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**Article**

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Financial Innovation

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Springer Nature

*Suggested Citation:* Ergün, Bahadır; Doruk, Ömer Tuğsal (2020) : Effect of financial constraints on the growth of family and nonfamily firms in Turkey, Financial Innovation, ISSN 2199-4730, Springer, Heidelberg, Vol. 6, Iss. 1, pp. 1-24,  
<https://doi.org/10.1186/s40854-020-00188-z>

This Version is available at:

<https://hdl.handle.net/10419/237211>

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# Effect of financial constraints on the growth of family and nonfamily firms in Turkey

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## Abstract

This study examined whether family-owned firms have advantages for accessing external financial sources for growth. Especially in developing countries with imperfect markets, firms can face difficulties accessing external financing sources; however, family-owned firms might have some advantages in this regard over nonfamily firms. Unlike previous studies, this study considered that, in the Turkish context, nonfamily firms are financially constrained while family firms are not. To examine this hypothesis, we used the generalized method of moments (GMM) approach to analyze panel data from 2006 to 2017. The findings showed that financing constraints were a significant obstacle to growth for nonfamily-owned manufacturing firms while the effect was not present for family firms since they are controlled by large, well-established family groups. These results elucidate the relationship between corporate ownership and growth among Turkish firms, especially those with strong links to large family-owned corporations. The results also revealed that reputation and network may facilitate easier access to external financing sources, especially when considering the “Big Six” family ties of firms.

**Keywords:** Financing constraints, Firm growth, Turkish manufacturing sector, GMM

**JEL codes:** D22, G32, O16

## Introduction

Access to financing is a significant constraint for firms operating in developing countries with incomplete financial liberalization processes (Chauvet and Jacolin 2017; for Turkey, see Gezici 2007). Such financing constraints have attracted research interest (for seminal studies, see Fazzari et al. 1988; Carpenter and Petersen 2002). Similarly, research on family firms has increased in recent years, with a particular focus on the differences between family and nonfamily firms (Zellweger et al. 2010). Along these lines, the present study aimed to reveal the relationship between financing constraints and firm growth in family and nonfamily firms in the context of the developing Turkish economy.

Business growth is affected by the costs and availability of financing (Binks & Ennew, 1996). Financing sources include internal cash flow and external debt or (new) equity.



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According to Modigliani and Miller (1958), in perfect markets, these sources are perfect substitutes for firms. However, a large body of literature has suggested that these sources do not have the same impact on all firms, and their accessibility may differ as well (Andres 2011). If a firm cannot obtain external financing, the only source left is its own internal cash flow. This means the firm is financially constrained.

The present study has its roots in Fazzari et al. (1988); Andres (2011); and Carpenter and Petersen (2002). Since Fazzari et al.'s (1988) seminal paper, many subsequent studies of financing constraints have demonstrated the dependency of firm investment on internal cash flow. In this strain of literature, Andres (2011) was one of the earlier studies to focus on family firms. That study suggested that founding family firms are less vulnerable to external financing constraints and face relatively lower agency costs. While the main concern of prior studies had been investment, Carpenter and Petersen (2002) moved the financial-constraint literature forward by focusing on firm growth.

Following these studies, the present study explored the financing-constraint–firm-growth nexus in the context of family and nonfamily firms in Turkey. Unlike previous studies, this study applied the literature on financial constraints, firm growth, and family firms to the context of Turkey as a developing economy and employed an advanced econometric panel-data method.

We propose that family firms have some structural features that tend to mitigate financing constraints in the Turkish economy context. The existing literature tends to assume that family firms are financially constrained (Andres 2011; Coleman and Carsky 1999; Croce and Marti 2017; Lopez-Gracia and Sanchez-Andujar 2007; Poutziouris 2001). The present study, however, assumes they are financially unconstrained. Since family firms are controlled by large family groups who tend to be highly reputable and have close ties to financing institutions, we assume they are financially unconstrained. We also estimated our model based on the “Big Six” family groups, who manage more than 50% of the manufacturing sector. Thus, this study contributes to the literature by focusing on the nexus of financing constraints and firm growth in the context of family firms and the related effects of network and reputation in a developing country where equity markets are limited, and credit rationing occurs.

Several studies have found that, in developing countries, financial liberalization policies are insufficient for supporting the finance–growth nexus and for mitigating firms' financing constraints (Demir 2009a; Gezici 2007; Laeven 2003; Ro et al. 2017). Likewise, there is no clear evidence that financial liberalization eases financing constraints in Turkey (Demir 2009a; Günçavdı et al. 1998). Turkey still has an underdeveloped capital market, even though it has initiated financial liberalization processes.<sup>1</sup> Capital market imperfections persist in Turkey, including credit rationing (Günçavdı et al. 1998) and a lack of capital market deepening (Demir 2009a, 2009b, 2009c; Capital Markets Board [CMB; in Turkish, SPK] 2019). Turkish capital markets are dominated by public bonds (SPK (CMB) 2019), which account for more than 75% of the capital market. Further, the market capitalization of publicly traded firms is lower than that of the Organization

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<sup>1</sup>In the current literature, the assumption that financial liberalization can support firm growth by boosting available funds through equity markets and financial institutions is supported. However, there are capital market imperfections in the Turkish economy (Demir 2009a, 2009b, 2009c). Stiglitz (2000) and Ang (2011) examined the deepening financial problems related to institutional transformation in developing countries. Moreover, while financial liberalization reforms are expected to reduce corruption (Jha 2018, 2019), such reduction might actually hinder firm growth (Ayaydn & Hayaloğlu, 2014).

for Economic Co-operation and Development and the global average (see World Bank World Development Indicators (World Bank 2019) for details). It is structurally harder to obtain external financing in Turkey, even for large publicly traded firms.<sup>2</sup> Moreover, the Turkish economy has been dependent on manufacturing since the structural transformation of the early 1980s.<sup>3</sup> In 2018, manufacturing accounted for approximately 20% of the gross domestic product (GDP). Furthermore, listed family-owned manufacturing firms have close ties to six influential families (i.e., the “Big Six”: Koç, Sabancı, Anadolu, Zorlu, Doğan, and Ülker), who hold more than 50% of the total equity in this sector. Thus, in the present study, nonfamily-affiliated firms are considered financially constrained since family membership offers the advantage of mitigating financing constraints.

Because of data limitations for family-based SMEs (small- and medium-sized firms) in Turkey, we studied large publicly held family firms. These are large companies owned and managed by a small number of families. This perspective provides for a unique analysis of the link between financing constraints and growth in emerging markets. This study aimed to fill a gap in the literature by focusing on the differences between family and nonfamily firms’ growth dependency on internal cash flow in a developing-country context. To the best of our knowledge, this study is among the first to consider the link between financing constraints, firm growth, and family-firm status in a developing country, with a focus on mitigating financing constraints in the face of capital market imperfections. In Turkey, the pyramidal state-organized business system has dominant characteristics; therefore, family firms are closely linked to reputation channels, and they show competitive dominance in the oligopolistic manufacturing sector. Thus, examining the financing-constraint hypothesis with regard to family ownership has important implications for the current related literature, especially the literature on emerging economies.

