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The Moderating Role of Corporate Governance on the Relationship between a Firm's Product Lifecycle and Risk-Taking

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ABSTRACT

Management accounting theories claim that firms experience different risks during different stages of a product's lifecycle. This study examines the moderating role of corporate governance on the relationship between a firm's product lifecycle and its risk- taking aspects. The study was conducted from 2006 to 2014 in the Tehran Stock Exchange. We conducted a statistical panel data analysis and the sample consisted of 128 firms (1,152 firm-year observations). The results showed that the decline stage of the product life cycle is the only stage that would affect the risk-taking of the selected firms. Conceivably, there is a positive relationship between the decline stage of the product lifecycle and risk-taking. In addition, the results indicate a positive relationship between the growth and decline stages of a firm's product lifecycle and its risk-taking when corporate governance plays a moderating role. In short, when corporate governance acts as a moderating variable, the relationship between a firm's product lifecycle and its risk-taking is lower than the time when there is no such variable. Hence, regulators and managers should consider the role of corporate governance in all the stages of a product's lifecycle to ensure successful firm decisions and strategies.

Keywords: Risk-taking; product lifecycle; corporate governance; agency theory.

INTRODUCTION

Emergence of literature on product life cycle (Al-Hadi, Hasan & Habib 2015; Habib & Hassan 2015; Rahimi & Fallah 2015) has unambiguously pointed out towards the significance of delineating a firm's risk throughout the product lifecycle. Life cycling of products involves the introduction, growth, maturity, decline, and shake-out stages (Gort & Klepper 1982). In effect, it has given rise to the following question: What is the significant effect of each stage of a product's lifecycle on the firm's risk-taking?

Meanwhile, corporate governance literature (Jensen & Meckling 1976; Lee, Kim & Kim 2016; Paminto 2015; Shleifer & Vishny 1986) reveals that the implementation of suitable corporate governance would enhance the firms' economic efficiency and growth. Hence, strong corporate governance could reduce the firm's risks in various domains. It eliminates or reduces the risk of conflicts of interests among the stakeholders of a firm, particularly the agency relationship between the management and stockholders (Namazi 1985 & 2013). The structure of corporate governance also unequivocally determines the rights and obligations of different stakeholders in the organization i.e. management, board members, shareholders, and other individuals. If the corporate governance mechanisms are effectively designed, the firm is expected to be effective in the decision- making process (Fung 2014). The improved decision -making process of the corporate governance mechanisms may also resulted in reduced risks (Lee, Kim & Kim 2016). Since important decisions related to the products, have to made by the firm, including- whether to maintain existing products or abandon some current products and introduce new ones- a strong corporate governance can significantly affect the relation between the product life- cycling process of the firm and its risks. Filatotchev, Toms and Wright (2006) suggest that governance issues should go beyond economic and financial perspectives to embrace product strategy and knowledge dimensions as well as contexture issues (Filatotchev et al. 2006: 257). They reveal that the corporate governance parameters might be linked to the strategic thresholds in the firm's product lifecycle and that successful transition over a threshold is accompanied by rebalancing the structure and roles of corporate governance at each stage of the lifecycle. In short, the key issues here is: Does corporate governance strengthen the relationship between each stage of the product lifecycle and the firm's risks?

The goal of this article is to respond to the preceding inquiries by examining the relationship between a firm's product lifecycle and its risks, and investigate the moderating role of corporate governance in the relationship. Despite various attempts of considering, the role of corporate governance in this sphere has not yet been investigated. A contemporary issue that has been studied recently is the effect of a firm's product life cycling in its risk- taking projects. Habib and Hasan (2015) maintain that corporate risk-taking is accompanied by the changes in the stages of a firm's product lifecycle. For instance, a firm's financial resource bases are more substantial, and require more risky investment for expansion during the early phase of a firm's product lifecycle. However, during

the decline stage, increased risk-taking is influenced by the firm's aim to return to profitability. Thus, this article contributes by extending the previous studies. It argues that changes in a firm's product lifecycle, will affect its risk-taking when corporate governance operates as a moderating variable. The empirical evidence of the study also indicates that there is a link between corporate governance and the firm's performance at various stages of its product lifecycle and risk-taking.

The rest of the article is structured as follows: Section 2 describes the theory. Section 3 reviews the literature and describes the development of the hypothesis. Section 4 presents the data and the adopted methodology. Section 5 delineates the results, and Section 6 provides a discussion and conclusion of the study.

THEORETICAL BASIS

A firm's risk-taking refers to the amount of uncertainty associated with the expected outcomes and cash flows as a result of investments in new projects (Habib & Hasan 2015; Wright, Ferrris & Awasthi 1996). It can provide some idea about the firm's growth, performance, and survival (Bromiley 1991; Habib & Hasan 2015; Lee, Kim & Kim 2016). According to the agency theory (Namazi 1985; Ross 1973), shareholders prefer of the firms implement positive net present value projects regardless of their associated risks (Faccio, Marchica & Mura 2011). However, managers are primarily influenced by their behavior of the self-interest and are reluctant towards undertaking risky projects (Fama 1980), and are likely to maintain the risk to the resulting significant investments (Parrino, Poteshman & Weisbach 2005). In these situations, when the firms maintain an excessive free cash -flows, growth- maximizing managements will tend to invest in projects where the yield is lower than the firm's cost of capital (Jensen 1986). Any firm earning significant free cash flows is likely to overinvest in negative net present value projects (Saravia 2013).

Low (2009) reveals that the managers with more sustained positions will reduce their risk- taking behavior. Consequently, two potential obstacles may arise such as: an agency problem and a risk- sharing problem (Emenyi 2013). An agency problem appears when the management's goals differ from those of the principals (i.e. moral hazard). This problem also arises when it is difficult or expensive to verify that the managements possesses the expertise and skills to perform the delegated tasks (i.e. adverse selection) that they claim to possess. A risk-sharing problem arises when the principals and the agents have different attitudes towards risk, and, hence, disagreements develop about the actions that should be undertaken (Namazi 1985; 2013; Ross 1973: 136). For these problems, the agency theory proposes two formal types of management mechanisms to monitor the relationships (Rungtusanatham, Rabinovich, Ashenbaum & Wallin 2007: 118). One is the outcome-based management mechanism, in which both the principals and the agents can jointly observe the outcome, and the reward of the agents is based on some observable measured performance (Ekanayake 2004; Choi & Liker 1995). The other management mechanism is behavior-based, in which the principals can establish the behavior controls to monitor the behaviors and efforts of the agents (Eisenhardt 1989; Ekanayake 2004; Emenyi 2013).

