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DOCTORAL DISSERTATION

Productivity, innovation and wage policies in family firms: Empirical evidence from Belgium and the Netherlands

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SAMENVATTING

Familiebedrijven bestaan al decennia lang en zijn goed in staat om op te boksen tegen de grote beursgenoteerde bedrijven. Gebaseerd op hun totale aandeel in de bedrijfswereld en hun totale bijdrage aan werkgelegenheid en het BNP van de meeste landen, is het duidelijk dat familiebedrijven beschouwd moeten worden als één van de belangrijkste organisatietypes. Dit maakt familiebedrijven voor academici dan ook zeer interessant om te onderzoeken. Familiebedrijven zorgen meestal voor een stabiliteit op lange termijn en leveren een essentiële bijdrage aan de arbeidsmarkt, waardoor ze een belangrijke determinant zijn voor de economie van een land. In België en Nederland wordt het economisch landschap gedomineerd door bedrijven die in familiale handen zijn. Meer bepaald, familiebedrijven zijn in deze landen verantwoordelijk voor ongeveer 53% van het BBP en ongeveer 49% van de arbeidsmarkt.

Een van de belangrijkste zaken die in een theorie rond familiebedrijven moet worden aangepakt, is hoe en waarom deze organisatievorm zich op een onderscheidbaar andere manier gedraagt en presteert dan niet-familiebedrijven. Onderzoekers zijn tegenwoordig steeds meer geïnteresseerd in welke rol de familiale eigenaarsstructuur kan spelen in het verklaren van verschillende patronen van productiviteitsgroei. Voorgaande studies omtrent de impact van familiaal eigenaarschap op productiviteit hebben geen eenduidig antwoord gegeven op de vraag of familiebedrijven meer of minder productief zijn dan niet-familiebedrijven, of de omstandigheden waaronder familiebedrijven meer of minder productief/efficiënt zijn.

Deze inconsistente bevindingen, die voornamelijk gebaseerd zijn op samples met alleen maar grote bedrijven, vragen om aanvullend onderzoek waarbij gebruik gemaakt wordt van meer geschikte schattingstechnieken. De meerderheid van empirische studies die productiviteitsverschillen tussen familiebedrijven en niet-familiebedrijven onderzoeken, richten zich op de gemiddelde waarde door gebruik te maken van klassieke lineaire regressie methoden (OLS of verscheidene panel data schattingen). Dit heeft geleid tot een

onvolledig beeld van productiviteit in familiebedrijven. De onconditionele kwantiel regressie methode maakt het mogelijk om de potentiële heterogene effecten van familiaal eigenaarschap te beoordelen voor de volledige onconditionele productiviteitsverdeling, in plaats van het gemiddelde bedrijf te bestuderen zoals OLS-technieken doen. Dit impliceert dat we de impact van familiaal eigenaarschap op arbeidsproductiviteit kunnen onderzoeken voor alle verschillende niveaus van de arbeidsproductiviteitsverdeling. Dit levert een uitgebreid beeld op van productiviteit in verschillende economische achtergronden.

Het is belangrijk dat de studie van familiebedrijven verder gaat en zich richt op het verklaren van variaties in de productiviteit van familiebedrijven door te focussen op de onderliggende routines, activiteiten en processen die productiviteitsverschillen in familiebedrijven creëren. Eigendomsstructuur kan productiviteitsverschillen tussen bedrijven verklaren. Dit kan het geval zijn omdat de houding en het gedrag van een onderneming met betrekking tot diversificatie en investeringen in R&D beïnvloed en/of bepaald kan worden door de eigendomsstructuur. De strategieën inzake diversificatie en investeringen in R&D kunnen leiden tot productiviteitsverschillen tussen bedrijven. Daarom is het essentieel om het deel van de familieproductiviteitspremium dat andere productiviteitsdeterminanten vasthoudt die verband houden met marktmacht effecten, innovatie, kapitaal, arbeid en loonkenmerken niet uit te sluiten.

Het doel van dit doctoraatsonderzoek is om inzicht te krijgen in de reden waarom familiebedrijven meer of minder productief zijn dan niet-familiebedrijven. We focussen in dit onderzoek op productiviteit, aangezien dit een belangrijk instrument is voor het analyseren van de economische prestaties van elke productie-eenheid. De algemene onderzoeksvraag van dit doctoraatsproefschrift wordt als volgt geformuleerd: "Hoe kan de productiviteitspremium/discount van familiebedrijven gemeten en verklaard worden?". Dit proefschrift is opgebouwd uit 3 delen, bestaande uit 3 verschillende studies en een hoofdstuk gerelateerd aan de dataverzameling. In de eerste twee empirische studies van dit doctoraatsproefschrift (hoofdstuk 2 en 3) wordt gebruik gemaakt van een panel dataset, die informatie bevat over

1802 bedrijven die gevestigd zijn in Nederland. Deze dataset werd samengesteld met de hulp van het Centraal Bureau voor Statistiek (CBS) in Heerlen. De derde empirische studie (hoofdstuk 4 en 5) is gebaseerd op een vragenlijst die we in 2015 verstuurd hebben naar een steekproef van Belgische niet-beursgenoteerde ondernemingen met meer dan 10 werknemers.

Empirisch bewijs omtrent de relatie tussen eigendomsstructuur en productiviteit is tegenstrijdig. In het **EERSTE DEEL** van dit doctoraatsproefschrift herbekijken we deze vraag door ons te concentreren op het heterogene effect van familiaal eigenaarschap, waarbij *socioemotional wealth* (SEW) wordt beschouwd als een belangrijke factor in het bepalen van het risicogedrag van familiebedrijven.

In **Hoofstuk 2** onderzoeken we de rol van familiaal eigenaarschap in het vormen van productiviteitsverdelingen van bedrijven, met andere woorden hoe variëren de arbeidsproductiviteitseffecten van familiaal eigenaarschap op verschillende punten van de onconditionele arbeidsproductiviteitsdistributie. De minst productieve familiebedrijven bij lagere kwantielen (meest productieve familiebedrijven bij hogere kwantielen) vertonen een productiviteitspremium (discount)[1] in vergelijking met niet-familiebedrijven. Anders gezegd zijn familiebedrijven minder geneigd om extreme arbeidsproductiviteitsuitkomsten te vertonen aan de onder- en bovenkant van de distributie, terwijl niet-familiebedrijven vaker extreme productiviteitsuitkomsten vertonen. Onze bevindingen bieden een sterke empirische ondersteuning aan het SEW verhaal. Ons model voorspelt namelijk een zeer duidelijk patroon van heterogene productiviteitsresponsen die niet alleen afhangen van het type eigendomsstructuur, maar ook van het initiële willekeurige productiviteitsniveau van een bedrijf. Familiebedrijven hebben de neiging om meer veerkrachtig te zijn in tijden van economische crisis door hun conservatieve financieringswijze, hun solide financiële buffers, hun langetermijnfocus en het vertrouwen van hun (loyale) werknemers. Familiebedrijven verdienen niet zo veel geld als bedrijven met een meer verspreide eigendomsstructuur wanneer de economie goed draait. Echter, als de economie slechter wordt, presteren familiebedrijven beter dan

[1] We definiëren productiviteitspremium (discount) als het verschil in productiviteit tussen familiebedrijven en niet-familiebedrijven, gemeten door het positieve (negatieve) effect van de familiaal eigenaarschap dummy op arbeidsproductiviteit.

niet-familiebedrijven. Familiebedrijven lijken een manier van verzoening tussen traditie en moderniteit te hebben gevonden en kunnen terugvallen op een sterk bestuursmodel in complexe en veranderende omgevingen, waardoor ze een stabiliserende factor in de economie vormen.

In het **TWEEDE DEEL** van dit doctoraatsonderzoek wordt de rol van loonbeleid in familiebedrijven en niet-familiebedrijven besproken. Het loonbeleid in bedrijven kan gezien worden als een determinant van productiviteit aangezien arbeidsproductiviteit rechtstreeks gelinkt kan worden aan de houding, het gedrag, de motivatie, de inzet, het moraal en de ambitie van werknemers. De verandering in het loon van werknemers kan het gevolg zijn van een verandering in het loonbeleid zodat dezelfde werknemer op een andere manier betaald wordt in familiebedrijven dan in niet-familiebedrijven. Ten eerste concluderen onderzoekers in voorgaande studies dat familiebedrijven hun werknemers een specifiek vergoedingspakket aanbieden met een lager loon in ruil voor grotere werkzekerheid. Ten tweede kan het loonverschil tussen familiebedrijven en niet-familiebedrijven ook verklaard worden vanuit een institutionele arbeidsomgeving, zoals de rol van vakbonden. Lonen kunnen worden bepaald volgens een efficiënt onderhandelingsproces tussen werkgevers en werknemers. Werknemers die deel uitmaken van een vakbond behoren minder vaak tot een familiebedrijf.

In **Hoofdstuk 3** van dit proefschrift onderzoeken we loonverschillen tussen familiebedrijven en niet-familiebedrijven. Deze loonverschillen kunnen veroorzaakt worden door observeerbare kenmerken van de werknemer[2] of het bedrijf[3] en door andere onobserveerbare kenmerken van de werknemer[4] of het bedrijf[5]. We bevestigen dat familiebedrijven gemiddeld gezien hun werknemers 15% minder betalen, wanneer er gecontroleerd wordt voor (on)observeerbare kenmerken van werknemer en bedrijf. Wij vinden dat 4.4% punten van dit loonverschil verklaard worden door onobserveerbare kenmerken van werknemers. Verder vinden we dat onobserveerbare bedrijfskenmerken ook bijdragen aan het loonverschil. Dit kan worden verklaard door het feit dat

[2] Bijvoorbeeld: ervaring, diploma, functie.
[3] Bijvoorbeeld: sector, grootte, leeftijd.
[4] Bijvoorbeeld: cognitieve vaardigheden, kennis, wil.
[5] Bijvoorbeeld: geschiedenis van het bedrijf, cultuur van het bedrijf.

werknemers in familiebedrijven de neiging hebben om te kiezen voor bedrijven die gemiddeld lagere lonen betalen. In het laatste deel van dit hoofdstuk maken we die onobserveerbare bedrijfskenmerken meer specifiek door het bestuderen van de onderhandelingsmacht van vakbonden binnen bedrijven. Deze onderhandelingsmacht blijkt lager te zijn in familiebedrijven, wat betekent dat de rol van vakbonden in die bedrijven eerder beperkt is.

Het **DERDE DEEL** van dit proefschrift bestudeert de rol van innovatie omdat we weten dat innovatie een belangrijke determinant van productiviteit is. Familiebedrijven verschillen van niet-familiebedrijven wat betreft innovatiestrategieën en de organisatie van het innovatieproces. Het doel van dit onderdeel is om te concentreren op het verklaren van variaties in het innovatieve gedrag bij familiebedrijven.

Het doel van **Hoofdstuk 4** is om inzicht te krijgen in het innovatieve gedrag van private Belgische bedrijven. In dit hoofdstuk vinden we verschillen in de gemiddelde waarden wat betreft innovatie tussen familiebedrijven en niet-familiebedrijven. Dit kan verschillen weerspiegelen in innovatiestructuur en innovatiegedrag tussen familiebedrijven en niet-familiebedrijven. Familiebedrijven geven aan dat ze gemiddeld meer opteren voor productinnovatie, procesinnovatie en organisatorische innovatie vergeleken met niet-familiebedrijven. De gemiddelde R&D-uitgaven in familiebedrijven (3.9%) zijn echter lager dan bij niet-familiebedrijven (4.45%). Familiebedrijven introduceren gemiddeld minder nieuwe of aanzienlijk verbeterde producten en/of diensten dan niet-familiebedrijven. Verder hebben we ook vastgesteld dat familiebedrijven meer kans hebben om actief samen te werken met externe innovatiepartners dan niet-familiebedrijven.

In **Hoofdstuk 5** onderzoeken we waarom bepaalde familiebedrijven succesvoller zijn in het effectief vertonen van innovatiegedrag in vergelijking met andere bedrijven. Familiebedrijven hebben doorgaans twee unieke familiegebonden kenmerken –*ability* en *willingness*- die hen kunnen helpen om particularistisch gedrag, zoals innovatie, te vertonen. Het hebben van *ability* en *willingness* om te innoveren garandeert niet dat familiebedrijven ook effectief innovatief gedrag zullen vertonen. Verscheidene factoren kunnen de directe relatie tussen *ability* en *willingness* om te innoveren en het effectief innovatief gedrag in familiebedrijven belemmeren. Voldoende financiële middelen zijn een essentieel onderdeel van het innovatief gedrag van bedrijven. Familiebedrijven moeten hun innovatieproces managen en dit vereist goed ontwikkelde financiële systemen. Het relatieve belang van *ability* en *willingness* om te innoveren in het voorspellen van innovatief gedrag zal naar verwachting verschillen tussen familiebedrijven wegens financiële beperkingen. Het zijn van een familiebedrijf kan namelijk de financieringsvoorwaarden beïnvloeden. Hoewel de *family-oriented particularistic behavior* theorie het belang van het *willingness* concept aangeeft, is het wellicht niet van toepassing op onze steekproef van private Belgische familiebedrijven. Daarnaast vinden we geen bewijs voor de modererende rol van financiële beperkingen. Voor onderzoekers, *practitioners* en beleidsmakers is het essentieel om familiebedrijven niet langer te beschouwen als een organisatievorm die niet innoveert. Familiebedrijven kunnen succesvol zijn in andere innovatie domeinen, bijvoorbeeld door een innovatieve ondersteunende cultuur te creëren en de creativiteit van de werknemers te stimuleren.