The rest of this paper is organized as follows: The second section presents the literature review and hypotheses. Then, we provide detailed information about the dataset and estimation methods. The fourth section discusses the econometric estimation results. In the fifth and final section, the findings, limitations, and suggestions for future research are discussed.

## Literature review and hypotheses

### *Literature review*

As previously mentioned, this study combined three strands of financial economics literature to examine the relationship between financing constraints and firm growth in the context of family firms in Turkey.

Financing constraints are considered a significant obstacle for firms that need external financing for their intangible or fixed capital investments (or research and development [R&D] investments) to meet their growth or profit goals. Thus, access to external financing plays an important role in firm growth. According to modern finance theories, under perfect capital market conditions, access to financing is dependent on

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<sup>2</sup>Using data for public manufacturing firms in Turkey, Demir (2009a) noted that “large firms are found to be more dependent on internal funds than small firms.”

<sup>3</sup>Structural transformation is beyond the scope of this article. As such, we only briefly mention the transition from agricultural production to manufacturing following the coup d’état in 1980.

corporate behavior (Harris and Raviv 1988; Myers and Majluf 1984). However, the reverse of the Modigliani and Miller (1958) theorem is the case in developing countries where, under imperfect capital market conditions, financial frictions are more often observed than in developed countries.

The financing-constraint hypothesis has been widely examined in the literature from the perspective of investment (Andres 2011; Atallah et al. 2014; Bertoni et al. 2010; Chen and Chen 2013; Chowdhury et al. 2016; Cleary 1999; ; Fazzari and Mott, 1986-1987; Fazzari and Petersen 1993; Fazzari et al. 1988; Hoshi et al. 1991; Hovakimian 2009; Kaplan and Zingales 1997; Serrasqueiro et al. 2016; Ughetto 2014). Those studies focused on financing constraints in developed countries. Only a handful of studies, however, have explored the financing-constraint hypothesis in developing countries (Bhaumik et al. 2012; Crnigoj and Verbic 2014; Demir 2009a; Ganesh-Kumar et al. 2001; George et al. 2011; Gezici 2007; Guariglia and Yang 2016; Laeven 2003; Lin and Bo 2012; Ro et al. 2017; Saeed and Vincent 2012; Shin and Park 1999). In the financial constraint–investment nexus literature, a few studies have examined financially constrained firms in developing countries in terms of family ownership or business group affiliations (Andres 2011; Bhaumik et al. 2012; George et al. 2011; Hoshi et al. 1991; Lensink et al. 2003; Shin and Park 1999).

In Hoshi et al.'s (1991) sample, firms unaffiliated with a business group faced problems accessing external financing. Shin and Park (1999) investigated the investment–cash-flow dependency of Korean firms in terms of their membership in conglomerates (i.e., *chaebols*, which are owned by a single large shareholder or by families). They found that *chaebols* were significantly less dependent on their cash flow for investment; however, non-*chaebols* were significantly reliant on internal cash flow. Lensink et al. (2003) suggested that business group–affiliated firms in India had better access than nonaffiliated firms to external financing. Bhaumik et al. (2012) suggested that business groups in India had easier access to external credit. Andres (2011) found that founding-family ownership was associated with lower agency costs and could reduce information asymmetry regarding external financing sources. In summary, the literature has indicated that being a business group member or a family firm is beneficial for overcoming cash-flow constraints for investments. Such firms are less dependent on their own cash flow.

Carpenter and Petersen (2002) developed a new approach to the financing-constraint hypothesis. Their approach, which has been adopted in subsequent studies, focuses on the relationship between financing constraints and firm growth (Coluzzi et al. 2015; Donati 2016; Fagiolo and Luzzi 2006; Guariglia and Mizen 2012; Guariglia et al. 2011; Hutchinson and Xavier 2006; Miroshnychenko et al. 2019; Oliveira and Fortunato 2006; Quader 2017; Serrasqueiro et al. 2010; Wagenvoort 2003; Yazdanfar and Turner 2013).

Some of the above-mentioned studies focused on the relationship between firm growth and financial constraints. Others have tested Gibrat's law<sup>4</sup> or other determinants of firm growth. In these studies, cash flow was used as an indicator of internal financing-generation capacity. Difficulty accessing external financing and having to finance growth through internal cash flow has produced larger cash-flow coefficients in models built to depict the determinants of growth.

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<sup>4</sup>Gibrat's law, or the rule of proportionate growth, proposes that firm growth does not depend on initial size or previous growth rates (Gibrat 1931). A review of the literature indicates that this has been widely tested (Sutton 1997).

From another perspective, a decrease in firm growth resulting from a lack of internal cash flow indicates reliance on increasing internal cash flow and problems accessing external financing. According to Carpenter and Petersen (2002), most small firms are constrained by internal financing for growth. Thus, only the small number of firms that use a great deal of external equity financing are less reliant on internal financing. Wagenvoort (2003) found that the relationship between growth and internal cash flow increases positively with a decrease in firm size. Meanwhile, listed firms suffer less from financing constraints. Hutchinson and Xavier (2006) explored differences in financing constraints between Slovenia and Belgium. They found that the growth of Slovenian firms was more constrained by internal financing than was the case for Belgium firms. In addition, the effect of cash flow on firm growth increased with a decrease in firm size. Oliveira and Fortunato (2006) suggested that the growth of young and small firms hinges on their internal cash-flow capacity. Fagiolo and Luzzi (2006) found that firm size was negatively affected by an increase in liquidity constraints. Serrasqueiro et al. (2010) demonstrated that cash flow is an important factor in the growth of SMEs; in addition, its influence increases when firm size decreases. Guariglia et al. (2011) found evidence that state-owned firms had access to external financing for growth; however, private firms were financially constrained. Exploring internal fund dependency in some Asian countries, Guariglia and Mizen (2012) found that firms used all their internal cash flow for growth, even during the 2008 global financial crisis. Yazdanfar and Turner (2013) found that internal cash flow had a positive effect on firm growth while Coluzzi et al. (2015) found that in five Euro-area countries, especially those with a larger percentage of small firms, the availability of internal cash flow had a more apparent effect on firm growth. Donati (2016) observed a positive effect of cash flow on firm growth in most sectors while Quader (2017) found that firm growth was dependent on profit-generation capacity. Therefore, an easing of financial constraints facilitates firm growth through access to external financing sources, and the incremental influence of cash flow on firm growth decreases monotonically. Finally, Miroshnychenko et al. (2019) found a positive effect of internal cash flow on firm growth. Table 1 provides more detailed information about the aforementioned literature.

