Product innovation in family vs. non-family firms: an exploratory analysis

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How family firms manage product innovation remains an overlooked topic in existing business research. This happens despite the fact that family businesses play a crucial role across all economies and they often use technological innovation to nurture their competitive advantage. By drawing upon the resource-based view of the firm as well as agency, stewardship and behavioral theories and using empirical evidence gathered through a multiple case study, the paper studies how and why the anatomy of the product innovation process differs between family and non-family firms. The analysis shows that family businesses differ from non-family ones as regards product innovation strategies and organization of the innovation process.

Introduction

Family firms can be defined as businesses "governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or a small number of families in a manner that is potentially sustainable across generations of the family or families" (Chua, Chrisman, and Sharma 1999). The fact that family businesses play a crucial role across all economies in the world is widely acknowledged (Aronoff and Ward 1995; La Porta, Lopez-de-Silanes, Shleifer and Vishny 1999; Neubauer and Lank 1998). There is also a growing body of empirical evidence showing that family firms leverage technological innovation to nurture their competitive advantage and overcome economic and financial downturns (Gudmundson, Tower, and Hartman 2003; McCann, Leon-Guerrero, and Haley 2001; Souder and Thomas 1994). Based on these premises, it is surprising that very limited attention has been devoted by management research to study technological innovation in family firms so far (Craig and Moores 2006; Tanewski, Prajogo, and Sohal 2003).

According to the established process-based conceptualization (Freeman 1976), technological innovation can be defined as the set of activities through which a firm conceives, designs, manufactures and introduces a new product, service or process (Burgelman et al. 1988). Technological innovation is therefore all about change, which can take two forms (Tidd et al. 2001, p. 6): "[…] in the things (products/service) which an organization offers, and change in the way in which they are created and delivered". Accordingly, two types of technological innovations are usually distinguished, that is product and process innovation (Utterback and Abernathy 1975).

There are strong conceptual reasons to argue that family involvement in ownership, governance and management affects how resources are managed and deployed (Sirmon and Hitt 2003) and determines distinctive incentives (Fama and Jensen 1983, Jensen and Meckling 1976), authority structures, and norms of accountability (Gedajlovic, Lubatkin, and Schulze 2004) resulting in unique advantages and disadvantages that may significantly affect the characteristics of the technological innovation process in family firms. There is a vast body of empirical evidence pointing to the distinctive nature of family firms regarding other business processes, for example, corporate governance (Randøy and Goel 2003),

internationalization (Zahra 2003), entrepreneurship (Naldi et al. 2007), and financing (Romano, Tanewski, and Smyrnios 2000). This suggests that there might be important differences as well in the anatomy of the technological innovation process that distinguish family and non-family firms.

The paper attempts to disentangle these differences by focusing in particular on product innovation. This for two reasons. First, product innovation poses the same problems as process innovation concerning how it is organized and managed internally, but it entails specific challenges in terms of interaction and engagement with external market actors, for example, clients, lead users, providers of complementary products and services, distributors. These distinctive features of product innovation are likely to result in exceptional challenges for family firms, due to their idiosyncratic ability and propensity to develop relationships between the family and the firm's stakeholder (see, for example, Gomez-Mejia, Nunez-Nickel, and Gutierrez 2001). Second, far more has been written on product innovation in comparison with process innovation. This allows us to have a broader and more consolidated body of empirical evidence against which the peculiarities of product innovation in family firms can be contrasted.

Although research has shown that family firms perceive dissimilar incentives and face different barriers to technological innovation (see, for example, Zahra et al. 2007), whether family businesses are more or less innovative than comparable, non-family ones remains an open question and contradictory results have been found in this regards (see, for example, Craig and Moores 2006; Morck et al. 2000). Instead of focusing on the outcome of family firms' efforts in technological innovation, this paper contributes to opening up the "black box" on innovation in family firms, by investigating what characterizes their product innovation process. To the best of the authors' knowledge, there are no studies that have attempted to identify what differentiates family firms from non-family companies as regards the organizational solutions and managerial principles used in this very important process. Uncritically applying the good practices identified by product innovation research to family businesses is risky because the latter has almost exclusively adopted the standpoint of non-family firms so far. By drawing upon and integrating several theoretical perspectives (that is resource-based view, agency, stewardship and behavioral theories), this paper argues that family businesses are different from non-family firms in several aspects of product innovation, therefore pointing

to the need for further research aimed at unearthing which critical success factors in product innovation specifically apply to family businesses.

The arguments of the paper are developed using empirical evidence gathered through a multiple case study, which involved 10 small-sized Italian firms, five of which are family and five non-family businesses. The analysis of the cases indicates that family firms only engage in innovation processes aimed at developing and bringing to market incremental new products or services, which are carried out relying on a functional organization, with high levels of decisional autonomy given to the project leader. Throughout this process, family firms rely on a relatively high number of collaborations with external sources of knowledge and technologies. Finally, the predominant organizational climate, which permeates the firm's attitude and behavior towards product innovation, is largely informal and unstructured and mainly risk-averse.

The structure of the paper is as follows. The next section provides the theoretical underpinnings of the research, whereas the third section illustrates the methodology employed in the empirical analysis. The fourth section reports and discusses the main findings of the multiple case study, and the last one concludes and outlines avenues for future research.

Theoretical Background

Sources of Differences between Family and Non-Family Firms

The distinctive nature of family firms has been empirically found to affect different business processes (Dyer 2003), for example, corporate governance (Randøy and Goel 2003), internationalization (Zahra 2003), entrepreneurship (Naldi et al. 2007), and financing (Romano, Tanewski, and Smyrnios 2000). There are different theoretical lenses that can be used to explain why and how family involvement in ownership, governance and management results in distinctive characteristics of the product innovation process in family firms if compared to non-family enterprises.

Resource Based View

A first theoretical framework which can be used to explain the distinctiveness of family enterprises is the resource based view of the firm (Wernerfelt 1984). In a family firm, the interaction between the family unit, the business entity, and individual family members create unique systemic conditions and constituencies (Habbershon and Williams 1999; Habbershon, Williams, and MacMillan 2003) that generate a bundle of unique resources and capabilities (Chua, Chrisman, and Sharma 1999; Zahra, Hayton, and Salvato 2004). Under this view, the interaction between the family and the business contributes to the building of competitive advantages or disadvantages through higher or lower stocks of social, human, and financial capital (Sirmon and Hitt 2003).

Social capital is defined as the resources embedded in the relationships among people (Hoffman, Hoelscher, and Sorenson 2006). It involves both relationships among the individuals working in the organisation (internal social capital) and between the organization and external parties (external social capital) (Adler and Kwon 2002). Within the organisation, social capital can reduce transaction costs, facilitate information flows, knowledge creation and accumulation (Lin 2001; Nahapiet and Ghoshal 1998), and improve creativity (Perry-Smith and Shalley 2003). One of the main competitive advantages of family firms is the use of a unique family language, which allows their members to communicate more efficiently and share more information (Tagiuri and Davis 1996). The shared goals and values characterizing family firms usually result in a higher degree of cohesiveness and commitment of the workforce, which contributes to creating potential advantages over non-family firms (for example, Fukuyama 1995; Lyman 1991). Outside the organisation, social capital improves alliance and partnership success (Ireland, Hitt, and Vaidyanath 2002; Koka and Prescott 2002). Family firms may have some advantages in developing social capital between the family and the stakeholders (Gomez-Mejia, Nuñez-Nickel, and Gutierrez 2001), given that they typically: (i) have the ability to foster and nurture long-standing relationships across generations, and the firm's stakeholders may be more likely to develop personal attachments to a family that owns and manages a business, rather than to an unfamiliar, impersonal firm (Carney 2005); (ii) pay particular attention to developing relationships with key stakeholders in order to improve their visibility and family reputation within the external community (Dunn 1996). Even if this is rarely recognized, social capital may also be a

source of competitive disadvantages of family firms over non-family enterprises, such as dysfunctional relationships due to bond ties, business complexity, and paralysis of action (Arregle et al. 2007; Pearson, Carr, and Shaw 2008). The characteristics of internal and external social capital of family firms may affect the characteristics of the product innovation process. For example, the ease of inter-individual communication may simplify the organizational solutions and managerial principles used to coordinate the different actors involved in innovation activities, or encourage collaborative, inter-organizational forms of innovation.