Meer diepgaande analyses tonen aan dat het belangrijk is om rekening te houden met het multidimensionale aspect van *socioemotional wealth*. We vinden verschillende innovatieve gedragingen, afhankelijk van de overheersende SEW dimensie, die gebruikt wordt om het concept *willingness* te meten in deze studie. Zo vinden we bijvoorbeeld interessante resultaten wanneer *emotional attachment* wordt gebruikt om *willingness* te meten, terwijl de resultaten niet significant zijn voor alle andere FIBR-dimensies[6]. Meer bepaald vinden we statistisch bewijs dat voor familiebedrijven met een hoge *ability* om te innoveren, het effect van *willingness*, gemeten aan de hand van de E-dimensie, op productinnovatie of procesinnovatie significant positief is. In tegenstelling tot werknemers in niet-familiebedrijven, hebben familiemedewerkers de dubbele rol van familielid en werknemer in het familiebedrijf, waardoor het nastreven van zowel familiale als bedrijfsdoelen complex kan worden. Elk van deze rollen heeft

[6] FIBER = dimensies van socioemotional wealth. Berrone, Cruz, and Gomez-Mejia (2012) hebben deze dimensies afgekort tot het FIBER begrip, wat staat voor 'Family control and influence', 'Identification of family members with the firm', 'Binding social ties', 'Emotional attachment of family members', and 'Renewal of family bonds to the firm through dynastic succession'.

zijn eigen normen, waarden en organisatorische structuren. Problemen ontstaan omdat de rollen in de familie en het bedrijfsleven verward raken, aangezien hetzelfde individu beide rollen moet vervullen. Daarnaast dient het bedrijf zelf te werken volgens goede bedrijfsvoering en principes, terwijl tegelijkertijd aan de behoeften van de familie voor werk, identiteit en inkomen voldaan moet worden.

Deze doctorale studie draagt bij aan de opkomende familiebedrijven literatuurstroom door enerzijds te onderzoeken of een familiebedrijf een effectieve bedrijfsstructuur is om een hogere productiviteit af te leveren dan niet-familiebedrijven, en anderzijds te onderzoeken welke kenmerken de productiviteitsverschillen tussen familiebedrijven en niet-familiebedrijven kunnen verklaren.

CHAPTER 1

INTRODUCTION

1. Overview of the literature

1.1. The importance of family firms

Family firms already exist for decades and hold up well against the large publicly held firms. Based on their total number as well as their total contribution to the employment and national product of most countries, it is obvious that family firms should be considered as one of the most important types of organization. According to some estimates, their share lies in a range of 50 to 96 percent of all companies depending on the country and the definition used (IFERA, 2003). The leading role of family firms in worldwide economic production and employment has been acknowledged, which makes family firms an interesting topic for scholarly research (Salvato & Aldrich, 2012).

Worldwide many companies are controlled by families, in particular by their founders or their founders' descendants (e.g., Bennedsen, Nielsen, Perez-Gonzalez, & Wolfenzon, 2007; Croci, Doukas, & Gonenc, 2011). Family firms are not only prevalent among privately held firms, but they can also be found in a major part of publicly held firms (e.g., Bertrand & Schoar, 2006). The ownership and control of more than one-third of the large publicly held firms located in the United States are in the hands of founding families (e.g., Anderson & Reeb, 2003; Villalonga & Amit, 2006). In several European countries, family firms are the majority of all businesses. Family firms make up more than 60 percent of all

European companies (European Commission, 2009). For example, on the French stock market one-third of the firms are widely held, whereas the remaining two-thirds are family firms (Sraer & Thesmar, 2007).

Family firms typically ensure a long-term stability and make an essential contribution to the employment market, which makes family firms an important determinant for the nation's economy (European Commission, 2009). In the United States family firms are responsible for 40 to 60 percent of the Gross Domestic Product (GDP) (Eddy, 1996). Also in Belgium and the Netherlands the family owned firms dominate the economic landscape. More specifically, in the Netherlands family firms make an essential contribution to the economy; in particular they are accountable for about 53 percent of the Dutch GDP and approximately 49 percent of the labor force in the Dutch economy (Flören, 2003; Flören & Geerlings, 2006; Flören, Uhlaner, & Berent-Braun, 2010). The figures prevailing in the Netherlands are similar for Belgium (Ceysens, 2008; IFERA, 2003).

1.2. The definition of family firms

In a family firm there is typically an overlap between the business, the family and the ownership component. Because of their overlapping memberships, family members working in the family firm can have three simultaneous roles, as relatives, as owners, and as managers (Tagiuri & Davis, 1996). The underlying conceptual model held that family firms are actually made up of three overlapping sub-systems: family, business and ownership (Gersick, Hampton, Lansberg, & Davis, 1997; Tagiuri & Davis, 1996). Each of these three systems has its own norms, membership rules, value structures, and organizational structures (Gersick et al., 1997). Problems arise because the same individual has to fulfill obligations in all three sub-systems (Gersick et al., 1997; Tagiuri & Davis, 1996). As family members they are concerned primarily with the welfare and the unity of the family; as owners they are interested in return on investment and in the viability of the firm; as managers, they work towards the firm's operational effectiveness (Tagiuri & Davis, 1996).

In drawing up a definition of family firms, there is an agreement on three essential elements: ownership, the family and the business. Chua, Chrisman, and Sharma (1999) define a family business as *"a business 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" (p. 25)*. Much has been published about family firms and it is rather comprehensive. This makes it difficult to find an unambiguous definition of a family firm. However, a typical family firm is marked as an organization controlled and usually managed by multiple family members, whereby the uniqueness of a family firm is determined by the family's involvement in the business (Chua et al., 1999; Miller, Le Breton-Miller, Lester, & Cannella, 2007).

In the family firm literature, different proxies have been used to define a family firm (e.g., Rutherford, Kuratko, & Holt, 2008). This dissertation employs the most commonly selected criteria of ownership and management control (Chua et al., 1999; Flören, 2002; Miller et al., 2007) and the CEO's perception of being a family firm (Westhead & Cowling, 1998) to select an operational definition of family firms. Therefore, firms will be classified as family firms if (1) at least 50 percent of the shares are owned by the family, the company is family managed or the family is responsible for strategic choices or succession decisions, and (2) the CEO perceives the firm as a family firm.

Given that this dissertation is a bundling of four different studies, some chapters report an operational definition that slightly differs from this overarching definition. First, the family firm definition used in **PART III** (i.e., Chapter 4 and Chapter 5) is based on frequently selected criteria of ownership (e.g., Anderson & Reeb, 2003; Chua et al., 1999) and the CEO's perception of being a family firm (e.g., Barbera & Moores, 2013; Westhead & Cowling, 1998). Accordingly, we define a firm as a family firm if (1) member(s) of a single family own(s) at least 50% of the shares and/or (2) the firm is perceived as a family firm by the CEO. Second, **PART I** (i.e., Chapter 2) and **PART II** (i.e., Chapter 3) drop the second requirement, since these parts are based on a different sample than

PART III and we have no explicit information on the CEOs perception. Furthermore, **PART I** and **PART II** add an additional requirement, namely at least the second generation has to be involved in the firm. To distinguish family firms from non-family firms in **PART I** and **PART II**, we rely on the procedure used by Elsevier. Elsevier selected family firms based on ownership and management control criteria and classified a firm as a family firm if (1) the majority of ownership (directly or indirectly) rests in the hands of a natural person and/or relatives of the family who has founded or has acquired the firm, (2) at least one representative of the family or kin is formally involved in the management of the firm. This is also consistent with the GEEF[7] definition (European Commission, 2009; Flören et al., 2010; Kansikas, Tourunen, & Laaksonen, 2011). Elsevier decided to tighten the GEEF definition by adding an extra criteria, namely (3) at least the second generation has to be involved in the firm. Due to data limitations, it is not possible to use the same definition throughout the entire dissertation. In our Dutch sample, we do not have detailed information on the family involvement, family ownership, and family control so we have to depend on the Elsevier lists of family firms. Nevertheless, all firms in this dissertation meet the requirements of the (rather broad) operational definition.

1.3. Productivity in the family firm

The influence of family ownership on firm performance has been an ongoing controversial topic among economists and business scholars. There exists some empirical evidence that family ownership may affect firm performance (e.g., Chrisman, Chua, & Sharma, 2005; Kellermanns, Eddleston, Sarathy, & Murphy, 2012). However, the results of prior studies investigating the relationship between family ownership and firm performance are mixed. The overlap between ownership and management can have both a positive and a negative effect on firm performance. One of the most important issues that must be addressed in a theory of the family firm is how and why this form of organization behaves and performs in a distinguishably different way from a non-family firm (Benavides-Velasco, Quintana-García, & Guzmán-Parra, 2013).

[7] European Group of Owner Managed and Family Enterprises.

Theoretical and empirical studies provide opposing evidence on whether family owned firms perform better than non-family firms. Usually performance is measured by financial measures such as Tobin's q or Return On Assets. While such measures make it easy for interpretation, in theory, they do not take into account input and output market imperfection (e.g., markups, capital and labor frictions) (e.g., Syverson, 2011; Tangen, 2003). Therefore, an estimated financial performance premium of family owned firms may yield substantially biased coefficients. In this dissertation, we focus on productivity, which is an important tool for analyzing economic performance of any production unit (Syverson, 2011). Our focus on this particular measure of performance is driven by two important reasons. First, when linking any type of performance measure to a firm that is family owned, it is not family ownership in itself that is the only predictor of performance but also the quality of the management (Bloom & Van Reenen, 2007). In this respect, it is critical to understand not just whether family owned firms influence a firm's financial performance but also how this influence is exerted. Since family ownership influences financial performance by affecting a firm's input and output fundamentals, a corresponding relationship between family ownership and the real side of firm performance is needed. In other words, productivity should be a channel through which family ownership works to influence financial performance. Second, under neoclassical assumptions[8], financial performance would be a good indicator of underlying firm productivity. However, in the presence of imperfections in the input and output market (e.g., markups, capital and labor frictions, agency-type problems) the relationship between productivity and financial performance may be weak. Therefore, we argue that productivity is a more reliable measure of performance than financial measures, as for instance returns on investment, profits or Tobin's q. In this dissertation, we will focus on productivity because we are interested in the efficiency of family firms.

Over the past decade, there has been a growing interest in the role of family ownership structure in explaining different patterns of productivity growth (see e.g., Barbera & Moores, 2013, for a recent review). Earlier studies on the impact of family ownership on productivity have not reached a consensus on whether

[8] In Chapter 3 we explicitly correct for imperfect competition in measuring productivity, while in Chapter 2 we assume perfect competition when measuring labor productivity.

family firms are more or less productive than non-family firms, or the circumstances under which family firms are more or less productive.

A first strand of literature observes lower labor productivity levels in family firms due to their typical **agency conflicts** and behavior. According to Jensen and Meckling (1976) agency conflicts arise if both, principal and agent, are utility maximizers. Accordingly, it is likely that the agent will not always act in the best interests of the principal (Jensen & Meckling, 1976). The problem arises because of information asymmetries between the parties and from their different incentives (Ang, Cole, & Lin, 2000; Fama & Jensen, 1983). Those agency costs between owners and managerial agents can be advantageously low in family firms if there is a close alignment or even identity between the interests of owners and managers (Dyer, 2006; Fama & Jensen, 1983). However, some authors disagree with the effectiveness of family ownership to cope with agency conflicts. They indicate that family firms have to deal with typical agency conflicts arising from conflicts between family and non-family members, family members in different roles, dominant and minority shareholders (Schulze, Lubatkin, & Dino, 2002, 2003; Schulze, Lubatkin, Dino, & Buchholtz, 2001). Agency theory argues that family firms could lead to lower productivity if the controlling family shareholders take advantage of their position. First, productivity of family firms can be negatively influenced by the family's role in selecting managers and directors (Anderson & Reeb, 2003; Dyer, 2006). Bertrand and Schoar (2006) use the terms *'inheritance norms'* and *'nepotism'* to refer to this situation. Such inheritance norms can vary from strict primogeniture to equal sharing rules among all the sons of a founder. Primogeniture may involve problems since it severely restricts the founders' ability to select the most talented person to take over the family firm. Nepotism can be generated by a culture based on strong family ties. Due to the strong family culture, a family shareholder might decide to appoint managers from within his/her kinship network instead of more talented professional managers (Bertrand & Schoar, 2006). The lower skill levels among family managers instead of professional managers may reduce a firm's productivity level (Barth, Gulbrandsen, & Schøne, 2005; Classen, Carree, Van Gils, & Peters, 2014). This type of recruitment procedure will also limit the opportunity for qualified employees to get the chance of occupying high corporate positions inside the company. As family members are entrenched in their managerial positions, less top managerial positions will be available for employee promotion or outside experts. This will imply a deterioration of employee motivation, commitment, morale, ambition and consequently productivity (Charbel, Elie, & Georges, 2013). Second, family shareholders might have the tendency to take actions which are benefiting themselves at the expense of firm performance (Anderson & Reeb, 2003; Demsetz, 1983; Villalonga & Amit, 2006). Entrenched family shareholders can expropriate wealth from the firm through excessive self-compensation, related-party transactions or special dividends, which results in less profit distribution for employees. This will also negatively affect employee motivation and commitment, which adversely affects labor productivity (J. Lee, 2004).

