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Determinants of Investment in Turkey: A Firm-Level Investigation

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ABSTRACT: In this article, we analyze the financing constraints-investment link for the case of Turkey between 1996 and 2013. As different from the existing studies on Turkey, we use a more comprehensive data set that includes both publicly-traded and privately-owned firms and analyze the differences in constraints across small- and medium-sized firms and large firms. In addition to the commonly used cash-flow sensitivities, we use alternative measures of constraints build from multiple firm specific variables. We find that small- and medium-sized manufacturing firms in Turkey are subject to financing constraints regardless of the measure used.

KEY WORDS: business fixed investment, capital accumulation, credit constraint, debt, financing constraint, investment, Turkey

JEL CLASSIFICATION: E22, D22, G31, O16

The link between firms' access to finance and accumulation of capital has been of interest to both economists and policymakers for a long time, especially given the crucial role of investment in economic growth and development. There is a large literature looking at the link between financing constraints and firm investment behavior starting with Fazzari, Hubbard, and Peterson (1988) seminal work. One of the main concerns in this literature is the issue of how to measure financing constraints. As financially constrained firms are expected to rely more on internal funds, a positive investment-cash flow sensitivity has been interpreted as the sign of constraints. (Bond and Van Reenen 2007; Chatelain and Teurlai 2006; Chirinko 1993; Hubbard 1998; Schiantarelli 1996).

In this article, we analyze the financing constraints-investment link for the case of Turkey by using alternative measures. Turkey stands out among other middle-income countries with its relatively lower level of corporate investment spending (Özmen, Şahinöz, and Yalçın 2012).[1] According to the *World Business Environment Survey* of the World Bank, more than half of the firms surveyed in Turkey self-reported financing constraints as a major impediment for investment.[2] Our study aims to find empirical evidence of constraints by using a comprehensive data set that includes both publicly-traded and private firms.[3] The large number of firms in this data set allows us to examine the constraints not only with alternative measures but also along size-based firm categories. In addition to presenting a firm-level analysis of financing constraint for different firm categories in Turkey, our major contribution lies in the alternative measures we use.

The article is organized as follows. We provide a brief overview of the main issues in the financing constraints literature in the next section. Then we introduce and discuss our benchmark investment model in relation to the literature. This is followed by the empirical analysis, which includes a an overview of the data set and the variables used. We conclude, in the last section, with a discussion of our findings and further research questions.

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Literature Overview

The origins of the discussion on the role of finance go back to Modigliani and Miller (1958) argument that under efficient financial markets, the firms' real and financial decisions would be strictly independent from each other, assuming perfect capital markets. As a result, financing choices would have no effect on the investment decisions or the market value of a firm. The market imperfections literature of the 1980s with its focus on asymmetric information and incomplete contracts, led to the emergence of the pecking order theory (Myers and Majluf 1984). According to this theory, firm managers have a preference to use internal funds to finance firm activities. Debt is used when internal funds are not sufficient and equity financing is preferred as a last resort.[4] A central proposition of this literature is that if a firm is subject to financing constraints, then the availability of internal funds will be a major determinant of its investment level. In empirical terms, this discussion led to the incorporation of a cash flow variable into investment model specifications. Fazzari, Hubbard, and Peterson (1988) look at the effects of cash flow on investment spending in the context of a Tobin's q model. They presuppose that firms retaining a higher percentage of their income must face higher costs of external financing and hence the investment-cash flow sensitivity would be greater than zero for firms with high retention ratios.

A number of studies find that financing constraints tend to be more binding in developing economies. These studies include transition economies in Europe as well as large developing economies such as Russia, India, China, and Brazil (e.g., Črnigoj and Verbič 2014; Kalatzis, Azzoni, and Achcar 2008; Konings, Rizov, and Vandenbussche 2003; Perotti and Gelfer 2001; Poncet, Steingress, and Vandenbussche 2010; Saeed and Vincent 2012). Studies on the investment behavior of Turkish firms and, more specifically, how their behavior is affected by financing constraints remain scarce. Demir (2009) presents a comparative examination of investment by publicly traded firms in Mexico and Turkey during the 1990s and finds these firms to be financially constrained throughout the period. Arslan, Florackis, and Özkan (2006) investigate the investment-cash flow sensitivities over the period of 1998–2002, using the same data for publicly-traded firms and find that constraints are binding only after the 2001 crisis. While studies with firm-level data are scarce, Günçavdı, Bleaney, and Mckay (2015), using aggregate data, argue that financing constraints have an important role in private investment determination in Turkey.