Human capital is defined as the knowledge and skills embodied in people (Hatch and Dyer 2004). The family business's human capital is supposed to be a source of competitive advantages because it is associated with attributes like commitment to the business (Horton 1986), motivation (Ward 1988), friendly, sincere and close relationships (Horton 1986). However, family firms are usually characterized by a lack of access to qualified human capital (Carney 1998; Miller and Le Breton-Miller 2005), because the family can exercise favouritism toward kin over more capable skilled individuals and unfair HRM practices may reduce employee incentive to invest in firm-specific knowledge (Miller, Le Breton-Miller, and Scholnick 2008). The idiosyncratic characteristics of family firms' human capital may affect the features of their product innovation process by determining specific advantages and disadvantages for family firms. For example, the superior commitment of employees may render decisional autonomy in the innovation process more easily to achieve, whereas the typical lack of access to skilled human resources, which is exacerbated in small firms (Freel 2000), may impact upon the orientation to rely on external sources of knowledge in innovation projects.

Financial capital is defined as the current and potential cash resources of the firm, comprising the ease with which it accesses new resources through financial markets and its average cost of capital (Hunt 2000). The management of financial resources in family firms is unique, as the interaction between family and business results in a long-term perspective (Gallo and Vilaseca 1996; Sharma, Chrisman, and Chua 1997), because families strive to ensure the longevity of the business through generations and protect the long-term financial security of the founding generation (Dunn 1996; Dyer 2003; Donckels and Frohlic 1991). The

characteristics of financial capital in family firms may affect different aspects of their product innovation process, such as the orientation to run into hazardous investments to the detriment of the family's security or the financial sources used to fund product innovation projects.

Agency Perspective

Agency theorists (Jensen and Meckling 1976) have viewed family firms as a highly advantageous governance structure because management and ownership are not separated but rather aligned, which in turn eliminates, or at least minimizes, potential agency costs (Fama and Jensen 1983). More recently, however, Schulze et al. (2001) and Gomez-Mejia, Nunez-Nickel, and Gutierrez (2001) have shown that private ownership and owner management characterizing family firms do not necessarily reduce the agency costs of ownership, because family firms may have other agency problems engendered by self-control and altruism (Lubatkin et al. 2005) that are not considered in the agency theory of the non-family firm.

Under an agency theory perspective, we can argue that, due to their ownership, family members enjoy certain control rights over the firm's assets and use these rights to exert influence over decision-making processes in the organization. The unification of ownership and control, especially in a small firm, incorporates organizational authority into the hands of the entrepreneur and his or her family, and generates three dominant propensities, acknowledged as parsimony, personalism and particularism (Carney 2005), which differentiate family firms from other governance archetypes. Parsimony is rooted in the fact that the alignment of owner-managers' interests in family firms reduces the tendency toward opportunism, and generates a propensity toward careful resource conservation and allocation relative to non-family enterprises (Jensen and Meckling 1976). Family firms make strategic decisions with the family's personal wealth and can be expected to behave more prudently in the management of the product innovation process.

Personalism stems from the fact that the family acts as a unique agent in which both ownership and management are concentrated, determining a personalization of authority that gives family members extremely high power and legitimacy within the organization. Consequently, the agents involved in the product innovation process can be exempted from the internal bureaucratic constraints and strictly

formalized management practices that limit managerial authority and inhibit ownership priorities in non-family firms.

Particularism follows from the personalization of authority and derives from the fact that family control rights entail a personalistic exercise of authority that allows family members to pursue diverse goals rather than pure profit or firm value maximization (Chrisman et al. 2011). For example, the family may intervene in the affairs of the firm by employing decision criteria based on altruism or nepotism, and this may impact upon several aspects of the innovation process.

Parsimony, personalism and particularism may affect the product innovation process in several ways. For example, the propensity for parsimony and personalism may drive the government of the innovation process toward cost-saving organisational solutions and low-bureaucracy methods, while particularism may affect the outcome of the innovation process, that is the type of product innovation achieved, as a result of the distinctive and particularistic goals of the owning family.

Stewardship Theory

Stewardship is a complementary perspective to agency theory, as managers find that they identify with their organization and do not instinctively act in an opportunistic way (Davis, Schoorman, and Donaldson 1997). The stewardship theory-based explanation of family firm behavior (Davis, Schoorman, and Donaldson 1997; Donaldson 1990; Donaldson and Davis 1991) proposes that family managers look at their firm as a vehicle to accomplish their needs for security, social contribution, belonging, and standing within the family (Gómez-Mejía et al. 2007; Miller, Le Breton-Miller, and Scholnick 2008).

A stewardship orientation is composed of three dimensions (Davis et al. 1997): (i) autonomous motivation, that is individuals act with a sense of volition that is in contrast with controlled motivation in which individuals feel pressured to perform a certain task (Ryan and Deci 2000; Gagné and Deci 2005); (ii) collective orientation, that is individuals are driven by and concern for the success of the collective organization rather then being centered on individualistic gains with a threat of guileful behaviors (Donaldson 1990; Zahra et al. 2008); and (iii) high-trust climate, that is organizational members, who are

autonomously motivated and collectivistic, very strongly trust each other (Mayer et al. 1995; Schoorman et al. 2007).

The distinctive stewardship orientation of family versus non-family firms may idiosyncratically affect the characteristics of the product innovation process. For example, autonomous motivation and collective orientation may positively affect the degree of decisional autonomy in organizing the innovation process, and may render a formalized approach to administering innovation activities unnecessary.

Behavioral Theory

Behavioral theory (Cyert and March 1963) has been used as the basis for proposing that family firms differ from non-family enterprises because they are more willing to pursue emotional value of ownership (Astrachan and Jaskiewicz 2008; Zellweger and Astrachan 2008), emphasize the creation and conservation of socioemotional wealth for the family (Gómez-Mejía et al. 2007), and altruism toward family members (Lubatkin et al. 2005; Schulze, Lubatkin, and Dino 2003). Chrisman et al. (2011) show that such psychological attachments to the firm by family members increase both commitment and pursuance of transgenerational family control.

The corroborated evidence on the importance put by family firms on the conservation of their socio-emotional wealth (Gomez-Mejia et al. 2007) leads controlling families to be strongly concerned about potential control losses. According to the behavioral theory, the reluctance to lose family control (Donnelly 1964) may generate differences between the extent to which family and non-family firms invest in innovation and the way they manage the innovation process. From this perspective, family firms may be less likely to be engaged in innovation activities, especially collaborative innovation projects, because innovation requires professional expertise which is not always available within the firm's boundaries. In addition there is the need to give autonomy to knowledge-intensive managers, who often cannot be groomed from within the family firm. As a result, it is frequently necessary to cede shares to outside parties, which may include venture capitalists or institutional investors (Gomez-Mejia et al. 2011).

The analysis reported in this section points therefore to the existence of important theoretical reasons that lead us to argue that family firms differ from non-family firms as regards the anatomy of the product innovation process. The next section provides an overview of the main theoretical and empirical findings on technological innovation in family firms.

Overview of the Literature on Technological Innovation in Family Firms

Although technological innovation has been considered in some streams of family business research, it is not a dominant topic in this literature. There have been some attempts to investigate whether family and non-family firms have a different propensity toward technological innovation (Craig and Moores 2006; Tanewski, Prajogo, and Sohal 2003), but they have reported contradictory findings.

Initial empirical studies found that family businesses are less innovative than comparable, non-family enterprises. For example, Dunn (1996) and Donckels and Frohlic (1991) argue that family firms tend to consider technological innovation as less important than non-family companies, and consequently they are seldom pioneers, leading to less innovation and growth, with evidence of technological innovation taking place only incrementally. Morck, Stangeland, and Yeung (2000) show that Canadian firms controlled by heirs were less active in technological innovation than comparable non-family firms, and Tanewski, Prajogo, and Sohal (2003) find, through the investigation of a large sample of 2,000 Australian companies, that family businesses have fewer technological innovations than non-family firms. More recently, Chen and Hsu (2009), Munari et al. (2010) and Muñoz-Bullón and Sanchez-Bueno (2011) report a lower technological innovativeness of family firms as a result of their lower R&D intensity. In other words, most scholars find a lower propensity toward technological innovation in family firms due to their tradition and aversion to risk (Morris 1998; Levinson 1987).