In summary, the review of the literature revealed that firms are financially constrained by their cash-flow-generation capacities. Researchers have explored differences in financing constraints based on firm size, age, geography, and other characteristics. Our literature review suggests that the present study is the first to focus on the effects of differences in dependence on internal cash flow on the growth of family- and nonfamily-owned firms. The current literature indicates that family firms have their own characteristics and have limited access to financing since they are relatively small (Anderson and Reeb 2003; La Porta et al. 1999; Shleifer and Vishny 1986; Ali et al. 2007; Anderson and Reeb 2003; Andres 2008; Asaba 2013; Block 2012; Chen et al. 2014; Chrisman et al. 2004; De Massis et al. 2014; Herrero 2011; Luo and Chung 2013; Maury 2006; Songini & Gnan, 2015; Villalonga and Amit 2006). However, family ownership may enable access to external finance channels. Such examples may not be generalizable given the nature of family firms. However, the pyramidal state-organized business system provides insight into the link between financing constraints and firm growth in developing countries (see Akkemik and Özen 2014, on the pyramidal state-organized business system in Turkey).

**Table 1** Literature Review

Author(s)	Year	Country	Time Span	Sample	Findings
Carpenter & Petersen	2002	USA	1980–1992	1637 small manufacturing firms	Firms generally retain all of their income and they use little or no external finance. They are constrained by internal finance
Wagenvoort	2003	EU Members	1996–2000	194,208 manufacturing and construction firms (SMEs)	The growth of the smaller firms rely on internal cash flows more than the larger firms
Fagiolo & Luzzi	2006	Italy	1995–2000	14,277 manufacturing firms (covering 90% of all Italian firms with sales larger than 1 M Euros)	Small firms show greater growth performance but they are also affected by financial constraints.
Hutchinson & Xavier	2006	Slovenia and Belgium	1993–2000 for Belgium and 1994–2002 for Slovenia	7139 Belgian and 4992 Slovenian manufacturing firms (Micro, SME, and large firms)	Slovenian firms are affected more from the financing constraints than the Belgian firms. Foreign firms can find external finance. De novo firms and firms with long term debt are the most reliant on the availability of internal finance for growth.
Oliveira & Fortunato	2006	Portugal	1990–2001	7653 surviving manufacturing firms (with all size classes, including micro firms)	The growth-cash flow sensitivity is greater for the smaller and younger firms.
Serrasqueiro et al.	2010	Portugal	1999–2006	2278 unlisted Portuguese SMEs	Cash flow dependency of growth takes higher importance for the smaller firms.
Guariglia et al.	2011	China	2000–2007	79,841 unlisted manufacturing and mining firms	State-owned firms are not constrained by their internal cash flow. However, the private firms especially those operating in coastal regions, with negligible foreign ownership, have problems accessing external finance.
Guariglia & Mizzen	2012	China, Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand.	2001–2009	19,918 firm-year observations	Internal cash flows positively affect firm growth (measured by the growth of the assets). The result means the growth of the firms relies on internal cash flows.
Yazdanfar & Turner	2013	Sweden	2007–2008	10,383 micro firms	The growth of micro firms is positively affected by internal cash flows. This means they are reliant on their own cash flows to grow.
Coluzzi et al.	2015	France, Germany, Italy, Portugal, and Spain	1993–2005	482 firms (with different firm types)	The growth of the firms is positively linked to internal cash flows.

**Table 1** Literature Review (*Continued*)

Author(s)	Year	Country	Time Span	Sample	Findings
Donati	2016	Italy	2011–2008	76,464 surviving SMEs firms	The effect of cash flow is positive and significant for all sectors. But firms belonging to low and medium-low technologies sectors are more liquidity constrained.
Quader	2017	UK	1981–2009	1122 listed firms on the London Stock Exchange	The findings are parallel with financial constraints stemming from market imperfections and refer a larger firm growth-cash flow dependency for firm years facing the most binding financial constraints
Miroshnychenko et al.	2019	Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, and Switzerland	2002–2011	832 non-financial and non-regulated European publicly-traded firms	The relationship between firm growth and cash flows is positive and significant which addresses problems about accessing external finance.

### **Hypotheses**

The main hypothesis of this study is that family-owned firms have advantages for accessing external financing for growth. Despite the perfect-market assumption, which dates back to Modigliani and Miller (1958), where all of the financing sources are perfect substitutes for each other, firms may have limited access to external financing in incomplete and imperfect markets, especially in developing countries. The sources of such distortion include asymmetric information, agency costs, and transaction costs (Andres 2011). We argue that being a family firm reduces the asymmetric-information problem (Shin and Park 1999).<sup>5</sup> Further, family firms are subject to fewer agency costs (Anderson and Reeb 2003). The incentive structures in family firms reduce agency conflicts between debt and equity claimants. Moreover, bondholders believe that family firms can better protect their interests (Anderson and Reeb 2003). These factors lead to easier access to external financing.

Moreover, we claim that, relative to nonfamily firms, family firms have structural advantages that mitigate financing constraints. Reputation and network effects are other factors that may facilitate access to external sources. Lensink et al. (2003) emphasized the significant effect of reputation on access to financing, noting that “the group name may serve as a high-quality brand name, or familiarity with other firms of the same group may induce a creditor to be more willing to lend to a

<sup>5</sup>Shin and Park (1999) noted that problems of information asymmetry can be effectively reduced among firms within the same chaebol (a large conglomerate owned by a single shareholder or family in Korea). This is similar to the organizational structure of family firms in Turkey. Thus, we propose that family-firm status reduces the problem of information asymmetry in our sample.

<sup>6</sup>The family firm is a type of business group in the Turkish economy. While Lensink et al. (2003) emphasized the relationship between financing constraints and business groups, the reputation effect can be applied to the family-firm sample in the present study.



firm” (p. 95).<sup>6</sup> In addition, the information-gathering channel might also be more effective for family firms than for their nonfamily peers. CEOs and other executives use information disclosure more efficiently than their nonfamily-firm peers since agency costs are expected to be minimal for family firms in our sample. This is because the family firms in this study belong to well-regarded small families, and therefore their executives are able to sustain their corporate cultures.

Stiglitz (2000) emphasized that information gathering is important for efficient firm-level decisions under imperfect capital markets. Family firms are managed by small families with a good reputation, and therefore they can gather relevant information about the financial markets. Akkemik and Özen (2014) and Gökşen and Üsdiken (2001) noted that the Turkish institutional environment is a kind of state-organized business system, and Turkey is dominated by large family firms. A majority of Turkey’s nongovernment firms are owned by families (Gunduz and Tatoglu 2003). Among publicly held firms in Turkey, 80% are controlled by families (Yurtoglu 2003). Further, the pyramidal structure of family firms amplifies family ownership (Oba et al. 2010). The essential characteristics of the Turkish institutional environment include its financial system and business-group membership. Most banks in Turkey belong to families that operate a large number of financial and manufacturing firms. This could lead to those families’ interests being favored in terms of monitoring (Yurtoglu 2000).<sup>7</sup>

Given Turkey’s underdeveloped capital market, firm growth may be reliant on internal cash-flow-generation capacity. We assert, however, that family firms can tackle such financing constraints based on their natural characteristics and their reputation and network channels.