Risk-taking can be influenced by agency problems. Two hypotheses for this issue are offered. The first one is the wealth transfer hypothesis (Cummins & Sommers 1996) that argues that the position of the equity holders is similar to a call option, and the value of this call option is determined by increasing the risk of the related assets. It suggests that as the manager's ownership increases his or her interests would become more compatible with the interests of the shareholders. This phenomenon will create a strong incentive to maximize the value of their call options because of adopting a higher level of risk (Galai & Masulis 1976; Chen, Steiner & White 2001).

The second hypothesis is the risk aversion hypothesis (Smith & Stulz 1985) that asserts that as the ownership shares of the managers increase, they become increasingly risk- averse and are more prone to risks (Chen et al. 2001). This risk aversion attitude may guide them to select less risky investments or to operate with larger amounts of capital than what stockholders would define as optimal (García-Marco & Robles-Fernández 2008). These managers will avoid very risky strategies in an attempt to keep their jobs and because they will not receive any extra compensation for getting a higher return by adopting a greater risk, they have no incentive to select risky projects (Rasmussen 1988; Masulis 1987). But, if a sufficient concentration of the ownership structure exists, the agency problem may be attenuated and the degree of risk aversion among managers could be monitored (García-Marco & Robles-Fernández 2008).

On the other hand, a firm's product lifecycle theory (Al-Hadi et al. 2015; Habib & Hassan 2015;) involves describing the characteristics of introduction, growth, mature, decline, and shake-out stages. This theory can be viewed as an extension of the product lifecycle concept, developed in marketing (Rink & Swan 1979). Similar to an individual who moves through a sequence of distinct stages of life, the life of a firm's product can also be described in terms of lifecycle stages. These stages depend on the portfolios of strategies, structures, obstacles, and processes that the product faces over a particular period in its life (Jaafar & Halim 2016). Because of the agency relations discussed earlier and the inherent characteristics of each life cycle, different amounts of risks, investments, cash flow and agency costs are associated with the various stages of the firm's product lifecycle. In other words, the amount of risk is not the same for each firm's product cycle stage; rather it is different at each stage.

Prior Studies and Hypothesis Development

Firm's Product Lifecycle and Its Risk

As environmental and organizational complexities grow by the day, different kinds of knowledge are required to operate the administrative affairs of a firm effectively and efficiently (Filatotchev et al. 2006: 264). Consequently, agency and monitoring issues would grow to become the dominant functions of the firm. With respect to a product's lifecycle, at the stage of maturity for instance- the monitoring function becomes dominant but establishing a suitable monitoring mechanism is costly. Mature firms may also face shortcomings in their corporate governance system and not adapt to the prevalent environmental changes (Filatotchev et al. 2006: 267-268). They may also miss the opportunity to undertake the superior positive net present value projects and maintain a substantial and free cash flow (Jensen 1993). These factors could also increase the amount of the risk and the cost of the agency.

A very limited number of studies have so far been conducted to empirically investigate the relationship between a firm's product lifecycle and its risks. Lin, Chen, Wang and AngelaLiu (2012) revealed that in the growth stage, firms would tend to accept more risk. Financial soundness is the focus of the premise for the developing firms to select risky investment projects. In the growth stage, firms would also focus on future growth rather than current performance. However, for firms in the shake-out stage, neither its resources nor performances affect their risk behavior significantly. In addition, foreign direct investments at each stage of the firm's lifecycle are highly related to the type of industry. Saravia (2013) demonstrated that as firms mature, the agency costs of the free cash-flows will also increase, more anti-takeover provisions will emerge, and firms will invest in projects with returns below their cost of capital. Al-Hadi et al. (2015) found that firms with a separate risk committee are associated with greater market risk disclosures, an effect that is more pronounced for the mature-stage firms. Rahimi and Fallah (2015) examined the lifecycle of the organizations (two banks) and their impact on the formulation of the strategy. They also outlined the peculiar characteristics required for the implementation of the strategy in each lifecycle. Habib and Hasan (2015), found that risk-taking is higher in the introduction and decline stages of the product lifecycle but lower in the growth and mature stages. They also reported that risk-taking during the introduction and decline stages adversely affects the future performance of the firm. This relation is positive for the growth and maturity stages. Habib and Hasan (2015) also reported that the manager's inner risk-taking inclination would increase during the periods of high emotional behavior of the investors. However, firms at different stages of product life cycle, respond to emotional behavior differently. Finally, their results suggested that a firm's life cycle posits explanatory power for a corporate organization's risk-taking behavior. Hence, the following hypothesis is provided:

H_1: Stages of a firm's product lifecycle affects its risk-taking action

The Role of Corporate Governance The theory of the firm (Jensen & Meckling 1976) identifies three factors that can alleviate agency conflicts and also might affect risk- taking: management incentives, monitoring, and ownership structure (Eling & Marek 2014).The structure of the board has especially been identified as a driver of the firm's risk (Pathan 2009). Although corporate governance is about ensuring accountability of the management to minimize downside shareholder risk, it is also concerned with enabling managerial entrepreneurship so that the shareholders benefit from the upside potential of the firms (Keasey & Wright 1993; and Filatotchev et al. 2006).

