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Credit Market Imperfections and Business Cycle Asymmetries in Turkey[1]

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The credit market imperfections have important consequences for aggregate cycles, especially for developing countries. The research on the relationship between imperfections and output dynamics at the macro level are ample, but the lack of wide coverage micro data sets for developing countries limit the study of aggregate implications of the micro level capital market imperfections. This paper presents micro evidence on the credit market imperfections in Turkey and connects these imperfections to macro movements. First part of the paper documents the aggregate boom-bust cycles in Turkey and shows that non-tradable sector is more volatile over the business cycle than tradable sector. Additionally, this sector based asymmetry is found to be strongly correlated with aggregate credit movements. To establish the connection between the sector based asymmetries and the credit markets further, second part of the paper constructs two micro data sets. Using structural estimation, we find that non-tradable sector is financially more constrained than tradable sector. With non-tradable sector being more constrained, credit movements become an important determinant of boom-bust cycles. Therefore, we can establish that the asymmetry in the financial constraints of the different sectors at the micro level can generate the observed asymmetrical aggregate response of sectors over the business cycle.

JEL Classification: D92; E44; G31

Key Words: Credit constraints; business cycle asymmetries; cash-flow regressions.

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1 Introduction

The financing of investment has important implications for the business cycles, volatility and economic growth of the countries. Although there is ample research on aggregate investment and business cycles, there exists only limited micro evidence to prove the possible effects of financing decisions of the firms on aggregate output dynamics.[2] Scarcity of detailed micro data is more evident, particularly for developing countries, which impedes the proper analysis of the connections between financial effects at the micro and aggregate levels. In this paper, we construct two micro level data sets for Turkey to assess the financing conditions at a more disaggregate level and demonstrate the connection of these findings with the aggregate output dynamics.

Turkey has experienced highly volatile business cycles after the financial liberalization of the economy in 1989, similar to the experience of other developing countries. These macro dynamics mostly resemble boom-bust cycles where expansionary periods are followed by sharp contractions. We show that there are asymmetries among sectors over the business cycles, and link these asymmetries to the structure of capital markets in Turkey. Then we present micro level evidence to support the proposed relationship between credit markets and sector based asymmetries.

The paper first documents the boom-bust cycles experience of Turkey after financial liberalization. The sector based asymmetries in the business cycles are revealed afterwards, i.e. nontradable sector is more volatile than tradable sector over the business cycle. Subsequently, it is shown that there are strong correlations between the asymmetrical response of the sectors and aggregate credit movements. The second part of the paper incorporates two data sets: a detailed data set at sector-based level and a firm-level data set of the stock market, in order to look at the financial constraints in the economy. Sector level data set is assumed to be representative of the whole economy, while stock market data is used as a control group. We find that nontradable sector is financially more constrained for sector level data set whereas in the stock market data we could not find any difference between sectors in terms of financial constraints.

[2] For relations between finance, business cycles, volatility and growth, see for example, Rajan and Zingales (1998), Beck et al. (2000), Bacchetta and Caminal(2000), Braun and Larrain (2005) and Levine (2005).

With nontradable sector being more constrained in terms of access to the financial markets, credit market developments become an important determinant of boom-bust cycles and the asymmetrical response of different sectors over the business cycle. Therefore, with an inflow of credit into the economy nontradable firms will benefit more from availability of financing and increase their investment and output at a faster rate than tradable firms. When faced with a drying of the credit during the bust, however, nontradable sector will be affected more disproportionately leading to asymmetries across sectors. As a result, we can establish that the asymmetry in the financial constraints of the different sectors at the micro level can generate the observed asymmetrical aggregate response of sectors over the business cycle.

Structural factors, financial and real frictions and business cycle properties are dramatically different in developed and developing countries. Analysis of structural factors and frictions in developing countries constitute a sizable empirical and theoretical research area in economics.[3] Identification of these structural factors are instrumental in analyzing their implications on aggregate dynamics of developing economies. In a detailed study, Tornell and Westermann (2005) documents the stylized facts about business cycles in middle income developing countries, and they name these cycles as boom-bust cycles due to the common pattern of up and down swings. Two important results stem from their analysis. First, there is significant sector based asymmetry over the business cycle, namely, nontradable sector output grows faster during the boom and falls harder during the bust. Second, the sector based asymmetry seems to have a strong correlation with the credit movements in the economy. This relationship can be linked to the fact that nontradable firms are more constrained than tradable firms.

Although Tornell and Westermann (2005) provide some indirect evidence about these financial constraints in the nontradable sector, the scarcity of micro level data and the absence of detailed sectors in these data sets

[3] For example, Neumeyer and Perri (2005) put working capital channel and risk premium variations as important sources of fluctuations in Argentina; Aguiar and Gopinath (2007) considers structural factors that produce variations in long-term growth trends as an important part of business cycles for Mexico; and Garcia-Cicco et al. (2010) using more than a century of data for Mexico and Argentina find that financial frictions provide a good account of business cycles in developing countries. Ranciere et al. (2008) analyze a large set of developing countries and find that countries with a moderate level of contract enforceability experience a higher mean growth but also greater incidence of crises.

for developing countries prove that a more detailed micro level analysis remains to be an important step to motivate connections between financial conditions and aggregate dynamics. This point is also emphasized in Hubbard (1998), where author reviews the literature on capital market imperfections and investment. Most of the studies on financial constraints and market imperfections analyze limited data either from publicly traded firms or companies in a small set of sectors such as manufacturing. Hubbard (1998) mentions that a multi sector based analysis would provide helpful for micro examination of aggregate investment and output dynamics. In this paper, we will try to establish a connection between these two research areas by constructing a wide micro level data set to see the financial constraints and also be looking at the macro level implications of these credit market imperfections.

Section 2 gives a brief summary of the literature, section 3 demonstrates the aggregate boom-bust cycles and asymmetries across sectors and connects these to aggregate credit movements. Section 4 shows the differences in the credit constraints between tradable and nontradable sectors followed by the conclusion in section 5.

2 Literature Review

Neoclassical theory of investment, as put in detail by Modigliani and Miller (1958), posits that under perfect capital markets a firm's investment decision is related only to the future expected profit opportunities and the user cost of capital. Furthermore, this decision is independent of the financial structure of the firm. In other words, since with complete markets, external and internal financing are perfect substitutes, financial conditions are irrelevant in a firm's investment decision. However, if capital markets are not functioning perfectly, such as due to information asymmetries, there will be a premium for external funds over internal funds. This difference is attributed to possible moral hazard and adverse selection problems between lenders and borrowers. Stiglitz and Weiss (1981) and Myers and Majluf (1984) present models where adverse selection, under imperfect information regarding the project returns of the borrowers, leads to external finance premium. Jensen and Meckling (1976) present a model with moral hazard under costly monitoring and incentive problems and show that lenders require a premium for compensation of moral hazard. Under such structures, investment decision and financial conditions of the firms are related so that investment will be positively correlated with the changes in the internal funds.

In a seminal study, Fazzari et al. (1988) tested the effects of financial conditions of firms on the investment decision using a Tobin's Q framework. They classify a sample of the U.S. manufacturing firms a priori according to dividend payout ratios (a proxy for financial constraints) and show that low dividend payout firms have higher investment responsiveness for internal funds than high dividend payout firms. A large literature has followed this seminal study to analyze the effects of financial constraints on investment decisions.[4] Tobin's Q approach was the first empirical way to test financial frictions. However, the problems with the measurement of Tobin's Q and also the sample of firms that are not traded in stock markets (so that one cannot estimate Tobin's Q) have led to other empirical approaches. Gilchrist and Himmelberg (1995) generate a 'Fundamental Q' and show that cash flow is still relevant for financially constrained firms. Contrary to the main findings in the literature, Kaplan and Zingales (1997), using Tobin's Q framework, claims that cash flow is more relevant for the least constrained firms. Cleary (1999) and Kadapakkam et al. (1998) find similar results for U.S. and other developed countries where least constrained firms have the highest sensitivity to the cash flow. However, Allayannis and Mozumdar (2004) show that these results are conditional on influential observations and negative cash flows. Once these are excluded from the estimation, cash flows become more correlated with investment for constrained firms.

Another approach is the accelerator approach, where instead of Tobin's Q one uses sales or change in sales as a variable to control for investment and profit opportunities. In these regressions, significant coefficient on internal funds is also interpreted as evidence of financial constraints. One other approach is the Euler equation approach where one derives a structural equation from the optimization problem of the firm without needing Tobin's Q. Whited (1992), Hubbard et al. (1995) and Bond and Meghir (1994) employ this approach and reject the perfect-capital markets model. Coefficients of this equation have structural interpretations so

[4] Following papers provide a detailed review of the literature: Chirinko (1993), Schiantarelli (1996), Hubbard (1998), Mairesse et al. (1999) and Bond and Reenen (2007).

that the equation controls for the expectations and the investment opportunities in a proper way. Using the different methods listed above, there have been several studies analyzing the investment behavior of firms in different countries.[5]

Aforementioned financial market imperfections have macro implications as well. Carlstrom and Fuerst (1997) and Bernanke et al. (1999) study closed economy general equilibrium model with financial frictions; and Gertler et al. (2007) studies the same mechanism in a small open economy framework. In these models, financial frictions amplify the macro effects of small shocks, so these models are called "financial accelerator" models. Schneider and Tornell (2004) uses a framework where non-tradable sector faces credit constraints and shows that boom-bust cycles arise in aggregate economy due to movements in credit availability. As these models illustrate, financial frictions that might lead to external finance premiums or credit constraints can have important aggregate results.