Thus, the main study hypotheses are expressed as follows:

*H1a: For family firms, there is no relationship between financing constraints and firm growth.*

*H1b: For nonfamily firms, there is a positive relationship between financing constraints and firm growth.*

The results obtained from testing these hypotheses may offer insight into the firm growth–financial constraint nexus in terms of family membership, especially in “state-organized business” markets in developing countries.

<sup>6</sup>The family firm is a type of business group in the Turkish economy. While Lensink et al. (2003) emphasized the relationship between financing constraints and business groups, the reputation effect can be applied to the family-firm sample in the present study.

<sup>7</sup>The current literature, as highlighted by Lensink et al. (2003), indicates that family ownership and cross-holdings of equity can provide advantages in the form of intercorporate loans, deposits, and investments. In Turkey, however, since 2006 (the start date of the analysis), firms belonging to conglomerates with their own banks are not required to get credit through banks. This is in accordance with the “Regulation on Procedures and Principles for Determination of Qualifications of Loans and Other Receivables by Banks and Provisions to Be Set Aside.” Thus, there is no easy way to obtain credit for the main shareholder, even if the firm belongs to a conglomerate or a holding structure that owns a bank. The regulation stipulates the strict monitoring of banks and conglomerates by the Banking Regulation and Supervisory Agency (BRSA; in Turkish, Bankacılık Denetleme ve Düzenleme Kurumu). Offshore and lending activities for the main shareholders existed during the pre-Regulation period (Delikanlı et al. 2012) but not the post-Regulation period (Doruk 2014). Therefore, this bank connection provides a useful monitoring advantage for firms, helping them to avoid the credit rationing problem. As such, family firms can get funding for investment and growth. Their nonfamily peers, however, may miss growth opportunities since they face the credit rationing problem.

## Data and method

### Dataset

This study used a firm-level dataset of publicly listed manufacturing firms from 2005 to 2017. All of the firm-level data were annually based and were obtained from the Finnet database.<sup>8</sup> The dataset comprised 165 manufacturing firms that met the study criteria. The following data-cleaning methods were applied: Firms for which sales, assets, and capital stocks were either zero or missing were excluded. Outliers were cleaned by trimming the top and bottom 1% of the tails of the variables; this was because the outliers might have involved poor accounting conditions, mergers, acquisitions, or other firm-level issues that could have led to a misinterpretation of the results. The sample comprised 165 firms for the period 2006–2017 after taking the growth values of the firms. The variables were deflated using a wholesale pricing index to remove the effect of inflation on the variables or estimations.

Table 2 presents the descriptive statistics for the variables used in the analysis. For the whole sample and in average terms, the yearly firm growth rate was approximately 2.85%. The firms used debt and equity equal to almost half of their capital stock at the beginning of the period. Capital comprised nearly one-third of the total assets. Firm size was approximately 18.65. Lastly, the amount of internal cash flow generated by the firms was 40% of the previous year's capital stock. Table 2 also provides descriptive statistics regarding the differences between family- and nonfamily-owned firms in terms of the largest block-holder criteria<sup>9</sup> for the family-firm definition. In summary, the growth ratios for family-owned firms were nearly 1% larger than for nonfamily firms. The leverage ratios of family firms were also bigger than those of nonfamily firms by 2%, even if the asset tangibility ratios of nonfamily firms were 5% larger. The firm size of family firms was found to be smaller. Finally, the internal cash-flow generation capacity of family firms was larger than that of nonfamily firms by 8%.

### Variable construction and econometric model

#### *Dependent variable*

$Growth_{i,t}$  was the dependent variable. In studies of the firm growth–financing constraint nexus, firm growth has been measured by sales data or the increase in total assets or employment. Because of the ability to reflect both short- and long-term changes in firms (Davidsson and Wiklund 2006), this study calculated firm growth as the growth rate of net sales—that is, the logarithmic difference between current net sales and lagged net sales.

#### *Financing constraints variable: nonfamily firms*

Because of family firms' advantage of easy access to external financing in Turkey, nonfamily-owned firms or firms with no family ties were classified as being financially constrained (see explanations in the hypotheses section).

The definition of family firm is still vague in the literature. Although Villalonga and Amit (2010) argued that choosing a definition is not a semantic matter, there are nevertheless different ways of defining family firms. For example, Ang et al. (2000) required

<sup>8</sup>Finnet is a private database that provides bulk downloads for the balance sheets and income statements of publicly held firms on the Borsa İstanbul. For details, see [Finnet.com.tr](http://Finnet.com.tr).

<sup>9</sup>See the next section (Variable Construction and Econometric Model).

**Table 2** Descriptive Statistics

Variable	Notation	Mean	Std. Dev.	Observations
<i>Whole Sample</i>				
<i>Firm Growth</i>	$Growth_{i,t}$	0.0285245	0.2015702	$N = 1805$
<i>Leverage</i>	$Lev_{i,t}$	0.5011674	0.3446351	$N = 1846$
<i>Asset Tangibility</i>	$K_{i,t}/A_{i,t}$	0.3749051	0.2877649	$N = 1847$
<i>Firm size</i>	$Size_{i,t}$	18.65363	1.55895	$N = 1846$
<i>Cash Flow Rate</i>	$CF_{i,t}/K_{i,t-1}$	0.4000716	0.4982892	$N = 1807$
<i>Family Firms</i>				
Variable	Notation	Mean	Std. Dev.	Observations
<i>Firm Growth</i>	$Growth_{i,t}$	0.0328215	0.1910388	$N = 1015$
<i>Leverage</i>	$Lev_{i,t}$	0.5098699	0.3377788	$N = 1048$
<i>Asset Tangibility</i>	$K_{i,t}/A_{i,t}$	0.3530055	0.1755016	$N = 1052$
<i>Firm size</i>	$Size_{i,t}$	18.58501	1.561491	$N = 1052$
<i>Cash Flow Rate</i>	$CF_{i,t}/K_{i,t-1}$	0.4361685	0.5331479	$N = 1019$
<i>Non- Family Firms</i>				
<i>Firm Growth</i>	$Growth_{i,t}$	0.0230037	0.2143399	$N = 790$
<i>Leverage</i>	$Lev_{i,t}$	0.4897385	0.3533249	$N = 798$
<i>Asset Tangibility</i>	$K_{i,t}/A_{i,t}$	0.4038841	0.3876573	$N = 795$
<i>Firm size</i>	$Size_{i,t}$	18.74454	1.551887	$N = 794$
<i>Cash Flow Rate</i>	$CF_{i,t}/K_{i,t-1}$	0.3533929	0.4452312	$N = 788$

at least 50% of firm shares to be held by the family. Anderson and Reeb (2003) used the fractional equity ownership of the founding family and/or the presence of family members on the board of directors to identify family firms; this definition does not require a threshold for family control or ownership. According to Barth et al. (2005), a family firm is one in which an individual shareholder or a family holds at least 33% of the shares. Villalonga and Amit's (2006) definition requires at least 5% of the shares to be held by officers, directors, or owners from the family. Pérez-González (2006), meanwhile, suggested that a firm is a family firm if it has two or more biologically related individuals as directors, officers, or shareholders, where one individual holds at least 5% ownership. Exploring listed family firms in Turkey, Sener (2014) defined a firm as a family business if the family is the largest shareholder and holds at least 20% of voting rights. In this regard, La Porta et al. (1999) argued that 20% voting rights is usually enough to control a firm. Yousaf et al. (2019) defined a family firm as one in which the family owns at least 20% of the shares or at least 33% of the shares are owned by one person or family.