Alternative Measures of Financing Constraint

Since Fazzari, Hubbard, and Peterson (1988), the use of investment-cash flow sensitivity as an indicator of financing constraints has been criticized by many. Kaplan and Zingales (1997) argue that under certain conditions, investment-cash flow sensitivities may increase as financing constraints are relaxed and they are not necessarily monotonic in the degree of financing constraints. Kaplan and Zingales (2000) reason that firms with more liquid assets borrow more and their investment is more sensitive to cash flow shocks due to the leverage effect. Therefore, firms with lower financing constraints may have larger investment-cash flow sensitivities than similar firms with lower levels of liquid assets. Cleary, Povel, and Raith (2007) find a U-shaped relationship between investment and cash flow, further contributing to the controversy. Some also argue that as the cash flow variable is closely related to operating profits, it is possible that instead of showing the liquidity effect it may as well be signaling expected future profitability or future investment opportunities not captured by the other variables.[5]

The measurement of financing constraints is a rather difficult task as these constraints are empirically not observable. Even though the researchers are understandably interested in making inferences about certain firm characteristics (size, age, etc.), any good measure of financing constraints should be firm-specific as access to finance is highly heterogeneous. Additionally, constraints are time-varying, since a firm may move from an unconstrained to a constrained state over time with changes in investment opportunities or idiosyncratic shocks. This implies that a

good measure should be a continuous variable rather than a binary classification to capture the degree of financing constraints.

Following the criticism of the use of cash flow sensitivities as the measure of constraints, some studies utilized survey data, where firms are directly asked whether they are financially constrained (e.g., Beck et al. 2006). While providing a direct measure, this approach has also been criticized for the subjective nature of self-assessed variables, as well as the difficulties of obtaining periodical survey data. An alternative approach to measuring constraints has been the use of an index, first implemented by Lamont, Polk, and Saaá-Requejo (2001). Using the coefficients of the probabilistic logistics model developed by Kaplan and Zingales (1997), Lamont, Polk, and Saaá-Requejo (2001) build a "synthetic KZ index," where the degree of financing constraints depends on five financial variables of the firm. The use of KZ index for different samples of firms than the one in the original study has been criticized, as it is not reasonable to expect that the index coefficients remain unchanged. Whited and Wu (2006) follow a different approach and base their index on the coefficients obtained from a structural Euler equation model. Specifically, the financing constraint index is the shadow cost of finance for the firm, derived as the Lagrange multiplier of the dividend constraint the firm faces. Empirically, this strategy boils down to the generalized method of moments (GMM) estimation of the index from financial variables of the firm. The major concern with this approach is the fact that the index results from a highly parameterized structural model, for which the parameter stability is assumed. While seemingly tackling with the Lucas critique that the coefficients of reduced-form models are not invariant to structural changes, structural Euler equation models are also shown to be prone to the problem of parameter instability (See Oliner, Rudebusch, and Sichel 1996).

An alternative measure that does not rely on an estimation with structural coefficients is a class-ranking index, first introduced by Musso and Schiavo (2008) and later adopted by Bellone et al. (2010). Here, firms in a certain class (e.g., industry or region), which are believed to be relatively homogenous, are ranked based on several variables that are found to have a relationship with financing constraints. For each variable, the relative position of each firm to the corresponding class average is computed and firms are ranked based on this relative position. Then rankings from all variables are collapsed into a single score of financing constraints. In our empirical analysis, we use cash-flow sensitivity, leverage and a class-ranking based index as alternative measures of financing constraints. In doing so, we also use firm size as a sample split criterion, by which financing constraints might differ.[6] Specific variables chosen for the index, and correlation among alternative measures of constraints are presented below in Section 4.