However, there are also several studies showing that family firms can be more innovative than non-family enterprises (for example, Craig and Dibrell 2006; Craig and Moores 2006; Naldi et al. 2007). McCann, Leon-Guerrero, and Haley (2001) underline the important role technological innovation plays in the family firm's competitive advantage. Westhead (1997) finds that family businesses offer a wider range of new products and services in the search for superior competitive advantage in comparison with non-family firms. One

recent contribution on technological innovation is the study from Cassia, De Massis, and Pizzurno (2011), who propose a preliminary set of family-related enabling and constraining factors for product innovation.

Taken together, this literature identifies several distinctive characteristics of family firms that may hinder or facilitate technological innovation. However, to the best knowledge of the authors, no attempts have been made so far to investigate how and why the innovation process in family businesses differs from non-family firms. This paper tries to fill this gap through a multiple case study, which involved 10 Italian SMEs, five of which are family firms and five non-family businesses. The next section develops a simple framework that identifies a set of dimensions that should be looked at in order to spot the major differences between family and non-family businesses as regards the characteristics of the product innovation process. It will be used as a lens to gather and interpret the empirical evidence collected through the multiple case study.

A Framework to Study Product Innovation in Family vs. Non-Family Firms

It is possible to identify three major areas around which the characteristics of the product innovation process can be grouped (Tidd et al. 2001; Trott 2008): (i) strategy, which refers to the long-term objectives of the product innovation process and their linkage with the firm's business and corporate strategy; (ii) organization, which refers to how resources involved in the product innovation process are ordered so as to accomplish the established goals; (iii) climate, which refers to the recurring patterns of behavior, attitude and feelings that permeate work in the innovation process. For each area, a set of important aspects should be looked at to gain a comprehensive picture of the anatomy of the product innovation process. In this paper, we focus on those described hereinafter:

Strategy

Radical vs. incremental. A first strategic aspect regards whether the goal of the product innovation process is to develop and bring to market something which represents a breakthrough advancement or only a minor improvement over the status quo (Bessant et al. 2005). A more risky strategy entails the development and commercialization of radically-new products and services, which offer completely new functionalities to

customers or cost far less than the alternatives they supersede. Alternatively, a firm might try to reduce risks and resource commitment by proposing a new product or service that only incrementally improves the benefits currently delivered to customers. Of course, these two strategic orientations can coexist within the same firm, with both radical and incremental product innovation processes.

Closed vs. open approach. A second strategic aspect regards whether a firm leverages the competencies and technologies of external organizations (for example, clients, suppliers, competitors, universities, individuals) during the innovation process, or rather if it relies on its own R&D and technological assets (Grönlund, Sjödin, and Frishammar 2010). Again, within the same firm different innovation processes, and even different stages of the same process, can be undertaken under highly dissimilar degrees of openness (Trott and Hartmann 2009).

Organisation

Cross-functional team vs. functional organisation. Concerning how the innovation process is organized, a first aspect regards whether process activities are carried out by purposefully created project teams, staffed with people temporarily drafted from the various functions of the firm (for example, R&D, marketing and sales, operations) who respond to the team leader, or rather the different functions contribute to innovation projects by devoting part of the time of their human resources, who however continue to respond to the functional head (Clark and Wheelwright 1992).

High vs. low decisional autonomy. A further important organisational issue regards whether the person responsible for a product innovation project is given a high or low degree of autonomy concerning how process activities have to be carried out and unexpected problems addressed (Johne 1985). Whereas high levels of autonomy can impede the exploitation of synergies across innovation processes, they are likely to improve the flexibility and speed of innovation activities.

Climate

Risk-taking vs. risk-averse. A first important aspect of the organizational climate regards the extent to which uncertainty, ambiguity and personal initiative are tolerated, or even encouraged (Isaksen and Tidd 2006). In a risk-taking climate, people will feel free to take a gamble on some of their ideas and think “out-

of-the-box", whereas in a risk-averse context people will be more cautious and will always try to "stay on the safe side". Product innovation might benefit from a risk-taking climate, which however may as well distract resources from everyday business activities to the detriment of the firm's overall efficiency.

High- vs. low formalisation. A second aspect regarding the recurring behaviours that permeate the product innovation process concerns whether a highly formalised and structured approach is superimposed to preside over the progress of innovation activities (for example, a stage-gate system) or rather a more adaptive and unstructured line is used, which entails continuous adaptation from individuals to the changing contingencies surfacing during the project (Cooper, Edgett, and Kleinschmidt 2002).

Figure 1 gives a synthetic representation of this framework. The arrows linking the three areas indicate that there might be relationships between them. To mention a few, it has been found that a firm's willingness and ability to pursue radical innovations is bolstered by a risk-taking organizational climate and a low degree of formalization (Tushman and O'Reilly 1997). Furthermore, a functional organization appears to be more appropriate when pursuing incremental innovations, whereas radically-new products and services require a cross-functional organizational endeavour (Clark and Wheelwright 1992). Finally, high decisional autonomy allowed to the individual responsible for the product innovation process is likely to be associated with a poorly formalized and adaptive climate in the innovation process.

Insert Figure 1 about here

The next section describes the methodology used in the exploratory empirical analysis which was designed and carried out to gain further clarifications as to how and why family firms differ from non-family ones concerning the idiosyncratic characteristics of their product innovation process.

Research Methodology

Given the aim of the investigation and our conceptual starting points, we adopted an exploratory approach in our empirical analysis. In particular, we used a multiple case study methodology (Yin 2003) for the study,

which was chosen because it allows both an in-depth examination of each case and the identification of contingent variables that distinguish each case from the other. Furthermore, as noted by Hall (2005), there is a need in the field of family business for qualitative research which both draws on and generates theory, because family businesses are characterized by complex relationships and interactions.

Our study involved 10 Italian firms, five of which are family and five non-family businesses, according to a "polar type" sampling logic (Eisenhardt and Graebner 2007). While a precise operational definition of the term "family firm" remains a topic of discussion (Westhead, Cowling, and Howorth 2001), in this study it refers to firms in which family plays a significant ownership and managerial role (Beer et al. 1997; Matho et al. 2010). However, Chua, Chrisman and Sharma (1999) assert that companies with the same level of family involvement in ownership and management may not consider themselves family businesses and, more importantly, may not behave as family firms. From an operational point of view, we adopted the following three criteria to distinguish family from non-family businesses consistently with the above-mentioned definition: (i) 50 percent or more of ordinary voting shares are owned by members of the largest family related by blood or marriage (Westhead, Cowling, and Howorth 2001); (ii) 50 percent or more of the management team are drawn from the largest family group who owns the company (Westhead 1997); and (iii) the company is perceived by the chief executive to be a family business (Westhead, Cowling, and Howorth 2001). Furthermore, we decided to focus on firms which are well respected for their prowess and success in the area of product innovation. Having selected companies that consider product innovation a critical determinant of their competitive advantage, we could not misinterpret differences in the anatomy of the product innovation process due to heterogeneity in the strategic relevance assigned to this activity. Finally, we decided to include in our sample only small companies (according to the definition provided by the Recommendation of European Commission 2003/361/EC), all with less than 50 employees. First, this choice was suggested by the fact that product innovation is considered one of the most critical determinants of sustained competitive advantage for this category of firms (Cefis and Marsili 2006; Hausman 2005). Second, innovation in small firms has several peculiarities which differentiate it from large companies (for example, Tan et al. 2009; Tether 1998). What is more, scholarly research has thus far focused in particular

on large firms and only to a lesser extent on small firms (Verhees and Meulenberg 2004). By focusing on small companies only, we also reduced the risk of unobserved heterogeneity due to differences in the size of the family and non-family firms in our sample. Besides family involvement, strategic relevance assigned to product innovation, size and geographical location (we focused indeed on companies headquartered in Northern Italy, for convenience reasons), we built a heterogeneous sample regarding other firms' characteristics, for example, industry belonging, age, presence of private equity in the firm's capital. We controlled for the impact of these variables on the characteristics of the product innovation process through cross-case comparison procedures, as will be mentioned later. We adopted this convenience, theoretical sampling approach because we needed to create an experimental empirical basis that allowed us to study the phenomenon under particularly insightful and illuminating circumstances (Siggelkow 2007). Of course it is not possible to statistically generalize results from this type of exploratory case study analysis (Yin 2003). Our aim is to make analytical and theoretical generalizations to the existing body of knowledge regarding the anatomy of the product innovation process in family-firms. The findings will hopefully inform future theoretical and empirical studies concerning product innovation in family firms, but cannot be generalized to populations of firms or markets (Harrison and Kjellberg 2010).