A second strand of literature reports higher labor productivity for family firms by using arguments from the **stakeholder theory**. More specifically, employees are considered as an important stakeholder group to firms and are seen as the greatest asset for firms (Donaldson & Preston, 1995). Family firms are more and more praised for their ability to deliver welfare and security to their close stakeholders (i.e., employees) (Bach, 2010). Family firms are typically focusing on the long term because they regard the firm as an asset to pass on to their descendants rather than wealth to consume during their lifetimes. This way of thinking allows them to invest in long-term projects since firm survival is an important issue for family firms (Anderson & Reeb, 2003; Bertrand & Schoar, 2006; Chami, 1999). The family creates and maintains close relationships with their employees. These close ties will generate goodwill and willingness (Dyer, 2006). A. L. Christensen, Mesquita, Hashimoto, Hom, and Gomez-Mejia (2014) argue that family firms more often support their workforce with a caring organizational climate[9] than do non-family firms. Family firms who implement those caring organizational policies actually realize productivity gains by strengthening workforce commitment and motivation among their employees. The underlying reasoning for this is when employees perceive caring policies and practices that meet their needs, they naturally display higher job-related efforts,

[9] Employees' perceptions of the firm's normative concern for the welfare of others rather than instrumental actions and values that define success primarily in financial terms (A. L. Christensen et al., 2014).

which results in higher labor productivity (Azoury, Daou, & Sleiaty, 2013; A. L. Christensen et al., 2014). Labor productivity is directly tied to employees' attitudes and behavior (Firfiray, Larraza-Kintana, & Gomez-Mejia, 2016). An example of such a caring organizational policy is that family firms provide more employment and wage insurance than firms without family control (e. g., Bach, 2010; Bassanini, Breda, Caroli, & Rebérioux, 2013; Ellul, Pagano, & Schivardi, 2014; H. M. Mueller & Philippon, 2011; Sraer & Thesmar, 2007). Family firms prefer not to downsize because they have a great willingness to care for their employees and their communities. In family owned and controlled firms downsizing might not match with the family values and goals, since it may disrupt the desired harmony, the stability and the reputation (Stavrou, Kassinis, & Filotheou, 2007). Hence, family firms can achieve higher productivity gains by paying their employees less for similar skills than non-family firms in return for job stability (Bassanini et al., 2013; Sraer & Thesmar, 2007).

Given these theoretical ambiguities, it is not surprising to see that the empirical literature has not reached a consensus with regard to the direction of the relationship between firm productivity and family ownership; the empirical results in the literature are mixed or even conflicting. Some studies find higher productivity levels in family firms compared to non-family firms (e.g., Galve-Górriz & Salas-Fumas, 2011; Martikainen, Nikkinen, & Vähämaa, 2009; Sraer & Thesmar, 2007), while other researchers observe that family firms have lower productivity compared to non-family firms (e.g., Barth et al., 2005; Classen et al., 2014; Cucculelli, Mannarino, Pupo, & Ricotta, 2014). In addition, there are also some studies that find no differences in productivity between family firms and non-family firms (e.g., Barbera & Moores, 2013).

First, these inconsistent findings mainly based on large companies warrant additional research using more suitable estimation techniques. Barbera and Moores (2013) state that the conflicting results among studies might be due to different definitions of a family firm, time periods, measures of productivity, methodologies and datasets. The majority of empirical studies investigating discrepancies between productivity of family firms and non-family firms focus at the mean value, thereby using classical linear regression (i.e., OLS or different panel data estimators). This has led to an incomplete depiction of productivity in family firms. In contrast, the unconditional quantile regression method allows for the estimation of potentially heterogeneous effects of family ownership along the entire unconditional distribution of firm productivity, rather than assuming the *'average firm'* as OLS techniques do (Porter, 2015). This implies that we can investigate the impact of family ownership on labor productivity at different levels of the labor productivity distribution (i.e., for low or high levels of labor productivity), which offers a comprehensive picture of firm productivity in distinct economic backgrounds.

Second, it is important that the study of family firms moves forward and focuses on explaining variations in the productivity of family firms by focusing on the underlying routines, activities, and processes that create productivity differences in family firms. Ownership structure might explain productivity differences between firms (Hill & Snell, 1989). This can be the case because a firm's attitude and behavior regarding diversification and investment in R&D can be influenced and/or determined by its ownership structure. The strategies[10] concerning diversification and investment in R&D can cause disparities in productivity between firms (Hill & Snell, 1989). Yet, it is essential to not rule out the part of the family productivity premium[11] that captures other productivity determinants linked to market power effects, innovation, capital, labor, and wage characteristics.

Therefore, the aim of this dissertation is to contribute to the emerging family firm research stream by examining on the one hand whether a family firm is an effective organizational structure in producing better than non-family firms and on the other hand what characteristics can explain this productivity difference.

[10] Lambrecht and Molly (2011) state that family firms often confuse strategy (i.e., doing the right things) with efficiency (i.e., doing things right).
[11] We define the family productivity premium (discount) as the difference in productivity between family firms and non-family firms, measured by the positive (negative) effect of the family ownership dummy on labor productivity.

2. The objective of the dissertation

This dissertation brings two strands of research together: the economics of family firms and productivity measurement. The overall research question of this dissertation can be formulated as: **"HOW CAN THE PRODUCTIVITY PREMIUM/DISCOUNT OF FAMILY FIRMS BE MEASURED AND EXPLAINED?"**. In other words, this dissertation investigates what makes family firms more or less productive than non-family firms. Do family firms become less productive because they are not so successful in engaging in innovative behavior? Or, do family firms become more productive because they employ a more caring wage policy among their employees (i.e., involving lower wages but greater job security), which improves employees' productivity?

Overall, in this dissertation the broad and difficult domain of productivity in family firms will be addressed relying on different methodologies. This dissertation is a bundling of three parts, consisting of three different studies and a chapter regarding the data collection. Through this varied way of addressing the research questions, this dissertation will provide rich insights into the unique productivity differences between family firms and non-family firms. This dissertation allows us to build upon new knowledge that will interest researchers dealing with performance measures or the level of the firm and/or researchers dealing with measurement applied to family firms both from a microeconomic and econometric perspective.

The general research question will be addressed by focusing on more specific research questions, which will be answered relying on a variety of theoretical and methodological approaches. First, several theoretical perspectives will be used, such as the socioemotional wealth perspective, the resource-based view, the family-oriented particularistic behavior theory and literature on wage policies (i.e., job security and union bargaining power). Second, this dissertation will use a selection of quantitative research methods, like unconditional quantile regression (i.e., non-parametric instrumental variable quantile regression estimator), Partial Least Squares Structural Equation Modeling, two way high dimensional fixed effects wage function, Gelbach's decomposition analysis, and production function with price markup and wage markup. Given the strong empirical research content of this dissertation, different levels of analyses will be used. We need individual firm-level data on production variables that can be linked to (i) matched employer-employee data, (ii) innovation and wage data, and (iii) ownership structure (for defining family firms).

Family firms are prominent present all around the world, however, we will single out Belgium and the Netherlands for two reasons. First, a study conducted by the University of Nyenrode shows that almost 70 percent of the Dutch firms are family firms, representing 53 percent of the Gross Domestic Product and approximately 49 percent of the total employment (e.g., Flören, 2003; Flören & Geerlings, 2006; Flören et al., 2010). The percentage of family firms in the Netherlands and their contribution to the economy is similar to those in neighboring countries, such as Belgium, Germany, and the United Kingdom (e.g., Flören, 1998; IFERA, 2003; Lambrecht & Molly, 2011). The research results presented here show that family firms have a great impact on the economy in both the Netherlands and Belgium (e.g., Flören, 1998; IFERA, 2003; Lambrecht & Molly, 2011). So, research on firm performance of family firms is relevant for Belgium and the Netherlands. The growth of the family firm field in the Netherlands and in Belgium, and the implications of that growth make it essential to establish a clear overview of family firms in these countries. Second, we have chosen to study firms in Belgium and the Netherlands keeping the data aspect in mind. Bel-First gives us access to detailed financial information on all Belgian firms. Furthermore, extensive data about Dutch firms was available through a co-operation with Statistics Netherlands.

3. Outline of the dissertation

This doctoral dissertation consists of three parts. Our more specific research questions are tested using data from samples of Dutch firms (**PART I** and **PART II**) and Belgian private family firms (**PART III**) in order to reach the objectives of this dissertation. The sample of Dutch firms was composed in the 2010-2013 period and the sample of Belgian private family firms in the 2015-2016 period.

PART I – PRODUCTIVITY (THE NETHERLANDS: SAMPLE OF DUTCH FIRMS)

Empirical evidence on the relationship between ownership structure and firm productivity is mixed. In **PART I** of the dissertation, we reinvestigate this question by focusing on the heterogeneous effect of family ownership[12], where the family's socioemotional wealth (further noted as SEW) is assumed to be a key factor determining the risk-taking propensities of family firms (e.g., Bennedsen, Perez-Gonzalez, & Wolfenzon, 2010; Chrisman & Patel, 2012). The large body of literature in family firms points towards the relevance that non-economic goals play in the decision-making process and outcomes of family owned firms which they group under the SEW label (e.g., Berrone et al., 2012; Cruz & Arredondo, 2016; Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007; Miller & Le Breton-Miller, 2014). Family owners' desire to maintain strong control over the firm can lead to asymmetric treatment of business activities, for example:

i. innovation investments (e.g., Firfiray et al., 2016);
ii. human capital (e.g., Sirmon & Hitt, 2003);
iii. HRM practices (e.g., Gedajlovic, Carney, Chrisman, & Kellermanns, 2012);
iv. strategic goals (e.g., Miller, Minichilli, & Corbetta, 2013);
v. internationalization activities (e.g., C. Chen & Steinwender, 2016; Minetti, Murro, & Chun Zhu, 2015);
vi. labor market institutions (see Chapter 3).

Unlike non-family firms, family firms may (i) invest less in risky R&D and innovation projects if these are perceived as a threat to their current (short-term) SEW, or (ii) invest more in such projects to preserve their future (long-term) SEW. We assume that this mechanism will be reflected in the family firms' tail behavior of the labor productivity distribution. Studies conducted to date on the impact of family ownership on productivity have not reached a consensus on whether family firms (at the mean) are more or less productive compared to non-family firms. The occurrence of these mixed empirical results also points to

[12] Measured in the dependent variable (i.e., labor productivity).

another form of asymmetry; namely, wide variations in the behaviors of family firms (Bennedsen et al., 2010; Chrisman & Patel, 2012; Melin & Nordqvist, 2007). The discretion to behave idiosyncratically and the pursuit of a unique and potentially varied set of family goals both suggest that family firms are likely to be more heterogeneous than non-family firms (Bennedsen et al., 2010; Chrisman & Patel, 2012; Gómez-Mejía et al., 2007). This points towards the need to understand the extremes as well as the central tendencies in family owned firms (Chrisman & Patel, 2012). We re-investigate the relationship between family ownership and labor productivity by focusing on heterogeneous effects, measured in the dependent variable. This part aims at answering the following research question:

"IS THE LABOR PRODUCTIVITY RELATIONSHIP BETWEEN FAMILY FIRMS AND NON-FAMILY FIRMS DIFFERENT FOR HIGH PRODUCTIVE VERSUS LOW PRODUCTIVE FIRMS?"

Chapter 2 examines the role of family ownership in shaping firms' productivity distributions; or in other words, how do the labor productivity effects of family ownership vary at different points of the unconditional labor productivity distribution. In accordance with the literature on socioemotional wealth, this framework allows us to move beyond the singular focus on the *'average effect'* of family ownership and to explore the varying effects of family ownership on different points of the unconditional firm-level labor productivity distribution. Family firms typically focus on socioemotional wealth goals in their decision-making process. The socioemotional wealth reference point might shift depending on the importance of particular socioemotional wealth benefits to the decision maker (Debicki, Kellermanns, Chrisman, Pearson, & Spencer, 2016).

More specifically, we argue that family firms will base their major business decisions on socioemotional wealth goals especially when the labor productivity is high. Typically, keeping control and influence over the family firm is a primary goal for most family owners. Maintaining family control over the business has been said to shape the family firm behavior as it contributes to the preservation of the family's SEW (Lambrechts, Voordeckers, Roijakkers, & Vanhaverbeke, 2017). However, if the family firm faces disappointing financial results their focus will be less on socioemotional wealth but more on increasing labor productivity in order to save the company and maintain the firm reputation. When performance falls below aspirations, the long-term continuity of the family firm may become problematic and processes are initiated to protect the family firm (Lambrechts et al., 2017). For example, under endangering circumstances family firms need to relax the SEW dimension associated with family control and influence by allowing the infusion of external capital or the recruitment of external expertise to assist in solving the business difficulties (Berrone et al., 2012; Martin & Gomez-Mejia, 2016). In case of low firm performance, the achievement of economic goals must take higher priority, especially in family firms, in which a family's financial wealth is strongly linked to a firm (Gómez-Mejía et al., 2007). This is because the risk of firm failure increases as performance declines and, if the firm does not survive, all of the socioemotional wealth associated with the family's control of the firm will be lost and this endangers passing the family firm on to the next generation (Gomez-Mejia, Makri, & Kintana, 2010). So, the effect of family ownership on labor productivity varies and becomes weaker or stronger depending on the location on the distribution of labor productivity, because the socioemotional wealth reference point is different for low and high productive firms.