This study defined family firms in three ways. In the main model, the criterion for family firm was based on the largest family block holdings,<sup>10</sup> as in Anderson and Reeb (2003). Furthermore, most firms in our family-firm sample belonged to the founding families or the families were represented on the board of directors. For the robustness checks, we used 50% and 20% thresholds of family ownership, following Ang et al. (2000) and Sener (2014), respectively. Meanwhile, to more clearly detect reputation and

<sup>10</sup>If the summation of the shares of different families fulfills the criteria, and if the family has equal shares with a nonfamily owner as one of the largest block holders, we assume these firms are also family firms.

network effects, we divided firms according to their affiliation with the Big Six families. The Big Six are important families that mostly dominate the manufacturing industry.

The family-firm variable is a dummy variable that takes 1 if a firm is a family firm and 0 otherwise. The family-firm dummy was then interacted with the cash-flow variable to measure the effect of internal financing and family (nonfamily) affiliation on firm growth. Therefore, we used  $Nonfamf^*CF_{i,t}/K_{i,t-1}$  as the financing-constraint variable while  $famf^*CF_{i,t}/K_{i,t-1}$  represented financially unconstrained firms. The cash-flow variable was estimated by dividing net operational profit plus amortization and depreciation to capital stock in the beginning of the period. Then, we interacted the cash-flow variable with nonfamily firms in the sample. The interaction between cash flow and family-firm membership was used as a benchmark variable in the analysis ( $famf^*CF_{i,t}/K_{i,t-1}$  in the econometric model).<sup>11</sup>

### Control variables

The relationship between firm growth and financing constraints for nonfamily firms in the Turkish manufacturing sector was analyzed using the following control variables: *leverage*, *firm size*, *lagged growth*, and *asset tangibility*.

*Leverage* ( $Lev_{i,t}$ ) was calculated as total debts over total assets. It was also a control for financial risk level in the model. Financial risks are uncertainties related to any form of financing (Kou, Peng, & Wang, 2014). With a solid capital structure, firms can more easily access financial sources (Wagenvoort 2003), and the ability to finance growth could be reduced by high leverage (Bernanke et al. 1994).

*Firm size* ( $Size_{i,t}$ ) was calculated as a natural logarithm of total assets. Although Gibrat (1931) argued that size and firm growth are uncorrelated, several studies have provided evidence for a relationship (Dunne et al. 1988; Evans 1987). Moreover, according to resource-based theory, larger-scaled firms are more likely to access financial and nonfinancial resources (Yazdanfar and Turner 2013). In the present model, *size* was the control for the ability to access resources for growth.

*Asset tangibility* ( $K/A_{i,t}$ ) was measured as total tangible fixed assets over total assets. *Asset tangibility* was the control for access to collateral channels since collateral is mostly used for obtaining external financing (Almeida and Campello 2004).

In the econometric model, the catch-up effects of firm growth were controlled by *lagged growth* ( $Growth_{i,t-1}$ ) in the estimation. The model used in the econometric estimation was as follows:

$$Growth_{i,t} = \beta_0 + \beta_1 Growth_{i,t-1} + \beta_2 Lev_{i,t} + \beta_3 i, t + \beta_4 \frac{Nonfamf_{i,t}^*CF_{i,t}}{K_{i,t-1}} + \beta_5 \frac{famf_{i,t}^*CF_{i,t}}{K_{i,t-1}} + \beta_6 \frac{K_{i,t}}{A_{i,t}} + \varepsilon_{i,t}, \quad (1)$$

where *growth*, *A*, *K*, *Lev*, and *Size* denote firm growth, asset tangibility, capital stock, leverage, and firm size, respectively. Regarding the hypotheses, we are interested in the coefficients of  $\beta_4$  and  $\beta_5$ . While positive coefficients will indicate an internal cash-flow

<sup>11</sup>We used interaction terms consistent with the current literature on financing constraints (Carpenter and Guariglia 2008; Guariglia and Yang 2016).

dependency for the growth of the aforementioned firm groups, negative coefficients will reveal that the firm groups can access finance (we expect that  $\beta_4 \geq 0$ ,  $\beta_4 < 0$ , or is expected to be insignificant).

### Estimation method

Diff-GMM (difference generalized method of moments) was selected as the estimation method. The GMM method allows for managing endogeneity, heterogeneity, and heteroscedasticity issues that could produce biased econometric estimations.

In the econometric model, the firm-level variables were candidates for potential endogeneity. There was a possibility of bicausal relationships across the variables. Therefore, all of the firm-level variables were treated as endogenous. Endogeneity in the right-hand side firm-level variables is an important matter in econometric estimations based on firm-level observations. The GMM method facilitates managing this endogeneity problem in econometric estimations. The GMM method also addresses heterogeneity across firms in a sample. Moreover, in Turkey, firm growth may be affected by other covariates, such as taxes, corruption, the state of the national and international economy, and infrastructural development. Unfortunately, the dataset we used had no information about such covariates. By using a GMM estimator, which relies on firm-level variables being treated as endogenous or predetermined, we could handle such omitted-variable bias by using the instruments of the variables in our estimations. We also used time dummies to control country-level developments in the estimations. Thus, the GMM estimations were very useful for handling such issues in our econometric estimations. Firms have different production scales and technical levels; therefore, taking the first differences of the variables can minimize the firm-level heterogeneity problem. For this reason, a difference-GMM model was used.<sup>12</sup>

Lastly, the GMM model also manages firm-level or cross-sectional heteroscedasticity through the Arellano and Bond (1991) or M tests. AR and M tests assess and allow for controlling heteroscedasticity in the second-order difference residuals (since GMM estimations rely on t-2 or later lags, AR[2] is accepted as a reliable condition for GMM estimations; see Arellano and Bond 1991).

In addition, diagnostic tests were performed to check the robustness of the estimated GMM model. The first diagnostic test was the previously explained AR or M test. The second was the Hansen *J* test or the Sargan–Hansen test for checking the overidentifying restrictions of the instruments set in the GMM model. The Hansen *J* test was preferred because the robust variance–covariance matrix was used for the instrument set. The third diagnostic test was the Wald test, which evaluates the significance of an estimated model as a whole.

Despite the advantages of the GMM models, the preliminary results were based on panel fixed-effects OLS models, in which endogeneity is a concern. Nevertheless, the panel fixed-effects OLS model estimations are provided as the preliminary results for the model.

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<sup>12</sup>The diff-GMM estimations are subject to the persistence of the dependent variable. However, our estimation results showed that there was no persistence for firm growth (see Tables 3, 4, 5, and 6). Nevertheless, we estimated system-GMM, and the estimation results of the diff-GMM were not altered.