The characteristics of the sampled firms are reported in Table 1.

Insert Table 1 about here

Comprehensive information regarding the scope and type of product innovation activities carried out in the sampled firms is reported in Appendix 1.

We identified the firms that met our convenience sampling criteria through preliminary interviews with some experts belonging to the Center for Young and Family Enterprise (CYFE) of the University of Bergamo, the Regional Committee for Small Enterprises of Confindustria (the major industrial association in Italy), and the Family Business Advisor Office of Unicredit, which is the largest banking group in Italy.

As regards data collection, we gathered information mainly through direct interviews, undertaken between October 2009 and December 2010. Specifically, the following steps were taken:

- At the outset of each case, a relationship was established with a senior manager from the selected firm. This person was briefed about the research project through a written project summary and a telephone meeting. During this meeting, we asked the respondent to introduce us to the entire top-management team and the staff in charge of product innovation.
- Then we personally interviewed at least two informants for each company. We undertook two semi-structured interviews for each respondent (each lasting on average one and a half hours), for a total of more than 35 hours of personal interviews. Direct interviews followed a semi-structured replicable guide that comprised a set of open questions for each area of the product innovation process included in the theoretical framework (see Appendix 2).
- Secondary information was collected in the form of company reports and project documentation. In particular, we gathered and analyzed all the available company documents, catalogs, family information and reports of product innovation projects. This informed the researchers with background information about the selected firms, the type of product innovation they undertake and the approaches they use to administer product innovation activities. Above all, these secondary information sources were integrated, in a triangulation process, with data drawn from the direct interviews, in order to avoid post hoc rationalization and to ensure construct validity (Yin 2003).
- All interviews were tape-recorded and transcribed; generally, at this stage a telephone follow-up with the respondents was conducted in order to gather any important missing data.

Before being analyzed, information gathered through the case studies was manipulated by applying data categorization and contextualization techniques (Miles and Huberman 1984). We then followed a structured process for data analysis, made up of a preliminary within-case study, an explanation-building investigation, followed up by a cross-case comparison. These structured procedures for data collection and analysis, as well as the use of the semi-structured interview guide, helped enhance the reliability of the research (Yin 2003).

Findings and Discussion

In this section, the findings of the case-study analysis are used to illustrate how family firms differ from non-family companies as regards the anatomy of their product innovation process, and to identify the reasons behind the emerged differences. The empirical evidence that we collected is synthesized and mapped along the six dimensions of the reference framework. This information is available upon request. Table 2 provides a synoptic view of these data to allow for a more straightforward comparison and analysis. An in-depth discussion of this empirical evidence is reported in the following paragraphs.

Insert Table 2 about here

Strategy: radical vs. incremental innovation

One first finding of our analysis is that family firms focus their efforts towards incremental product innovations, while non-family firms are more often engaged in breakthrough and radically-new product development projects, which aim to offer completely new functionalities to customers and are targeted to unknown market segments. For instance, Firm D invests exclusively in product innovation with the aim of introducing minor improvements on its existing production machineries and more than 10 new products have been created in 2009 merely by gradually enhancing existing ones (for example, plasticized PVC or a new rubber range of products). As the CEO (father) of Firm D stated: *"We strongly believe in the importance of product innovation, but I have to carefully manage the resources of our family and avoid as much as possible an excessive consumption of our personal wealth by proposing new products that only incrementally improve the existing ones".* The non-family firms in our sample, on the other hand, show a stronger propensity to invest in radical innovations, that is new products and offerings that represent a major improvement over the

status quo and offer something completely new to customers. These efforts toward radical innovation often coexist with incremental innovation projects, as clearly emerges in the firms G, H and I. The attitude toward radical and incremental innovation can be explained with the agency theory. The propensity toward parsimony (Carney 2005) of family firms entails a careful preservation of resources that hinders their inclination to experiment costly and radically-new business opportunities because they root out the slack resources needed for successful experimentation (Nohria and Gulati 1996). Moreover, family firms are less able to undertake radical innovation because the potential agency problems arising from information asymmetries between family business owners and lenders (Jensen and Meckling 1976) limit their ability to borrow, so that they have limited external financial resources compared to non-family firms. The behavioral theory provides a complementary perspective to interpret this empirical evidence. The family firms' documented aversion toward control losses in order to protect their socioemotional wealth (Gomez-Mejia et al. 2007) reduces the possibility to invest in radically-new products, which are far more expensive than incremental innovations, because funding breakthrough innovation projects frequently requires ceding shares to outside parties such as venture capitalists or institutional investors (Gomez-Mejia et al. 2011).

Strategy: closed vs. open approach

As regards the "openness" of the innovation process, it emerges that family firms are much more inclined to rely on external sources of knowledge and technologies during innovation activities, whereas non-family firms predominantly adopt a closed and inward-looking approach. Specifically, family firms are used to leverage their network of external stakeholders to collaboratively carry out most of the stages of the product innovation process. This is clear when analyzing the Firms A, B, C and D. For instance, Firm A works on a continuous basis with three suppliers, the Department of Materials Engineering of a local university and a thermoplastic specialized research center throughout the R&D process, and 50 percent of the firm's R&D budget is dedicated to fund collaborations with outside partners. As the second generation Chief Commercial Officer of Firm A said: "*We are a very well-known family in this province, and this is very helpful when it comes to building partnerships and alliances with our external stakeholders, who are so critical for the success of our new product*". An exception to this trend is Firm E, which appears to be very closed to external

collaborations. However, this is also the result of a very negative experience the firm had with an external partner in the near past, which created a soaring fear of losing control over core competencies and appropriability over the results of innovation activities: *"We had a very bad experience in the past when we tried to co-develop a new technology with a research center. After 7 months of hard work and the commitment of substantial resources, our partner decided to stop the collaboration and licensed the new technology to our competitors. Today, our innovation projects are carried out autonomously, with a high level of protection, so as to avoid opportunistic behavior"* (interview with the Head of R&D). On the other hand, non-family firms appear to rely predominantly on internal capabilities to execute the activities of the product innovation process. This emerges in the cases of Firms F, G, H, I and L, where our respondents acknowledged that technological collaborations are very infrequently employed during the innovation process, unless external support has to be sought out due to lack of a specific piece of knowledge or technology.

The superior ability to nurture and develop prosperous, long-standing relationships with the stakeholders (Miller and Le-Breton Miller 2005; Gomez-Mejia, Nuñez-Nickel, and Gutierrez 2001) and the greater inclination to raise visibility and family reputation with outside interested parties (Dunn 1996), explain why family firms tend to rely to a greater extent on the contribution of external sources of knowledge during innovation projects. This finding is consistent with previous studies that argued that external social capital improves alliance and partnership success (Ireland, Hitt, and Vaidyanath 2002; Koka and Prescott 2002). On the contrary, this apparently seems to be in contrast with recent behavioral theory-based predictions centered around the concept of socioemotional wealth (Gomez-Mejia et al. 2011) because the proved evidence on the importance family firms put on the conservation of their socio-emotional wealth (Gomez-Mejia et al. 2007), which leads controlling families to be strongly concerned about potential control losses, is expected to complicate collaborative relationships with external partners when open innovation implies a restriction to the firm's control over the product's technological trajectory (Almirall and Casadesus-Masanell 2010). However, a more careful and nuanced analysis of our empirical findings shows that the type of technological collaborations set up by the family firms in our sample basically involved universities, public research

centers and suppliers (the last bound by severe IP contractual agreements). These forms of collaboration are likely to determine a lower loss of socioemotional wealth if compared to "horizontal" collaborations with competing firms. Our study suggests, therefore, the importance of distinguishing between different forms of collaboration – horizontal (with competitors), vertical (with suppliers and clients) and with public research institutions such as universities – the former that appear to be the most critical as regards the loss of socioemotional endowment by family firms.