Family owners' preferences and decisions, which are driven by a desire to preserve SEW, are reflected in the variations in the family firms' behavior. Variations in family firms' behavior are reflected in the distribution of firm performances, where this distribution for family firms is different from that of their non-family counterparts. We hypothesize that the family firms' labor productivity distribution exhibits thinner tails than that of their non-family counterparts. To test this hypothesis, we apply the (non-parametric) instrumental variable unconditional quantile regression estimator proposed by Frölich & Melly (2010, 2013). This estimator allows us to identify and estimate labor productivity differences between family firms and non-family firms and to see how these differences vary along the quantiles of the labor productivity distribution. The purpose of this part is to present ceteris paribus effects of family ownership along the unconditional labor productivity distribution.

PART II – WAGE POLICIES (THE NETHERLANDS: SAMPLE OF DUTCH FIRMS)

PART II of the dissertation discusses the role of wage policies in family firms versus non-family firms. Wage policies can be considered as a determinant of productivity, because labor productivity is directly tied to employees' attitudes, behavior, motivation, commitment, morale and ambition (e.g., Charbel et al., 2013; Firfiray et al., 2016). Job insecurity leads to decreased employee morale, commitment and loyalty (K. Cameron & Huber, 1997). This realizes labor productivity losses because the lack of employees' morale and motivation has a direct impact on labor productivity (e.g., Charbel et al., 2013; Sahdev, Vinnicombe, & Tyson, 1999).

In **Chapter 3**, we examine wage differences between family firms and non-family firms. We define the family wage discount as the difference in wages between family firms and non-family firms, measured by the estimated negative effect of the family ownership dummy on wages. By explaining the wage discount of family firms versus non-family firms, a natural explanation of the gap in average wages between family firms and non-family firms is that firms and/or workers might have different characteristics, which are decisive for the individual pay level in the firm (Bassanini et al., 2013; Sraer & Thesmar, 2007). These characteristics can be observed or unobserved. Examples of unobserved heterogeneity across firms and workers may include different employment histories (Abowd, Kramarz, & Margolis, 1999) or innate skill differences, which include cognitive skills, knowledge, willingness, attitude towards the job/firm. The first step of this chapter is to quantify the contribution of worker-level and firm-level (un)observable characteristics in explaining the family wage discount. We use an employer-employee matched dataset in order to determine how much of the family wage discount can be explained by variation in (un)observable worker and/or firm characteristics. Hence, our first research question is:

"HOW MUCH OF THE FAMILY WAGE DISCOUNT CAN BE EXPLAINED BY VARIATION IN (UN)OBSERVABLE WORKER AND/OR FIRM CHARACTERISTICS?"

A worker may be paid less in monetary terms because he/she is receiving part of his/her compensation in terms of other hard-to-observe characteristics of the job. This may include lower effort requirements, more pleasant working conditions or better amenities. With specific reference to firm-level heterogeneity, wage policy factors, such as job security or labor union bargaining power, can also be relevant in explaining wage differences between family firms and non-family firms. As a second step of this chapter, we investigate the influence of a different wage policy on the family wage discount. To do so, we use firm-level data in order to make the unobserved firm heterogeneity (i.e., wage policy) more explicit by looking at the union bargaining power within family firms located in the Netherlands. This part aims at answering the following research question:

"WHAT IS THE ROLE OF UNION BARGAINING POWER (AS AN ASPECT OF WAGE POLICY) IN EXPLAINING THE FAMILY WAGE DISCOUNT?"

PART III – INNOVATION (BELGIUM: SAMPLE OF BELGIAN PRIVATE FAMILY FIRMS)

PART III of the dissertation looks at the role of innovation since we know that innovation is an important determinant of productivity (e.g., Syverson, 2011). Family firms differ from non-family firms in terms of innovation strategies and organization of the innovation process. The purpose of this part is to move forward and focus on explaining variations in the innovative behavior among family firms. This part aims at answering the following research question:

"WHY ARE SOME FAMILY FIRMS MORE SUCCESSFUL IN ACTUALLY PERFORMING INNOVATIVE BEHAVIOR THAN OTHERS?"

Before further shedding light on the role of external financial constraints in explaining the innovative behavior of private family firms, we describe the sample in **Chapter 4**. The purpose of this chapter is to get insights into the innovative behavior of private Belgian firms. It is interesting to focus on innovation, since innovation can be considered as a major determinant of productivity (e.g., Syverson, 2011). Innovation is generally considered as a way of improving the competitiveness, productivity, performance and long-term survival of firms (e.g., Cefis & Marsili, 2006; Dabla-Norris, Kersting, & Verdier, 2012; Hall, Lotti, & Mairesse, 2009; Hashi & Stojčić, 2013; Price, Stoica, & Boncella, 2013).

Most empirical studies on innovation and productivity reveal a positive relationship. Lichtenberg and Siegel (1991) and Griliches (1986) find evidence of a strong positive correlation between R&D investment and productivity growth, which means that higher R&D investments lead to higher levels of productivity growth. Hall et al. (2009) examined the relationship between innovation input, innovation output and firm productivity, with special attention to the distinction between process innovation and product innovation. They find that both, process innovation and product innovation, have a positive influence on firm productivity. Dabla-Norris et al. (2012) used a firm-level, cross-industry and cross-country dataset of manufacturing firms to conclude that innovation has a significant impact on firm performance as it directly enhances firm productivity. They found that manufacturing firms that have not innovated over the last three years are significantly less productive than innovating manufacturing firms. By defining innovation Dabla-Norris et al. (2012) took into account the introduction of new products, the improvements in production processes and the adoption of existing technologies. Hashi and Stojčić (2013) used a model which links the decision of firms to innovate, their innovation expenditure, innovation output and productivity. They found that innovation activities have a positive impact on innovation output, which in turn leads to a higher level of productivity (Hashi & Stojčić, 2013).

In Chapter 4, we perform descriptive statistics to get a more complete picture of the firms in our dataset regarding innovation. We explicate the development of the survey instrument as well as the data collection process. Further details of the sample selection are provided, together with some general descriptive statistics regarding the corresponding private Belgian firms. This sample will form the basis of the analyses performed in Chapter 5.

In **Chapter 5**, we explicitly look at the role of innovation as a major determinant of productivity by examining causal relationships. Indeed, we investigate why some family firms are more successful in performing innovative behavior compared to others. Innovations are not always realized in private family firms, even though these firms have the ability[13] and the willingness[14] to innovate. In other words, innovative behavior[15] is not always a true reflection of a firm's ability and willingness to innovate. Relying on the resource-based view, we argue that family resources alone, which are embedded in the ability and willingness concepts, are not enough to explain the innovative behavior of private family firms. The relationship between ability and willingness to innovate and innovative behavior might be influenced by the lack of sufficient financial resources. Therefore, we investigate the moderating role of financial constraints on this relationship. A quantitative Partial Least Squares Structural Equation Modeling is performed on a sample of private Belgian family firms. Our sample of firms consists of 110 privately-held family firms with high ability to innovate located in Belgium.

[13] Ability refers to the owners' discretion to direct, allocate, add to or dispose of a firm's resources (De Massis, Kotlar, Chua, & Chrisman, 2014).

[14] Willingness is defined as the disposition of the family owners to engage in distinctive behavior based on the goals, intentions and motivations that drive the owners to influence the firm's behavior in directions diverging from those of non-family firms or the institutional norms among family firms (De Massis et al., 2014).

[15] We define innovative behavior in terms of innovation output, namely product innovation, process innovation, and organizational innovation (Zahra, Neubaum, & Huse, 2000).

PART I

PRODUCTIVITY – THE NETHERLANDS

CHAPTER 2

SOCIOEMOTIONAL WEALTH AND PRODUCTIVITY DIFFERENCES BETWEEN FAMILY FIRMS AND NON-FAMILY FIRMS: A DISTRIBUTIONAL ANALYSIS

1. Introduction

In organizational economics, there has been an ongoing debate on the relative economic valuation of family firms. Family ownership is dominant in private businesses (IFERA, 2003; Westhead & Howorth, 2007) and makes a significant contribution to wealth creation and job generation (Westhead & Howorth, 2007). Theory and numerous previous empirical studies suggest that family ownership may influence firm performance (e.g., Chrisman et al., 2005). The presence of family ties within the ownership of the firm can create conditions for obtaining differentiated performance (Erbetta, Menozzi, Corbetta, & Fraquelli, 2013). Despite numerous studies examining financial performance differences between family firms and non-family firms, investigation of the impact of family ownership on the distribution of firms' performances in general or in terms of productivity has only gained little (or no) attention hitherto.

Palia and Lichtenberg (1999) claim that the role of productivity in firm performance is of fundamental importance to the economy. We believe productivity is a more reliable measure of firm performance than financial measures, as for instance Tobin's q or Return On Assets, because the financial measures do not take into account input and output market imperfections (e.g., Syverson, 2011; Tangen, 2003). Moreover, productivity is less exposed to creative accounting and manipulation than most financial measures (e.g., Barth et al., 2005; Martikainen et al., 2009). In this chapter, we focus on labor productivity because it is an essential component of total factor productivity, for which previous studies have found differences between family firms and non-family firms. Labor productivity is the most common single-factor productivity measure and measures output per working hour or per employee (e.g., Syverson, 2011; Tangen, 2003).

Prior studies on the impact of family ownership on productivity have not reached a consensus on whether family firms are more or less productive compared to their non-family counterparts, or the circumstances under which family firms are more or less productive. On the theoretical level, two main theories, agency theory and stakeholder theory, have their own arguments for explaining productivity differences between family firms and non-family firms. From an *agency theory perspective*, a negative impact of family ownership on productivity can be expected. Indeed, employees' motivation, commitment, and ultimately labor productivity is lowered when family owners entrench themselves at the expense of their employees (e.g., Charbel et al., 2013; J. Lee, 2004). From a *stakeholder theory perspective*, employees' labor productivity is likely to be higher in family firms due to a caring organizational climate[16]. When employees experience caring policies and practices that meet their needs, they show higher job-related vivacity, which is translated into higher labor productivity (Azoury et al., 2013; A. L. Christensen et al., 2014; Firfiray et al., 2016). The contradictory predictions from different theories are mirrored in the available empirical evidence. On the one hand, certain researchers observe higher productivity levels in family firms by arguing that family firms make more efficient use of their labor and capital resources (e.g., Galve-Górriz & Salas-Fumas, 2011; Martikainen et al., 2009; Sraer & Thesmar, 2007). On the other hand, some studies provide evidence of worse productivity for family firms due to lower skill levels or the preservation of their socioemotional wealth (SEW),

[16] Employees' perceptions of the firm's normative concern for the welfare of others rather than instrumental actions and values that define success primarily in financial terms (A. L. Christensen et al., 2014).

thereby sacrificing productivity (e.g., Barth et al., 2005; Classen et al., 2014; Cucculelli et al., 2014). Moreover, there are also some papers that indicate no differences in productivity between family firms and their non-family counterparts (e.g., Barbera & Moores, 2013). No convincing conclusion can be drawn from prior productivity studies. We believe that such empirical inconclusiveness may, in part, be explained by the dominant estimation method used, being classical linear regression or derivatives thereof.

A substantial share of empirical studies in this research field has focused on the question whether family firms are more or less productive than non-family firms. No prior study has investigated productivity differences between family firms and non-family firms over the whole productivity distribution[17]. Velucchi and Viviani (2011) highlight that the relationships between labor productivity and firm characteristics do not hold uniformly across quantiles of the labor productivity distribution. They disentangle the effect of a set of variables on different levels of labor productivity showing that what is relevant for highly productive firms may not work for low productive firms. So, it is interesting to get at a complete picture of how the family productivity premium[18] varies along different points of the productivity distribution because the typical characteristics of family firms might cause different reactions and behaviors depending on the level of productivity. For example, family firms are likely to be prudent and risk averse in strategic decision-making, due to the close link between family and firm assets. In addition, family firms are mainly concerned with the long-term survival of the firm and prefer passing the firm to their descendants rather than consuming the created wealth. Therefore, family firms tend to hold large and undiversified equity positions in their firms (Ang, 1991, 1992). These characteristics, which may have a negligible effect in periods of stable productivity growth, can become a major obstacle for family firms when the economic system has to deal with competitive pressures brought about by market globalization (Mannarino, Pupo, & Ricotta, 2011).

[17] Recent studies evaluating the heterogeneity effects of productivity determinants include Montresor and Vezzani (2015) on the specific role of R&D; Bartelsman, Dobbelaere, and Peters (2015) on the role of human capital; Powell and Wagner (2014) on the role of exports.
[18] We define the family productivity premium (discount) as the difference in productivity between family firms and non-family firms, measured by the positive (negative) effect of the family ownership dummy on labor productivity.