Moreover, there have been empirical studies looking at the relationship between financing constraints and selected micro and aggregate variables. However, most of the studies in the investment-cash flow literature use either stock market firms or limited surveys of firms in some sub-sectors of the aggregate economy such as manufacturing.[6] Publicly traded firms constitute a very biased sample of the economy, particularly for

[5] Among these are Hoshi et al. (1991) for Japan; Shin and Park (1999) for Korea; Gelos and Werner (2002) for Mexico; Athey and Laumas (1994) for India; Bond et al. (2003) for Belgium, France, Germany and the UK; Calomiris and Hubbard (1995) for US; Carpenter and Guariglia (2008) for UK; Poncet et al. (2009) for China; Jaramillo et al. (1996) for Ecuador; Becker and Sivadasan (2010) for Europe; Gilchrist and Himmelberg (1995) for US; Harhoff (1998) and Gorodnichenko et al. (2009) for Germany; Galindo and Schiantarelli (2002) for Latin America; and Schaller (1993) for Canada. There are studies looking at financial fricitions in Turkey using micro level data also. For example, see Kaplan et al. (2006), Yesiltas (2009) and Yurtoglu (2006). Ozmen et al. (2011) provides a detailed analysis of corporate savings and investment in Turkey.

[6] For example, about financial liberalization and financial development, Love (2003) and Islam and Mozumdar (2007) show that financial development decreases the level of financial constraints, Harrison et al. (2004) analyses the relationship between capital flows and financing constraints and Leaven (2002) finds that financial liberalization reduces financing constraints for small firms. Almeida et al. (2004) checks the effect of cash holdings on financial constraints, Agca and Mozumdar (2008) examines the relationship between investment-cash flow sensitivity and factors related to capital market imperfections and Brown and Petersen (2009) studies the effect of changing decomposition of investment and increasing public equity on investment-cash flow sensitivities.

developing countries. These firms are usually very large with conglomerate and bank connections and some with foreign ownership. Therefore it would be misleading to arrive at aggregate conclusions for developing countries merely from the analysis of publicly traded firms. Limited surveys covering few sectors can also produce very valuable information, but again it will be difficult to infer about the aggregate stance of the investment dynamics in these countries. Few papers connect the financial constraints to aggregate investment cycles. Brown et al. (2009) show that for the U.S., financial factors for young high-tech firms can explain most of the boom and bust in aggregate R&D in 1990s.[7] Authors use Euler equation framework to estimate financial frictions and show that shifts in the internal and external financing can account for the aggregate R&D cycles. In a similar fashion, in this study we will first demonstrate the differences in aggregate cycles across sectors and establish a link between these asymmetries and the aggregate credit movements in Turkey. Then using a detailed data set, we will examine the financial constraints across sectors and conclude that differences in the financial structure of the sectors are closely in line with the aggregate differences for sector based movements.

3 Macro Comovements

After Turkey opened up its trade markets in early 1980s, liberalization of financial accounts followed in 1989 as the natural second step of economy-wide liberalization. Opening the domestic markets to financial flows was followed by the economy experiencing two main boom-bust cycles that were closely related to the financial account. The first boom ended in the current account crises of 1994 and second boom has ended in the twin crises (current account and banking) of 2001. Here in this section, we will document the basic boom-bust cycles and comovements in Turkish economy for the period after financial liberalization and also

[7] Goyal and Yamada (2004) uses stock market data from Japan and find that investment-cash flow sensitivities are correlated with the boom and busts in aggregate asset prices. This study connects the aggregate cycles to the financial frictions. Gorodnichenko and Schnitzer (2010) study how financial constraints affect macroeconomic outcomes of a country like level of income and export intensity. They find that financial constraints restrict the ability of firms to innovate and export, thereby hindering the catching-up process of development.

demonstrate sector based asymmetries between non-tradable and tradable sectors over the business cycle in a macro level analysis.

3.1 Financial Liberalization and Boom-Bust Cycles

Figure 1 shows the percentage deviations of real GDP from HP trend for the period of 1990-2004. There are two major negative deviations from trend in the years 1994 and 2001. First one corresponds to the current account crises of 1994 and second one corresponds to the twin crises (current account and banking) of 2001. It is clear from Figure 1 that both of these crises are preceded by a boom, and the corresponding boom ends with the crises. So, we will consider these two boom-busts after financial liberalization.

Following the expenditure approach to GDP, we will first decompose the deviations in real GDP into the parts arising from investment and consumption. Later, we will decompose the deviations in real GDP into parts stemming from different sectors of the economy following the production approach to GDP. Taking the expenditure approach into consideration, Figure 2 shows the deviations in consumption and investment for the same period. Similar to the cases in most of the other developing countries, first inference from the graph is that investment is more volatile than consumption. Consumption moves in the $\pm 5\%$ interval for the sample period. In contrast, investment makes swings as large as $+25\%$ and -30%. This implies that investment volatility is an important source of fluctuations.

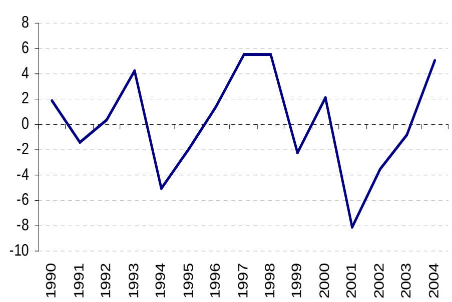


Figure 1: Percentage Deviations of GDP from HP trend

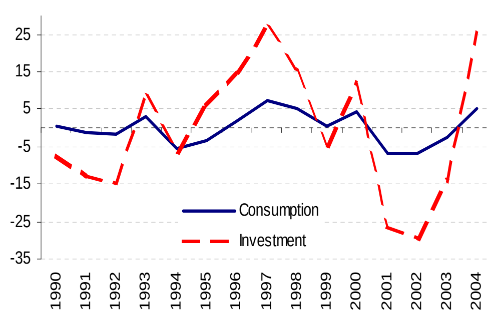


Figure 2: Percentage Deviations from HP trend: Consumption and Investment

As an alternative way, we will also look at the differences in the production side. In order to do this, we will decompose the GDP into the value-added by different sectors. Viewing Turkey as a small open economy, it is natural that first way of disaggregating output would be to separate production to tradable and non-tradable parts as T and NT, respectively. Tradable refers to the industry sector of the economy, which includes manufacturing, electricity, gas and water, and mining. For non-tradable, we will include transportation and communication, commerce and construction. We omit financial sector and agriculture in our analysis. To depict the different movements more starkly, we plot the ratio of NT to T value in Figure 3. Firstly, it is easily noticeable that this ratio is not a constant or a random walk but it has clear cycles. Secondly, the cycles closely correspond to the boom-bust cycles in real GDP. During the boom-bust cycle of 1991-1994, NT over T ratio follows the same trend with an initial increase and a decrease later. The second cycle in GDP of 1995-2001 is also followed closely. This picture shows that there is an asymmetry in the sector based movements of the output. In other words to say, aggregate cycle masks an asymmetrical move in the sector based output.

We also analyze the size of the credit markets in Turkey after financial liberalization. Figure 4 presents the ratio of private sector credit to GDP. There is a startling resemblance between this credit data and the Non-tradable to Tradable output ratio in Figure 3. Evidently, during a boom, credit to GDP ratio increases along with non-tradable to tradable ratio. Similarly, credit to GDP ratio and non-tradable to tradable ratio decrease in tandem during a crisis. This might be due to the fact that non-tradable sector is more responsive to the credit markets than the tradable sector. We suggest that there is a credit channel that works asymmetrically across sectors. In the next subsection, we will try to establish this conjecture using our macro variables.

3.2 Macro Comovements and Credit

Main mechanism we offer for the macro level comovements is based on Tornell and Westermann (2005). They explain the cycles in developing economies in terms of cycles in financial markets, more specifically in credit markets. They decompose an economy into tradable and non-tradable sectors. Tradable sector is assumed to have better access to external finance than non-tradable sector. As a result, non-tradable sector will be financially constrained and more responsive to the changes of credit in the economy. In general, their mechanism can explain the basic cycles in developing countries and as a further step it can also account for the sector based asymmetries. The authors effectively prove their mechanism for developing countries using macro level data in Tornell and Westermann (2005).

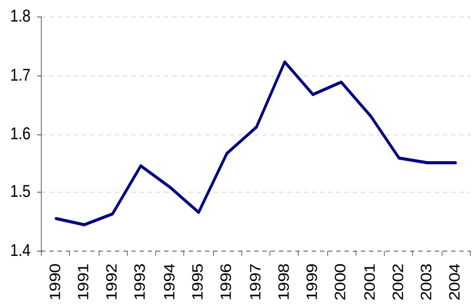


Figure 3: N / T Output Ratio

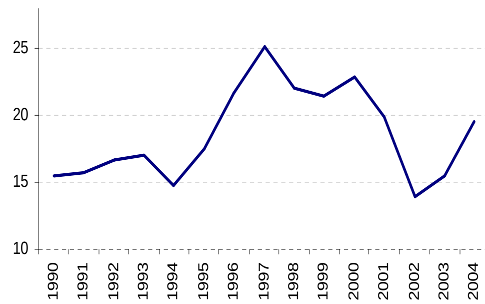


Figure 4: % Private Credit / GDP

We also show these macro correlations for Turkey. Moreover, as an extra effort to display the relationship more concretely, we connect these macro correlations to a micro level data set in subsequent sections. By doing so, we aim to show that non-tradable sector is indeed more constrained than tradable sector. Then, we can argue more boldly that credit is an important factor for asymmetrical business cycles. We can suggest that non-tradable sector is more responsive to the credit and thus any movement in credit can induce movements in NT over T ratio as well as overall economy.