Eling & Marek (2014) presented an empirical evidence on the link between corporate governance and risk- taking, considering insurers from two large European insurance markets (UK and Germany). They found that higher levels of compensation, increased monitoring, and more block-holders are associated with lower risk-taking. When chief executives officers (CEOs) are encouraged to take higher risks, they might protect themselves from the risk by raising the fixed component proportion of their pay and reducing the variable component (Aggarwal & Samwick 1999). Coles, Daniel and Naveen (2006) suggest that firms that desire to implement risky policies might select a higher sensitivity of CEO's pay to stock return volatility to increase the exposure of the managers to stock volatility. They state that a higher sensitivity of the CEO's pay to stock return volatility would lead to selecting more risky investments and higher equity volatility. In effect, shareholders encourage the CEOs to take risky investment decisions because risky projects create value for the firm and provide gains to the owners. On the other hand, the CEOs with no incentive packages are risk- averse because their compensation, reputation, job security, and career are associated with the firm they manage, and they cannot be diversified. Therefore, a risk-averse CEO prefers to run the firm in a static and stable way (Jafri & Trabelsi 2013).

Jiraporn, Chatjuthamard, Tong and Kim (2015) maintain that weaker corporate governance imposes fewer restrictions on the managers. This provides managers more latitude in organizing corporate policies that reflect their attitude of risk-aversion. Their result reveals that the firms with more effective governance establish corporate strategies that are significantly less risky. Effective governance substantially diminishes the degree of risk-taking.

Shleifer and Vishny (1986) show that major shareholders tend to lead firms towards selecting high-risk and high-return projects. John, Litov and Yeung (2008) and Laeven and Levine (2009) also empirically document that corporate governance affects risk-taking. A board with a greater number of more independent members and more meetings might monitor its executives more strictly. Stricter monitoring would limit executive discretion and decrease the chances of exerting excessive risk- taking.

This might ultimately leads to a negative relation between monitoring and risk -taking.

Even though there is no optimal board size for firms, the size of the board also appears to affect the value of the corporate's organization (Coles, Daniel & Naveen 2008; Uchida 2011), the firm's policy choices, and its risk-taking behavior (Wang 2012). Shareholders posit a significant impact on the firm's financial decisions by holding sizable stakes in the company. They can shape the nature of the firm's corporate risk-taking, which may affect its ability to compete and eventually survive (Paligorova 2010; Wright et al. 1996). Greater insider ownership is an effective means of aligning the interests of managers and shareholders. Nakano and Nguyen's (2012) results indicate that firms with larger boards induce lower performance volatility as well as lower bankruptcy risk. The low cross-sectional variation in risk-taking among Japanese firms is considered to play a role. In addition, they demonstrate that the effect of the board size is less significant when the firms maintain plenty of investment opportunities but it's much stronger when the firms posit fewer growth options. The researchers reported that the negative effect of a large board should be weaker for high-growth firms but more severe for low-growth firms. The reason is that when a firm maintains a large number of projects, these projects can be allocated to and evaluated by smaller sub-groups of directors. Hence, each of these sub-groups is effectively evaluating the same number of projects as complete, but smaller, the board of a firm with fewer projects. In effect, a greater proportion of risky projects survive the screening process (Nakano & Nguyen 2012: 370). Huang and Wang (2014) also showed that smaller boards are accompanied by riskier firm policy choices and, consequently, greater risk for the firm. Their results reveal that Chinese companies with more concentrated ownership are less likely to invest in relatively riskier research and development- intensive investments. The findings also reveals that Chinese companies with smaller boards are more interested in ratifying risky policy choices dovetailed with the shareholders' interest. Garcia-Marco & Robles-Fernandez (2008) studied whether the differences in risk behavior are related to different ownership structures or other constructs such as the size of the entity. They found that Spanish commercial banks were more risk-inclined than Spanish savings banks. They also reported that size is relevant for explaining risk-taking. In general, smaller institutions appear to assume lower risks.

Other studies (Amihud, Lev & Travlos 1990; Bauguess, Slovin & Sushka 2012) also found that large equity holdings by insiders can lead to risk avoidance with respect to business strategies and investments, considering the undiversified financial and human capital of the insiders. As the ownership stake increases, owners maintain greater incentives to raise a firm's profit by selecting risker projects. Concentrating much of their wealth on a single firm might force the major shareholders to lead business from a more risk- adverse situation than if they had diversified the portfolios of the firms (Paligorova 2010). The net effect of the ownership structure on risk-taking is less unambiguous and depends on the optimal trade-off between the costs and benefits of the large ownership interests (Paligorova 2010).

The type of shareholders also plays a potent role in the sphere of a firm's risk-taking (Anderson, Mansi & Reeb 2003). For instance, Saito (2008) indicates that a greater alignment of interest for the family firms affects risk-taking. Paligorova (2010) reports that family firms do not select risky projects as their controlling stake increases. They also participate in a much smaller degree in groups, which makes it impossible to evaluate the effect of the ownership structure on risk- taking in family-controlled groups. The results point out that they avoid risk-taking outside the groups. Thus, the family firms might avoid taking risks due to their goal of passing firms on the next generation (Anderson et al. 2003). The results of the research conducted by Nguyen's (2011) also provide an economic rationale for the higher (and lower) performances of the family- controlled (bank-controlled firms, respectively). The results explain the higher performance of the firms with concentrated ownership by relating their governance structures to risk-taking. Finally, the study shows that the impact of the governance structures on risk -taking is stronger after controlling to avoid endogeneity. John et al. (2008) also demonstrate that superior investor protection leads to riskier and more value-enhancing investments, and strong investor protection is expected to be positively related to risk-taking (Paligorova 2010). Galai and Masulis (1976) point out that shareholders with limited liability tend to display some incentive to take excessive risk to maximize the corporate value at the expense of bondholders. Evidence presented by Chen et al. (2001) demonstrated that the level of a life insurance company's risk is dependent on the level of its managerial ownership. In particular, as the level of managerial ownership increases, the level of risk also increases; thus, it supports a wealth transfer hypothesis over a risk- aversion hypothesis.

Filatotchev et al. (2006) contend that the corporate governance issues go beyond economic and financial perspectives; It encompasses strategy and knowledge dimensions as well as the contextual issues (Filatotchev et al. 2006: 257). They reveal that the corporate governance parameters are linked to the strategic thresholds in the firm's life-cycle and a successful transition over a threshold is accompanied by the study of the corporate governance structure at each stage of the product lifecycle.