We extend the previous research by applying the socioemotional wealth perspective in order to explain productivity differences between family firms and non-family firms. This theoretical perspective can consolidate the productivity debate and might reconcile seemingly conflicting evidence. Ownership and management in family firms are typically in the hands of a small group of family members who are in a position to derive monetary and non-monetary benefits from the business (Chrisman, Chua, Kellermanns, & Chang, 2007; Debicki et al., 2016). The non-monetary benefits embody various socio-affective domains, such as positive family reputation, establishment of binding social ties and capital within the workforce, perpetuation of family values as well as the family dynasty through the business (A. L. Christensen et al., 2014). The non-monetary values accruing to a family through its ownership position in a particular firm has been labeled as socioemotional wealth (SEW) (Gómez-Mejía et al., 2007). Family firms are motivated by, and committed to, the preservation of their SEW. Gains or losses in SEW represent the fundamental frame of reference that family owned firms use to make major strategic decisions (Berrone et al., 2012). This SEW reference point might shift depending on the importance of particular SEW benefits to the decision maker (Debicki et al., 2016).

On the *theoretical front,* we reconcile with the idea that family firms base their major business decisions on SEW goals especially when the productivity level is high. Typically, keeping control and influence over the family firm is a primary goal for most family owners. Maintaining family control over the business has been said to shape family firm behavior as it contributes to the preservation of the family's SEW. However, if the family firm faces disappointing financial results their focus will be less on SEW but more on increasing productivity in order to save the company and maintain the firm reputation. When productivity falls below aspirations, the long-term continuity of the family firm may become problematic and processes are initiated to protect the family firm[19]. For example, the goal of keeping *'family control and influence'* may hamper labor productivity, whereas *'dynastic succession intentions'* imply a long-term orientation, continuity, and growth, which are more likely to increase the firm's

[19] See Lambrechts et al. (2017) for a similar argumentation in their exploratory cross-case analysis on open innovation in entrepreneurial private family firms.

productivity level under these endangering circumstances. So, the effect of family ownership on productivity varies and becomes weaker or stronger depending on the location on the distribution of firm productivity, because the SEW reference point will change depending on the level of productivity of the firm.

On the *empirical front*, we rely on unconditional quantile regression (UQR) estimation. The existing literature on productivity differences between family firms and non-family firms seems to focus only on the *'average firm'* by using OLS techniques (Porter, 2015), thereby ignoring the fact that the family productivity premium might vary along the entire productivity distribution. This quantile regression technique allows us to observe how the effect varies at different quantiles of the distribution, whereas classical linear regression only estimates the effect of an independent variable at the mean of an outcome (Porter, 2015). The UQR enables us to empirically investigate the productivity differences between family firms and non-family firms for different productivity levels. The focus of UQR on the overall population is particularly relevant in two cases. First, it can be expected that the family productivity premia are different for low- and high-productive firms (i.e., firms in the lower and upper tail of the unconditional labor productivity distribution). Second, research interest might lie in examining how the distribution of labor productivity across firms changes as a result of changes in family ownership. In sum, we believe the UQR method offers an alternative approach to reconcile the mixed evidence of family ownership on productivity that cannot be identified through classical linear regressions, as employed in almost all prior studies on productivity in family firms. Therefore, our research question is: "Is the sign and/or magnitude of the family productivity premium different for different levels of productivity; in other words: is this relationship different for high productive versus low productive firms?".

This chapter contributes to the literature in several ways. First, we contribute to the theoretical productivity debate by joining the recent debate cited by Martin and Gomez-Mejia (2016) on the interaction between socioemotional wealth and financial wealth (FW). This alternative theoretical perspective provides more insights into the explanation of the family productivity premium and can be helpful in reconciling the seemingly conflicting findings from studies using the agency theory or stakeholder theory. While classical agency and stakeholder theories focus on maximizing shareholder wealth (Tosi, Brownlee, Silva, & Katz, 2003), this assumption may need to be relaxed in family firms to include both monetary and non-monetary benefits (Chrisman et al., 2007). This study builds further on the theoretical debate of Martin and Gomez-Mejia (2016) by empirically testing the interaction between SEW and FW over the whole productivity distribution. Second, we contribute to the empirical productivity debate by suggesting unconditional quantile regression as an advanced estimation method new to the literature on productivity differences between family firms and non-family firms. UQR enables us to assess the impact of the family ownership at different quantiles of the unconditional, or marginal, distribution of the productivity level. The UQR method allows us to reveal differences of the impact of family ownership on labor productivity between low- and high-productive firms. Such important differences would have remained unnoticed if we had used conventional mean regressions. The use of UQR will help to bring out the full productivity differences between family firms and non-family firms. Finally, studies of the relationship between family versus non-family ownership and productivity (either labor productivity or total factor productivity) could potentially suffer from endogeneity problems. The ownership type of a firm is a decision variable (i.e., family firms and non-family firms are not randomly plucked out of the air), which may be correlated with unobservables that could affect productivity as well (e.g., due to different priorities). Therefore, standard regression techniques (like OLS) are very likely to produce biased and inconsistent estimates. To control for potential endogeneity, we use the IV-UQTE estimator, recently proposed by Frölich & Melly (2010, 2013). This new estimator aims at estimating *unconditional quantile treatment effects (UQTEs)* when the *treatment* (i.e., firm ownership type) selection is *endogenous*. To implement this estimator, we use an instrumental variable (IV) to solve for the endogeneity of the binary treatment variable (=1 if family firm, and =0 if non-family firm).

The rest of the chapter is organized as follows. In section 2, we give a brief overview of the literature on productivity differences between family firms and non-family firms, which may help the reader in appreciating the empirical results presented later in this chapter. In section 3, we describe the data used, the variables included in the empirical model, along with basic descriptive statistics and some distribution characteristics. Section 4 presents the empirical model and our estimation strategy, with a focus on the IV-UQTE estimator. Section 5 contains a description of the main results, followed by some robustness checks. Section 6 contains a discussion of the main results, while section 7 formulates some concluding remarks.

2. Literature review

Much of the literature about productivity differences between family firms and non-family firms falls under two perspectives: the agency theory and the stakeholder theory, which seem to conflict quite directly. From the agency perspective, family firms are considered to be less productive than non-family firms. By contrast, stakeholder theory predicts a positive effect of family ownership on productivity. Hence, we extend the previous research by introducing socioemotional wealth as an alternative theory to explain productivity differences between family firms and non-family firms.

2.1. Interaction between socioemotional wealth and financial wealth priorities

Family firm decision-making is argued to differ from that of non-family firms because family firms have the tendency that both financial and non-financial motives simultaneously drive their decision-making (Gedajlovic et al., 2012). Non-financial motives are said to derive from a number of sources, including preserving the family dynasty (Berrone et al., 2012), caring for family members (Schulze et al., 2003), enjoying the exercise of authority (Schulze et al., 2003). The non-financial aspects of the firm that meet the family’s affective needs such as identity, the ability to exercise family influence, creating jobs for family members and the perpetuation of the family dynasty have been labeled as socioemotional wealth (SEW) by Gómez-Mejía et al. (2007). SEW is anchored in the behavioral tradition of the management field (e.g., Berrone et al., 2012; Gomez-Mejia et al., 2010). According to the behavioral agency model developed by Wiseman and Gomez-Mejia (1998) decision-makers' risk preferences can shift depending on the reference point used to compare anticipated outcomes. The prospect theory tells us that the behavioral preferences of individuals are shaped by problem framing and loss aversion, in other words decision makers will weigh losses more heavily than gains (Kahneman & Tversky, 1979). In the context of family firms, aversion to the loss of SEW is a primary driver of family firms' strategic behavior. Indeed family firm leaders will exhibit risk-averse behaviors when facing possible gains to SEW and risk-seeking behaviors when facing SEW losses (e.g., Berrone et al., 2012; Gomez-Mejia et al., 2010). When facing decisions that may result in SEW losses, family firms are likely to tolerate threats to their financial welfare in order to preserve their SEW (Debicki et al., 2016; Gómez-Mejía et al., 2007). Unlike agency theory and stakeholder theory, the behavioral agency model does not imply that family firms are necessarily risk averse or that risk preferences are constant (Chrisman & Patel, 2012).

Given that there are numerous diverse non-financial benefits available to family firm owners, the multidimensionality of SEW is broadly acknowledged (e.g., Berrone et al., 2012; Debicki et al., 2016; Hauck, Suess-Reyes, Beck, Prügl, & Frank, 2016; Miller & Le Breton-Miller, 2014). Berrone et al. (2012) identify five dimensions that underlie the SEW construct with their FIBER model, including the following dimensions (Berrone et al., 2012):

i. **F**amily control and influence;
ii. **I**dentification of family members with the firm;
iii. **B**inding social ties;
iv. **E**motional attachment of family members;
v. **R**enewal of family bonds through dynastic succession.

Most of the existing literature assumes that the preservation of SEW in family firms translates into suboptimal financial performance. In other words, SEW gains and financial gains are inversely related (Martin & Gomez-Mejia, 2016).

Indeed, the SEW literature suggests that the family firms' superior financial gains would be at the expense of the socioemotional goals, like non-family firms do (Berrone et al., 2012; Kellermanns, Eddleston, & Zellweger, 2012). However, Martin and Gomez-Mejia (2016) introduce a recent theoretical SEW debate that sheds light on the differences between family firm and non-family firm decision-making by challenging the taken-for-granted assumption about the detachment of financial wealth (FW) and SEW maximization. Specifically, Martin and Gomez-Mejia (2016) developed a more complete theory of wealth concerns that may inform family firm decision-making by looking into the interaction of both financial goals and SEW goals. The impact of SEW on firm behavior will be consistent with the needs and preferences of family owners and managers. Nevertheless, the reference point is likely to shift depending on the importance of particular SEW benefits to the decision maker (Debicki et al., 2016). Berrone et al. (2012) expect that the various SEW dimensions would have different weights depending on the owning family's preferences. Some dimensions of SEW may be negatively related to financial performance (e.g., nepotism, favoritism), while others are positively related to the achievement of financial goals (e.g., greater commitment to firm, long-term orientation) (Martin & Gomez-Mejia, 2016). In short, it is recognized that there are different behaviors depending on the predominant dimension of FIBER (e.g., Cruz & Arredondo, 2016; Kabbach de Castro, Crespi-Cladera, & Aguilera, 2016; Martin & Gomez-Mejia, 2016).

The effect of performance upon SEW will be stronger in situations where performance changes are more extreme (positive as well as negative), such as performance declines leading to bankruptcy or industry leading performance (Martin & Gomez-Mejia, 2016). Minor changes in financial performance in the mid-range of what is considered to be acceptable performance are less likely to influence the family firm's SEW reference point. This is because the reputational, control and dynastic succession dimensions of SEW are all less likely to be affected if there are only small changes in performance that are unlikely to change perceptions of management ability, improve the capital position to change reliance on outsiders or the probability of handing the firm to the next generation (Martin & Gomez-Mejia, 2016). Because productivity is an important indicator of firm performance (e.g., Balk, 2010; Barth et al., 2005; Martikainen et al., 2009; Palia & Lichtenberg, 1999; Tangen, 2003), our central idea is that the SEW reference point will change depending on the level of labor productivity of the firm. Accordingly, we argue that the effect of family ownership on labor productivity is not invariant to the level of labor productivity, after controlling for important firm characteristics (e.g., innovation, export, foreign ownership, etc.). Therefore, we explore how and to what extent labor productivity differences between family firms and non-family firms vary at different points (quantiles) of the labor productivity distribution.

2.2. Socioemotional wealth, financial wealth, and productivity

Following Chrisman and Patel (2012), we assume that behaviors reflect preferences and argue that family goals are heterogeneous rather than homogeneous and therefore lead to variations in family firm behavior. The pursuit of family goals provides a number of sources of current and future SEW. However, relative importance of these could vary according to the priorities placed on long-term and short-term family goals (Chrisman & Patel, 2012).

2.2.1. Divergence of SEW and FW priorities in high productive family firms

Family firms positioned in the *upper* part of the productivity distribution (i.e., high productive family firms) are likely to reduce their reliance on external capital, increase their family control and have the resources to hire additional family members which amplifies their family involvement (Martin & Gomez-Mejia, 2016). High productive family firms may focus less on value creating goals but more on SEW goals because their financial situation has no need to change since the firm is already highly productive. When firms have a high productivity level, family firms are expected to be less productive than non-family firms due to the hyper-conservative strategies caused by the family's dominant focus on maintaining family control and therefore limiting career opportunities for non-family members (Miller & Le Breton-Miller, 2014). This will result in a decline of employee motivation, commitment, ambition and eventually productivity (e.g., Charbel et al., 2013; Firfiray et al., 2016; Sahdev et al., 1999). Therefore, we expect to see *shorter tails on the right side* of the labor productivity distribution for family owned firms, ceteris paribus, as compared to their non-family counterparts.

Even though these outcomes may satisfy the socioemotional objectives from the family, they can hamper firm productivity because the focus on such restricted SEW priorities (Miller & Le Breton-Miller, 2014) will result in lower levels of trust among employees as the firm grows (Firfiray et al., 2016; Miller & Le Breton-Miller, 2014).