We use annual data from 1970 to 2004 to run the regression model in equation (1) coming from Tornell and Westermann (2005) . Our aim in this simple regression is to quantify the relationship between Credit over GDP and NT over T ratios after controlling for other explanatory factors. We use trade and financial liberalization dummies to control for structural changes in the economy. We have used the lagged trade liberalization dummy, because compared to financial liberalization, it's a real sector adjustment, which means it should take some time before we notice its effects. We also include the crises and the lagged crises dummy variables because we expect their impact on the non-tradable sector to be more pronounced and hence we expect a negative coefficient for these dummies. Table 1 provides the results for our macro data regression analysis. Since both Credit over GDP and NT over T ratios are not rejected to be unit root we use the first differences of the corresponding variables in the regressions.

$$\begin{aligned}
\Delta\left(\frac{NT_t}{T_t}\right) &= \beta_0 + \beta_1 \Delta\left(\frac{Credit_t}{GDP_t}\right) + \beta_2 \Delta\left(\frac{Credit_{t-1}}{GDP_{t-1}}\right) \\
&\quad + \beta_3 Lagged\ Trade\ Liberalization + \beta_4 Financial\ Liberalization \\
&\quad + \beta_5 Crises + \beta_6 Lagged\ Crises + \varepsilon_t
\end{aligned} \tag{1}$$

Our results for macro analysis in Table 1 show that, for all five models Credit to GDP ratio affects NT to T ratio significantly with one year lag. The coefficient of the lagged first difference of the Credit to GDP ratio is highly significant, at least 5% level. This shows that there is a strong relation between the credit market and sector based asymmetries. We see that trade liberalization dummy affects NT over T ratio negatively in the sense that it helps more to T sector. On the other hand, financial liberalization affects NT over T ratio positively. We expect that with financial liberalization, credit in the economy will increase and this will benefit non–tradable sectors more profoundly due the fact that they are more financially constrained than tradable sectors. Both of the coefficients are quite significant as expected. These results are closely in line with findings of Tornell and Westermann (2005) who show that NT over T ratio decreases with trade liberalization and increases with financial liberalization for a large sample of developing countries. Crises of 1994 and 2001 have negative effects on NT over T ratio supporting the observation that non-tradable sector is hit more heavily by the crises but the crises dummy is only significant for our most general model, i.e. model five.

In these regressions, the strong relationship between NT over T ratio and the aggregate credit movements is notable. For the aggregate economy, we see a close comovement of sector based production ratios and amount of available credit to agents. However, we should note that these regression results do not necessarily imply a casual relationship from credit markets to sector based differences in output. To establish such a claim, in the next section we use micro data sets and structural estimation methods.

4 Micro Evidence

If we can prove the hypothesis that non-tradable firms are more constrained than tradable firms, then we can generate the aggregate boom-bust cycles we see in the macro data. During a credit boom, firms that are more responsive to the credit (non-tradable) will increase their investment and correspondingly their output more than other firms (tradable). So NT over T ratio will increase over the boom. And during a credit bust or decrease, non-tradable firms will decrease investment and output more than other firms, and we will see NT over T ratio decreasing. This will potentially indicate that credit market is an important part of the boom-bust cycles in the economy and this effect is asymmetric across sectors. This part of the paper will try to establish that non-tradable sector is more constrained than tradable sector, in a more structural way using the micro level data sets.

4.1 Model

To test the capital market imperfections across sectors, we use the Euler equation approach to investment. Following Bond and Meghir (1994) and Bond et al. (2003), we assume that there is a firm maximizing the stream of net cash flows under the presence of symmetric quadratic adjustment costs. The firm i solves the following problem:

$$\max E_t \left\{ \sum_{j=0}^{\infty} \beta_{t+j}^{t} R(K_{i,t+j}, L_{i,t+j}, I_{i,t+j}) \right\} \tag{2}$$

subject to the capital accumulation constraint,

$$K_{i,t} = (1-\delta)K_{i,t-1} + I_{i,t} \tag{3}$$

where $R_{i,t} = p_{i,t}F(K_{i,t}, L_{i,t}) - p_{i,t}G(I_{i,t}, K_{i,t}) - w_{i,t}L_{i,t} - p^I_{i,t}I_{i,t}$ is the current net cash flow. $L_{i,t}$ denotes variable factor inputs, $K_{i,t}$ denotes the beginning of the period capital stock, $I_{i,t}$ denotes the investment, $w_{i,t}$ is the price of variable factors, $p_{i,t}$ is the price of output, $p^I_{i,t}$ is the price of investment, β^t_{t+j} is the discount factor between period t and period $t+j$, δ is the rate of depreciation, F is the production function and G is the adjustment cost function. The first order conditions yield the following Euler equation:

$$-\left(\frac{\partial R}{\partial I}\right)_{i,t} = -(1-\delta)\beta^t_{t+1}E_t\left(\frac{\partial R}{\partial I}\right)_{i,t+1} + \left(\frac{\partial R}{\partial K}\right)_{i,t} \tag{4}$$

Under the assumption of competitive markets and that F being constant returns to scale, and with the adjustment cost functional form $G(I_{i,t}, K_{i,t}) = \frac{b}{2}\left[(I/K)_{i,t} - c\right]^2 K_{i,t}$, we can write equation (4) as follows:

$$\left(\frac{I}{K}\right)_{i,t} - \alpha_1\left(\frac{I}{K}\right)^2_{i,t} = \alpha_2 E_t\left(\frac{I}{K}\right)_{i,t+1} + \alpha_3\left[\left(\frac{\Pi}{K}\right)_{i,t} - J_{i,t}\right] + \alpha_0\ . \tag{5}$$

Here, $\Pi_{i,t} = p_{i,t}F(K_{i,t}, L_{i,t}) - p_{i,t}G(I_{i,t}, K_{i,t}) - w_{i,t}L_{i,t}$ is the gross current profit and $J_{i,t}$ is the real cost of capital. This equation implies that current investment is positively related to the expected future investment and to the current gross profits, and negatively related to the cost of capital. There are two points to be emphasized. Firstly, the expectation is captured by one-period-ahead investment forecast. Secondly, profits that are likely to be correlated with cash flows enter the equation even without financial constraints. Therefore, we can have structural interpretation of the basic Euler equation for investment-cash flow regressions. By using realized $(I/K)_{i,t+1}$ plus an error term instead of expectation and rearranging equation (5) we can arrive at the following empirical specification:

$$\left(\frac{I}{K}\right)_{i,t+1} = \beta_1\left(\frac{I}{K}\right)_{i,t} + \beta_2\left(\frac{I}{K}\right)^2_{i,t} + \beta_3\left(\frac{\Pi}{K}\right)_{i,t} + \beta_4\left(\frac{Y}{K}\right)_{i,t} + d_{t+1} + \eta_i + \upsilon_{i,t+1} \tag{6}$$

where the cost of capital is replaced by time and firm fixed effects, and output-capital ratio is added to account for the possibility of non-constant returns to scale or monopolistic competition. Under the case of no financial constraints, we have the following properties for the coefficients: $\beta_1 \geq 1, \beta_2 \leq -1, \beta_3 < 0$ and $\beta_4 \geq 0$.

The main advantage of this structural Euler equation approach is that it controls for the effects of expectations on investment decisions. In a non-structural estimation like accelerator model, when financial variables enter the regression with significant coefficients, one cannot be very conclusive due to the possibility that these financial variables might be correlated with future profitability. The Euler equation approach eliminates this problem and shows that cash flow or profits enter the specification even without financial constraints. However, the model implies that coefficient on profits (β_3) will be negative. However, if firms face financial constraints, Bond et al. (2003) write that, "investment spending is positively related to cash flow or profits through the effect of financial constraints." And " since the gross operating profits term $(\Pi/K)_{i,t}$ in equation (6) will be highly correlated with cash flow, the prediction of a negative sign on this term may be expected to fail in the presence of financial constraints." As a result, a first test of the financial constraints would be to look at the sign of the lagged cash flow or profits variable in equation (6). So, if the coefficient on lagged cash flow is positive ($\beta_3 > 0$), then this positive coefficient will indicate to presence of financial constraints. Furthermore, under the financial constraints, one would expect positive relationship between investment and current cash flow which is the basic internal finance option for the firm. As in Brown et al. (2009), we add contemporaneous cash flow or profits to see this positive relationship. Due to the correlation between sales and cash flow, contemporaneous sales are also added as an additional control for firm demand to avoid the omitted variable bias. As a result, a second test of the financial frictions would be to check at the coefficient on the contemporaneous cash flow or profits variable in equation (7). If this coefficient is positive ($\beta_5 > 0$), then it will indicate to the presence of financial frictions. Therefore, we will also use the following modified specification as in Brown et al. (2009):

$$
\begin{aligned}
\left(\frac{I}{K}\right)_{i,t+1} \quad = \quad & \beta_1 \left(\frac{I}{K}\right)_{i,t} + \beta_2 \left(\frac{I}{K}\right)^2_{i,t} + \beta_3 \left(\frac{\Pi}{K}\right)_{i,t} + \beta_4 \left(\frac{Y}{K}\right)_{i,t} \\
& + \beta_5 \left(\frac{\Pi}{K}\right)_{i,t+1} + \beta_6 \left(\frac{Y}{K}\right)_{i,t+1} + d_{t+1} + \eta_i + \upsilon_{i,t+1}
\end{aligned} \tag{7}
$$

4.2 Methodology and Data

We estimate equations (6) and (7) using both fixed and random effects models, and the first difference GMM method developed by Arellano and Bond (1991). In order to compare the efficiency of random and fixed effects, we also conduct Hausman test. For the first difference GMM estimates, we assume that all the right hand side variables are possibly endogenous and use the appropriate lagged levels as the instruments.