Model

Testing for the role of financing constraints can be done in a framework of structural equations or reduced form models of investment. More recent empirical investment literature utilizes structural equations, such as the Q model or the Euler equation model (Bond and Van Reenen 2007; Chirinko 1993; Kopcke and Brauman 2001). Although both models are derived from the same optimization problem, the main difficulty with using the Q model for empirical analysis is in finding a proxy for unobservable marginal q. A commonly used proxy is the market value of assets relative to the book value of a company. Given that the majority of companies in our data set are not publicly listed, we opt for the Euler equation model. This also allows us to compare our results to other works on investment in Turkey, specifically Demir (2009) and Günçavdı, Bleaney, and Mckay (2015), which adopt an Euler equation framework.

The Euler equation is derived from dynamic optimization process in the presence of adjustment costs and posits a relationship between investment rates in successive periods. It is built on the assumption that the firm maximizes expected present value of current and future cash flows. Optimal investment strategy is constituted through a comparison of the net benefits of investing

today versus investing tomorrow. The following specification is derived from a standard Euler equation model (see Bond and Meghir 1994; Bond et al. 2003; and Bond and Van Reenen 2007; for formal derivations):

$$(I/K)_{it+1} = \beta_1(I/K)_{it} + \beta_2(I/K)_{it}^2 + \beta_3(Y/K)_{it} + \beta_4(CF/K)_{it} + \alpha_{t+1} + \varepsilon_i + u_{it+1}, \quad (1)$$

where i denotes firms, and t denotes years. α_{t+1} is included for year dummies, ε_i are firm-fixed effects, and u_{it+1} is the error term. I stands for investment, K for capital stock, Y for net output, and CF for cash flow. In this specification, output-to-capital ratio is a proxy for the marginal product of capital; investment-to-capital ratio and its square represent the assumption of quadratic adjustment cost function.

Equation (1) is commonly used in the empirical literature to test for financing constraints. As noted by Bond et al. (2003), with the inclusion of the marginal product of capital in its structure, the Euler equation captures the impact of current expectations of future profitability on current investment by design. Therefore, the cash flow variable in this specification should not be interpreted as a proxy for expected future profitability. Cash flow ratio affects the rate of intertemporal substitution between investment today and investment tomorrow with its effect on firm's discount factor. If a firm is not constrained, the impact of cash flow ratio on investment will be zero. For a constrained firm, an increase in cash flow ratio will increase the effective discount factor (or equivalently, lower the implied cost of capital) making investment today more attractive than investment tomorrow. A significantly positive cash flow sensitivity of investment is then considered as evidence of financing constraints.

While our theoretical framework is similar to Bond and Meghir (1994), we modify their framework by explicitly introducing alternative measures of constraints. One potential criticism of the Euler equation approach in Bond and Meghir (1994) is that they interpret the rejection of their model as an indicator of credit constraints while the rejection of the model may indicate numerous other problems with the specification. By explicitly including credit constraints in the initial benchmark we avoid such potential risk of misidentification of the problems. First, assuming a borrowing constraint along the lines of Whited (1992), we include a debt ratio variable into the specification. This ratio can be interpreted as an indicator of financial distress as the firm with a high debt ratio is seen as more likely to default. Second, we include a class-rank based index in the specification as an alternative way of explicitly capturing financing constraints.

Data and Variables

We use the *Company Accounts* data set, which covers the period between 1996 and 2013.[7] It is the most comprehensive source of firm-level annual balance sheet and income statement data on non-financial firms in Turkey. The data set is well-suited to the study of financing constraints as it includes the firms in the economy that have accounts with the banking system (CBRT *Methodological Information*).[8] We focus on manufacturing firms (NACE Revision 2, industries C10–C33) that constitute the largest portion of employment and total assets in the data set. At the end of 2013, the data set includes around 4000 manufacturing firms, which make up approximately 54% of total manufacturing sales and 27% of total manufacturing employment in the economy.[9] Focusing on manufacturing firms is appropriate for our interest in investment as manufacturing firms are more likely to make steady investments in tangible fixed assets. They constitute the largest sample in the data set that has been reporting financial statements in a continuous way. Moreover, the exclusion of diverse sectors, such as mining and agriculture, helps limit firm heterogeneity in the sample.