2.2.2. Convergence of SEW and FW priorities in low productive family firms

Conversely, family firms positioned in the *lower* part of the productivity distribution (i.e., low productive family firms) may focus less on SEW but more on financial goals in order to increase productivity. Declines in productivity will be associated with declines in family SEW (Martin & Gomez-Mejia, 2016). According to Chrisman and Patel (2012) decisions aimed at preserving SEW are less likely to be pursued when the family owners have failed to achieve performance aspirations. In case of low firm performance, the achievement of economic goals must take higher priority, especially in family firms, in which a family's financial wealth is strongly linked to a firm (Gómez-Mejía et al., 2007). This is because the risk of firm failure increases as performance declines and, if the firm does not survive, all of the socioemotional wealth associated with the family's control of the firm will be lost (Gomez-Mejia et al., 2010). In other words, SEW and FW goals are expected to converge as firm productivity declines. When productivity is low, family firms need to relax the SEW dimension associated with family control and influence by allowing the infusion of external capital or the recruitment of external expertise to assist in solving the business difficulties (Berrone et al., 2012; Martin & Gomez-Mejia, 2016).

A low productive family firm is flexible enough to temporarily accept changes to its traditional goals in order to stimulate productivity growth. When the family firm faces again productivity growth, they will re-adopt their traditional behaviors (Amann & Jaussaud, 2012). The financial value creation is more relevant for low productive family firms and they should focus more on financial goals in order to increase firm productivity and being able to pass a prosperous firm on to the next generation. Therefore, we expect to see *shorter tails on the left side* of the labor productivity distribution for family owned firms, ceteris paribus, as compared to their non-family counterparts.

Certain typical characteristics of family firms can become a big help for low productive family firms to produce better than low productive non-family firms. First, family firms are generally risk averse (Amann & Jaussaud, 2012; Andres, 2011). When family firms are faced with disappointing firm results, they tend to take more risk in an effort to reverse the performance decline or to secure the firm's competitiveness (Chrisman & Patel, 2012; Kotlar, Fang, De Massis, & Frattini, 2014). In times of productivity downturn, family firms give up their traditional debt-related behavior and acknowledge the need to vary their risk preferences (Amann & Jaussaud, 2012). For example, family firms typically have a long-term management policy, which ensures them to invest less in booms, more in recessions, and to focus on job preservation (Sraer & Thesmar, 2007). In order to stimulate productivity growth family firms make more efficient use of their labor and capital resources, which implies higher productivity rates compared to non-family firms (Barth et al., 2005; Sraer & Thesmar, 2007). Indeed, family firms hoard labor in economic bad times and hire less in economic good times compared to non-family firms (Sraer & Thesmar, 2007). Job insecurity leads to decreased employee morale, commitment and loyalty (K. Cameron & Huber, 1997). This realizes labor productivity losses because the lack of employees' morale and motivation has a direct impact on labor productivity (Sahdev et al., 1999). Second, proper management of survivability capital[20] can help sustain the family firm during poor economic times by enhancing productivity. Survivability capital in the form of free labor, loaned labor or additional equity investments are less common in non-family firms due to the lack of loyalty, strong ties, or long-term commitments along their employees (Sirmon & Hitt, 2003). In addition, Bauweraerts and Colot (2013) indicate that family firms have significantly higher levels of self-funding. They

[20] The pooled resources that family members are willing to loan, contribute, or share for the benefit of the family firm (Sirmon & Hitt, 2003).

seem to accumulate more resources than non-family firms, indicating that they are more able to absorb shocks such as financial downturns (Bauweraerts & Colot, 2013). Third, innovation makes the firm better able to cope with changes induced by a crisis (Bauweraerts & Colot, 2013). According to Bauweraerts and Colot (2013), family firms have higher investment rates during crisis periods. This implies that family firms are more proactive regarding their innovation process during financial downturns (Bauweraerts & Colot, 2013).

In conclusion, the financial value creation is more relevant for low productive family firms and they should focus more on financial performance based goals in order to make the firm more productive and being able to pass a prosperous firm on to the next generation.

2.3. Hypothesis about link between socioemotional wealth and productivity

Based on Martin and Gomez-Mejia's (2016) recent SEW debate, building on knowledge regarding the two-way relationship between SEW and FW, we argue that the SEW reference point varies with the level of a firm's (labor) productivity. The expected distributional implication of this is that productivity differences between family firms and non-family firms are varying throughout the unconditional labor productivity distribution. We want to test if the family productivity premium is larger for low productive firms than for high productive firms, holding all other observed firm characteristics fixed. In other words: family firms are more productive than non-family firms for low productive firms, but family firms are less productive than non-family firms for high productive firms. This leads us to the following hypothesis:

> **Hypothesis:** *Due to the SEW reference point change occurring in family owned firms, the incidence of both extremely low and extremely high productivity levels for family firms are less frequent than for non-family firms, ceteris paribus. Stated more technically, the productivity distribution for family firms has lower kurtosis (thinner tails) than the non-family firms' productivity distribution.*

To graphically illustrate this hypothesis, Figure 1 shows hypothetical productivity distributions for family firms and non-family firms (that are otherwise identical), under the assumption of heterogeneous quantile changes (panel A) and homogeneous quantile changes (panel B), giving rise to differential (multi-directional) horizontal shifts and parallel (one-directional) location shifts, respectively.

A: Quantile regressions (differential horizontal shifts) | B: Mean regressions (parallel location shifts)

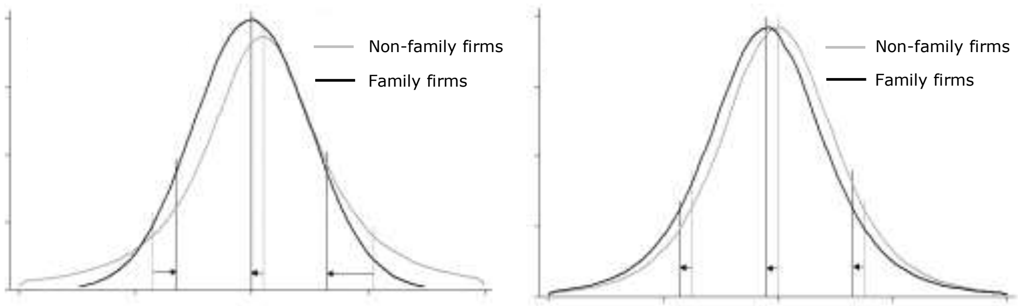

Figure 1: Hypothetical productivity distributions for family firms and non-family firms

A singular focus on the mean of the productivity distribution would imply homogeneous quantile changes and therefore parallel (one-directional) location shifts either to the left or to the right of the productivity distribution (panel B), suggesting that family firms exhibit on average a productivity discount or premium, respectively, as compared to their non-family counterparts. The kernel densities in *panel B* of Figure 1 show a pure location shift to the left, suggesting that family firms exhibit, *on average*, a productivity discount compared to their non-family counterparts. On the other hand, the kernel densities in *panel A* show a smaller productivity dispersion for family firms as compared to non-family firms (apart from having a slightly smaller mean productivity level), which primarily stems from a lower frequency of productivity levels for family firms at both the left and the right tail of the distribution (smaller kurtosis).

3. Data, variables, and descriptive statistics

3.1. Data and data sources

We used several data sources combining data information on firm ownership type, labor productivity, employment and firm characteristics. The final set of variables retained for analysis is given in Table A1 in Appendix A. The sampling frame was taken in the 2010-2013 period from a wider descriptive study investigating ownership, strategic issues, governance and leadership issues in firms located in the Netherlands.

Starting point is the Elsevier list of the 500 largest consolidated firms based on their return in 2012 situated in the Netherlands. Elsevier restricts itself to firms who actually produce, trade or provide services. This means that firms who only invest in other firms will not be included in this list. Thus, Elsevier excluded investment companies and investment holdings because the financial statements of these firms look different. We have made a panel dataset of this TOP 500 list for the years 2010, 2011, 2012 and 2013. Elsevier classified a firm as a family firm[21] if (1) the majority of ownership rests in the hands of a natural person and/or relatives of the family who has founded or has acquired the firm, (2) at least one representative of the family is formally involved in the management of the firm, and (3) at least the second generation has to be involved in the firm. The identification process for family firms is discussed in Table B1 in Appendix B.

The ownership criteria to matching subsidiaries with consolidated firms is essential in the construction of the final data sample. We start at the enterprise level of the 530 parent firms and then go down to the firm-level, which results in 1802 subsidiaries. The statistical unit in our sample is *'firms'*[22] which can either be a subsidiary of a group enterprise located in the Netherlands or abroad or a firm itself in case there is one single firm. Note that we work at this firm analysis level so to link the employee-employer, innovation, trade and registry data.

[21] We do not have detailed information on the family involvement, family ownership, and family control so we have to depend on the Elsevier lists of family firms. Nevertheless, all family firms in this dissertation meet the requirements of the (rather broad) operational definition.
[22] We do not work with the overarching holdings, but with the underlying operating companies.

Since we identify firms at the level of the ultimate ownership (i.e., parent firm), we retrieved information on firms ownership structure to find the names and the direct ownership (expressed in percentage) of all their subsidiaries from the general business register (in Dutch: Algemeen Bedrijven Register, ABR), issued yearly by Statistics Netherlands. We only include firms that are fully (for 100%) controlled by their respective parent firm in the sample. The ownership criteria to matching the family status to firms are essential in the construction of the sample. We assume that if the parent firm is family owned, the respective subsidiaries are also family owned because we only include subsidiaries that are fully controlled by their respective parent firm. We consider a subsidiary as not family owned if the respective parent firm is not family owned. The sub-sample of family firms counts 551 firms.

3.2. Basic descriptive statistics

Table 1 presents basic descriptive statistics of our main variables for estimating the production functions. As can be seen from this table, the mean of labor productivity is 22212.38. Only 10% of the firms have a labor productivity below 110.15, while the firm at the 90^{th} percentile has a labor productivity of 1767.57.

We would expect from firm-level data that there is some degree of dispersion in the data. Some minor differences exist between family firms and non-family firms in terms of dispersion. Table 2 also reports the first two moments (mean and standard deviation) as well as some interesting quantiles of the labor productivity distribution by firm ownership type (family firms vs. non-family firms). The first part of the table presents the distributional characteristics for the sample of family firms, the second part reports the labor productivity distribution characteristics for the non-family firm sub-sample. The group of family firms contains 1028 observations (30%) and the group of non-family firms comprises 2379 observations (70%). The average labor productivity is for family firms 27293.01 and 200019.1 for non-family firms. The median values for each of the main variables are slightly larger for non-family firms.

Table 1: Basic descriptive statistics – Annual data 2010-2013

Variables	**N**	**Mean**	**Sd.**	$q_{0.10}$	$q_{0.25}$	$q_{0.50}$	$q_{0.75}$	$q_{0.90}$
Labor productivity	3406	22212.38	185075.10	110.15	174.32	313.48	663.90	1767.57
Log(materials/labor)	3407	4.71	3.20	1.99	4.06	5.11	6.09	7.29
Log(capital/labor)	3407	1.67	2.47	-0.80	0.68	1.76	2.67	3.81
Log(labor)	3407	5.20	1.57	3.40	4.11	5.08	6.09	7.17
Family ownership	3407	0.30	0.46	-	-	-	-	-
Log(firm age)	3407	7.27	0.97	6.19	7.11	7.58	7.79	7.89
Foreign ownership	3407	0.28	0.45	-	-	-	-	-
Exporting firm	3407	0.97	0.16	-	-	-	-	-
Innovative firm	3407	0.53	0.50	-	-	-	-	-

Table 2: Basic descriptive statistics for family firms and non-family firms – Annual data 2010-2013

Variables	**Measurement units**	**#Obs**	**Mean**	**Sd.**	**$q_{0.10}$**	**$q_{0.25}$**	**Median**	**$q_{0.75}$**	**$q_{0.90}$**
Panel A: family firms									
Labor productivity	Sales per employee	1027	27293.01	218929.5	101.81	163.13	269.80	596.16	1600.59
Log(labor productivity)		1028	5.88	1.66	4.57	5.07	5.58	6.37	7.37
Log(materials/labor)		1028	4.71	3.05	2.00	4.09	5.01	5.93	7.18
Log(capital/labor)		1028	1.23	2.55	-1.66	0.08	1.39	2.41	3.59
Log(labor)		1028	4.76	1.54	3.05	3.77	4.56	5.63	6.60
Log(firm age)	Years	1028	7.33	1.01	6.19	7.39	7.59	7.88	7.89
Foreign ownership	Dummy	1028	0.01	0.10	-	-	-	-	-
Exporting firm	Dummy	1028	0.97	0.16	-	-	-	-	-
Innovative firm	Dummy	1028	0.51	0.50	-	-	-	-	-
Panel B: non-family firms									
Labor productivity	Sales per employee	2379	200019.1	168374.9	113.80	178.97	336.10	700	1855.63
Log(labor productivity)		2379	6.04	1.76	4.73	5.18	5.81	6.54	7.52
Log(materials/labor)		2379	4.71	3.26	1.99	4.03	5.17	6.12	7.37
Log(capital/labor)		2379	1.87	2.41	-0.25	0.91	1.91	2.78	3.89
Log(labor)		2379	5.38	1.55	3.53	4.32	5.29	6.37	7.32
Log(firm age)	Years	2379	7.24	0.95	6.19	7.03	7.58	7.76	7.89
Foreign ownership	Dummy	2379	0.40	0.49	-	-	-	-	-
Exporting firm	Dummy	2379	0.97	0.16	-	-	-	-	-
Innovative firm	Dummy	2379	0.54	0.50	-	-	-	-	-

Note: For estimation purpose (later in the chapter), we use 1028 observations for family firms (30.2%) and 2379 observations for nonfamily firms (69.8%), which is a total of 3407 observations (100%). The production variables are in real terms, expressed for year 2000 in thousands of euros.