Although the preceding studies have enhanced the extent of knowledge in this domain, the effect of corporate governance has not yet been studied thoroughly. Less attention has been given to the effect of corporate governance and its relation to each elements of the product lifecycle (Filatotchev et al. 2006; O'Connor & Byrne 2015). The corporate governance literature in the domain of governance to value has demonstrated a causal relation between corporate governance and the firm's value and risk. However, there is no evidence of a causal relationship

exists between each stage of the firm's product lifecycle and corporate governance. Hence, in this study, corporate governance was used as the moderating variable to investigate its potential impact on the relationship between the firm's product life cycle and its risk.-taking behavior. Hence, this article extends previous research and argues that the changes at each of the stages tend to maintain an effect on the firm's risk-taking. This relationship depends on the corporate governance structure and thus the structure plays a significant role. It provides empirical evidence on the links between corporate governance and risk-taking at various stages of the firm's product lifecycle. Hence, the following hypothesis is provided:

H_2: Corporate governance moderates the relationship between the stage of a firm's product lifecycle and its risk-taking behavior.

Research Method

This study aims to investigate the moderating role of corporate governance on the relationship between a firm's product lifecycle and its risk-taking, as listed in the Tehran Stock Exchange (TSE). Hence, this is an applied research, in which the research plan is based on a one-shot ex-post design only (Smith 2015). Figure 1 shows the conceptual framework of the study.

Population, Sampling and Data Collection

The population of this study comprises all the firms listed on the TSE. The TSE was selected because it is the only market place that lists the larger and established firms in Iran. It is Iran's largest stock exchange, and a member of the World Federation of Exchanges. It's also a founding market of the Federation of Euro-Asian Stock Exchanges and has been identified as an emerging market (Namazi & Khansalar 2011). Although, in recent years, the privatization law has caused the TSE firms to go through private ownerships, hence, most firms are still controlled by the public and institutional corporate ownership.

In this study, the initial sample contained 401 firms (3,609 firm-years) during a nine-year sample period from 2006-2014. However, in pursuing the aim of this research, the public, financial and real estate firms were excluded from the sample because the nature of their operations is different. In addition, the firms that changed their financial period during the research, and those without enough data for estimating other control variables in our baseline regression models were excluded from making the data comparable and complete. This provided us with 128 firms (1,152 observations). Table 1 shows the sample selection. The data was obtained from two databases: www.codal.ir and www.rdis.ir. The annual reports of the listed companies from 2006-2010 are available on the www.rdis.ir and the annual reports of the companies from 2011-2014 are available on the www.codal.ir. All these annual reports are audited. The information exerted from the reports are elements of the cash-flow statement, assets, shareholders' equity, debts, and the net incomes that are necessary for the calculation of the variables of this study.

Variable Measurements

Dependent Variable In this research, the dependent variable is designated as the firm's risk-taking. Following Rajgopal and Shevlin (2002) and Imhof and Seavey (2014), a firm's risk was measured using the standard deviation of the operating cash- flows for the three-year period (t-1, t , and t+1) (deflated by total assets). The higher the variance of operating cash-flows, the higher the uncertainty in the

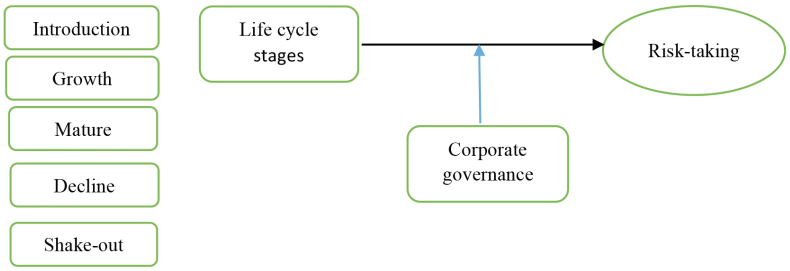

FIGURE 1. Conceptual framework of this study

TABLE 1. Sample selection

Total firms in year 2014	401
Public, finance and real estate sectors firms and firms that changed their financial year during research period	(271)
Firms that their data were not available	(2)
Total	128

expected cash-flows associated with prior investments and the greater the corporate risk.

Independent Variable The independent variable of this research represents the firm's lifecycle, which consists of the various stages such as introduction, growth, mature, decline, and shakeout .Assessing the lifecycle stages at the firm level is difficult because the firm's operation is composed of many overlapping and distinct stages of a product's life cycle stages (Dickinson 2011). In order to overcome this estimation problem, we followed the methodologies of Dickinson (2011) to develop proxies for the stage in the firms' lifecycle, by combining production theory, investment, learning and experience and market share theory. We also developed and validated a parsimonious cash proxy model, based on the predicted behavior of three significant variables: operating, investing, and financing the cash- flows of the firm-across the firm's lifecycle. In effect, this study substituted and validated the cash- flow patterns in accounting as a proxy of identifying the firm lifecycle. Hence, following the methodologies of Dickinson (2011), Suberi, Hsu and Wyatt (2011), and Hasan, Hossain and Habib (2015), the firm's risk cash flows from operating (CFO), investing (CFI), and financing (CFF) were used to group firms at different stages in their lifecycles. The methodology was as follows:

The firm is at the introduction stage, if CFO < 0, CFI < 0, and CFF > 0;

The firm is at the growth stage, if CFO > 0, CFI < 0, and CFF > 0;

The firm is at the mature stage, if CFO > 0, CFI < 0, and CFF < 0;

The firm is at the decline stage, if CFO < 0, CFI > 0, and CFF$\leq$ or ≥ 0;

And the remaining firm years are classified under the shake-out stage.

Livnat and Zarowin (1990) showed that the decomposition of cash flows into operating, investing, and financing activities differentially affects the stock returns (see also Khansalar & Namazi 2017). Therefore, cash flows capture the differences in a firm's profitability, growth, and risk. The combination of the three types of cash flows is mapped into the lifecycle theory to derive the lifecycle classification, used throughout the study.

In this study, the cash flow was calculated following the equation, presented in Table 2.

Moderating Variable Corporate governance was used as a moderating variable in this study. A moderating variable refers to a qualitative or quantitative variable that affects the strength and/or the direction of the relationship between the criterion variables and the predictor variables (Baron & Kenny 1986; Namazi & Namazi 2016: 542). Corporate governance was employed as a moderating variable to determine the effect of the governance in each product lifecycle of the firm and identify the strength and the direction of the relationship between the firm's product life cycling and its risk. Corporate governance includes several features and these features separately can be examined through a partial analysis.