We place special emphasis on firm size as one of the determinants of financing constraints. Despite the debate on measurement issues, much of the literature agrees that firm size should figure prominently in any measure of financial constraints. Hadlock and Pierce (2010) compare various approaches and conclude that firm size and age matter regardless of the way constraints are measured. In the case

of Turkey, small- and medium-sized firms (SMEs) are particularly important with their share in employment and output: in 2013, SMEs constituted 74.2% of employment, 63.8% of sales and 53.3% of gross investment in tangible goods (TURKSTAT 2015). The question of whether SMEs are financially constrained or not have important implications for the growth prospects of the economy. In this study, we investigate this question by classifying firms based on the number of employees. Firms are defined as "large" if the average number of employees in the firm over the period of data availability is greater than 250. Firms with less than 250 employees on average are classified as SMEs.

Table 1 presents a snapshot of firms included in our sample in 2013. While sale and asset values (expressed in Turkish Liras) follow the employment-based size differences for large firms and SMEs, we do not observe much difference between these two categories in return on total assets (ROA) and Debt/Asset ratios. While SMEs have slightly lower ROA and slightly higher Debt/Asset ratios than large firms, these values are within reasonable ranges for both categories.

Before carrying out the analysis, we use the manufacturing price index to convert nominal values into real ones. We define net capital stock (K) as real "tangible fixed assets net of depreciation" at the beginning of the period.[10] Investment (I) is defined as change in real net capital stock in 1 year. Output (Y) is real net sales, cash flow (CF) is real operating profits (i.e., earnings before interest and taxes), and debt (D) is long-term debt. The data set is cleaned for outliers by excluding the 2% on each side of the distribution for each of (I/K) and (Y/K), (CF/K) and (D/K).[11] We also require that a firm has at least 5 consecutive years of observations to be included in the regression analysis. Our final sample then consists of 3681 firms with a total of 35,629 observations.

In order to build our alternative measure of financing constraints, *Score*, we collapse information from four different variables selected on the basis of their perceived importance in determining ease of access to external funds: firm size, profitability, liquidity, and cash flow generating ability. Firm size is based on total assets; profitability is measured as ROA; liquidity is the ratio of current assets to current liabilities; and cash flow generating ability is the ratio of net profits to net sales. For each of these four dimensions and for each year, we first compute the 2-digit NACE sector averages and scale each firm/year observation by the corresponding 2-digit NACE sector average. Sector averages are used to account for industry-specific differences in these financial variables. Based on the distribution of these

Table 1. Sample overview, 2013.

	Median	Mean	Number of firms
All firms			
Employment	202.50	484.33	1188
Sales	78,600,000.00	305,000,000.00	1188
Assets	64,600,000.00	256,000,000.00	1188
ROA	0.03	0.05	1188
Debt/asset	0.34	0.34	1188
Large firms			
Employment	649.00	1061.71	449
Sales	244,000,000.00	688,000,000.00	449
Assets	233,000,000.00	577,000,000.00	449
ROA	0.03	0.05	449
Debt/Asset	0.32	0.33	449
Small- and medium-size firms			
Employment	112.00	133.53	739
Sales	33,600,000.00	72,500,000.00	739
Assets	31,200,000.00	60,900,000.00	739
ROA	0.02	0.04	739
Debt/asset	0.34	0.34	739

Table 2. Descriptive statistics for regression variables.

	Median	Mean	Std. dev.	# of firms	# of observations
All firms					
I/*K*	0.15	0.31	0.54	3721	36,423
Y/*K*	5.32	9.56	13.32	3721	36,423
CF/*K*	0.36	0.67	1.04	3721	36,423
D/*K*	0.00	0.32	0.66	3721	36,423
Score A	6.00	6.21	1.48	3721	36,423
Score B	6.00	6.36	2.03	3721	36,423
Large firms					
I/*K*	0.16	0.28	0.28	884	10,460
Y/*K*	4.47	6.82	6.82	884	10,460
CF/*K*	0.39	0.64	0.64	884	10,460
D/*K*	0.10	0.38	0.38	884	10,460
Score A	7.00	6.97	6.97	884	10,460
Score B	8.00	7.79	7.79	884	10,460
Small and medium firms					
I/*K*	0.15	0.32	0.57	2837	25,963
Y/*K*	5.77	10.66	14.71	2837	25,963
CF/*K*	0.35	0.68	1.09	2837	25,963
D/*K*	0.00	0.30	0.65	2837	25,963
Score A	6.00	5.91	1.43	2837	25,963
Score B	6.00	5.79	1.88	2837	25,963

Table 3. Correlation matrix.