Organisation: cross-functional team vs. functional organisation

Concerning the organization of the innovation process, our empirical analysis first indicates that family firms usually adopt functional structures, whereas non-family ones mostly use cross-functional teams, made of employees temporarily separated from the department (for example, R&D, marketing, operations) to which they belong. For instance, in the family Firms A, D and E, R&D is given the responsibility over administering product innovation projects, and both the marketing and manufacturing functions devote part of the time of their resources to participate to specific phases of the product development process. As stated by the CEO (father) of Firm A: *"When a new project is started, the first step is to estimate the competences and resources needed to carry out the project. Then, a formal meeting with all the corporate functions is held and the amount of resources to be devoted to the project estimated. At this point we search for the commitment of each functional head, which is critical for the success of our innovation projects, which are always organized through a functional approach"*. An exception to this trend is Firm B, where product innovation projects are usually carried out through cross-functional teams made of external consultants, suppliers and employees from the engineering, procurement, manufacturing and logistics departments. Again, this is due to the presence, among the shareholders of Firm B, of a venture capital fund, which has struggled to introduce new practices in product innovation since its arrival in 2003, in the attempt to exert a stronger control. On the other hand, non-family firms are used to build cross-functional teams to carry out product innovation projects, as it is clear if we examine all the non-family firms in our sample, that is Firms F, G, H, I and L.

Our analysis indicates that the higher motivation, cohesiveness and commitment (Fukuyama 1995; Lyman 1991), the easier communication and information exchange (Tagiuri and Davis 1996), and the closer relationships between individuals (Horton 1986) that characterize family firms, which are the unique traits of their human and internal social capitals (Adler and Kwon 2002; Hatch and Dyer 2004), offer a possible interpretation for the observed differences between family and non-family firms as regards the organization of product innovation activities. Specifically, this particular resource endowment of family firms allows them to mitigate the drawbacks that characterize the use of functional organizations (for example, communication problems, conflicts between the functional heads), and to manage the complexity of product innovation projects without incurring into the high costs and resource duplication associated with cross-functional teams. The adoption of this efficient and cost-saving structural solution to organize the product innovation process is also explained by the parsimonious attitude of family firms (Carney 2005), that agency theorists acknowledge as a consequence of the unification of ownership and management (Jensen and Meckling 1976).

Organisation: high vs. low decisional autonomy

We move now to the second variable which defines the organization of product innovation activities, that is the degree of autonomy given to the head of the innovation project. Our multiple case study indicates that this autonomy is usually very high in family firms, whereas less delegation of decisional power characterizes the innovation projects undertaken in non-family companies. This is clear if we look at the family Firms A, C, D and E, where the managers interviewed acknowledged that a very high level of decisional autonomy is given to the innovation project leader. In Firm E, for example, *"We trust the leaders of our R&D projects and we purposefully give high autonomy to them. This is key to ensure flexibility and ability to fix the unforeseeable problems that necessarily occur"* (interview with the Head of R&D, the father's brother). An exception to this trend is Firm B, where all project leaders are given low decisional autonomy and have to get back to the CEO (father of the family) when they take decisions affecting the progress of product innovation projects. This is due however to the uncontrolled diffusion of nepotism (Gomez-Mejia, Nuñez-Nickel, and Gutierrez 2001) in this firm, caused by the unwillingness of the father to fire an incompetent

family manager, which resulted in increased agency costs (Jensen and Meckling 1976). Therefore, leaving a low level of decisional autonomy to the manager was the only viable alternative. In non-family firms, on the other hand, innovation project leaders usually have a lower level of decisional autonomy, as explicitly emerges from the analysis of Firms G, H, I and L. An exception to this trend is Firm F, where the project leader has always had full decisional autonomy in recent new product and service development projects. This exception is explained by the words of the Director of the Technical Department: *"The rapidly-changing competitive and market conditions require us to be as quick and flexible as possible to develop new products. This has led us to give a high level of decisional autonomy to the project leader, but this autonomy is somehow 'bounded', because he is always a member of the Board of Directors who acts consistently with the policies defined by the Chairman of the company and the Board Members".*

The difference between family and non-family firms regarding the level of decisional autonomy is mainly due to the autonomous motivation (Ryan and Deci 2000; Gagné and Deci 2005), collective orientation (Donaldson 1990; Zahra et al. 2008), and high trust (Mayer et al. 1995; Schoorman et al. 2007) that characterize family firms' individuals. These three characteristics ensure that organizational members act as stewards (Davis, Schoorman and Donaldson 1997) strongly identified with the organization and motivated to pursue the interests of the collectivity, thus allowing innovation activities to be administered with a high decisional autonomy.

Climate: risk-taking vs. risk-averse

As regards the organizational climate, one first finding of our analysis is that family firms are characterized by a risk-averse climate which permeates their decisions in product innovation, whereas non-family enterprises are predominantly risk-taking. An internal organizational context (Gibson and Birkinshaw 2004) which promotes entrepreneurial behavior is lacking and incentives to experiment with risky innovation opportunities are hindered by the predominant family climate. This is clear, for example, in Firms A, C, D and E, where the family firm's climate is characterized by conservative behavior and incentives toward assuming risks and experimenting with really-new innovation opportunities are used.

This seems to arise from the fact that family firms pay more attention to protecting the financial security of the family and ensuring the longevity of the business (as it emerged from the interviews in Firms D and E), which leads to them avoiding risky innovation projects that often promise very high short-term pay-offs, as clearly stated by the CEO (father) of Firm C: "*I would never put the destiny of my family at risk by undertaking irresponsible innovation projects to gain high profits in the short term. I have to think about the future of the firm"*. Firm B, whose organizational climate is predominantly risk-taking, is an exception in this respect. However, this can be explained considering the fact that this family firm is partially owned by a venture capital fund, which heavily affected its dominant climate and improved its short-term attitude. If we look instead at non-family firms, it clearly emerged that they have a relatively more risk-taking dominant climate.

The long-term orientation (for example, Dyer 2003) and conservativeness that characterize the entrepreneurial behavior of family firms (for example, Dunn 1996), which are the distinctive traits of their financial capital (Hunt 2000), explain, from a RBV perspective, the rationale behind the differences between family and non-family firms as regards the predominant climate permeating product innovation management decisions. This explanation is also consistent with an agency interpretation of the emerged findings, given that the idiosyncratic propensity for particularism and parsimony of family firms (Carney 2005) causes an augmented attention of the firm to pursue particularistic goals that are different from value maximization and to efficiently use the resources, and this leads to avoiding risky projects that have strong resource commitment requirements and largely unpredictable outcomes.

Climate: high vs. low formalization

The empirical analysis concerning the recurring attitude toward the product innovation process further reveals that family firms are more inclined to employing an unstructured and flexible approach to govern the innovation process, while non-family firms more often administer innovation activities with highly formalized and structured methods. All the managers we interviewed in the sampled family firms told us indeed that the progression of product innovation projects is controlled with very unstructured methods. In Firm D, for instance, the Chief Technical Officer (son) said: "*We govern innovation projects with an*

unstructured and flexible approach that continuously adapts to the changing and ongoing contingencies arising throughout the project itself". It is worth noting that even if a low level of formalization is predominant among family firms, different processes undertaken within the same firm may be administered according to higher levels of formalization. This happens, for instance, in the case of Firm C, where complex new textiles have been exceptionally developed following a very structured method employing a stage-gate system. Non-family firms, on the other hand, are more likely to adopt rigid and formalized methods to govern product innovation projects, as clearly emerges when analyzing all the non-family firms in our sample. For instance, in Firm H a specific software called "aiR&D" is currently used to monitor the advancement of all innovation projects and support the management of the gates with specific "checkpoints" that call for the authorization of the CEO.

The observed differences in the degree of formalization of the product innovation process between family and non-family firms can be explained considering the personalization of authority (Carney 2005) stemming from the concentration of ownership and management that characterizes family firms, a fact which endows owner-managers with high power and authority within the organization, so that they possess the managerial discretion (Hambrick and Finkelstein 1987) to avoid formalized management practices that constrain their managerial authority. This finding is consistent with previous studies showing that family firms do not develop the planning systems and structured management methods required for deliberative and coordinated adjustments of complex and interdependent activities (Chandler 1990). The agency theory provides therefore a useful perspective to interpret the emerged empirical evidence.