In order to measure corporate governance, various indices have been devised in other countries. For instance, Gompers, Ishii and Metrick (2003), by focusing on the external role of corporate governance, devised a summary index for measuring corporate governance, known as G-index, based on the 24 pertinent provisions of the firm. Brown and Caylor (2006) introduced a Gov-Score according to 51 internal and external measures of the corporate governance for each firm. Brown and Caylor (2006) and Jiang, Lee and Anandarajan (2008), among others, provide various advantages of using multidimensional-indices which adopt internal and external firm-specific measures. They mention that the multidimensional-indices are broader in scope with respect to the measuring governance; cover more firms, and are more dynamic and more reflective of the recent changes in the corporate governance environment for using a multidimensional criterion of corporate governance.

In Iran, however, corporate governance indexing is a recent development. The TSE started to devise the corporate governance index for its companies in 2014.Accounting research in this sphere (Mehrani & Safar Zadeh 2010; Namazi et al. 2013) is also a few. Nevertheless, by considering the literature of corporate governance indices, we concluded that, in this study, a combined multiple provisions index is required that would be compatible with Iran's environment as well as the reflecting peculiarities of the firm's product lifecycle. Hence, the internal and external provisions of the corporate governance were considered in five dimensions: 1) characteristics of the board of directors, 2) accounting and corporate governance mechanism, as the internal

TABLE 2. Cash flow details

Cash flows from operating activities	EBIT + depreciation – taxes
Cash flows from investing activities	Acquisition and disposal of the company's long-term investments such as property, plant and equipment, investment in subsidiaries and associates and so on.
Cash flows from financing activities	The amount of cash received from issuing stock or debt-cash paid as dividends and re-acquisition of debt or stock

dimensions, 3) auditing functions, 4) public disclosure and information assimilation, and 5) external affairs as external dimensions. Then, the 18-item measures shown in Table 2, adopted from Mehrani and Safar Zadeh (2010), were implemented because these were identified after an extensive investigation of the domestic and foreign literature. They also encompass various multi- internal and external provision factors on the corporate governance. They were selected among many factors and finalized by a group of highly pertinent experts (certified accountants, corporate managers, university professors for accounting and finance and doctorate students, capital market's experts, and the CEOs of the TSE firms).

In order to operationalize the selected 18-item multidimensional list, following Brown and Caylor (2006) and Cremers and Nair (2005). "Coding and accumulating methodology" was implemented. Hence, we coded each of the 18 factors, either 1 or 0, depending on the operational definition provided in Table 3. We summed a firm's binary variables to determine each firm's corporate governance measures between 0 and 1. Therefore, the maximum total points of the corporate governance of a firm could be 18. In this study, the points were added and later defaulted by 18 for homogenization with other variables. Higher values suggest superior corporate governance. Table 3 presents these details.

Control Variables In this research, the following two control variables were also adopted because of their significance in the relationship between the firm's life cycles and its risks: Return on Equity (ROE) and debt to equity.

ROE = Net Income/Shareholder's Equity.

In various stages of a firm's life lifecycle, a higher level of risk assets might be associated with higher profits, especially in favorable times. Higher levels of profits might be expended to seek new loans and investments in the next period. In contrast, excessive high risks might lead to issues with loans and lower profitability that will eventually imply fewer risk assets in the next period (Delis & Kouretas 2011).

Debt to Equity = Total Debt/Total Equity.

In the various stages, the debt-to-equity ratio remains as a component of the leverage measure. However, it will additionally be included on its own since it is one of the most common measures of financial risk. Managers tend to have incentives for both to invest in riskier assets and to implement more aggressive debt policies (Close et al. 2006).

MODELS

The following regression models were used to test the research hypotheses:

$$RT = \alpha_0 + \alpha_1 \text{ Introduction} + \alpha_2 \text{ Growth} + \alpha_3 \text{ Mature} + \alpha_4 \text{ Shakeout} + \alpha_5 \text{ Decline} + \alpha_6 \text{ ROE} + \alpha_7 DE + \varepsilon \quad (1)$$

$$RT = \alpha_0 + \alpha_1 CG + \alpha_2 \text{ Introduction} + \alpha_3 \text{ Growth} + \alpha_4 \text{ Maturity} + \alpha_5 \text{ Shakeout} + \alpha_6 \text{ Decline} + \alpha_7 CG * \text{Introduction} + \alpha_8 CG * \text{Growth} + \alpha_9 CG * \text{Maturity} + \alpha_{10} CG * \text{Shakeout} + \alpha_{11} CG * \text{Decline} + \alpha_{12} \text{ ROE} + \alpha_{13} DE + \varepsilon \quad (2)$$

Where,

RT: Risk-taking, Introduction, Growth, Maturity, Shakeout, Decline: Components of the firm lifecycle, CG: Corporate governance.

FINDINGS

DESCRIPTIVE STATISTICS

Table 4 presents the descriptive statistics of the research variables.

Table 3 shows that the means (medians) of risk-taking and corporate governance are 0.073 (0.052) and 0.376 (0.4), respectively. As Table 3 shows, the mean score of each stage of the firm is different. Most of the firms are in the growth stage (with a mean of 0.4) and the lowest firms are at the decline stage (with a mean of 0.105). Results of the risk-taking variable show that the selected firms do not take much risk. In addition, the mean of corporate governance is low (0.376), which means that these firms do not maintain a high standard of corporate governance. Regarding the dispersion of the variables, Table3 also reveals that risk-taking ranges from 0 to 1.52, with a standard deviation of 0.099. Corporate governance ranges from 0.11 to 0.61 with a standard deviation of 0.99. Risk information of each stages of product lifecycle is also presented in Table 3.

The number of selected firms for each year of the span of the study (2006-2014) was 128, which is equal to 11% of the total number of firms.