### Results

Before the GMM models were built, panel fixed-effects OLS models were used to perform a preliminary analysis. In the current literature, the estimations of fixed-effects OLS models (or pooled OLS) and GMM models have been used together for robustness checks. Table 3 shows the results of the panel fixed-effects OLS models.

While families were the largest block holders in our main model (Model 1) for the family-firm variable, for the robustness checks, the family-firm criteria were at least 50% and 20% family ownership in Models 2 and 3, respectively. Model 1 indicated that the magnitude of the cash-flow–investment sensitivity of nonfamily owned firms was more than that of family-owned firms. *Leverage* had positive effects while *asset tangibility* had negative effects on firm growth, but these effects were not statistically significant. *Size* significantly positively affected firm growth. *Lagged firm growth* had a statistically significant negative effect. The robustness checks (i.e., Model 2 and Model 3) also supported Model 1.

These results were preliminary because endogeneity was a concern in the OLS coefficients (see the estimation method provided in previous sections). Therefore, GMM models were estimated; Table 4 presents the findings. The findings for Model 4—our main model in the GMM estimations—indicated that the magnitude of cash-flow–firm-growth sensitivity was valid and slightly greater for non-family firms than that found using the panel data model with fixed effects. In Model 4, cash-flow–firm-growth sensitivity was also greater for nonfamily-owned than family-owned firms. Further, such sensitivity was not found to be

**Table 3** Preliminary Analysis: Panel Fixed Effects Regressions

	(1) <i>Growth<sub>it</sub></i> : Main model. Family firm definition: Families are the largest block holders	(2) <i>Growth<sub>it</sub></i> : Family firm definition: At least 50% family ownership	(3) <i>Growth<sub>it</sub></i> : Family firm definition: At least 20% family ownership
<i>Growth<sub>it-1</sub></i>	-0.130*** (-4.62)	-0.129*** (-4.58)	-0.131*** (-4.64)
<i>Lev<sub>it</sub></i>	0.0615 (1.33)	0.0561 (1.20)	0.0623 (1.35)
<i>K/A<sub>it</sub></i>	-0.0623 (-0.84)	-0.0634 (-0.85)	-0.0591 (-0.80)
<i>Size<sub>it</sub></i>	0.0827*** (3.79)	0.0854*** (3.91)	0.0822*** (3.73)
<i>famf<sub>it</sub>*CF<sub>it</sub>/K<sub>it-1</sub></i>	0.114*** (4.21)	0.114*** (3.63)	0.115*** (4.51)
<i>Nonfamf<sub>it</sub>*CF<sub>it</sub>/K<sub>it-1</sub></i>	0.207*** (6.38)	0.177*** (6.00)	0.223*** (5.89)
$\beta_0$	-1.597*** (-3.99)	-1.645*** (-4.09)	-1.589*** (-3.93)
<i>N</i>	1525	1525	1525
<i>R2 within</i>	0.09	0.08	0.09
<i>F stat., p val.</i>	0.00	0.00	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. Variables are defined in Table 2

**Table 4** GMM Estimation Results

	(4)	(5)	(6)
	<i>Growth</i> <sub><i>i,t</i></sub> : Main model. Family firm definition: Families are the largest block holders	<i>Growth</i> <sub><i>i,t</i></sub> : Family firm definition: At least 50% family ownership	<i>Growth</i> <sub><i>i,t</i></sub> : Family firm definition: At least 20% family ownership
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.0853* (-2.04)	-0.0754 (-1.86)	-0.0847* (-2.13)
<i>Lev</i> <sub><i>i,t</i></sub>	0.132 (1.24)	0.125 (1.13)	0.123 (1.11)
<i>K/A</i> <sub><i>i,t-1</i></sub>	-0.180 (-0.96)	-0.153 (-0.80)	-0.152 (-0.83)
<i>Size</i> <sub><i>i,t</i></sub>	0.172*** (3.77)	0.181*** (3.84)	0.167*** (3.68)
<i>Nonfam</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.294* (2.29)	0.189* (2.39)	0.317* (2.27)
<i>fam</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.0740 (1.62)	0.0655 (1.21)	0.0549 (1.23)
Time fixed effects	Yes	Yes	Yes
<i>N</i>	1338	1338	1338
<i>AR</i> (1)	0.00	0.00	0.00
<i>AR</i> (2)	0.12	0.14	0.15
Hansen's <i>J</i> Test, <i>p</i> val.	0.14	0.33	0.18
Wald Test, <i>p</i> val.	0.00	0.00	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. The lag structure: t-2 to t-4. Coefficients for time dummies are not reported. For each econometric estimation, the number of instruments is less than the number of groups (see Roodman 2009). The variables are defined in Table 2

statistically significant for family firms. Moreover, *leverage* had positive but statistically insignificant effects on firm growth while *asset tangibility* had negative but insignificant effects and *firm size* had significant positive effects on firm growth. *Lagged firm growth* and *firm growth* effects were significantly negative. The robustness checks (Models 5 and 6) also confirmed the main model, especially for the main variables.

The findings confirmed the hypothesis that the relationship between cash flow and firm growth is positive for nonfamily firms. Family-owned firms did not have significant cash-flow–firm-growth sensitivity; however, nonfamily-owned firms showed significant cash-flow–firm-growth sensitivity in the Turkish manufacturing sector. The results of the panel fixed-effects OLS models were found to be biased because of endogeneity that might not have been managed by OLS estimation. The results of the Hansen *J* and *AR*(2) tests indicated that there was no overidentification problem in the instrument matrix. In addition, there was no second-order autocorrelation in the difference residuals. The results of the Wald test also indicated that the estimated model was valid as a whole.

Table 5 provides an overview of the findings for the main econometric model, which defined family firms according to the largest block-holder criterion. The hypotheses are confirmed here as well.

**Table 5** Expected & Estimation Results

Variables	Expected sign	Estimation Results
$Growth_{i,t-1}$	-	-
$Lev_{i,t}$	-/+	+, but insig.
$K/A_{i,t}$	+	-, but insig
$Size_{i,t}$	+	+
$famf_{i,t} * CF_{i,t} / K_{i,t-1}$	-/0	+, but insig.
$Nonfamf_{i,t} * CF_{i,t} / K_{i,t-1}$	+	+

The evaluation is made according to the main GMM Model 4

The econometric models were also estimated using the system-GMM method to control the robustness of the findings obtained from the diff-GMM estimations. The findings of the system-GMM models do not alter the diff-GMM findings. The results are given in the [Appendix](#). We also used lagged firm size and firm age in our econometric models in both system-GMM and diff-GMM models. The findings do not alter the main results from the diff-GMM models.<sup>13</sup>

**Further findings: big six families who dominate manufacturing and the Reputation Channel in cash flow–growth sensitivity**

We defined family firms according to their affiliation with the Big Six families to more clearly see the effects of reputation and network. To our knowledge, this is the first empirical analysis of the link between reputation channels and strong families in terms of cash-flow–growth sensitivity in developing countries. We propose that the strongest families have a clear advantage over other firms when it comes to obtaining credit. In Model 7, a firm is a family firm if Big Six family members are the largest block holders while in Model 8, Big Six families hold at least 50% of the shares. We did not forecast the model for the 20% criterion since this criterion and the largest block-holder criterion resulted in the same samples and, naturally, the same results for the Big Six families. The findings presented in [Table 6](#) indicate that firms that did not belong to Big Six families were dependent on their cash-flow capacity for growth. Dependency on cash flow for growth was also positive for Big Six family firms but was statistically insignificant.