	I*/*K	***Y*/*K***	***CF*/*K***	**Debt/*K***	**SCORE_A**	**SCORE_B**
I/*K*	1					
Y/*K*	0.2408	1				
CF/*K*	0.2128	0.5676	1			
Debt/*K*	0.121	0.0121	0.0395	1		
SCORE_A	–0.0273	–0.0408	0.2075	0.0427	1	
SCORE_B	0.0057	–0.0191	0.2356	0.0218	0.7505	1

scaled values within each year, we assign a number to each firm, ranging from one to five, depending on the quintile the firm observation corresponds to. Hence, for each firm/year observation we end up with four scores ranging from one to five. By adding up these four scores we obtain an index for each firm in each year. Index values are expressed as ranging from 2 to 10. Firms with low scores are expected to be the most financially constrained; as the index number goes up, we expect financial constraints to be weakened. For robustness check, we use two versions of the index. A broad version (*Score A*) is the one described above with computed from rankings on all four variables. A narrow version (*Score B*) is computed from rankings on the first two variables.

Table 2 shows the descriptive statistics for variables used in regressions for the whole sample and size categories. Table 3 presents the pairwise correlation coefficients among different measures of financing constraints and regression variables.

Econometric Analysis

Moving from the Euler equation described above, we include Debt-to-capital ratio (D/K) and *Score* variable to test for financing constraints.

$$(I/K)_{i,t} = \beta_1 (I/K)_{i,t-1} + \beta_2 (I/K)_{i,t-1}{}^2 + \beta_3 (Y/K)_{i,t-1} + \beta_4 (CF/K)_{i,t-1} + \beta_5 (D/K)_{i,t-1} + \beta_6 (Score)_{i,t} + \alpha_t + \varepsilon_i + u_{it}. \quad (2)$$

The inherent assumption of quadratic adjustment cost function in the Euler model implies that β_1 is greater than 1 and β_2 is less than −1. A positive β_3 indicates the role of demand factors in the product markets. The coefficients of remaining three variables are of interest to test for financing constraints. For financially constrained firms, increasing cash flow has a positive effect on investment, leading to a value of β_4 greater than 0. Alternatively, if β_5 is greater than 0, we infer that firms are likely to be up against their borrowing constraints. Finally, if β_6 is greater than zero, increasing credit score has a positive effect on investment, then the firms are assumed to be financially constrained. We are also interested in how these coefficients differ across SMEs and large firms.

An ordinary least squares estimation of these equations would yield biased results, as firm-level dynamic investment models are likely to be prone to heterogeneity and endogeneity problems in estimation. Heterogeneity is a potential problem, because many firm-specific factors such as production technology and managerial abilities can lead to substantial differences in investment behavior across firms. Endogeneity is expected; the error term may be correlated with the explanatory variables since they would all be affected by technology shocks. The presence of the lagged endogenous variable for investment would further bias coefficient estimates. The problem of heterogeneity could be eliminated by using a fixed-effects model in which all the variables are first-differenced. However, this would not solve the problem of endogeneity, since the first-differenced error term would no longer be orthogonal to the first-differenced regressors. Hence an instrumental variable technique is called for. We employ the system GMM approach to eliminate individual heterogeneity and the problem of endogeneity. This technique also allows us to use the lags of the dependent variable, which captures the potential dynamic effects without creating an endogeneity problem.