INFERENTIAL STATISTICS

In order to examine the relationship between the stages of the firms' lifecycle and its risk-taking, the Spearman correlation analysis was employed and $\alpha = 5\%$ was chosen for testing the significance level. Table 4 indicates the result of the correlation between the variables. As shown in Table 4, risk-taking is only negatively and significantly correlated with G (growth), and positively and significantly correlated with S (shake- out). Corporate governance is only negatively and significantly correlated with M (mature) and positively and significantly correlated with S (shake-out) of the stages of a firm's lifecycle. The association between corporate governance and the size of the firm is also negative and significant.

TABLE 3. The checklist of the indices of corporate governance

	No.	Item	Operational definition
A. Internal Provisions 1. Characteristics of the board of directors	1	Use of non-executive members on the board	If the ratio of the specific firm (the proportion of the independent nonexecutive directors to the total number of directors) is greater than the mean ratio of the total firms, a value of 1 is assigned; otherwise 0 is assigned.
	2	Separation of the roles of the CEOs and the chairman of the board	If the chief executive officer is also the chairman of the board, a value of 1 is assigned; otherwise 0 is assigned.
	3	Stability of the CEOs	For change of the executive in two prior years, 1 is assigned; otherwise 0 is assigned.
	4	Concentration of the ownership	If the percentage of free float shares of the firm is higher than the mean of free float shares of the total firm, 1 is assigned; otherwise 0 is assigned.
2. Mechanisms of accounting and corporate governance	5	Presence of the internal audit unit	If the firm has internal audit unit, 1 is assigned; otherwise 0 is assigned.
	6	Related party transactions	If the related party transactions to a firm, are less than the mean of the total firms, 1 is assigned; otherwise 0 is assigned.
	7	Annual adjustments of the financial statements	For absence of annual adjustments 1 is assigned; otherwise 0 is assigned.
B. External provisions 1. Auditing functions	8	Rotation of the audit partners	For rotation in two prior years, 1 is assigned; otherwise 0 is assigned.
	9	Audit size	If the audit income is greater than the mean of the member of the Iranian Society of Certified Public Accountants audit firms, 1 is assigned; otherwise 0 is assigned.
	10	Specialization of the auditor in the industry	If the auditor is specialized, 1 is assigned; otherwise 0 is assigned.
	11	Opinion of the auditor	For the unqualified opinion, 1 is assigned; otherwise 0.
2. Public disclosure and information assimilation	12	Presence of a website	For presence of a website, 1 is assigned; otherwise 0 is assigned.
	13	Timing of the provision of information.	If the rating of the updates is greater than 50, the value of 1 is assigned; otherwise 0 is assigned.
3. External variables	14	The use of financial and accounting experts	For using an expert for the firm, 1 is assigned; otherwise 0 is assigned.
	15	The use of services of specialized consulting	For using consulting services, 1 is assigned; otherwise 0 is assigned.
	16	Presence of the rights of the shareholders to control	If the shareholders of the firm maintain the right, 1 is assigned; otherwise 0 is assigned.
	17	Types of the ownership: Owned or state shareholders	If the public ownership of the firm is greater than the mean of the total firms, 1 is assigned; otherwise 0 is assigned.
	18	Presence of a legal case against the company	For absence of legal case against the company in three prior years, 1 is assigned; otherwise 0 is assigned.

TABLE 4. Descriptive statistics of the firms (2006-2014)

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
Risk-taking	0.073	0.052	1.152	0	0.099
Corporate governance	0.376	0.4	0.61	0.11	0.099
Introduction	0.227	0	1	0	0.419
Growth	0.4	0	1	0	0.474
Maturity	0.341	0	1	0	0.474
Decline	0.105	0	1	0	0.307
Shake-out	0.169	0	1	0	0.375

TABLE 4. Results of the spearman correlation analysis

	RT	CG	I	G	M	D	S	Size	ROE
RT	1	0.056	-0.24	-0.042*	0.081	-0.068	0.029*	0.193	0.696
CG		1	-0.208	-0.193	-0.01*	-0.095	0.006*	-0.003*	-0.182
I			1	-0.38	0.018*	-0.182	-0.0388	0.998	0.995
G				1	-0.079	0.183	-0.003*	-0.374	0.972
M					1	0.004*	0	0.001*	-0.083
D						1	-0.043*	-0.18	0.133
S							1	0.096	0.021*
DE								1	0.001*
ROE									1

Note: Significant at: *5 percent levels

The Spearman correlations between the risk- taking of the firm and its corporate governance, mature firms, shake-out firms, and the size of the firms are positive. However, a significant relationship exists only among risk- taking, mature firms, and shake-out firms. The only positive correlation between corporate governance and the other variables is related to the shake-out stage of the firms. On the other hand, another significant relationship exists among corporate governance, mature firms, shake-out firms, and the size of the firms.

Testing the Effect of Product Lifecycle and Risk Although there is no statistically significant relationship between the introduction, mature, and decline stages and the risk- taking of the firms, they were included in the regression model as they are the components of firms' lifecycles. Hence, to test the hypothesis of the study, all the stages of the lifecycle were examined to determine the effect of each stage according to the theory of lifecycle management. However, prior to a running related regression model, its assumptions were checked. First, the reliability position of the variables was examined. Based on the unit root test of Levin, Lin and Chu (2002), if the test result statistic is significant and less than 0.05, the independent, dependent, and control variables in the study are valid. The results of the reliability of the test variables are presented in Table 5.

Table 5 shows that, for all the independent, dependent, and control variables, the unit root test of Levin et al. (2002) is significantly smaller than 0.05, which shows that the variables are stationary. This implies that the mean variance and covariance of the variables of the study is constant over time and between different the variables. As a result, the examined companies do not experience structural changes of these variables in the regression model.

In order to attain the objective of the study, an estimation of the pertaining research model was made via the Panel Data Method for each stages of the firm's product lifecycle instead of the running a single regression model for the whole product lifecycles of the firms. In this method, it is necessary to carry out appropriate tests to estimate the efficiency of a regression model. Hence, first to decide which one of the common, fixed or random effects models should be selected, the regressions were applied. Then, the F-Limer test was used to choose between the no-effect and the fixed-effect model and the Hausman test was applied in each stages of the product lifecycle to find out whether to choose a fixed or a random effects model. Table 6 demonstrates the results of the test.