Our goal in this study is to examine the sector based asymmetries in terms of capital market imperfections and determine the relation between these asymmetries and boom-bust cycles. To understand whether the internal funds of firms matter for investment decision or not, we start with equation (6), which specifies a model without capital market imperfections, i.e. frictionless capital markets. Suppose, due to credit market imperfections, firms have some kind of credit constraints or high information costs or the cost of external financing exceeds that of internal one, then changes in net worth would affect the investment decision of such firms. To see the effects of financial constraints in more detail, we proceed with equation (7).

For our analysis of the micro data sets, first we run the cash-flow regressions for tradable and non-tradable sectors separately. Secondly, we pool the data and introduce a dummy variable that takes the values of 1 for non-tradable sectors and 0 for tradable sectors. The definitions of the variables used in our regression are given in Table 2. In this part, we use two different micro data sets, one of which is the Company Accounts Survey conducted by the Central Bank of Turkey (CBT) and the other is a firm level data set for the Istanbul Stock Exchange (ISE) firms. For all these data sets, we define the tradable and non-tradable sectors as the manufacturing sector and the non-manufacturing sector, respectively. We use the production price index (PPI) to control for inflation.

The Company Accounts Survey [8] data set has been gathered by the CBT since 1992. The CBT collected this data set annually by asking thousands of firms to submit their balance sheets corresponding to last three years. For example, firms in 1997 survey data set are asked to bring their balance sheets for 1994, 1995 and 1996. That's why our main data set covers the years between 1989 and 2006. The publicly available part of the data set gives us the aggregate balance sheet for each sector. We divide this data set into two main sectors as well, tradable and non-tradable. Both tradable and non-tradable sectors also have available information for their sub-sectors. The names of the sub-sectors used in this study and the way we handle the data set can be found in Appendix. The ISE firm level data set between the years of 1987 and 2003 is the second data set used in this study. It is used to test our findings among the large firms of the ISE in a firm level analysis.

4.3 Results for Company Accounts Survey Data Set

Table 3 gives the summary statistics of mainvariables used for the non-tradable and tradable sectors. At first glance, the variables show that non-tradable sector's investment normalized by capital stock has a higher average and a much more volatility compared to that of tradable sector, even tough the mean and standard deviations of cash flows are not so different for the two sectors. This implies that for given similar cash flow levels and volatilities, we observe a higher volatility in the investment of nontradable sector. The ratio of standard deviation of investment to cash flow is 0.4879 in nontradable sector which is much higher than the corresponding value of 0.2670 in tradable sector.

We can see the same patterns in the Figures 5 and 6 where the cash flow figures for both sectors resemble each other closely, whereas the investment figure is much more volatile for nontradable sector over the whole period. For very similar levels of cash flows, non-tradable sector experiences a higher investment during boom years and a lower investment during bust years. These results highlight that, even though both sectors might have similar internal funds, structural differences like access to financing can produce pronounced differences

[8] This data set is publicly available in the CBT website under Periodic Publications.

in investment behavior. This hypothesis of difference in the investment behavior across sectors is analyzed in a more structural way through the regression results.

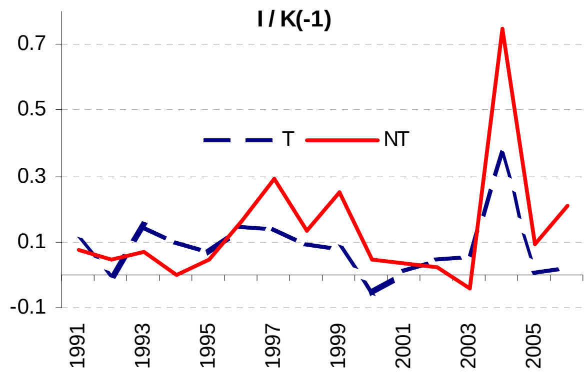


Figure 5: Investment over Capital ratio for Tradable and Non-tradable sectors

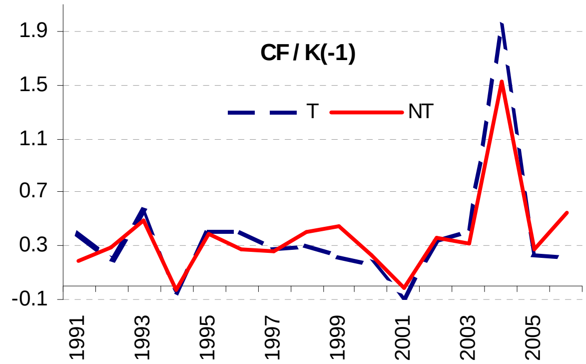


Figure 6: Cash flow over Capital ratio for Tradable and Non-tradable sectors

Table 4 displays the separate cash flow regressions for both tradable and non-tradable sectors using fixed effects and first-differenced GMM methods. Model 1 is the equation (6) corresponding to the perfect markets case, and Model 2 is the equation (7) corresponding to the financial constraints case. Neither non-tradable nor tradable sectors fully satisfy the coefficient restrictions of perfect capital markets case. In Model 1, coefficient of lagged sales is positive and coefficient of lagged cash flows is negative for tradable sector; and these signs are in line with the perfect capital markets hypothesis. However, for non-tradable sectors, none of the coefficients are in line with the perfect markets case, with insignificant numbers for lagged sales and cash flow variables. Therefore, we can strongly reject the perfect capital markets for non-tradable sectors. We then add current sales and cash flows to the regressions to quantify the financial market imperfections as in Brown et al. (2009). Current cash flow coefficient in Model 2 is significant for both tradable and non-tradable sectors at one percent level. This might suggest that both sectors face financial constraints. However, there is a startling difference between the current cash flow coefficients across sectors. The value is around 0.13-0.16 for tradable compared to 0.36-0.38 for non-tradable sector. As a result, for similar amounts of variance in the cash flows, the response of investment will be much higher for non-tradable sector. This finding is in line with Figures 5 and 6, where average cash flow profiles are very similar over time but investment is more volatile for non-tradable sector.

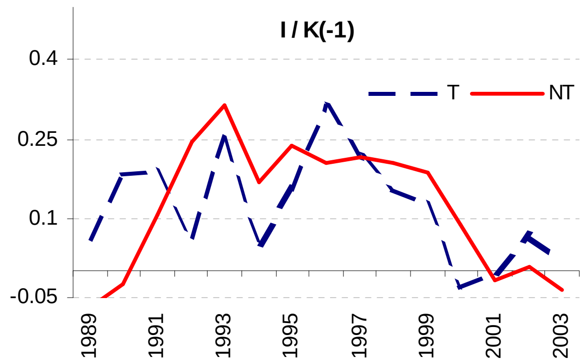
Table 5 combines the data for both sectors and includes a dummy for non-tradable sector for the coefficient of cash flows. We use fixed effects, random effects and first-differenced GMM estimations in the regressions. When we conduct fixed effects and random effects regression for both perfect capital markets case (Model 1) and financial constraints case (Model 2), Hausmann test chooses random effects as more efficient estimation than fixed effects. In Model 1, where we test perfect markets assumption, random effects show that lagged cash flow dummy is negative for tradable sector as proposed by perfect markets the theory but the dummy for non-tradable sector is significantly positive meaning that non-tradable sector does not satisfy perfect capital markets. In the case of GMM estimation lagged cash flow is not significant for both sectors thereby rejecting the perfect markets for both sectors. In both estimations, we discard the perfect access to capital markets assumption for nontradable sector. Then in Model 2 we include current sales and cash flows as additional variables to see the financial constraints. Hausmann test favors random effects regression over fixed effects regression again. And both random effects and GMM estimations find that current cash flow is significant for non-tradable and tradable sectors. This shows that financial constraints can be binding for both sectors. We also see that the coefficient on cash flow for nontradables is significantly higher than tradables. As in Table 4, this difference shows that for very similar amounts of volatility in cash flows, investment response in non-tradable sector is significantly larger than that of tradable sector. Therefore, any movements in financing sources will be reflected in higher volatility of investment for non-tradable sectors. This finding is also in accordance with the asymmetrical aggregate movements across sectors.

We can infer from these results that in the economy, non-tradable sectors are always more financially constrained and its responsiveness to business cycle is higher. Tradable sectors are classified as constrained with respect to fixed investment but tradable firms are less constrained than non-tradable firms. Since most of the cash flow studies in the literature use either stock market data, which is not a representative sample of the overall economy, or limited firm level data from manufacturing sector, our result is also important for aggregate investment dynamics and business cycles. For example, Gelos and Werner (2002) consider the investment behavior for manufacturing firms in Mexico for the period 1984-1994. They find that firms are financially constrained. However, this result would not be enough to infer about the aggregate investment and output dynamics. As stated by Hubbard (1998), estimating investment equations for other sectors of the economy would provide helpful for aggregate investment dynamics. In the Turkish case, we have estimated the investment equations for non-tradable and tradable sectors of the economy, and obtained micro evidence for the aggregate investment and output dynamics. In our estimation, we have a higher sensitivity of non-tradable sector. This implies that non-tradable firms will be more responsive to external finance or bank credit. So when there is a lending boom, non-tradable firms will be investing and producing more, and when credit decreases non-tradable sector will decrease investment and output more than tradable sector. Then this framework presents micro evidence for the macro correlations between NT/T ratio and Credit/GDP ratio, and establishes the link between credit markets and output dynamics.

4.4 Results for Istanbul Stock Exchange Firms Data Set

We conduct cash-flow regression analysis on stock market firms in this section. Our period covers 1987 to 2003. We exclude financial and utility firms. We again categorize our firms into non-tradable and tradable sectors. In Table 6, we first check the summary statistics. In contrast to the summary statistics in survey of sectors, stock market firms there are do not display much difference in levels and variances of both investment and cash flow variables. Our analysis yields very similar values for the ratio of standard deviations of investment and cash flows for tradable and nontradable sectors, namely 0.4799 and 0.4543 respectively.