**Discussion**

Diff-GMM analysis was performed based on firm-level data for 165 listed firms during the period 2006–2017. Flow variables were used to represent firms’ financing constraints.<sup>14</sup> The analysis confirmed that financing constraints were a significant obstacle for nonfamily-owned firms. It also highlighted the relationship between corporate ownership and firm growth with regard to financial constraints. The growth of family firms

<sup>13</sup>We thank the referees for alerting us to problems that may arise from finite sample bias and dynamic size estimations.

<sup>14</sup>Cash flow was defined as a flow variable rather than a stock variable. Specifically, the cash flow variable refers to cash in the current term rather than the accumulation of cash as a stock variable.



**Table 6** GMM Estimation Results for Big-Six Families

	(7)	(8)
	<i>Growth</i> <sub><i>i,t</i></sub> : Family firm definition: Big-Six Families are the largest block holders	<i>Growth</i> <sub><i>i,t</i></sub> : Family firm definition: Big-Six Families have at least 50% of the shares
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.0676 (-1.66)	-0.0674 (-1.65)
<i>Lev</i> <sub><i>i,t</i></sub>	0.0582 (0.47)	0.0503 (0.42)
<i>K/A</i> <sub><i>i,t-1</i></sub>	-0.0269 (-0.15)	-0.0877 (-0.48)
<i>Size</i> <sub><i>i,t</i></sub>	0.184*** (3.87)	0.186*** (3.83)
<i>Nonfam</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.137* (2.08)	0.147* (2.13)
<i>fam</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.0502 (1.06)	0.0356 (0.72)
Time fixed effects	Yes	Yes
<i>N</i>	1338	1338
<i>AR</i> (1)	0.00	0.00
<i>AR</i> (2)	0.13	0.12
<i>Hansen J Test</i> , <i>p val.</i>	0.31	0.50
<i>Wald Test</i> , <i>p val.</i>	0.00	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. Coefficients for time dummies are not reported. For each econometric estimation, the number of instruments is less than the number of groups (see Roodman 2009). The lag structure: t-2 to t-4. The variables are defined in Table 2

was not dependent on internal cash flow. As expected, family firms could obtain external financing; thus, they were less financially constrained than nonfamily-owned firms.

For nonfamily firms, the effect of cash flow on firm growth was positive and statistically significant at the 5% level. The results showed that nonfamily firms must use internal finances for firm growth. Such an effect was also positive for family firms but statistically insignificant. The coefficients of *leverage* and *size* were positive while the coefficient of *asset tangibility* was negative. However, only *size* had statistically significant effects on firm growth.

The coefficient of the cash-flow variable and its family-firm and nonfamily-firm interaction variables validate the hypotheses. The dependence of family firms on internal finances was lower than that of their nonfamily peers. Moreover, even if family firms have less asset tangibility, their leverage rate is higher than for their nonfamily peers. This may also indicate easier access to external creditors. The effects of reputation and network channels on financing constraints were examined using firms' affiliations with the Big Six families. The Big Six families have clear dominance in the manufacturing sector and have the highest reputation among manufacturing firms. Such a mitigation effect was also valid for firms with Big Six family affiliation.

Moreover, several robustness checks were conducted. Here, the estimations were reestimated using system-GMM models, as well as models with lagged firm size and firm age. The results were not altered.

## Conclusion

This study aimed to reveal the effects of external financing constraints on the growth of listed Turkish manufacturing firms in terms of family ownership effects. Following the seminal work of Fazzari et al. (1988) and Carpenter and Petersen (2002), this study focused on the family affiliations of firms.

Various studies of the firm-growth-financing-constraint nexus have considered the problems of external financing access and constraints on growth resulting from firms' capacity to generate cash flow (Carpenter and Petersen 2002; Coluzzi et al. 2015; Donati 2016; Fagiolo and Luzzi 2006; Guariglia and Mizen 2012; Guariglia et al. 2011; Hutchinson and Xavier 2006; Miroshnychenko et al. 2019; Oliveira and Fortunato 2006; Quader 2017; Serrasqueiro et al. 2010; Wagenvoort 2003; Yazdanfar and Turner 2013). Unlike definitions used in previous studies, this study defined financial constraints based on a firm's nonfamily status. Since family-owned firms in Turkey are well established and are generally organized around holding companies, they have better access to information and networks than nonfamily firms. They also tend to have good reputations. The Turkish institutional environment has the characteristics of a state-organized business system (Akkemik and Özen 2014; Gökşen and Üsdiken 2001). Consequently, family firms have easier access than nonfamily firms to financing sources. Nonfamily firms are thus considered to be financially constrained.

This study's contribution to the literature is threefold. First, we examined the link between internal cash-flow dependency and firm growth in a developing country by focusing on the differences between family and nonfamily firms. Second, we used firms controlled by the Big Six families. These families are well known and hold nearly 50% of the equity in Turkey's manufacturing sector. This may reveal the reputation and network effect in external financing. Third, relatively few studies have explored the relationship between financing constraints and firm growth in developing countries. Therefore, this article fills a gap by examining the interrelationships among financing constraints, firm growth, and family firms in a developing-country context.

According to the findings, even using different criteria to define family firms, family firms still had easier access to external financing. Nonfamily firms, meanwhile, faced financing problems and were dependent on internal cash flow. The results also showed the effects of reputation and network more clearly in terms of external financing.

This study does have some limitations. First, data were only available for publicly held family-owned firms in Turkey. Data for other family-owned firms, or family-based SMEs, were not publicly available. Second, the findings are limited to a single country (Turkey) and are therefore not generalizable to all developing countries. Future studies can explore the relationship between financing constraints and firm growth among family and nonfamily firms in multiple country contexts.