Summary

The results of the case study findings are summarized in Figure 2, which provides a tentative synoptic view of the differences between family and non-family businesses as regards the characteristics of the product innovation process.

Insert Figure 2 about here

From our exploratory analysis it emerges that family firms only engage in innovation processes aimed at developing and bringing to market incremental new products, which are carried out relying on a functional organization, with high levels of decisional autonomy given to the project leader. Throughout this process, family firms rely on a relatively high number of collaborations with external sources of knowledge and technologies. Finally, the predominant organizational climate, which permeates the firm's attitude and behavior towards product innovation, is largely informal and unstructured and mainly risk-averse.

On the contrary, non-family firms invest both in incremental and radical innovations, and predominantly establish cross-functional teams to carry out these projects, with limited delegation of decisional authority to the project leader. The innovation process is highly structured, based on formal stage-gate systems and it is closed, with only sporadic, ad hoc collaborations with external partners. Finally, non-family companies are more risk-taking and individual entrepreneurship is strongly encouraged.

Conclusions, limitations and future research

Considering the importance that product innovation has for family firms and their ubiquity in most industrialized economies, this paper investigates the differences in the anatomy of the product innovation process between family and non-family businesses. Drawing upon and combining the resource-based view as well agency, stewardship and behavioral theories and using an exploratory multiple case study as an empirical research strategy, the paper shows that family firms differ from non-family ones under several aspects of the product innovation process (see Figure 2). The reasons underlying these dissimilarities are discussed in light of the peculiarities of family firms' resources, authority structures, incentives, orientations and behavioral attitudes.

Of course the main limitation of our study descends from its exploratory nature. Because our objective was to gain theoretical clarifications as to how and why the product innovation process in family firms is different from non-family firms, our findings should not be generalized to any populations of companies. However, and this represents the main contribution of our study, these findings will hopefully encourage family business and product innovation scholars to examine whether the results of our analysis can be

statistically generalized. This would require building random samples of family and non-family businesses, and testing for the existence of the differences in the characteristics of the product innovation process unearthed by our analysis. By constructing random samples that include both SMEs and large businesses, firms that consider product innovation as a critical determinant of competitive advantage as well as companies that are not very innovative, firms headquartered in different countries, such confirmatory studies will be able to understand whether and how the anatomy of the product innovation process in family firms is contextual upon a set of exogenous factors that were not considered in our exploratory analysis. The firms that we studied are indeed all small companies. Although the decision to focus on small firms reduced the risk of unobserved heterogeneity due to differences in firm size, we consider this a further limitation of our study since some peculiarities of product innovation may be different between small- and large-sized companies (Tan et al. 2009), so that not all the results of the study may be applicable when large family firms are considered. Furthermore, in recent years family business researchers have increasingly moved from viewing family firms as homogeneous entities to viewing them as heterogeneous ones (e.g., Westhead and Howorth 2007). Future scholars are encouraged to understand whether different characteristics within family firms (e.g., different degrees of family involvement in ownership and management, different generations of family control) may affect the anatomy of the product innovation process. Future research should also theoretically and empirically study if our findings apply to other types of technological innovations (in particular process innovations) and consider as well other aspects of the technological innovation process, which were outside the scope of the present analysis. For instance, it would be interesting to see what differentiates family and non-family firms as regards the way they listen to the needs of their clients, the approaches they adopt in Intellectual Property management, the criteria on the basis of which innovation projects are evaluated and selected. Another contribution of our study is to show that some established theories in family business research (for example, agency and stewardship theories) can be usefully applied to study problems in technological innovation. Scholars are therefore encouraged to see if these theoretical models can be used to interpret - from a different angle – well-known innovation management phenomena (for example, response to disruptive technological change or design-driven innovation) taking place in non-

family companies. In this regard, scholars who are willing to apply the socioemotional wealth theory to study collaborative innovation in family firms are encouraged to distinguish between different types of collaboration (for example, horizontal, vertical and with public research institutions) as they appear to entail dissimilar levels of loss of socioemotional endowment.

These directions for future study will strongly benefit both family business and innovation management research. The former has started only very recently indeed, as noted in the literature review section of this paper, to open up the "black box" on innovation in family firms. The latter will benefit from theoretically and empirically considering how family involvement in ownership, governance and management affects innovation. For instance, models predicting success and failure in technological innovation do not consider whether the Critical Success Factors (CSFs) differ between family and non-family firms, although our exploratory analysis identifies several theoretical reasons suggesting that the 'family' variable would be a relevant moderator of the relationship between CSFs and success. In this regard, it is exemplary to note, for example, the large diffusion of the functional organization among the family firms in our sample, which might suggest that cross-functional teams are not necessarily the most appropriate solution to administer product innovation projects in family businesses, as instead innovation management research mostly suggests (Clark and Wheelwright 1992).

This of course also represents a very important issue for managers working in family firms, who are encouraged not to take for granted what technological innovation management handbooks propose as universally applicable good practices. They should carefully think instead about how family involvement in ownership, governance and management of the organization they work in could affect the effectiveness of these good practices and how they should be revised to best suit its distinctive characteristics. Although our analysis remains exploratory in intent, we believe that it will inspire future work with strong impact on management practice.

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Tables and Figures

Table 1
The Studied Cases and Demography of the Respondents

Company	Family business	No. of employees	Turnover (Mio Euro)	Geographical location	Industry	Generation	Family ownership	Family management	Organisation (functions)	Interviewees	Age range
Firm A	Yes	48	8.9	Bergamo province	Plastic molding	2nd	100%	80%	Purchasing; R&D; Manufacturing; Technical Dept.; Marketing; Finance; Quality.	CEO (father) Chief Commercial Officer (son) Chief Technical Officer (son)	61-80 25-40 25-40
Firm B	Yes	22	2.1	Pavia province	Wood products	2nd	80%	80%	R&D; Engineering; Procurement; Manufacturing; Logistics; Sales.	CEO (father) Head of R&D (brother-in-law) Chief Commercial Officer (son)	61-80 41-60 25-40
Firm C	Yes	45	9,6	Varese province	Textiles and fashion	3rd	100%	60%	Creative Dept.; Operations; Human Resources; Manufacturing; Marketing & Sales; Administration & Finance	CEO (son) Chief Technical Officer (father) HR Executive Officer (non-family manager)	41-60 61-80 25-40
Firm D	Yes	26	6,2	Milan province	Plastic goods	3rd	90%	80%	Logistics; R&D; Operations; Marketing; Administration;	CEO (father) Chief Technical Officer (son)	61-80 41-60
Firm E	Yes	40	8,5	Milan province	Vending machines	4th	100%	60%	Procurement; R&D; Manufacturing; Technology Scouting; Finance; Marketing; Distribution; Customer Service.	CEO (father) Head of R&D (father's brother)	61-80 41-60
Firm F	No	15	0,9	Milan province	Technical and scientific services	NA	0%	0%	R&D; Technical Dept.; Operations; Marketing & Sales; Finance.	CEO Director of Technical Department	41-60 41-60
Firm G	No	49	9,8	Lodi province	Food	2nd	20%	0%	R&D; Production; Quality; Planning & Organization; Packaging & Logistics; Marketing & Communication.	CEO Head of R&D Chief Commercial Officer	61-80 41-60 25-40
Firm H	No	31	3,9	Milan province	Aeronautics	NA	0%	0%	R&D; Design & Engineering; Assembly & Manufacturing; Planning & Control; Marketing & Sales.	CEO Chief Technical Officer	61-80 41-60
Firm I	No	38	8,3	Milan province	Shoes	2nd	20	10%	Purchasing; R&D; Design & Manufacturing; Accounting & Finance Marketing; Sales.	CEO Head of R&D Chief Designer	41-60 25-40 25-40
Firm L	No	48	9,5	Bergamo province	Industrial automation	NA	0%	0%		CEO Director of Innovation	61-80 41-60

	Innovation; HR; Control & Accounting; Marketing; Sales; Distribution; Logistics; IT.	HR Executive Officer	41-60