All estimation results reported in Table 4 are obtained using the two-step system GMM approach with orthogonal transformation and heteroscedasticity-robust standard errors. In all estimations, all explanatory variables, except year dummies, are treated as endogenous and instrumented by their second and farther available lags. Instruments are collapsed to limit the instrument proliferation problem as suggested by Roodman (2009). Time dummies are included in order to capture unobservable year-specific factors. We report results from our benchmark Equation (1) for all firms in the first column. In columns 2 and 3, we report estimation results from this benchmark model for different firm sizes. In columns 4–6, we report results from the model augmented by the *Score A* variable and Debt ratio (2) and in columns 7–9 by the *Score B* variable and Debt ratio, for the same firm categories.

Our main coefficients of interest are the coefficients of cash flow, debt ratio and credit score variables. But we also note that past investment ratio shows no statistically significant impact on the current investment, providing no evidence for an adjustment cost process. While there is macroeconomic evidence for the existence of adjustment costs for investment in Turkey as reported by Günçavdı, Bleaney, and Mckay (2015), Demir (2009), a firm level analysis of investment conducted with a smaller sample of publicly traded firms finds the opposite of expected effect for these coefficients.[12] On the other hand, the output variable has a positive and statistically significant impact on investment in all specifications, providing evidence for the presence of imperfect competition and underlining the role of demand in the product market.

In the benchmark Euler equation regressions, we find a positive and statistically significant cash flow sensitivity of investment, indicating the presence of financing constraints for the whole sample.

Table 4. Estimation results.

	Benchmark equation			Augmented (broad index)			Augmented (narrow index)		
	All	**SMEs**	**Large**	**All**	**SMEs**	**Large**	**All**	**SMEs**	**Large**
(I/K)	−0.012	−0.203	−0.003	0.032	−0.061	0.113	−0.081	−0.185	0.05
	(0.156)	(0.211)	(0.175)	(0.127)	(0.168)	(0.126)	(0.13)	(0.186)	(0.14)
$(I/K)^2$	−0.017	0.031	0	0.024	0.065	−0.09	0.109	0.15	−0.056
	(0.089)	(0.113)	(0.108)	(0.077)	(0.091)	(0.089)	(0.08)	(0.101)	(0.1)
Y/K	0.013***	0.012***	0.018***	0.009***	0.008***	0.016***	0.008***	0.007**	0.015***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
CF/K	0.033*	0.033	0.008	0.001	−0.005	0.024	0.013	−0.004	0.037
	(0.019)	(0.026)	(0.028)	(0.022)	(0.03)	(0.03)	(0.021)	(0.029)	(0.029)
D/K				0.028	0.042*	0.034	0.029	0.050*	0.032
				(0.018)	(0.025)	(0.025)	(0.019)	(0.027)	(0.025)
Score A				0.105***	0.123***	0.02			
				(0.025)	(0.034)	(0.024)			
Score B							0.077***	0.113***	0.025
							(0.019)	(0.029)	(0.017)
# of observations	32,674	23,104	9570	32,674	23,104	9570	32,674	23,104	9570
# of firms	3721	2837	884	3721	2837	884	3721	2837	884
# of instruments	61	61	61	92	92	92	92	92	92
Sargan	chi2	chi2	chi2	chi2	chi2	chi2	chi2	chi2	chi2
	(39) = 51.81	(39) = 42.49	(39) = 53.39	(68) = 61.37	(68) = 62.29	(68) = 60.1	(68) = 63.78	(68) = 59.05	(68) = 56.97
	(0.52)	(0.85)	(0.46)	(0.7)	(0.67)	(0.74)	(0.62)	(0.77)	(0.83)
Hansen	chi2	chi2	chi2	chi2	chi2	chi2	chi2	chi2	chi2
	(39) = 75.1	(39) = 74.05	(39) = 50.95	(68) = 82.65	(68) = 89.67	(68) = 66.15	(68) = 84.82	(68) = 87.3	(68) = 66.86
	(0.02)	(0.03)	(0.55)	(0.11)	(0.04)	(0.54)	(0.08)	(0.06)	(0.52)
AR(1)	−4.22	−2.98	−3.52	−6.15	−4.95	−4.6	−6.18	−5.07	−4.08
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AR(2)	0.2	0.01	−0.05	1.13	1.12	−0.81	1.75	1.56	−0.66
	(0.85)	(0.99)	(0.96)	(0.26)	(0.26)	(0.42)	(0.08)	(0.12)	(0.51)

Notes: (i) For coefficients standard errors are reported in parentheses. For the Sargan, Hansen, and AR tests, *p*-values are reported in parentheses. (ii) Constant and time dummies included in all regressions. (iii) ***$p < 0.01$, **$p < 0.05$, *$p < 0.05$. (iv) GMM estimates are obtained by the two-step system GMM using Stata 14.