Graphical representation of investment and cash flows over the sample period in Figures 7 and 8 further reinforces this result and illustrates that for the given similar levels of cash flows, we get very similar movements of investment in both tradable and nontradable sectors. Therefore, from the first diagnostics of the data, we do not find significant differences in the investment and financial variables.



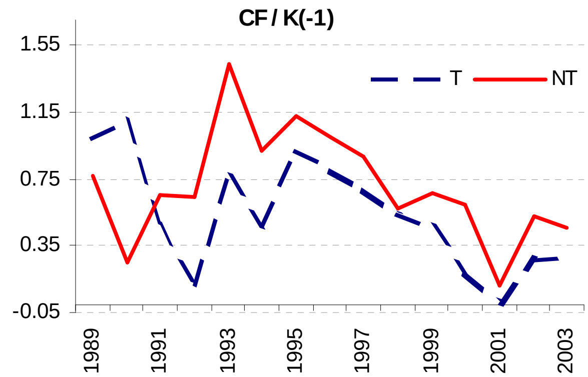


Figure 7: Investment over Capital ratio for Tradable and Non-tradable sector

Figure 8: Cash flow over Capital ratio for Tradable and Non-tradable sector

Table 7 provides the results for several models of cash flow regressions for pooled data of all firms. We estimate fixed effects, random effects and first-differenced GMM regressions. Hausmann test favors fixed effects as the efficient estimator over random effects. For the case of perfect capital markets setup, in Model 1, coefficients of the regressions do not satisfy the restrictions. Coefficient of lagged cash flow, which is predicted to be negative under perfect markets case, is insignificant in fixed effects estimation and positive in first-differenced GMM estimation. Moreover the dummy for non-tradable sector is not significant in either case. Hence, we can conclude that perfect capital markets hypothesis is rejected for both sectors under an Euler equation approach.

To further quantify the market imperfections, we add current sales and cash flows to the benchmark regression as in Brown et al. (2009) in Model 2. The coefficient of current cash flow in the imperfect capital markets case is significant and positive for all estimations and the number is around 0.11-0.13. For our purpose of analyzing the sector based differences in access to financial markets, we also look at the dummy for non-tradable sector cash flow. This coefficient is insignificant in all cases. In contrast to the survey data set, where we have found significant differences in cash flow coefficients across sectors, for the stock market data there are no differences in capital market imperfections. Despite both tradable and non-tradable firms being financially constrained, their responses to cash flow movements do not diverge. This finding is in line with Figures 7 and 8, where both investment and cash flow profiles are very similar across sectors.

Comparing these results to the previous section's results for a larger and more representative data set for economy, we conclude that using stock market firms we can assess whether they are constrained or not, but it does not help with studying the bigger macro picture. From these micro results, we can conclude that market imperfections are of paramount importance for the economy and there is an asymmetry across sectors that non-tradable sectors are more constrained than tradable sector.

5 Conclusion

In this study, we pointed to the macro relationship between non-tradable to tradable ratio and private credit to GDP ratio and demonstrated that there is a close relationship between two ratios. We concluded from this that credit market is an important component of the boom-bust cycles in the economy and this effect is asymmetric across sectors. To support these findings we checked two separate micro data sets. For stock market firms, we get that there is no difference in terms of credit constraints for the firms. However, we noticed that this data set is not representative of the economy, since these firms are very large with respect to average firms and have easier access to credit markets. To see more representative results, we checked a larger data set for different sectors. From this data set, we concluded that non-tradable sectors are financially more constrained than tradable sectors.

Given the fact that non-tradable sectors are more constrained than tradable firms, we can generate the boom-bust cycles we see in the data. During a credit boom, firms which are more responsive to the credit (non-tradable) will increase their investment and correspondingly their output more than other firms (tradable). So NT/T ratio will increase over the boom. And during a credit bust or decrease, non-tradable firms will decrease investment and output more than other firms, and we will see NT/T ratio decreasing. Therefore, we provide micro evidence that observed aggregate asymmetric volatility of tradable and tradable sectors over the business cycle can be the result of the fundamental differences in access to financing of sectors.

6 References

Agca, Senay., Mozumdar, Abon., 2008. The impact of capital market imperfections on investment–cash flow sensitivity. Journal of Banking and Finance 32, 207–216.

Aguiar, Mark., Gopinath, Gita., 2007. Emerging market business cycles: The cycle is the trend. Journal of Political Economy 115 (1), 69-102.

Allayannis, George., Mozumdar, Abon., The impact of negative cash flow and influential observations on investment–cash flow sensitivity estimates. Journal of Banking and Finance 28, 901–930.

Almeida,Heitor., Campello, Murillo., Weisbach, Michael., 2004. The Cash Flow Sensitivity of Cash. Journal of Finance 59, 1777-1804.

Arellano, M,.Bond, Stephen R., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277-297.

Athey, Michael J., Laumas, Prem S., 1994. Internal funds and corporate investment in India. Journal of Development Economics 45, 287-303.

Bacchetta, P., Caminal, R., 2000. Do capital market imperfections exacerbate output fluctuations?, European Economic Review 44 (3), 449–468.

Beck, T., Levine, R., Loayza, N., 2000. Finance and the sources of growth. Journal of Financial Economics 58, 261-300.

Becker, Bo., Sivadasan, Jagadeesh., 2010. The Effect of Financial Development on the Investment-Cash Flow Relationship: Cross-Country Evidence from Europe. The B.E. Journal of Economic Analysis & Policy: Vol. 10 : Iss. 1 (Advances), Article 43.

Bernanke, B., Gertler, M., and S. Gilchrist, 1999. The financial accelerator in a quantitative business cycle framework.In: Woodford, M., Taylor, J. (Eds.), Handbook of Macroeconomics. North-Holland.

Bond, Stephen., Meghir, Costas., 1994. Dynamic Investment Models and the Firm's Financial Policy. Review of Economic Studies 61 (2), 197-222.

Bond, Stephen., Elston, Julie Ann., Mairesse, Jacques., Mulkay, Benoit., 2003. Financial Factors and

Investment in Belgium, France, Germany, and the United Kingdom: A Comparison Using Company Panel Data. The Review of Economics and Statistics 85 (1), 153-165.

Bond, Stephen., Van Reenen, John., 2007. Microeconometric Models of Investment and Employment. Handbook of Econometrics, in: J.J. Heckman & E.E. Leamer (ed.), Handbook of Econometrics, edition 1, volume 6, chapter 65 Elsevier.

Braun, M., Larrain, B., 2005. Finance and the business cycle: internationald, inter-industry evidence. Journal of Finance 60, 1097-1128.

Brown, James R., Fazzari,Steven M., Petersen, Bruce C., 2009. Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom. Journal of Finance 64 (1), 151-185.

Brown, James R., Petersen, Bruce C., 2009. Why has the investment-cash flow sensitivity declined so sharply? Rising R&D and equity market developments. Journal of Banking & Finance 33, 971–984.

Calomiris, Charles W., Hubbard, R. Glenn., 1995. Internal Finance and Investment: Evidence from the Undistributed Profits Tax of 1936-37. Journal of Business 68 (4), 443-482.

Carlstrom, C.T., and T.S. Fuerst, 1997. Agency costs, net worth, and business fluctuations: A computable general equilibrium analysis. American Economic Review 87 (5), 893–910.

Carpenter, Robert E., Guariglia, Alessandra., 2008. Cash flow, investment, and investment opportunities: New tests using UK panel data. Journal of Banking and Finance 32, 1894-1906.

Chirinko, Robert S., 1993. Business Fixed Investment Spending: Modeling Strategies, Empirical Results, and Policy Implications. Journal of Economic Literature 31 (4), 1875-1911.

Cleary , Sean., 1999. The Relationship Between Firm Investment and Financial Status, Journal of Finance, 54 (2), 673-692.

Fazzari, Steven., Hubbard, Glenn., Petersen, Bruce., 1988. Financing Constraints and Corporate Investment, Brookings Paper on Economic Activity, 141-206.

Fazzari, Steven., Hubbard, Glenn., Petersen, Bruce., 2000. Investment-Cash Flow Sensitivities are Useful: A Comment on Kaplan and Zingales, Quarterly Journal of Economics, 115 (1), 695-705.

Galindo, Arturo., Schiantarelli, Fabio., 2002. Credit Constraints in Latin America: An Overview of the Micro Evidence. Boston College Working Papers in Economics 537.

Garcia-Cicco, Javier., Pancrazi, Roberto., Uribe,Martin., 2010. Real Business Cycles in Emerging Countries?. American Economic Review, forthcoming.

Gelos, R. Gaston., Werner, Alejandro M., 2002. Financial liberalization, credit constraints, and collateral: investment in the Mexican manufacturing sector. Journal of Development Economics 67 (1), 1-27.

Gertler, M., S. Gilchrist and Fabio M. Natalucci, 2007. External Constraints on Monetary Policy and the Financial Accelerator. Journal of Money, Credit and Banking, 39 (2-3), 295-330.

Gilchrist, Simon., Himmelberg, Charles P., 1995. Evidence on the role of cash flow for investment. Journal of Monetary Economics 36(3), 541-572.

Gorodnichenko, Yuriy., Schaefer, Dorothea., Talavera, Oleksandr., 2009. Financial constraints and continental business groups: Evidence from German Konzerns. Research in International Business and Finance 23(3), 233-242.

Gorodnichenko, Yuriy., Schnitzer, Monika., 2010. Financial constraints and innovation: Why poor countries don't catch up. NBER Working Papers 15792.

Goyal, Vidhan K., Yamada, Takeshi., 2004. Asset Price Shocks, Financial Constraints, and Investment: Evidence from Japan. Journal of Business 77 (1), 175-200.

Harrison, Ann E., Love, Inessa., McMillan, Margaret S., 2004. Global capital flows and financing constraints. Journal of Development Economics, Elsevier 75 (1), 269-301.