3.3. Firm characteristics across segments of labor productivity distribution

It could be instructive to know if different segments of the (overall) labor productivity distribution are associated with specific (observable) firm characteristics, as this might improve our appreciation of the results that follow later in this chapter. Therefore, we attempt to identify the bundles of firm characteristics associated with the bottom, middle, and top segment of the labor productivity distribution by regressing an indicator (i.e., dummy variable) for a firm positioned in one of these segments. Specifically, we use their interquartile range to define the 25% lower tail, the 50% middle/interquartile range, and 25% upper tail of the labor productivity distribution, and estimate three separate probit models, one for each segment[23].

The results of the probit analysis, summarized in Table 3, provide some valuable insights into the firm characteristics associated with different segments of the labor productivity distribution. The general picture is that most firm characteristics are different depending on whether the firms end up in the lower tail, middle range, or upper tail of the distribution.

Family firms (panel A) in the bottom (top) segment are likely to be larger (smaller), tend to use less (more) materials per worker, and exhibit a weaker (stronger) global orientation. Family firms in the middle (top) segment are more (less) frequently foreign owned. Family firms in the bottom segment are less likely to be innovative, with the family firms positioned in the middle segment displaying the strongest innovative mindset. Moreover, family firms in the bottom segment tend to be less capital intensive. Finally, firm age does not really allow us to assign family firms to any of the segments of the labor productivity distribution.

Non-family firms (panel B) in the bottom (top) segment are likely to be larger (smaller), tend to use less (more) materials per worker, and are less (more) frequently foreign owned. Non-family firms in the top segment are likely to be older. Moreover, non-family firms in the top segment tend to be more capital

[23] See L. Peeters, Schreurs, and Van Passel (2017) for a similar idea in their study on examining how cadmium pollution of the soil affects farmland prices in Belgium.

intensive, whilst –somewhat unexpectedly– they show a tendency to be appreciably less innovative than those in the middle segment (inverse V-form relationship across segments, though with shorter left leg). Finally, global orientation does not really allow us to assign family firms to any of the segments of the labor productivity distribution.

The following findings stand out when comparing family firms with non-family firms. First, family firms in the top segment show a tendency to be appreciably more innovative than those in the bottom segment, while non-family firms in the top segment show a tendency to be appreciably less innovative than those in the middle segment (inverse V-form relationship across segments). Second, family firms in the top segment are less likely to be foreign owned than those in the middle segment, while non-family firms in the top segment show a tendency to be more foreign owned than those in the bottom segment.

Table 3: Probit classification according to labor productivity segments

Dependent variable: $\Pr(y = 1|x)$ that labor productivity is within relevant productivity range or tail

Panel A: family firms	**Lower 25% productivity tail**	**Middle 50% productivity range**	**Upper 25% productivity tail**
Log(materials/labor)	-0.262^{***} (0.024)	-0.029^{*} (0.016)	0.510^{***} (0.039)
Log(capital/labor)	-0.060^{**} (0.026)	-0.004 (0.019)	0.008 (0.027)
Log(labor)	0.093^{***} (0.036)	0.071^{**} (0.030)	-0.245^{***} (0.050)
Firm(age)	0.033 (0.054)	-0.001 (0.045)	0.033 (0.072)
Foreign ownership		1.642^{***} (0.605)	-3.237^{***} (0.884)
Exporting firm	-0.379 (0.304)	-0.416 (0.280)	2.752^{***} (0.931)
Innovative firm	-0.530^{***} (0.120)	0.326^{***} (0.096)	0.041 (0.135)
Intercept	-3.531 (413.040)	4.182 (107.445)	-8.798 (114.211)
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	1005	1016	984

Panel B: non-family firms	**Lower 25% productivity tail**	**Middle 50% productivity range**	**Upper 25% productivity tail**
Log(materials/labor)	-0.215***	-0.005	0.263***
	(0.013)	(0.009)	(0.016)
Log(capital/labor)	-0.138***	-0.022*	0.104***
	(0.018)	(0.012)	(0.016)
Log(labor)	0.151***	-0.014	-0.116***
	(0.022)	(0.018)	(0.026)
Firm(age)	0.009	-0.044	0.062*
	(0.037)	(0.029)	(0.038)
Foreign ownership	-0.498***	0.108*	0.228***
	(0.076)	(0.057)	(0.072)
Exporting firm	-0.069	0.010	0.006
	(0.203)	(0.175)	(0.251)
Innovative firm	-0.009	0.173***	-0.170**
	(0.074)	(0.058)	(0.073)
Intercept	0.648*	-0.727**	-2.018***
	(0.364)	(0.303)	(0.410)
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	2366	2366	2366

*Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

4. Empirical framework

4.1. Empirical model specification

The standard starting point is an extended Cobb-Douglas production function as a tool for testing labor productivity differences between family firms and non-family firms. Suppose a Cobb-Douglas production function, $Q_{it} = A_{it}F_i(K_{it}, L_{it}, M_{it})$, where Q_{it} is the gross output of firm *i* at time *t*, K_{it} denotes the stock of capital, L_{it} is the volume of total labor, and M_{it} intermediate goods, consisting of materials and energy. The variable A_{it} represents the Hicksian neutral efficiency level, and is defined as total factor productivity. The function F_i is assumed to be homogeneous of degree θ_{it} so that by the Euler rule this is equal to the sum of all output elasticities with respect to the three non-negative factor inputs, X_{ijt}, that is:

$$\theta_{it} \equiv \sum_{j\in\{K,L,M\}} \frac{\partial Q_{it}}{\partial X_{ijt}} \frac{X_{ijt}}{Q_{it}} \equiv \sum_{j\in\{K,L,M\}} \theta_{ijt} \quad (1)$$

We denote firm *i*'s elasticities of output with respect to capital as θ_{iKt}, labor as θ_{iLt}, and intermediate goods as θ_{iMt}. Dividing the production function by total labor L_{it} and by logarithmic differentiating, this gives:

$$\log\left(\frac{Q_{it}}{L_{it}}\right) = \theta_0 + \theta_{iMt}\log\left(\frac{M_{it}}{L_{it}}\right) + \theta_{iKt}\log\left(\frac{K_{it}}{L_{it}}\right) + \theta'_{it}\log(L_{it}) + \log(A_{it}) \quad (2)$$

where θ_{iKt}, θ_{iMt} are the firm *i*'s elasticity of output, respectively to capital and intermediate goods.

The model to be estimated can be derived from Eq. (2):

$$\log\left(\frac{Q_{it}}{L_{it}}\right) = \beta_0 + \beta_1\log\left(\frac{M_{it}}{L_{it}}\right) + \beta_2\log\left(\frac{K_{it}}{L_{it}}\right) + \beta_3\log(L_{it}) + \beta_4 FAM_{it} + \alpha Controls + \varepsilon_{it} \quad (3)$$

The parameters β_1 and β_2 measure the output elasticity of materials and capital whilst the parameter β_3 allows to test for scale economies. $\beta_3 = 0$ indicates that there are constant returns to scale; $\beta_3 < 0$ indicates decreasing returns to scale; whilst $\beta_3 > 0$ indicates that there are increasing returns to scale. Finally, the indicator (binary) variable *FAM* is additionally included and takes the value 1 if firm *i* is family owned in year *t* and 0 otherwise. The level of total factor productivity (TFP), represented by $\log(A_{it})$, is captured by a random error term, ε_{it}. Furthermore, we extended the production function with additional controls which is explained in more detail in section 4.1.2.

4.1.1. Production function variables

We now turn to a more detailed description of the variables included in the empirical model specified in Eq. (3).

The dependent variable is sales per employee and measures labor productivity. The regressors include log material input, $\log\left(\frac{M_{it}}{L_{it}}\right)$, log capital intensity, $\log\left(\frac{K_{it}}{L_{it}}\right)$, log labor, $\log(L_{it})$, the family ownership dummy, FAM_{it}, and a set of control variables (see further below).

The cost of intermediate inputs include costs of energy, intermediate materials and services deflated by the industry-level intermediate consumption price index. Capital intensity is the gross book value of tangible assets deflated by the industry-level gross fixed capital formation price index for all assets. Labor (L_{it}) refers to the average number of employees in each firm for each year, collected in September of that year. Conditioning on L_{it} allows labor productivity to depend on plant size, and should therefore further mitigate possible identification problems stemming from unobserved plant size effects (S. Mueller, 2015). The share of labor (s_{iLt}), material input (s_{iMt}) and capital (s_{iKt}) is constructed by dividing respectively the firm's total labor cost, undeflated intermediate consumption and undeflated capital stock by the firm's undeflated production and by taking the average of this ratio over adjacent years.

The effect of the family ownership dummy can be computed as $100 \times \left[e^{\beta_{FAM}} - 1\right]$, which can be interpreted as the *percentage* difference in labor productivity between family firms and non-family firms, holding all other observed characteristics constant. We call this the family productivity premium over non-family firm.

To avoid possible reporting problems caused by outliers, we have trimmed the data (Daouli, Demoussis, Giannakopoulos, & Laliotis, 2013). More specifically, we only use those observations which fall between the 1st and 99th percentile range based on the production variables. We skipped the 1% lower and upper tails from the original dataset to form the estimation sample.

4.1.2. Control variables

Several variables have been included to control for firm-specific characteristics. First, innovation is an important determinant of productivity (Syverson, 2011). Indeed, innovation might increase the competitiveness, productivity, and the probability of survival of firms (e.g., Cefis & Marsili, 2006; Dabla-Norris et al., 2012; Hall et al., 2009). Second, we also control for foreign ownership, which is measured by a binary indicator equaling one if the firm has a non-Dutch mother company. Foreign subsidiaries in host countries are found to be more productive than domestic firms (e.g., Benfratello & Sembenelli, 2006; de Backer & Sleuwaegen, 2003; Dunning & Lundan, 2008). Third, we include a predetermined binary variable that controls for the internationalization model of firm *i* at time *t*. It is well established that exporting plants are, on average, more productive than firms that sell on the national market only (e.g., Powell & Wagner, 2014). Thus, it is recommended to control for international trade in our production function. Finally, we control for firm age since firm performance can be regarded as ambiguous (Tan & Smyrnios, 2011). The final set of control variables and their corresponding definitions and data sources are given in Table A1 in Appendix A.

4.2. Estimation strategy: unconditional quantile treatment effects estimator

Almost all econometric research has been concerned with *mean* effects rather than distributional effects. However, the distribution of the outcome variable may change in many different ways that are not revealed –or are at best only partly revealed– by an examination of *averages*. In this chapter, we use the unconditional quantile treatment effects (UQTE) estimator, recently introduced by Frölich and Melly (2013), to assess the impact of family ownership on the labor productivity distribution[24]. Two points about this UQTE estimator are particularly worth noting. First, it provides a powerful and intuitive tool to identify the causal effects of a treatment for the entire productivity distribution –i.e., not just the distribution conditional on the values of the regressors[25].

[24] We refer to the papers by Frölich and Melly (2013) and Frölich and Melly (2010) for more background and technical details.

[25] The fact that the interpretation of unconditional quantile effects is fundamentally different from the interpretation of their conditional counterparts is a point which has all too often been overlooked in empirical studies using the quantile regression method developed by Koenker and Bassett (1978). This difference in interpretation stems from the definition of the quantile –i.e., whether or not it is defined as a function of the covariates. For example, if one is interested in a low quantile of an outcome variable *Y*, the conditional quantile effect summarizes the effect for individuals with relatively low quantile conditionally –i.e., in a given conditional (sub-population) distribution, defined conditionally on certain values of the regressors –even if their absolute level in the unconditional (population) distribution of Y is high. Conversely, the unconditional quantile effect summarizes the effect with a relatively low absolute Y (Frölich & Melly, 2010, p. 429). As a result, many researchers inadvertently have misused conditional quantile regression for answering research questions that are posed in terms of unconditional quantiles, for which the unconditional quantile regression methods developed by Firpo, Fortin, and Lemieux (2009) and Frölich and Melly (2013) are appropriate (for exogenous and

Second, it allows us to address the potential endogeneity of the treatment choice due to omitted variables– i.e., due to selection on unobservables.

The unconditional UQTE estimator measures the effect of a binary treatment variable *D* (where $D = 1$ if family firm, $D = 0$ if non-family firm) on a continuous outcome variable *Y* (labor productivity level). Let Y_i^1 and Y_i^0 be the potential outcomes for firm *i*. Then, Y_i^1 would be realized if firm *i* was to receive *'treatment'* (family ownership), and Y_i^0 would be realized otherwise (no family ownership). Finally, Y_i is the observed outcome, which is $Y_i = Y_i^1 D_i + Y_i^0(1 - D_i)$. We use the UQTE estimator to identify and estimate the entire distribution functions of Y^1 and Y^0.