## Appendix

**Table 7** System GMM Results for the Main model

	(1)
	<i>Growth</i> <sub><i>i,t</i></sub> System-GMM: t-4 to t-5
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.0832 (-1.17)
<i>Lev</i> <sub><i>i,t</i></sub>	0.00495 (0.07)
<i>K/A</i> <sub><i>i,t</i></sub>	0.00795 (0.16)
<i>Size</i> <sub><i>i,t</i></sub>	0.00654 (1.81)
<i>famf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.0314 (1.06)
<i>Nonfamf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.111* (2.22)
$\beta_0$	-0.129 (-1.88)
<i>N</i>	1525
<i>AR</i> (1)	0.00
<i>AR</i> (2)	0.13
<i>AR</i> (3)	0.11
<i>AR</i> (4)	0.71
<i>Hansen J Test, p val.</i>	0.15
<i>Diff-Hansen Test, p val.</i>	0.77
<i>Wald Test, p val.</i>	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. Variables are defined in Table 2

**Table 8** System GMM and Differenced GMM results with lagged size

	(1)	(2)
	<i>Growth</i> <sub><i>i,t</i></sub> : Diff-GMM	<i>Growth</i> <sub><i>i,t</i></sub> : System-GMM
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.399** (-3.71)	-0.110 (-1.54)
<i>Lev</i> <sub><i>i,t</i></sub>	0.094 (0.63)	0.00607 (0.09)
<i>K/A</i> <sub><i>i,t</i></sub>	-0.173 (-0.54)	0.000927 (0.02)
<i>Size</i> <sub><i>i,t-1</i></sub>	-0.054 (-1.16)	0.00340 (0.92)
<i>famf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.125 (1.32)	0.0338 (1.11)
<i>Nonfamf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.3545* (3.44)	0.117* (2.25)
$\beta_0$		0.0244 (0.33)
<i>N</i>	1339	1527
<i>AR</i> (1)	0.05	0.00
<i>AR</i> (2)	0.00	0.08
<i>AR</i> (3)	0.12	0.11
<i>AR</i> (4)	-	0.76
<i>Hansen J Test, p val.</i>	0.15	0.19
<i>Diff-Hansen Test, p val.</i>		0.89
<i>Wald Test, p val.</i>	0.00	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. The lag structure of System-GMM: t-4 to t-5, and for Diff-GMM: only t-3. Variables are defined in Table 2

**Table 9** The estimated models with Investment

	(1)	(2)
	<i>Growth</i> <sub><i>i,t</i></sub> System-GMM with investment t-4 t-5	<i>Growth</i> <sub><i>i,t</i></sub> Diff-GMM with investment t-2 t-4
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.0678 (-0.94)	-0.0808 (-1.87)
<i>Lev</i> <sub><i>i,t</i></sub>	-0.0492 (-0.68)	0.110 (0.89)
<i>K/A</i> <sub><i>i,t</i></sub>	0.0605 (1.15)	-0.00211 (-0.01)
<i>Size</i> <sub><i>i,t</i></sub>	0.00659 (1.82)	0.202*** (4.21)
<i>I<sub>i,t</sub>/K<sub>i,t-1</sub></i>	-0.0348 (-0.81)	-0.0131 (-0.38)
<i>famf<sub>i,t</sub>*CF<sub>i,t</sub>/K<sub>i,t-1</sub></i>	0.0299 (0.96)	0.169** (2.86)
<i>Nonfamf<sub>i,t</sub>*CF<sub>i,t</sub>/K<sub>i,t-1</sub></i>	0.122* (2.43)	0.292* (2.41)
$\beta_0$		
<i>N</i>	1500	1299
<i>AR(1)</i>	0.00	0.00
<i>AR(2)</i>	0.12	0.16
<i>AR(3)</i>	0.01	
<i>AR(4)</i>	0.83	
<i>Hansen J Test, p val.</i>	0.44	0.46
<i>Diff-Hansen, p val.</i>	0.94	
<i>Wald Test, p val.</i>	0.00	0.00

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. Variables are defined in Table 2.  $I_{i,t}/K_{i,t-1}$ : investment rate

**Table 10** The estimated models with Age and Size

	(1)	(2)	(3)	(4)
	<i>Growth</i> <sub><i>i,t</i></sub> : System-GMM With age	<i>Growth</i> <sub><i>i,t</i></sub> : Diff-GMM With age	<i>Growth</i> <sub><i>i,t</i></sub> : Diff-GMM with lagged Size and age	<i>Growth</i> <sub><i>i,t</i></sub> : System-GMM with lagged Size and age
<i>Growth</i> <sub><i>i,t-1</i></sub>	-0.0908 (-1.42)	-0.0834* (-2.13)	-0.342*** (-6.64)	-0.128* (-1.99)
<i>Lev</i> <sub><i>i,t</i></sub>	0.0535 (0.95)	0.167 (1.44)	-0.0292 (-0.24)	0.0431 (0.73)
<i>K/A</i> <sub><i>i,t</i></sub>	-0.0269 (-0.60)	-0.117 (-0.62)	-0.283 (-1.34)	-0.0252 (-0.55)
<i>Size</i> <sub><i>i,t</i></sub>	0.0149* (2.40)	0.170*** (3.74)		
<i>famf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.0297 (0.93)	0.128* (2.26)	0.0683 (1.29)	0.0325 (1.01)
<i>Nonfamf</i> <sub><i>i,t</i></sub> * <i>CF</i> <sub><i>i,t</i></sub> / <i>K</i> <sub><i>i,t-1</i></sub>	0.144** (2.81)	0.306* (2.53)	0.303** (3.00)	0.145** (2.74)
<i>Age</i> <sub><i>i,t</i></sub>	-0.00302 (-1.68)	0.0236 (0.21)	-0.0929 (-0.48)	
<i>Size</i> <sub><i>i,t-1</i></sub>			-0.0669 (-1.60)	0.0115 (1.84)
<i>Age</i> <sub><i>i,t-1</i></sub>			-0.203	-0.00281
$\beta_0$			(-0.89)	(-1.53) -0.123 (-1.59)
<i>N</i>	1525	1335	1339	1527
<i>AR</i> (1)	0.00	0.00	0.00	0.00
<i>AR</i> (2)	0.12	0.12	0.00	0.05
<i>AR</i> (3)	0.11		0.11	0.11
<i>AR</i> (4)	0.71		0.52	0.77
<i>Hansen J Test, p</i> <i>value</i>	0.16	0.10	0.12	0.16
<i>Diff-Hansen</i>	0.76			0.77
<i>Wald Test, p val.</i>	0.00	0.00	0.00	0.00
<i>Lag structure</i>	t-4 t-5	t-2 to t-3	t-3 to t-5	t-4 to t-5

*t* statistics in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . All the estimations are based on heteroscedasticity and autocorrelation robust standard error. Variables are defined in Table 2

#### Abbreviations

GMM: Generalized method of moments; CMB: Capital Markets Board (in Turkish, SPK); WDI: World Development Indicators; GDP: Gross domestic product; SME: Small- and medium-sized firm; R&D: Research and development; BRSA: Banking Regulation and Supervisory Agency (in Turkish, BDDK); AR: Arellano-Bond

#### Acknowledgements

We are thankful to the anonymous reviewers for their constructive comments on the earlier version of this paper.

#### Authors' contributions

All authors have a same contribution. The authors read and approved the final manuscript.

#### Funding

No specific financial support was received to carry out the study.

**Availability of data and materials**

The datasets generated and/or analysed during the current study are available in the Finnet database, [[www.finnet.com.tr](http://www.finnet.com.tr)].

**Competing interests**

The authors declare that they have no competing interests.

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Received: 20 February 2020 Accepted: 17 June 2020

Published online: 12 July 2020

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