Harhoff, Dietmar., 1998. Are There Financing Constraints for R&D and Investment in German Manufacturing Firms? Annales d'Économie et de Statistique 49-50, 421-456.

Hayashi, Fumio., 1982. Tobin's Marginal q and Average q: A Neoclassical Interpretation, Econometrica, 50 (1), 213-224.

Hoshi, Takeo., Kashyap, Anil., Scharfstein, David., 1991. Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups. The Quarterly Journal of Economics 106 (1), 33-60.

Hubbard, R Glenn., Kashyap, Anil K., Whited, Toni M., 1995. International Finance and Firm Investment. Journal of Money, Credit and Banking 27 (3), 683-701.

Hubbard, Glenn., 1998. Capital Market Imperfections and Investment, Journal of Economic Literature, 36, 193-225.

Islam, Saiyid S., Mozumdar, Abon., 2007. Financial market development and the importance of internal cash: Evidence from international data. Journal of Banking and Finance 31, 641–658.

Jaramillo, Fidel., Schiantarelli, Fabio., Weiss, Andrew., 1996. Capital Market Imperfections Before and After Financial Liberalization: An Euler Equation Approach to Panel Data for Ecuadorian Firms, Journal of Development Economics, 51, 367-386.

Jensen, Michael C., Meckling, William H., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, Journal of Financial Economics, 3(4), 305-60.

Koo, Jaewoon., Maeng, Kyunghee., 2005. The effect of Financial Liberalization on Firms' Investments in Korea, Journal of Asian Economics, 2005, 16, 281-297.

Kadapakkam, Palani-Rajan., Kumar, P.C., Riddick, Leigh A., 1998. The Impact of Cash Flows and Firm Size on Investment: The International Evidence, Journal of Banking and Finance, 22, 293-320.

Kaplan, Cafer., Ozmen, Erdal., Yalcin, Ciha., 2006. The Determinants and Implications of Financial Asset Holdings of Non-Financial Firms in Turkey: An Empirical Investigation. " The CBRT Working Paper, No: 06/06.

Kaplan, Steven., Zingales, Luigi., 1997. Do Investment-Cashflow Sensitivities Provide Useful Measures of Financing Constraints?, Quarterly Journal of Economics, 112, 169-215.

Leaven, Luc., 2002. Does Financial Liberalization Reduce Financing Constraints?, Financial Management 31 (4).

Levine, R., 2005. Finance and growth. In: Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth. Elsevier Science, Amsterdam, The Netherlands.

Love, Inessa., 2003. Financial Development and Financing Constraints: International Evidence from the Structural Investment Model. Review of Financial Studies 16 (3), 765-791.

Mairesse, Jacques., Hall, Bronwyn H., Mulkay,Benoit., 1999. Firm-Level Investment in France and the United States: An Exploration of What We Have Learned in Twenty Years. Annales d'Economie et de Statistique 55-56, 28-67.

Modigliani, Franco., Miller, Merton H., 1958. The Cost of Capital Corporation Finance and the Theory of Investment, American Economic Review, 48(3), 261-97.

Myers, Stewart C., Majluf, Nicholas S., 1984. Corporate Financing and Investment Decisions When Firms have Information that Investors Do Not, Journal of Financial Economics, 13, 187-221.

Neumeyer, Pablo A., Perri, Fabrizio., 2005. Business cycles in emerging economies: The role of interest rates. Journal of Monetary Economics 52 (2), 345-380.

Ozmen, Erdal., Sahinoz, Saygın., Yalcin, Cihan., 2011. Corporate Sector Savings and Investments in Turkey. Background paper for Turkey's Country Economic Memorandum (World Bank).

Poncet, Sandra., Steingress, Walter., Vandenbussche, Hylke., 2009. Financial Constraints in China: Firm-Level Evidence. CEPR Discussion Papers 7132.

Rajan, R.JG., Zingales, L., 1998. Financial dependence and growth. American Economic Review 88, 559-596.

Ranciere, Romain., Tornell, Aaron., Westermann, Frank., 2008. Systematic Crisis and Growth. Quarterly Journal of Economics 123 (1), 359-406.

Schaller, Huntley., 1993. Asymmetric Information, Liquidity Constraints and Canadian Investment. Canadian Journal of Economics 26 (3), 552-74.

Schiantarelli, Fabio., 1996. Financial Constraints and Investment: Methodological Issues and International Evidence. Oxford Review of Economic Policy 12 (2), 70-89.

Schneider, Martin., Tornell, Aaron., 2004. Balance Sheet Effects, Bailout Guarantees and Financial Crises. Review of Economic Studies 71 (3), 883-913.

Shen, Chung-Hua., Wang, Chien-An., 2005. Does Bank Relationship Matter for a Firm's Investment and Financial Constraints? The Case of Taiwan, Pacific-Basin Finance Journal, 13, 163-184.

Shin, Hyun-Han., Park, Young S., 1999. Financing Constraints and Internal Capital Markets: Evidence from Korean 'Chaebols', Journal of Corporate Finance, 5, 169-191.

Stiglitz, J., Weiss, A., 1984. Information imperfections in the capital market and macroeconomic fluctuations. American Economic Review74, 194–199.

Tornell, Aaron., Westermann, Frank., 2005. Boom-Bust Cycles and Financial Liberalization. The MIT Press.

Whited, Toni M., 1992. Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. Journal of Finance 47 (4), 1425-60.

Yesiltas, Sevcan, 2009. Financing Constraints and Investment: The Case of Turkish Manufacturing Firms. Bilkent Universtiy, Masters Thesis.

Yurtoğlu, B. Burçin, 2006. Firm-level Profitability, Liquidity, and Investment, in The Turkish Economy: The Real Economy, Corporate Governance and Reform, Eds. Sumru Altuğ and Alpay Filiztekin, Routledge Press, 345-380.

Table 1: Regression Results

Macro Data: Sample:1970-2004					
Dependent Variable: Annual Difference in Non-tradable (NT) / Tradable (T)					
	1	**2**	**3**	**4**	**5**
Annual Difference in Credit/GDP ratio	-0.0004	0.0012	-0.0011	-0.0046	-0.0060
	(0.0063)	(0.0067)	0.0061	(0.0063)	(0.0065)
Lag of Annual Difference in Credit/GDP ratio	0.0187***	0.0172**	0.0170**	0.0188***	0.0173**
	(0.0067)	(0.0071)	(0.0066)	(0.0065)	(0.0067)
Lag of Trade Liberalization Dummy		-0.0053	-0.0779*	-0.0773*	-0.0798*
		(0.0328)	(0.0442)	(0.0429)	(0.0432)
Financial Liberalization Dummy			0.0874**	0.1020**	0.1133**
			(0.0424)	(0.0422)	(0.0442)
Crises Dummy				-0.1049	-0.1169*
				(0.0646)	(0.0662)
Lag of Crises Dummy					-0.0591
					(0.0660)
Constant	-0.0051	-0.0045	0.0028	0.0027	0.0038
	(0.0151)	(0.0264)	(0.0238)	(0.0231)	(0.0232)
$\mathbf{R}^2$	0.2640	0.2340	0.3202	0.3590	0.3540

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.
Credit/GDP is the ratio of private sector credit to GDP. Crises is the dummy for 1994 and 2001 crises.
Trade liberalization dummy with one lag is 1 for the 1985-2004. Financial liberalization dummy is 1 for the 1990-2004.
All regressions include a dummy for 1980 where there was a military coup. The dummy is significant.

Table 2: Variable Definitions

Variable	**Definition**
K_t	Capital stock at the beginning of period t.
I_t	Investment in period t.
	$= K(t) - K(t-1)$
S_t	Net sales in period t
CS_t	Change in sales
	$= S(t) - S(t-1)$
CF_t	Cash flow in period t.
	= Net Profit+Owners Capital+
	Depreciation Allowances
D	Dummy variable
	$= \begin{cases} 1 \text{ for non-tradable sector} \\ 0 \text{ for tradable sector} \end{cases}$

Table 3: Summary Statistics
CBT Company Accounts Survey Weighted Average Data Set

Tradable Sector

	Mean	Std. Dev.	Min	Max	Std. Dev. Ratio*
I/K(-1)	0.0806	0.1421	-0.1803	0.6677	0.2670
CF/K(-1)	0.3738	0.5323	-0.4692	3.3668	
CS/K(-1)	0.3760	0.8468	-3.2910	5.7014	

Non-tradable Sector

	Mean	Std. Dev.	Min	Max	Std. Dev. Ratio*
I/K(-1)	0.1542	0.2813	-0.2076	1.7014	0.4879
CF/K(-1)	0.3984	0.5765	-0.5948	2.9687	
CS/K(-1)	0.6869	1.3283	-0.9691	8.1573	

* Standard deviation ratio of I/K(-1) and CF/K(-1).