However, when we split the sample by size, the cash flow sensitivity of investment stays positive yet loses its statistical significance. In the augmented versions of regressions, where debt ratio, *Score A* and *Score B* variables are included, the group of small-medium firms are consistently found to be constrained as indicated by positive and statistically significant coefficients for these alternative measures. The same coefficients are statistically insignificant for large firms.

Overall, our findings indicate that, even with the use of alternative measures, as expected and emphasized in the literature, SMEs are the ones suffering from financing constraints. For example, Günçavdı, Bleaney, and Mckay (2015) find, using aggregate data, a significant effect of financing constraints on private investment. Demir (2009), using a different measure of financing constraints, finds dependence on internal funds for investment purposes. Using an asset-based size measure, Arslan, Florackis, and Özkan (2006) find similarly binding constraints for small firms, although only for post-2001 crisis era. While the use of different models and financing constraints variables make a comparison of coefficients across studies impossible, the overall results of our study support the findings of the earlier studies on the Turkish economy.

Concluding Remarks

Our main goal in this study was to provide a comprehensive firm-level examination of financing constraints for nonfinancial firms in Turkey, whose investment spending stands quite low compared to firms in other middle-income countries. Previous studies on this issue were either conducted at macro level as in Günçavdı, Bleaney, and Mckay (2015), or utilized a very limited data set of publicly traded firms as in Demir (2009) and Arslan, Florackis, and Özkan (2006). The comprehensive data set we used provided us with a much larger sample of firms, allowed us to analyze constraints along size-based categories and made possible the use of class-ranking based index as an alternative measure of constraints.

In testing for financing constraints, we adopted a Euler equation model framework and augmented it with debt ratio and ranking-based index as alternative measures for constraints. While the results from this benchmark model confirm the presence of constraints as expected based on cash flow sensitivity, when augmented by the alternative rank-based measures and debt ratio for constraints, cash flow sensitivity lost its significance. Such result gives support to the idea that, even with a structural equation framework, such as Euler, cash flow sensitivities might not be the most appropriate way to capture financing constraints. In fact, it is quite possible that the initial significance of cash flow coefficients in the benchmark results is the symptom of misspecification problems as discussed by Whited (1992) among others. Based on the other two measures of constraints, our findings indicate that small and medium sized firms in Turkey are still subject to financing constraints compared with large firms.

Implication of our findings for the firms in the Turkish economy is quite telling. Based on the World Bank Enterprise Survey data of 28 countries, Şeker and Correa (2010) find that the SMEs in Turkey grow slower than those in the Eastern Europe and Central Asia. Our findings suggest that, among other reasons, the credit constraints these firms face are likely to be responsible from their slow growth performance. Despite the abundance of finance in the mid-2000s and claims that liberalized finance would contribute to easier financing conditions, policies addressing the barriers to SMEs' access to credit have not achieved the desired outcomes. Rethinking these policies is likely to improve the potential output and employment level of the country.

Still, it is important to remember Chirinko's (1993) remark that "[n]o single study, regardless of the generality of the specification nor the richness of the data, will deliver 'the' definitive test" (p. 1907). While our study is a contribution to the empirical literature on financing constraints, two issues are of particular importance for further studies on investment in the Turkish economy. First, especially within the last half-decade, firms in Turkey have increased their borrowing in foreign currency, both from domestic and international markets. Whether this has relaxed constraints on investment or constrained investment further by creating balance sheet fragilities is an issue that deserves specific attention.