According to the results in Table 6, the fixed effects method should be used for all the stages of the product lifecycle to perform the regression analysis.

In order to test the auto regression (AR) assumption (the assumption of the independence of the residuals in a different period) of the multiple regression analysis, the Durbin-Watson test was performed at each stages of the product lifecycle since the stages were to be considered

TABLE 5. Results of the unit root test

Variables	Statistic	p-value*
Risk- taking	-20.649	0.00
Introduction	-4.813	0.00
Growth	-8.351	0.00
Maturity	-5.206	0.00
Decline	-2.097	0.00
Shake-out	-2.057	0.00
Corporate Governance	-9.305	0.00
ROE	-8.222	0.00
Debt-Equity	-9.512	0.00

Note:* Significant at: 5 percent levels

independently. Table 7 reveals the Durbin-Watson statistics of the model, indicating that the regression model does not exhibit any problem in this regard. The R^2 of the model for each stage of the lifecycle illustrates the power of each stage. While the amount of R^2 of all the five stages is close to each other, the amount of power of the firms at the decline stage (0.296), in relation to the risks of the firms, is the highest among various stages. This finding unequivocally indicates that the firms at the decline stage could explain 29.6% of the variations of the firm's risks.

The results of the regression analysis of the first hypothesis also shows that only the effect of the decline stage (with a *p*-value of 0.0015) is significant and positively (with the coefficient of 0.038) related to the firm's risk-taking behavior. Table 7 also reveals that the coefficients of the introduction, growth, and mature and shake-out stages are 0. 012, -0.005, -0.01 and -0.004, respectively. The results in Table 7 also indicate that the introduction, growth, mature and shake-out stages do not posit a significant effect on the firm's risk-taking variable. The significant control variables in each product lifecycle are also presented in Table 7. According to the provided information, the ROE is positively significant at all the five stages of the product lifecycle of the firms, whereas debt equity is only positively significant ($P = 0.004$*) at the introduction stage.

Testing the Effect of Corporate Governance The result for the second hypothesis is shown in Table 8 for the situation in which corporate governance is used as a moderating variable in the relationship among the stages of a firm's product lifecycle and its risk-taking. This table indicates that corporate governance changes throughout the lifecycle. In fact, none of the stages of the firm's lifecycle are significant when considered individually. However, at the 5% confidence level, when the interaction effects of the corporate governance at each stages of the product lifecycle are considered, there is a significant and negative effect ($P = 0.0398$*, coefficient = -0.133385) on the interaction among the growth stage and corporate governance, and the firm's risk- taking. Whereas, there is a positive and significant effect ($P = 0.0254$*, coefficient = 0.272835) on the interaction on the decline stage and corporate governance, and the firm's risk-taking. This means that when the firm is in the growth or the decline stage, corporate governance posits a significant effect on the company's position that would lead to a decrease or

TABLE 6. Result of the F-Limer, Hausman and Breusch-Pagan tests

	Fixed effects test	Hausman test	Breusch-Pagan test
Variables	Statistic	Statistic	Statistic
Introduction	0.42568	1.36985	10.42351
Growth	0.534546	2.931707	10.54117
Maturity	0.620284	0.968885	10.32594
Decline	0.652314	2.086762	10.12460
Shake-out	0.579904	1.025445	10.39200

Note: Significant at: *5 percent levels

TABLE 7. Regression analysis of the first hypothesis

Variables	Coefficient	t-Statistic	Prob.	Adjusted R^2	Durbin-Watson•
Introduction	0.012863	1.702815	0.0889		
ROE	0.0509	1.038	0.000*	0.293990	1.605273
Debt-Equity	0.07	1.762	0.004*		
Growth	-0.005668	-0.898195	0.3693		
ROE	0.0027	0.352	0.0072*	0.292670	1.604540
Debt-Equity	0.001	2.022	0.7247		
Maturity	-0.010949	-1.739804	0.0822		
ROE	0.0728	1.594	0.0201*	0.293375	1.601334
Debt-Equity	0.0731	3.4	0.4		
Decline	0.038332	3.175837	0.0015*		
ROE	0.0769	1.424	0.04*	0.296513	1.616795
Debt-Equity	-0.0542	-1.074	0.134		
Shake-out	-0.004825	-0.572641	0.5670		
ROE	0.0745	2.169	0.001*	0.292765	1.606543
Debt-Equity	-0.0058	-1.359	0.3652		

• with considering AR (1)
Note: Significant at: *5percent levels
Dependent variable is Risk-taking

an increase in the firm's risk-taking. Thus, the moderating effects of corporate governance would become prominent. In the first hypothesis, only the effect of the decline stage was positively significant. However, in the second hypothesis, the interaction effect of both the growth stage and the decline stage firms are significant. Whereas the interaction effect of the first stage affects the relationship as a negative factor and the latter one as a positive factor. This means that for the second hypothesis, there are two stages of a product lifecycles that can explain the variations of a firm's risk-taking. Table 8 also reveals the information regarding control variables. It shows that the ROE is still positively significant for the interaction effect of the corporate governance and all stages of the firm's product lifecycles. Debt-equity, however, is only negatively significant (P = 0.002*) for the interaction effect of the firm's corporate governance and the introduction stage. Hence, corporate governance changed the sign of the effect of debt-equity at the introduction stage.

As Table 8 shows, when corporate governance is considered as a moderating variable, the power of the model improves for each stages of the product lifecycle in comparison with the previous model used in the first hypothesis. For instance, the power of the decline stage in the previous model was 0.296513, however, when corporate governance is exerted in the model, the power increases to 0.302177. The same pattern is observed with respect to the power of the growth stage, showing an increase from. 0.292670 to 0.300213. Hence, corporate governance would enhance the effect of the lifecycle and the firm's risk-taking, particularly at the decline and growth stages.