Table 4: Regression Results
CBT Company Accounts Weighted Average Data Set

Dep Var.	Tradable				Non-tradable			
I/K(-1)	FE		GMM		FE		GMM	
Variable	1	2	1	2	1	2	1	2
I(-1)/K(-2)	-0.059	0.051	-0.050	0.079	-0.078	-0.120**	-0.070	-0.083
	0.134	0.124	0.113	0.095	0.061	0.052	0.091	0.078
$[I(-1)/K(-2)]^2$	0.276	0.273	0.213	0.209	-0.076*	-0.080**	-0.076	-0.084*
	0.297	0.266	0.183	0.143	0.039	0.034	0.053	0.046
S/K(-1)		0.012		0.020**		-0.032**		-0.034***
		0.009		0.009		0.016		0.008
S(-1)/K(-2)	0.027***	0.010	0.048***	0.019**	0.003	0.007	0.005	0.016*
	0.008	0.009	0.008	0.008	0.007	0.009	0.008	0.008
CF/K(-1)		0.132***		0.156***		0.355***		0.378***
		0.017		0.014		0.072		0.046
CF(-1)/K(-2)	-0.065***	-0.050***	-0.039*	-0.028*	-0.054	0.078	0.009	0.089
	0.021	0.017	0.021	0.017	0.053	0.048	0.064	0.055
Constant	0.103*	-0.051	0.002	-0.002	0.149**	0.281**	0.015**	-0.007
	0.053	0.042	0.002	0.002	0.067	0.125	0.007	0.007
# of Obs.	414	414	384	384	188	188	172	172
R-sq.	0.217	0.376			0.168	0.293		
m1 (p-value)			0.000	0.000			0.000	0.000
m2 (p-value)			0.701	0.170			0.827	0.658
Sargan (p-value)			0.011	0.126			0.918	0.996

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.
FE and RE (random effects) give very similar results, but Hausmann test favors FE. Therefore we do not report RE.
In GMM estimation t-2 to t-5 lags are used as instrumental variables. FE and RE results are the same.

Table 5: Pooled Regression Results
CBT Company Accounts Weighted Average Data Set

Dep Var. I/K(-1)	1			2		
Variable	FE	RE	GMM	FE	RE	GMM
I(-1)/K(-2)	0.018	0.074*	0.019	0.060	0.100*	-0.013
	0.050	0.045	0.051	0.063	0.060	0.044
$[I(-1)/K(-2)]^2$	-0.070*	-0.040	-0.069**	-0.053	-0.005	-0.071**
	0.037	0.026	0.035	0.042	0.042	0.031
S/K(-1)				0.017	0.015	-0.027***
				0.012	0.013	0.005
S(-1)/K(-2)	0.009**	-0.001	0.011**	-0.003	-0.018	0.019***
	0.004	0.002	0.005	0.007	0.011	0.005
CF/K(-1)				0.131***	0.143***	0.186***
				0.017	0.016	0.020
CF(-1)/K(-2)	-0.065***	-0.055***	0.002	-0.033*	-0.015	0.006
	0.020	0.021	0.025	0.017	0.016	0.021
D*CF/K(-1)				0.173***	0.153**	0.187***
				0.066	0.061	0.035
D*CF(-1)/K(-2)	0.018	0.062***	-0.021	0.064*	0.023	0.054
	0.035	0.033	0.042	0.034	0.031	0.037
Constant	0.070**	0.300***	0.004	-0.068	0.093	-0.007***
	0.032	0.076	0.003	0.070	0.062	0.002
# of Obs.	602	602	556	602	602	556
R-sq.	0.083	0.147		0.211	0.374	
Hausman (p-value)	0.996			0.988		
m1 (p-value)			0.000			0.000
m2 (p-value)			0.678			0.260
Sargan (p-value)			0.033			0.252

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.
We used t-2 to t-12 lags for GMM estimation. Coefficients don't change when we used all the lags available.

Table 6 : Summary Statistics
ISE Firms Data Set

	Tradable Sector				
	Mean	**Std. Dev.**	**Min**	**Max**	**Std. Dev. Ratio***
I/K(-1)	0.1062	0.4219	-0.5096	2.5669	0.4799
CF/K(-1)	0.5355	0.8792	-1.1222	4.4564	
CS/K(-1)	0.2274	1.3943	-4.2843	4.8296	
	Non-tradable Sector				
	Mean	**Std. Dev.**	**Min**	**Max**	**Std. Dev. Ratio***
I/K(-1)	0.1097	0.4180	-0.3418	1.4469	0.4543
CF/K(-1)	0.7144	0.9201	-0.4706	3.6901	
CS/K(-1)	0.3612	1.2484	-1.8577	4.2099	

* Standard deviation ratio of I/K(-1) and CF/K(-1).

Table 7: Pooled Regression Results
ISE Firms Data Set

Dep Var.						
I/K(-1)	1		1	2		2
Variable	FE	RE	GMM	FE	RE	GMM
I(-1)/K(-2)	-0.101**	0.053	-0.128*	0.048	0.112**	-0.040
	0.046	0.045	0.069	0.049	0.046	0.077
$[I(-1)/K(-2)]^2$	0.006	-0.011	0.037	-0.026	-0.017	-0.021
	0.018	0.014	0.028	0.018	0.012	0.024
S/K(-1)				0.071***	0.024**	0.102***
				0.016	0.011	0.019
S(-1)/K(-2)	0.027***	0.003*	0.014***	0.016*	-0.007	0.042**
	0.006	0.002	0.005	0.009	0.009	0.020
CF/K(-1)				0.108***	0.126***	0.134***
				0.032	0.029	0.046
CF(-1)/K(-2)	0.002	0.036**	0.075**	0.008	-0.009	0.100**
	0.024	0.018	0.032	0.024	0.021	0.043
D*CF/K(-1)				0.022	-0.008	-0.092
				0.064	0.060	0.077
D*CF(-1)/K(-2)	0.042	0.004	0.040	0.046	0.004	0.002
	0.034	0.022	0.056	0.040	0.041	0.070
Constant	-0.033	0.107	-0.010**	-0.282***	-0.033	-0.002
	0.069	0.063***	0.004	0.081	0.058	0.005
# of Obs.	1581	1581	1398	1300	1300	1051
R-sq.	0.031	0.072		0.082	0.131	
Hausman (p-value)	0.002			0.000		
m1 (p-value)			0.000			0.000
m2 (p-value)			0.205			0.574
Sargan			0.265			0.090

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.

7 Appendix

In this study, we have used two different micro data sets, one of which is the Company Accounts Survey conducted by the Central Bank of Turkey (CBT) and the other is a firm level data set for the Istanbul Stock Exchange (ISE) firms. For all these data sets, we defined the tradable and non-tradable sectors as the manufacturing sector and the non-manufacturing sector; respectively.We used the production price index (PPI) to control for inflation.

We use our main data set of Company Accounts Survey in two different ways to run our regressions. We have last three years data for every year the survey is conducted and because of that we actually have three different observations of a variable for each observation period, coming form three different surveys. Suppose, we have a variable ${}_{y}X_{s,t}$ for sector s in year t from the survey conducted in year y. Then, we can easily see that $y \in \{t+1, t+2, t+3\}$ or $t \in \{y-1, y-2, y-3\}$ and $1 \leqslant y - t \leqslant 3$. The first way to use our Company Accounts survey data is that, we pick the last observation from each survey and if a lagged variable is needed in our regression we take it from the same survey year. In other words to say, we use ${}_{t+1}X_{s,t}$ and when we need one lag of this variable, we use ${}_{t+1}X_{s,t-1}$, not ${}_{t}X_{s,t-1}$. This provides us within survey consistency when using our data. We use the last observation from each survey, e.g. ${}_{t+1}K_{s,t}$, and for the lagged variables we do not change the survey year but the observation year, e.g. ${}_{t+1}K_{s,t-1}$ or ${}_{t+1}K_{s,t-2}$. The reason behind this is that the size of the survey samples change from year to year and it is logical to use the same samples' lagged variable to form our variables that are going to be used in the regression analysis, e.g. ${}_{t+1}CF_{s,t}/{}_{t+1}K_{s,t-1}$. So, our model for the Company Accounts Survey data can be written as the following:

$$\begin{aligned} \frac{{}_{t+1}I_{s,t}}{{}_{t+1}K_{s,t-1}} &= \beta_1 \frac{{}_{t+1}I_{s,t-1}}{{}_{t+1}K_{s,t-2}} + \beta_2 \left(\frac{{}_{t+1}I_{s,t-1}}{{}_{t+1}K_{s,t-2}} \right)^2 + \beta_3 \frac{{}_{t+1}\Pi_{s,t-1}}{{}_{t+1}K_{s,t-2}} + \beta_4 \frac{{}_{t+1}Y_{s,t-1}}{{}_{t+1}K_{s,t-2}} \\ &\quad + \beta_5 \frac{{}_{t+1}\Pi_{s,t}}{{}_{t+1}K_{s,t-1}} + \beta_6 \frac{{}_{t+1}Y_{s,t}}{{}_{t+1}K_{s,t-1}} + d_t + \eta_s + \upsilon_{s,t} \end{aligned} \tag{8}$$

Results of these regressions are presented in the Tables 6A and 7A of this appendix and are in line with the main results of the paper. Although we have the lagged observation for the variables in this specification, they are not the lag of the variables as it is seen in equation (9).

$$lag\left(\frac{{}_{t+1}I_{s,t}}{{}_{t+1}K_{s,t-1}}\right) = \frac{{}_{t}I_{s,t-1}}{{}_{t}K_{s,t-2}} \neq \frac{{}_{t+1}I_{s,t-1}}{{}_{t+1}K_{s,t-2}} \tag{9}$$

To deal with this problem and see the dynamic properties of the model in a better way, we form look at a different specification and form the weighted average data.

In this second specification, we take a different strategy to form continuous variables from our data set in order to understand the dynamic properties of the data in a better way. For this purpose we form weighted average variables, i.e. we use the average of three observations for a period, coming from three different surveys. Let's assume that we have a variable ${}_{y}X_{s,t}$ and the number of the firms , ${}_{y}N_{s,t}$, for sector s in year t from the survey conducted in year y. We calculate the weighted average value of our variable as,

$$x_{s,t} = \frac{X_{s,t}}{N_{s,t}} = \frac{\sum_{y\in\{t+1,t+2,t+3\}}\left({}_{y}X_{s,t}\right)}{\sum_{y\in\{t+1,t+2,t+3\}}\left({}_{y}N_{s,t}\right)}.$$

We say weighted average because our observations not only differ in the value but also in the size of sample as well, i.e. number of the firms in our sample changes from year to year[1], and we don't have any information about the firms entering in to or exiting out from the Company Accounts Survey. In other words to say, we have ${}_{t}N_{s,t-1} =_{t} N_{s,t-2} =_{t} N_{s,t-3}$ but ${}_{t+1}N_{s,t} \neq_{t+j} N_{s,t}$ for $j \in \{2,3\}$. A firm taking place in all $t+1, t+2, t+3$ surveys have triple the weight of a firm that take place in only one those surveys for the year t observation. That's why; we have formed our new data set by taking the weighted average of each variable and named it as weighted average data set.