Second, a large number of firms are organized in a group structure under "holding companies," which in most cases include a bank or are closely affiliated with a bank. Firms with group affiliation may be able to obtain funding from other group companies or banks, which serve as internal capital markets. These firms may also have easier access to external funds due to reputational effects or within group mutual debt-guarantees that serve to mitigate moral hazard problems. These financial interlinkages can serve as effective means of risk sharing, because of the diversified nature of business groups. [13] Among the few studies on the Turkish business groups, Uğurlu, Altıok, and Akben-Selçuk (2017) utilize data from 347 publicly traded firms for the period of 2006–2012 and find important differences between firms with and without group affiliation: group-affiliated firms have higher capital expenditures, higher cash flows, higher profitability and higher leverage. They also find that investments of group-affiliated firms have lower cash flow sensitivity than those of independent firms. The challenge lies in the difficulty of obtaining ownership data for the private firms that make up most of the firms in a comprehensive data set, such as the one used in this study. While our data set does not provide ownership information due to the lack of public disclosure requirements for private firms, the inclusion of both public and private firms precludes a potential sample bias issue that could have arisen with only publicly traded firms, which are expected to have easier access to finance compared to private firms. Even though it is not the focus of this study due to data limitations, the group affiliation of firms continues to be an important issue to be tackled in future research.

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Notes

1. Özmen, Şahinöz, and Yalçın (2012) report that capital expenditures (as a percent of net sales) are the lowest for publicly traded nonfinancial firms in Turkey compared with firms in other 16 middle-income economies.

2. http://go.worldbank.org/RV060VBJU0.

3. Kaplan, Özmen, and Yalçın (2006) and Özmen, Şahinöz, and Yalçın (2012) also use this data set and examine the cash holding and saving and investment behavior of the nonfinancial corporations. Köksal and Orman (2015), again using the same data set, examine the capital structure of nonfinancial corporations. Their analyses do not specifically tackle with the issue of financing constraints.

4. Hubbard (1998) provides a comprehensive review of market imperfections and investment models informed by such imperfections.

5. As noted by Bond et al. (2003), although this possibility is particularly transparent for reduced-form investment equations, which make no explicit attempt to control for expected future profitability, it will also apply to structural investment equations such as Euler equation models, which are not correctly specified.

6. A size-based time-invariant classification of firms into groups cannot be considered a sufficient way of capturing financing constraints. The endogenous switching regression model is proposed as a more appropriate method, where an unknown sample selection process is assumed to identify the likelihood of firms to be constrained. Hu and Schiantarelli (1998) and Črnigoj and Verbič (2014) use this method among others. As we do not solely rely on the ex-ante category of size to identify firms with constraints, we chose not to pursue the analysis with the estimation of a switching function in this study.

7. The data set is compiled by the Central Bank of the Republic of Turkey. The Bank does not make the data set publicly available due to confidentiality issues. However, an aggregated version of the data is available at www.cbrt.gov.tr and researchers can access the data set on site at the Bank.

8. Firms are required to report their financial statements to the banks that they have accounts or credit relations with. In turn, banks are legally mandated to report these statements to the Central bank. A major disadvantage of the data set is that financial statements of the private firms in the data set are not audited.

9. In order to calculate these ratios, we take our sample totals and divide them by the aggregate manufacturing employment and gross sales statistics for the whole economy. Aggregate data comes from the *Annual Industry and Service Statistics* by the Turkish Statistical Institute (www.tuik.gov.tr).

10. Since "land" values in the Turkish accounting system are not revalued but kept at historical cost, we exclude land from the calculation of K.

11. Our results are robust to outlier cleaning at 1%.

12. One possible explanation for the lack of evidence might be the presence of firms, for which investment activities are multi-year projects that follow a lumpy trajectory rather than a smooth path. Two-year time horizon implied by the Euler specification in this article might not be appropriate to capture such behavior.

13. Claessens and Yurtoglu (2013) provide a survey of various corporate governance patterns in emerging markets, where they discus both potential benefits and costs of group affiliation. In this survey, the cases of Korea and India are examined with the positive effects of reforms including mandatory quotas for outsider members of the board directors, the elimination of cross-debt guarantees, restrictions on intra-group transactions.

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