Discussion and Conclusion

The major objective of this article was to identify the effect of each stage of a firm's product lifecycle on its risk- taking behavior, particularly when corporate governance plays a moderating role in the relation between the two. The TSE data was gathered for the period between 2006 and 2014.The panel data was employed as well. The findings suggest that among the different stages of the product lifecycles of the firms listed on the TSE, the mere effect of the decline stage is positively significant, and the other stages of the lifecycle would not exhibit any significant relationship with a firms' risk-taking behavior. However, when corporate governance is added to the model as a moderating variable, two life-cycle stages would become significant: the interaction with corporate governance at the decline stage and the interaction with corporate governance at the growth stage. While the first interaction affects the firm's risk- taking positively, the second one posits a negative effect. In addition, when the moderating effects of corporate governance are considered, the power of the model is enhanced. The ROE is also positively significant for the effect of interaction with the corporate governance and all the stages of the firm's product lifecycle. Debt-equity, however, is only negatively significant for the effect of interaction with the firms' corporate governance and the introduction stage. These findings reveal the significance of corporate governance, as a moderating variable, on a firm's life-cycles.

One possible reason, regarding our findings, might be related to the nature and characteristics of the growth and

TABLE 8. Regression analysis of the second hypothesis

Variables	Coefficient	t-Statistic	Prob.	Adjusted R^2	Durbin-Watson
Introduction	0.01249	1.6257	0.104	0.31452	1.542681
Introduction *CG	0.2836	0.75421	0.10421		
ROE	0.041	3.51	0.005*		
Debt-Equity	-0.067	-2.6	0.002*		
Growth	0.0447	1.7816	0.0751	0.300213	1.602277
Growth *CG	-0.133385	-2.057803	0.0398*		
ROE	0.075	2.367	0.0401*		
Debt-Equity	0.052	1.625	0.1057		
Mature	-0.007	-0.2749	0.7834	0.295140	1.593005
Mature *CG	-0.010871	-0.170795	0.8644		
ROE	0.0318	1.518	0.000*		
Debt-Equity	-0.0403	-2.896	0.06		
Decline	-0.072	-1.4446	0.1148	0.302177	1.616517
Decline *CG	0.272835	2.238603	0.0254*		
ROE	0.0192	1.291	0.001*		
Debt-Equity	-0.007	-1.143	0.2534		
Shake-out	-0.0236	-0.7496	0.4537	0.294985	1.595346
Shake-out *CG	0.052259	0.639616	0.5226		
ROE	0.0437	1.875	0.0101*		
Debt-Equity	-0.173	-2.862	0.0843		

Note: Significant at: *5 percent levels
Dependent variable is Risk-taking

decline stages. Dickinson (2011), Suberi, Hsu and Wyatt (2011) and Hasan, Hossain and Habib (2015) contend that at the growth stage, the firm's condition is: CFO > 0, CFI < 0, and CFF > 0,while at the decline stage, the firm will maintain: CFO < 0, CFI > 0, and CFF≤ or ≥0..In both of these situations, maintaining an optimal amount of cash for each purpose, and balancing the required cash for operations ,investment and financing is extremely crucial because the product life cycling are at the turning point at these stages, and, therefore, would affect the risks of the firm. At the growth stage, however, if rebalancing the CFO, CFI, and CFF is done efficiently, the risk of the normal operation of the firm will reduce since there is an additional investments and management-related narcissism concerning future operations of the firm. While, at the declining stage, an additional risk will be dovetailed to the normal operation of the firm because the sign of unfavorable conditions has already appeared, and, hence, a potential risk of bankruptcy has emerged with more clarity.

Another reason why our findings show that the other stages of the lifecycle do not exhibit any significant relationship with the firms' risk-taking might be related to our definition and formulation of the risk-taking criterion. The risk-taking model in this study was only related to the parameters of cash flows. According to Born, Payne, Scholar, Lin and Wen (2014), cash flows can be generated through underwriting activities, financing and investing choices, and even managing risks. It might not be sufficient to disclose significant risks of all the stages of the lifecycle. A company with a higher level of corporate governance is linked to lower firm risk. Managerial risk-taking would have important implications for a firm's growth, performance, and survival (Bromiley 1991). The results of this study showed that risk-taking is significant and higher at the decline stage of the firm's life cycle. This result is consistent with the study of Habib and Hasan (2015). According to Habib and Hasan (2015), once a firm moves into the decline stage, the managers are likely to assume more risk in an attempt to return to profitability as the declining sales during this phase generates negative returns. Our results concerning the role of corporate governance is also consistent with the study done by Filatotchev et al.'s (2006), which points out that corporate governance does indeed change along with the firm's life-cycle. It is also in compliance with the work of O'Connor and Byrne (2015), who report that young, fast-growing firms are likely to establish desirable corporate governance practices to attract external financing, increase profitability, and, therefore, create value for the firm.

One of the reasons firms are likely to have very different governance needs at any one point in time is because these firms are likely to be at different stages in their lifecycles. In turn, firms at different stages of lifecycles are likely to discern different governance needs, since the wealth creation and protection functions of corporate governance change as the firm matures.

Previous literature (Adams, Almeida & Ferreira 2005; Saravia 2013) also finds that young, fast-growing firms are likely to establish suitable corporate governance practices to attract external finance, increase profitability, and, therefore, create value for the firm. Our findings suggest that the quality of corporate governance achieves greatness when the firms are at the growth and decline stages. This finding is in accordance with the firm's life cycle theory (Adams et al. 2005; Saravia 2013).

Based on the findings of this study, it is suggested that managements, stockholders, stock market officials and actors, and security analysts should pay attention to the importance of corporate governance in their operations at each stages of a firm's lifecycle. This attention is particularly vital for firms that are at the growth or decline stages because these significantly affect the firm's policies, investments, cash flows, and profitability.

It is also suggested that managements and organizations concerned attempt to establish a "risk committee" within the firms, and try to improve the quality of risk information and provide transparent information about the products and their lifecycles.

Future researchers can also work on the type of investment decisions required at each stage of the firm's lifecycle. Investment influences a firm's risk-taking behavior and its lifecycle. Further research on the relationship of capital expenditures and bankruptcy with risk-taking is particularly suggested.

The result of this study is confined to the information obtained from the TSE market and Iran's corporate governance criteria. It is suggested that future studies extend the results of this research to other developing and developed markets to explore whether there is any significant differences between the markets and the role of corporate governance in this regard.

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