Then, our model used for this data set can be written as follows,

[1] You may find the number of firms for each subsector in CBT Company Accounts survey data set in Table 3A and 4A for tradable and non-tradable sectors, respectively.

$$
\begin{aligned}
\frac{I_{s,t}}{K_{s,t-1}} &= \beta_1 \frac{I_{s,t-1}}{K_{s,t-2}} + \beta_2 \left(\frac{I_{s,t-1}}{K_{s,t-2}}\right)^2 + \beta_3 \frac{\Pi_{s,t-1}}{K_{s,t-2}} + \beta_4 \frac{Y_{s,t-1}}{K_{s,t-2}} \\
&\quad + \beta_5 \frac{\Pi_{s,t}}{K_{s,t-1}} + \beta_6 \frac{Y_{s,t}}{K_{s,t-1}} + d_t + \eta_s + \upsilon_{s,t}
\end{aligned} \tag{10}
$$

and hence the model in equation (10) has the desired dynamic properties. This specification is used in the main part of the paper.

Our second micro data set is the firm level data for ISE firms. This data set is bought from a private data management company, Finnet[2]. There are 175 firms used from this data set. We also divide them in to two groups, namely tradable and non-tradable, depending on their sectors[3]. As a result our model for the ISE firms can be written as the following,

$$
\begin{aligned}
\frac{I_{i,t}}{K_{i,t-1}} &= \beta_1 \frac{I_{i,t-1}}{K_{i,t-2}} + \beta_2 \left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_3 \frac{\Pi_{i,t-1}}{K_{i,t-2}} + \beta_4 \frac{Y_{i,t-1}}{K_{i,t-2}} \\
&\quad + \beta_5 \frac{\Pi_{i,t}}{K_{i,t-1}} + \beta_6 \frac{Y_{i,t}}{K_{i,t-1}} + d_t + \eta_i + \upsilon_{i,t}
\end{aligned} \tag{11}
$$

[2] Wed address for Finnet is www.finnet.com.tr .

[3] For ISE firm level data set, you may find the names of the sectors and the number of firms in each sector in Table 5A.

Table 1A: Survey and Observation Relation
CBT Company Accounts Data Set

Year	Survey Year ...	1996	1997	1998	1999	...
...						
1992	...					
1993	...	X				
1994	...	X	X			
1995		X	X	X		
1996			X	X	X	
1997				X	X	
1998					X	
...						...

This table shows us how the data is collected.

Table 2A: Sector Names
CBT Company Accounts Survey Data Set

Tradable Sector

Sector Code	Sector Name
DA-15	Manufacture of Food Products & Beverages
DA-16	Manufacture of Tobacco
DB-17	Manufacture of Textiles
DB-18	Manufacture of Wearing Apparel, Dressing and Dyeing of Fur
DC	Manufacture of Leather and Leather Products
DD	Manufacture of Wood and Wood Products
DE	Manufacture of Pulp, Paper & Paper Products, Publ. & Printing
DG	Manufacture of Chemicals, Chemical Prod. & Man-made Fibres
DH	Manufacture of Rubber and Plastic Products
DI	Manufacture of other Non-metallic Mineral Products
DJ	Manufacture of Basic Metals and Fabricated Metal Products
DK	Manufacture of Machinery and Equipment N.E.C.
DL	Manufacture of Electrical and Optical Equipment
DM	Manufacture of Transport Equipment
DN	Manufacture of Furniture, Manufacturing N.E.C.

Non-Tradable Sector

Sector Code	Sector Name
F-451	Site Preparation
F-4520	Building of Compl. Constr. or Parts Thereof, Civil Engineering
F-4521	General Constr. of Buildings and Civil Engineering Works
F-453	Building Installation
F-454	Building Completion
G	Wholesale and Retail Trade
H	Hotels and Restaurants
I	Transport, Storage and Communication

Table 3A: Number of Firms in Tradable (Manufacturing) Sectors
CBT Company Accounts Survey Data Set

	Survey Year															
Sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
DA-15		546	665	670	691	700	689	581	599	612	615	680	628			
DA-16		21	22	20	22	23	22	21	19	14	14	14	13			
DB-17		505	644	583	641	649	648	509	538	507	514	549	580	576	615	663
DB-18		419	556	428	513	531	434	308	310	307	318	345	351	329	321	298
DC		52	72	76	87	93	102	84	84	79	77	81	82	71	73	72
DD		101	144	144	148	169	151	104	101	104	106	109	96	71	76	83
DE		132	161	165	176	182	172	129	138	144	154	158	150	132	133	18
DG	112	238	282	282	304	311	261	259	262	263	281	289	255	216	249	260
DH		140	166	184	184	217	233	181	184	197	210	222	203	195	209	224
DI		202	238	247	257	275	258	229	237	240	256	265	250	224	241	277
DJ	149	343	416	417	469	476	422	315	320	329	337	366	335	298	378	403
DK	119	214	266	268	300	319	293	241	248	248	253	273	269	248	285	287
DL		162	200	201	204	225	207	160	166	165	166	181	176	151	155	174
DM		142	174	185	196	231	205	177	189	193	213	214	210	207	224	250
DN		55	63	65	90	129	111	89	91	109	124	135	136	126	122	134
Total	377	3272	4069	3935	4282	4530	4208	3387	3486	3511	3638	3881	3734	2838	3081	3143

Table 4A: Number of Firms in Non-tradable (Non-manufacturing) Sectors
CBT Company Accounts Survey Data Set

	Survey Year															
Sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
F-451					364		69	66	103	112	110	105	79	67	57	49
F-4520					388	609	440	274	308	330	329	328	283	324	453	
F-4521					364	269	256	177	159	138	129	118	98	70		
F-453					81	215	99	83	79	83	79	77	76	73	64	66
F-454					262	395	334	330	344	341	338	294	226	167	145	127
G	792	2259	2497	2245	2701	2797	2170	1618	1567	1436	1482	1522	1460	1471	1504	1527
H	145	343	455	463	746	480	332	289	293	282	296	316	273	220	266	272
I	125	323	450	459	471	542	427	310	318	332	348	394	319	307	357	361
Total	1062	2925	3402	3167	5377	5307	4127	3147	3171	3054	3111	3154	2814	2699	2846	2402

Table 5A: Sectors and Number of Firms in each Sector
ISE Firms Data Set

Tradable Sector	
Sector	**Number of Firms**
Food and Beverages	23
Textile	25
Furniture	2
Paper	14
Chemicals	20
Metal	25
Metal Products	15
Other Manufacturing	1
Total	125

Non-tradable Sector	
Sector	**Number of Firms**
Rocks and Sand	25
Electricity	3
Construction	2
Whole Sale	3
Retail Sale	7
Hotels and Restaurants	5
Transportation	4
Communication	1
Total	50

Table 6A: Regression Results
CBT Company Accounts Survey Data Set

Dep Var.	Tradable		Non-tradable	
I/K(-1)	FE		FE	
Variable	1	2	1	2
I(-1)/K(-2)	0.099	0.178	0.263	0.032
	0.148	0.152	0.196	0.172
$[I(-1)/K(-2)]^2$	0.225	0.190	-0.167*	-0.092
	0.245	0.234	0.098	0.077
S/K(-1)		0.016		-0.040
		0.010		0.026
S(-1)/K(-2)	0.019**	0.003	-0.013	0.010
	0.009	0.011	0.011	0.014
CF/K(-1)		0.049*		0.310***
		0.026		0.116
CF(-1)/K(-2)	-0.019	-0.029	0.059	0.134**
	0.028	0.024	0.070	0.067
Constant	-0.007	-0.016		-0.413
	0.059	0.056		0.518
# of Obs.	222	222	103	103
R-sq.	0.475	0.497	0.429	0.428

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.
Random effects results are very similar and Hausmann test prefers FE results.

Table 7A: Pooled Regression Results
CBT Company Accounts Survey Data Set

Dep Var. I/K(-1)	1		2	
Variable	FE	RE	FE	RE
I(-1)/K(-2)	0.268**	0.275***	0.446***	0.465***
	0.113	0.101	0.106	0.099
$[I(-1)/K(-2)]^2$	-0.153**	-0.102**	-0.238***	-0.201***
	0.064	0.044	0.056	0.046
S/K(-1)			0.028***	0.026***
			0.005	0.005
S(-1)/K(-2)	-0.007	-0.005	-0.020***	-0.027***
	0.011	0.004	0.007	0.005
CF/K(-1)			0.043	0.056*
			0.030	0.033
CF(-1)/K(-2)	0.001	0.014	-0.006	0.017
	0.029	0.024	0.029	0.025
D*CF/K(-1)			0.223***	0.192***
			0.078	0.074
D*CF(-1)/K(-2)	0.044	0.069*	0.105***	0.045
	0.044	0.041	0.035	0.035
Constant	0.124	0.065		0.035
	0.086	0.049		0.033
# of Obs.	325	325	325	325
R-sq.	0.309	0.323	0.526	0.611
Hausman (p-value)	1.000‡		1.000‡	

* 10%, ** 5%, *** 1% Significance levels. Standard deviations are in parenthesis.

‡ Generalized Hausman Test is used instead of Hausman Test.

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