Table 2
Synoptic Representation of the Case-Study Evidence

Company	Family business	Strategy		Organisation		Climate	
		Radical vs. incremental	Closed vs. open approach	Cross-functional team vs. functional organisation	High vs. low decisional autonomy	Risk-taking vs. risk-averse	High vs. low formalisation
Firm A	Yes	Incremental	Open	Functional	High	Risk-averse	Low
Firm B	Yes	Incremental	Open	Cross-functional	Low	Risk-taking	Low
Firm C	Yes	Incremental	Open	Functional	High	Risk-averse	Low
Firm D	Yes	Incremental	Open	Functional and cross-functional	High	Risk-averse	Low
Firm E	Yes	Incremental	Closed	Functional	High	Risk-averse	Low
Firm F	No	Radical and incremental	Closed	Cross-functional	High	Risk-taking	High
Firm G	No	Radical and incremental	Closed	Cross-functional	Low	Risk-taking	High
Firm H	No	Radical and incremental	Closed	Cross-functional	Low	Risk-taking	High
Firm I	No	Radical and incremental	Closed	Cross-functional	Low	Risk-averse	High
Firm L	No	Radical	Closed	Cross-functional	Low	Risk-taking	High

Figure 1
Key Aspects in the Product Innovation Process

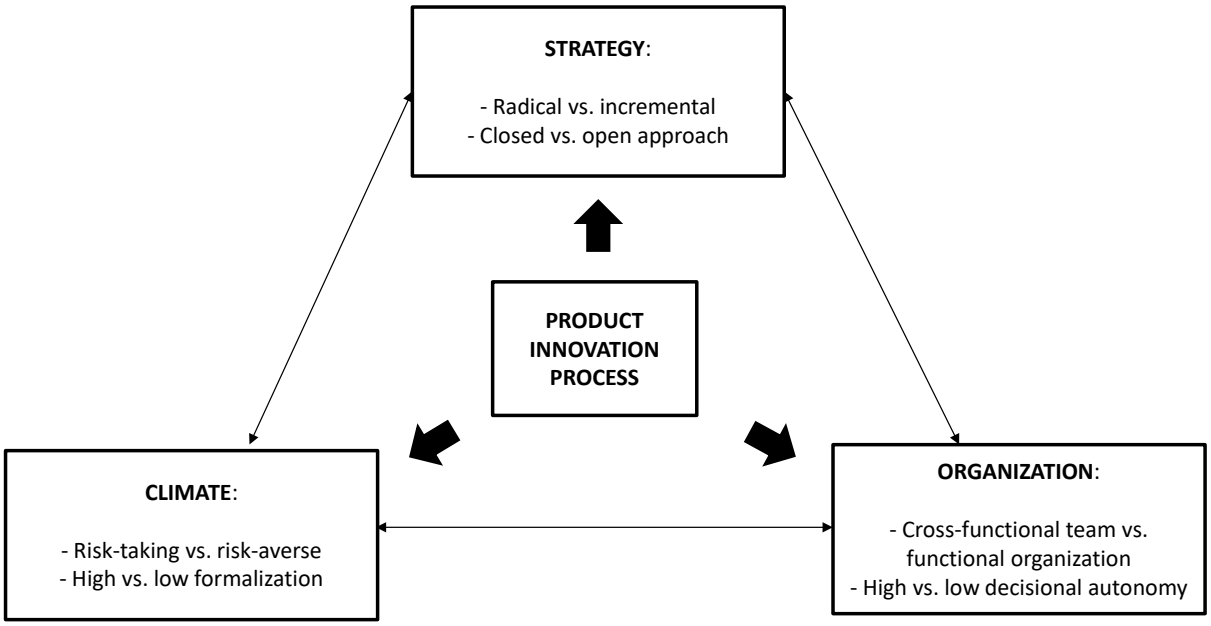
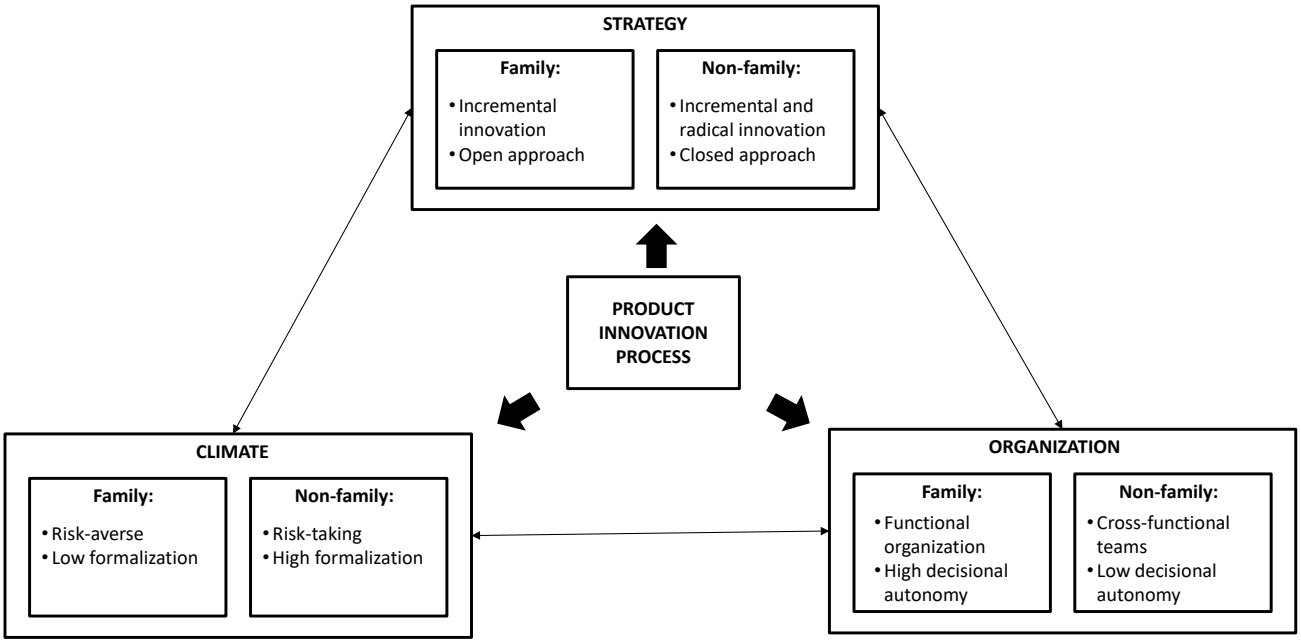


Figure 2
Differences in the Product Innovation Process Between Family and Non-Family Firms



Appendix 1
Product Innovation in the Studied Cases

Company	Type of product innovation projects	No. of resources in R&D (full-time equivalent) *	Annual R&D budget (Euro)*	Product innovation performance
Firm A	95% of NPD projects the firm has initiated in the last five years (about 20) has been motivated by the attempt to satisfy a latent need in the market. Very often, it is customers who get in touch with the firm to ask for improvements or modifications to their current products. These improved products are then also transferred to other clients of the firm. It happens less frequently (in 5% of product development projects) that the firm develops new solutions or technologies for which a market application is sought. 80% of NPD projects consist of on-demand manufacturing new plastic molds by applying the firm's knowledge in the field of thermosetting to new materials and cutting edge technologies that are purchased from corporate partners. The average budget per NPD project is 160 kEuro, and the average project duration is 8 months.	4	800.000 (~80% for product innovation)	40% of sales from new products sold in the last 3 years; product innovation is the main issue in the firm's industrial plan 2010-2012
Firm B	Classic product innovation projects (70% of the total) entail developing new products that better satisfy customer needs by improving the superficial material of wooden products. Five years ago the firm decided to leverage the increasing attention of its clients toward the environment to innovate its products and manufacturing processes by reducing their environmental impact. Since then, the firm's innovation efforts have been directed toward improving the sustainability of its offering, so as to take advantage of the growing demand for "green" products and services. Environmental innovations (30% of the total) are carried out by co-designing ecological and socially sustainable new products with universities, research centers, suppliers and customers. 4 new projects are launched every year, the average budget per NPD project is 40 kEuro, and the average project's duration is 6 months.	6	160,000 (~70% for product innovation)	The whole range of products has been completely renewed in the last 3 years; winner of several awards for product innovation
Firm C	Innovation projects regard the analysis of the most recent market trends and customer preferences, and the employment of innovative mixes of fabrics (for example, silk, wool, cotton, rayon and linen) to combine shapes, geometries and colors that originate new clothes that respond to market needs. The development of new collections of clothes and accessories is the result of a continuous, on-going analysis of the needs of the customers. 100% of the new collections are originated as a response to the identification of an unmet market need. 5 new projects are launched every year, the average budget per product innovation project is 130 kEuro, and the average project duration is 6,5 months.	4	720,000 (~70% for product innovation)	60% of product mix made of new products introduced every year
Firm D	In 2009 the firm brought to market 10 new products, and 5 product innovation projects were launched in 2010. The firm invests in both market-pull and technology-push innovation projects. About 50% of its new products (as the new type of stiff PVC, launched in 2009) are triggered by the recognition of a latent need on the market. 50% of them (as the new halogen-free material commercialized in 2010) result instead from research conducted in the firm's lab. Innovation projects typically consist in applying new technologies provided by TSS firms to fabricate new plastic materials developed by changing the composition of existing ones (for example, synthetic resin polyester). The average budget per innovation project is 110 kEuro, and the average project duration is 6 months.	3	550,000 (~70% for product innovation)	One third of sales from new products introduced every year
Firm E	Product innovation projects consist in conceiving and developing new models of vending machines on the basis of information on customer needs and preferences. The firm uses systematized methods to analyse customer needs so as to generate ideas for product innovation. In particular, every 4 months a questionnaire is sent to all the operators of their vending machines. On average, the response rate is very high, close to 75%. Every year a prototype for a new vending machine is built and given to the employees to test the new functionalities. By doing so, the firm further collects ideas and latent needs that can be used to generate or refine product concepts. Only very infrequently (less than 5% of cases) is the innovation project triggered by the identification of a technology for which a market application is sought. The average number of new products launched in the last three years is 12. The average budget per innovation project is 75 kEuro, and the average project duration is 9 months (the maximum duration is 24 months for very complicated projects).	4	700,000 (~80% for product innovation)	15 new products introduced in 2009 and 10 of them had commercial success
Firm F	The firm works to support the innovation process of its clients, therefore the largest portion of new services are developed through product innovation projects, which are triggered by the attempt to satisfy clients'	3	95,000 (~70% for product	30% of sales from new products and

