it has a negative influence on adjustment speed of STL and TL ratios while it has a positive influence on that of LTL-ratio. We observe, more or less, similar results for the stock market liquidity variable. These results vindicate Deesomsak *et al.* (2009) who argue that developed stock markets, by reducing information asymmetry, may trigger firms to switch to long-term debt. As such, firms may rapidly adjust their LTL than STL ratio in countries with bigger and developed stock markets.

In line with extant literature (e.g. Öztekin and Flannery, 2012), our results show a statistically weak but positive relationship between relative size of banking sector and capital structure adjustment speed. Thus, our result supports the proposition that firms in countries with more developed banking sector adjust their capital structure more rapidly than is the case in countries with less developed banking sector.

5. Conclusions

In this paper, we extended the debate on capital structure decisions of firms in developing countries along the lines of empirical endeavours in advanced economies. We contended that capital structure of firms in developing economies displays target behaviour and the pace at which firms adjust their capital structure to a target is a function of not only firm characteristics but also of industrial, institutional, and macroeconomic factors. We examine the data using sys-GMM panel data estimator, which is robust to firm heterogeneity and variable endogeneity problems.

The paper presented evidence that capital structure of firms in developing countries not only converges to a target but also that it faces varying degrees of adjustment costs and/or benefits in doing so. This suggests not only that dynamic trade-off theory explains capital structure decisions of firms but also rules out the dominance of information asymmetry-based theories within the context of firms in developing countries.

Also, the study established that the extent of costs and/or benefits of adjustment that firms in developing countries face is determined, *inter alia*, by firm-specific factors such as firm profitability, size, growth opportunities, and the gap between observed and target capital structure. Furthermore, except for firm profitability, which positively influences adjustment speed, we observe that the nature of influence that firm-specific characteristics exert on adjustment costs and/or benefits is a function of how we measure capital structure. The role that firm-specific characteristics play in the determination of adjustment speed suggests that financing costs, financial flexibility, access to external finance, the potential cost of distress and the value of debt-related tax-shields are at play in aggravating or mitigating adjustment costs and/or benefits.

In terms of inter-industry differences in adjustment costs and/or benefits, we note once again that the relationships are sensitive to how one defines capital structure. On a STL-ratio basis, firms within the Durables and Chemicals and Construction industries move towards their target capital structures relatively faster than is the case in other industries. In contrast, on a STL-ratio basis, firms within the Health, Oil and Gas, and Regulated industries move towards their target capital structures relatively quicker compared to other industries. A further investigation points to the tendency that firms in riskier industries adjust faster than those in less risky industries. This implies that cost of bankruptcy has an important place in determining adjustment costs and/or benefits of sample firms. However, as the present study did not include variables defining industry characteristics (such as industry risk) into the models, the conclusions pertaining to inter-industry variation in adjustment speed should be considered with caution.

In addition, consistent with the view that adjustment costs should be lower and/or adjustment benefits should be higher in common law origin countries; we observe evidence that firms in countries with common law tradition tend to more rapidly adjust their capital structure than is the case in countries with civil law system. In terms of more-narrowly defined institutional variables, we observe that shareholder rights protection and rule of law, in contrast to creditor rights protection, have positive influence on capital structure adjustment speed. The implication of these findings is that investor protection and contract enforceability are important matters in the determination of adjustment costs and/or benefits of sample firms.

The present study also proffers evidence that more developed banking sectors and stock markets deter the pace at which firms adjust their STL and TL-ratios. Contrary to expectation, adjustment speeds of ST and LTL-ratios are slower in richer countries than is the case in poorer countries. Furthermore, firms in countries which have higher marginal corporate tax rate and inflation tend to have faster adjustment speed. Put together, the evidences again suggest that access to external finance and tax issues are central to the determination of adjustment costs and/or benefits of sample firms.

Overall, the study points out that the adjustment speed of capital structure of sample firms towards the optimum is influenced by a host of firm, industry, and country-level variables. We draw two important implications for corporate finance. First, to the extent that firm managers could exert their influence on firm characteristics, they could influence capital structure adjustment speed and hence optimum cost of capital. Second, to the extent that regulators could exert their influence on country level variables, they could influence the rate at which firms rebalance their capital structure towards the optimum level and, hence their cost of capital.

Notes

1. While there is a separate and growing literature on the adjustment speed of specific dimensions of capital structure including debt maturity structure, the review in this section has purposely focused on the literature pertaining to the adjustment speed of "basic capital structure" in line with the aim of the paper.

2. See Haugen and Senbet (1978), Barnea *et al.* (1980), DeAngelo and Masulis (1980), Kim (1982), and Modigliani (1982) for elaborate discussions on the [ir]relevance of bankruptcy costs to capital structure decisions.

3. Leary and Roberts (2005) provide an elaborate discussion on the implication of the structure of adjustment costs on the adjustment speed of capital structure.
4. These measures are different from those commonly used to measure debt maturity structure of a firm. For elaborate discussions on various measures of debt maturity structure, see Barclay and Smith (1995), Stohs and Maur (1996), Antoniou *et al.*, 2006, Deesomsak *et al.* (2009), and Lemma and Negash (2012, 2013a).
5. We thank Andrei Shelifer for making data pertaining to creditor rights, shareholder rights and legal origin freely available on his page (www.economics.harvard.edu/faculty/shleifer/dataset).
6. The classification of countries by income groups is a contentious issue and surrounded by fierce debate. Different institutions (e.g. the World Bank, IMF, the economist, CIA, etc.) use different criteria for different purposes to classify countries. The classification in this study was based on the World Bank's income group of countries. Hence, Botswana, Mauritius, and South Africa fall under upper-middle-income countries; Egypt, Morocco, and Tunisia fall under to lower-middle-income; and Ghana, Kenya, and Nigeria fall under low-income countries.
7. Comparisons in most studies make reference to Rajan and Zingales (1995). However, since we note that Cheng and Shiu (2007) is more recent and comprehensive, we opted to compare our results with Cheng and Shiu (2007).
8. Average leverage ratio of firms in our sample countries appear to be invariably greater than the five countries sampled in Gwatidzo and Ojah (2009). These differences may probably have resulted due to the bigger sample we examined and some differences in definitions of leverage ratios.
9. The inconsistency in the number of observations for the three measures of leverage in Table IV and subsequent tables is due to missing data points.
10. Note that Equation (6) specifies a negative sign on $n\ \omega_1$, and therefore the signs of the estimated coefficients on the respective interaction terms must be interpreted accordingly.
11. The figures in parenthesis are robust standard errors.
12. The results of the other four countries including Botswana, Ghana, Mauritius, and Nigeria were not reported owing to sample size issues.
13. While Botswana, Ghana, Kenya, Nigeria, and South Africa have common law legal systems, Egypt, Mauritius, Morocco, and Tunisia have civil law legal systems.

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