	needs. Only very infrequently (about 10% of cases) does the firm propose new technologies and solutions, especially to its long-standing clients and partners. The firm has patented many breakthrough technologies (> 10 in the last 3 years) which are a significant competitive advantage when it comes to providing assistance to prospective and current customers. 12 new product innovation projects were started in 2009, and 15 in 2010. The average budget per innovation project is 10 kEuro, and the average project duration is 4 months.		innovation)	service introduced every year
Firm G	Product innovation projects are mainly triggered by the attempt to follow the evolution of the firm's clients' tastes, regarding for instance dietary or health reasons. More recently, the firm has also tried to address, by launching projects aimed at developing revolutionary new products, promising market segments regarding clients with particular dietary needs for religious reasons (i.e. kosher, halal). For example, in 2009 the firm completed a project aimed at replacing alcohol-based ingredients (forbidden to Muslims) in chocolate cream. These revolutionary projects are 30% of the total. The company has launched 9 new products in the last two years, and the most successful innovation has been a self-baking cake batter that heats the oven and cooks itself in less than 5 minutes, which was commercialized in 2010. The average budget per innovation project is 70 kEuro, and the average project duration is 7 months.	4	800,000 (~70% for product innovation)	Product innovation is the main issue of the firm's industrial plan 2011-2013; 25% of sales from new products introduced in the last 2 years.
Firm H	Product innovation projects in the field of military and civil aircraft are triggered by the identification of unmet client needs. On the other hand, in the field of new components, it is often the development of new materials or devices (for example, fuel valves or novel electromechanical actuators) that determine the initiation of a new innovation project, which looks for market needs that can be addressed by using the new technologies. 19 product innovation projects were launched in 2008 and 2009. 12 of them were originated to respond to an unmet market need, while the remaining 7 were undertaken to develop leading-edge technologies that only in a second phase would possibly generate market applications. The average budget per innovation project is 40 kEuro, and the average project duration is 10 months (the maximum duration has been 36 months for very complex projects).	4	390,000 (~80% for product innovation)	Winner of product innovation award in 2009 and 2008; 50% of 2010 sales from new products
Firm I	Product innovation is based upon an artisan-like approach to the design and manufacturing of products, and product innovation projects traditionally consist in searching for and developing new materials and technologies that can profoundly improve the performance and functionalities of the new products. However, any innovation project is initiated by the identification of an unmet need or an opportunity in the market, for which a solution is sought. Each project always starts with a careful scanning and understanding of market trends and of the evolution of clients needs. It never happens that the firm engages in the development of new technologies without a clear idea of where and how it could be applied. The average number of new product innovation projects started in the last three years is 5. 20% of the profits are invested in very ambitious projects with a success rate lower than 10% (the two most innovative and successful projects of 2009 and 2010 were the development of a pair of shoes made of innovative plastic materials and a pair of water-proof shoes made of nanomaterials). The average budget per innovation project is 70 kEuro, and the average project duration is 6 months.	3	600,000 (~70% for product innovation)	Half of net profits invested in product innovation every year; two thirds of product mix made of new products introduced every year.
Firm L	Product innovation projects are usually triggered by the identification of new technologies, which are then developed so that they can be applied to the firm's products. The functionalities enabled by the new technologies are tested with selected clients to understand how they can be better integrated in the firm's offering. 95% of projects consist in the development of cutting-edge new technologies, materials and product architectures characterized by very innovative functionalities and exceptional performance. The remaining 5% of projects consist in making gradual improvements over existing products. 2 new product innovation projects were started in 2010. The average budget per innovation project is 100 kEuro, and the average project duration is 30 months (6 months for the minority of projects implying simple improvements over existing products).	4	750,000 (~70% for product innovation)	50% of profits invested in activities related to product innovation every year

* Calculated as the average value in the last three years.

Appendix 2
Interview Protocol

- When was your firm founded? Which industry does it operate in? What are the sources of its competitive advantage? What are the main economic and financial data? How many employees work in your firm? Which is your average annual R&D and innovation budget? Do you think that your firm is more or less innovative then its direct competitors?

- How are the major responsibilities in your firm organized? Who takes critical governance decisions? How many members are there in your family? Who works in the company and what positions they hold? Do you have any expectation(s) regarding one or more family members continuing with the company in the future? Would you mind if it were someone outside the family? Is the family a conditioning factor in terms of decision making at the company?

- Do you invest in innovation projects aimed at producing a really-new product, which represents a breakthrough over the status quo? If so, how often in the last five years? Why do you invest money in these kinds of projects? What is the success rate of these projects? How important are incremental innovation projects for your strategy? How often do you start a project like this? How do you ensure a proper balance between radical and incremental innovation projects in your portfolio?

- What is the most common source of ideas for your innovation projects? Do you usually turn to your customers (both existing and potential) to identify new product opportunities? Is this your predominant approach to concept generation, or do you also start from new technologies for which a market application is sought? How often does this happen? What portion of your budget for innovation is devoted to market-driven and technology-push projects?

- Are your employees encouraged to express out-of-the-box ideas for new products? Is failure accepted and risk tolerated in your firm? Are there any extrinsic (for example, monetary incentive) or intrinsic (for example, easier career progress) rewards for those employees who propose valuable innovation opportunities? Do you think they might be useful for improving your product innovation performance?

- How are your innovation projects organized? Do people take part in the project dedicated to innovation activities on a full time basis? Or rather, do they continue working in their own functions and work part time on the innovation project? Does the innovation project leader have a higher authority in comparison with the heads of the business functions? Does your firm apply the same organizational structure to all innovation projects? If not, why?

- What types of decisions is the project leader entitled to take without the need for authorization from higher-level managers? Does the project leader have full responsibility over the results of the innovation project? Is he/she rewarded depending on the results of the firm's innovation project? Are there any differences in the project leader's decisional authority depending on the type of innovation project?

- Does your firm employ any methods for monitoring the progress of innovation projects? If so, do they entail the use of milestones and metrics? How often are they measured? Are these criteria for project control strictly applied? Are there any differences in the application of these methods depending on the characteristics of the innovation projects?

- Do you collaborate often with external partners during innovation activities? If so, in which phases of the innovation project? Who are the partners you most often collaborate with? What are the reasons why you have decided to access external sources of knowledge and technologies? What are the advantages and drawbacks of these collaboration activities? Are there any particular innovation projects during which you collaborate more often with external partners?