The UQTE for the τ-th quantile of the unconditional outcome distribution is given by:

$$\Delta q_\tau = q_\tau(Y^1) - q_\tau(Y^0) = q_\tau^{FAM} - q_\tau^{NON-FAM} \tag{4}$$

where it is important to note that the UQTE is not defined as a function of covariates; that is, the UQTE does not change when we change the set of covariates (which contrasts with conditional QTEs). Accordingly, the UQTEs provide an intuitive way to summarize the distributional impacts of treatment (family ownership structure).

We further allow the family ownership dummy *D* to be endogenous, where identification is achieved via an instrumental variable (IV), which we will discuss later on. Since the treatment effect is allowed to be arbitrarily heterogeneous, we are only able to identify effects for the sub-population of firms that respond to a change in the value of the instrument; that is, we focus on the UQTEs for the so-called compliers. So, we have:

---

endogenous treatment selection, respectively). In addition, the use of conditional quantile regression, proposed by Koenker and Bassett (1978) (Stata's qreg command), was not deemed appropriate to answer our central research question, which is about the *unconditional* productivity distribution. In the case of CQR (changes in) the covariates redefine the quantiles of the unconditional distribution of the outcome variable. Bartelsman et al. (2015), Velucchi and Viviani (2011) and Ramdani and van Witteloostuijn (2010) are prominent examples of the application of CQR. Some good expositions on the difference between UQR and CQR can be found in, e.g., Borah and Basu (2013), Killewald and Bearak (2014), Porter (2015), Borgen (2016) and L. Peeters et al. (2017).

$$\Delta q_\tau^c = q_\tau(Y^1|c) - q_\tau(Y^0|c) = q_\tau^{FAM,c} - q_\tau^{NON-FAM,c} \quad (5)$$

where $q_\tau(Y^1|c)$ is the τ-th quantile of Y^d in the sub-population of compliers[26].

While conditional and unconditional *average* treatment effects (ATEs) have similar meanings because of the linearity of the expectation operation (by virtue of the Law of Iterated Expectations), this is not the case for *quantile* treatment effects (QTEs). Consider the following simple example, borrowed (with modifications) from Frölich and Melly (2013, p. 346), in which labor productivity is related to, say, a measure of managerial ability, and where the *unconditional* 0.9 quantile refers to high productive firms (most of whom will have a high level of managerial ability), while the 0.9 quantile *conditional* on managerial ability refers to high productive firms *within* a given managerial ability class, which, however, may not necessarily represent high productive firms *overall* or *unconditionally* (i.e., in the *population* distribution). Assuming a strong positive correlation between managerial ability and productivity, it may well be that the 0.9 quantile among low productive firms is smaller than, say, the median (0.5 quantile) or even the 0.1 quantile among high productive firms. Clearly, the interpretation of *'the 0.9 quantile'* is entirely different for conditional and unconditional quantiles. Obviously, the UQTEs are the right estimators to consider when the object of interest is the impact on the unconditional (marginal) productivity distribution[27].

For the sake of comparison, we also show the results obtained using conventional *mean* regressions, in particular OLS and a number of IV estimators. Nevertheless, it should be emphasized that mean regressions mask the *heterogeneity* in the productivity-ownership nexus. In this respect, Powell and Wagner (2014, p. 774) rightly noted that *"on average has never been a satisfactory statement with which to conclude a study on heterogeneous populations. If we acknowledge that firms are heterogeneous, we have reasons*

[26] Despite the fact that the UQTE is conditioned on being a complier, Δq_τ^c remains to be referred to as an unconditional treatment effect since we do not condition on the other covariates included in the model.

[27] It should be noted that the IV-UQTE estimator, proposed by Frölich and Melly (2013), is notably different from the unconditional quantile regression (UQR) estimator, introduced by Firpo et al. (2009). In fact, this UQR estimator is implemented by using OLS (Stata's rifreg command), where all covariates –and thus the family firm indicator– are assumed to be exogenous.

to suspect that the difference in labor productivity between family firms and non-family firms does not need to be the same for all firms". For example, the productivity difference between family firms and non-family firms may be different for firms at the lower or upper end of the labor productivity distribution. Therefore, unconditional quantile regression is a more powerful tool than linear regression due to its ability to identify potential impacts on the entire distribution of the outcome variable; that is, to go beyond the mean (Porter, 2015).

4.3. Identification strategy: instrumental variable estimation

4.3.1. Endogeneity concerns

The literature about productivity and family ownership concerns about the endogeneity of family ownership. Roberts and Whited (2011) define endogeneity as the correlation between explanatory variables and the error term in a regression. Endogeneity causes parameter estimators to become biased and inconsistent. The literature suggests two reasons of why a variable measuring family ownership is endogenous in a model with productivity as the dependent variable.

First, there may be omitted variables from the model. There is omitted variable bias when a variable, which affects the dependent variable and is correlated with one or more explanatory variables, is omitted from the regression (Stock & Watson, 2015). Productivity in family firms may differ from productivity in non-family firms in ways that are not easily measured. Such unobservables are, for instance, exceptional management skills or the firm culture/history. Even though we include the major determinants of productivity (Syverson, 2011), our measures will be crude and their inclusion in the model will not sufficiently remove the correlation between family ownership and the error term, which leads to bias in the estimate of the effect of family ownership. It is very likely that many factors driving (decisions about) productivity also drive decisions about family ownership. So, we can claim exogeneity only if none of the factors in the error term are correlated with the family ownership variable. Therefore, we have to account for endogenous treatment choice –that is, self-selection (family versus non-family ownership) on unobservables (Demsetz & Villalonga, 2001).

Second, OLS assumes that the causal chain of events runs from *X* to *Y*. Reversed causality occurs when it can reasonably be contended either that the independent variable determines the dependent variable or that the dependent variable determines the independent variable (Roberts & Whited, 2011). Some researchers would contend that the relationship between productivity and family ownership can also potentially suffer from reverse causality. However, several arguments can be found in the literature against the conjecture that productivity influences ownership structure. For instance, Andres (2008) points out that ownership stakes of families remain quite stable, even over generations, because they have a long-term orientation. He further maintains that families hold their ownership and control of their firm even in economically bad times. According to Claessens, Djankov, Fan, and Lang (2002) it seems rather questionable that firms can change their current ownership structure quickly and frequently. Accordingly, we pay no further attention to the issue of potential reverse causality and focus solely on the selection of unobservables and the IV-UQTE estimator proposed by Frölich and Melly (2010) to address the potential endogeneity problem.

The IV estimator can avoid the bias that OLS imparts when an exploratory variable in a regression is correlated with the regression's error term (e.g., Bascle, 2008; Murray, 2006). We are interested in the distributional effect of a binary treatment variable (family ownership indicator) on a continuous variable (labor productivity). The UQR estimator uses the re-centered influence function (RIF)[28] to transform the dependent variable before employing OLS to estimate the coefficients (Porter, 2015). However, OLS assumes exogeneity[29], conditional independence, or selection on observables. Therefore, Frölich and Melly (2013) propose an IV estimator for unconditional quantile regression[30] when the main focus of interest is the effect of a binary treatment variable, and a credible

[28] More information on UQR-RIFREG can also be found in Appendix D.
[29] Exogeneity means that the independent variables in the model are uncorrelated with the error term.
[30] For further technical details on the unconditional quantile regression with endogenous treatment, we refer to Frölich and Melly (2013).

binary instrument for the treatment exists. Identification is based on a monotonicity assumption in the treatment choice equation and is achieved without any functional form restriction. They propose a weighting estimator that is extremely simple to implement. This estimator is root *n* consistent, asymptotically normally distributed, and its variance attains the semiparametric efficiency bound (Frölich & Melly, 2013).

4.3.2. Choice of instrument

The impact of differential ownership structures on firms' productivity distribution is of great interest to both researchers and policy-makers, but its estimation is challenging due to the endogeneity of the family ownership indicator (e.g., Demsetz & Villalonga, 2001). Therefore, we have to find a valid instrument for ownership to control for unobserved heterogeneity. The key to identification is the choice of a valid instrument *Z* that should have a strong direct effect on (link with) family ownership and should not affect labor productivity other than through family ownership. Moreover, the use of the IV-UQTE estimator requires the selection of a binary instrument (Frölich & Melly, 2013). The instrument should meet the following five assumptions:

i. Stable Unit Treatment Value;
ii. Random assignment;
iii. Exclusion restriction;
iv. Nonzero average causal effect of instrument on treatment;
v. Monotonicity.

Data limitations prevent us from using instruments that are similar to the common ones used in earlier studies of the relationship between productivity and ownership structure. For example, importance of control of the firm, time length of family involvement in the firm, family members as working directors or proprietors of the family firm are used to predict the family dummy in the first stage (e.g., Barbera & Moores, 2013; Barth et al., 2005). Nonetheless, our data (sourced from the Social Statistics database along with a matched employer-employee database)[31] allowed us to select one particular feature of the within-firm wage distribution, which can be related to (continued) family ownership, given that family firms create different working conditions at all levels of seniority as compared to their non-family counterparts, regardless of the firms' performance level (Sraer & Thesmar, 2007).

Our instrument choice is based on the following considerations. Family ownership is generally thought to improve the quality of labor relations within workplaces and family owners develop a peculiar relationship with all their employees. This could derive from special corporate practices and/or commitments (Belot & Waxin, 2015; H. M. Mueller & Philippon, 2011). For example, family firms develop close and trusting relationships with their employees (e.g., Bach, 2010; A. L. Christensen et al., 2014; Dyer, 2006; Karra, Tracey, & Phillips, 2006), provide wage insurance (e.g., Bassanini et al., 2013; Sraer & Thesmar, 2007), promise to avoid downsizing (e.g., Block, 2010; Stavrou et al., 2007), and experience fewer labor conflicts (e.g., Belot & Waxin, 2015; H. M. Mueller & Philippon, 2011; Waxin, 2010). Those corporate practices, sometimes called *'wage policies'*, are decisive for the individual pay level[32] (e.g., Bassanini et al., 2013; Sraer & Thesmar, 2007).

Furthermore, family firm CEOs receive less compensation than CEOs of non-family firms (e.g., Cheng, Lin, & Wei, 2015; Croci, Gonenc, & Ozkan, 2012; Gomez-Mejia, Larraza-Kintana, & Makri, 2003; McConaughy, 2000), for two reasons. First, family firms offer their CEOs lower compensation in exchange for higher job security, especially if the CEOs are related to the owners (Gomez-Mejia et al., 2003). Second, family ties increase the commitment of the CEO to the firm, where the greater commitment means that CEOs in family firms are less likely to leave the firm for another firm and will be more prone to accept a lower level of pay (Croci et al., 2012; Gomez-Mejia et al., 2003). Additionally, family firms pay on average lower wages than non-family firms to their

[31] The resulting dataset includes all tax-paying employees with a current address in the Netherlands. In order to rank income-level categories, we only selected full-time (FTE) jobs that have lasted for at least an entire year. In addition, we selected only those employees that worked during that year in non-agricultural industries, due to the many difficulties one is likely to encounter in measuring productivity inputs and outputs for the agricultural sector (Dobbelaere & Vancauteren, 2015).
[32] See Chapter 3 for a comprehensive literature review on the relationship between wage policies and family ownership.

employees, even after allowing for skill and age structure (e.g., Bassanini et al., 2013; Carrasco-Hernandez & Sánchez-Marín, 2007; Sraer & Thesmar, 2007).

To construct our binary instrument *Z*, we looked for a variable which allows us to characterize each sample firm's wage distribution. To create this within-firm wage variable, we first classified the firms' occupations into low-paid and high-paid jobs by selecting some threshold levels derived from the distribution of wages for **all** registered jobs in the Netherlands in 2013[33]. The threshold values we chose correspond to the 30th and 81th percentile of the overall wage distribution[34].

In Table 4 we can find some descriptive statistics for the overall wage distribution in the Netherlands. For example, only 20 percent of all registered jobs in the Netherlands have annual wages lower than the threshold value of 19682 euros (FTE), while only 80 percent of all registered jobs in the Netherlands have annual wages at or above the threshold value of 51860 euros (FTE). Table 4 shows that age does not vary but that our wage distribution commoves with education.

Table 4: Descriptive statistics for the overall wage distribution in the Netherlands

	20th percentile	80th percentile
Average annual wage (expressed in 2013 euros)	19682	51860
By age group:		
- Age group 1 $[< 30]$	19522	51363
- Age group 2 $[31 - 40]$	19727	51901
- Age group 3 $[41 - 50]$	20001	52001
- Age group 4 $[> 51]$	20310	51859
By educational-attainment group (at firm-level):		
- Average number of low-educated workers	68.6	7.8
- Average number of middle-educated workers	39.4	34.5
- Average number of high-educated workers	4.4	47.9

Note: The total number of observations in the overall wage distribution is 1134000.

[33] See Dobbelaere and Vancauteren (2015) for an application of this approach for defining skill heterogeneity and Groot, de Groot, and Smit (2014) for an application of this approach on regional labor market effects.
[34] See Dobbelaere and Vancauteren (2015) for a similar idea.

Next, we determined for each firm *i* in the sample how many employees have a low-paid job and how many employees have a high-paid job in firm *i*, respectively. We classified employees as having a low-paid job if their annual wage is equal to or below the 30th percentile of *all* registered jobs in the Netherlands by age category and NACE 2-digit industry. We classified employees as having a high-paid job if their annual wage is above the 81st percentile of *all* registered jobs in the Netherlands by age category and NACE 2-digit industry. Then, based on this information, we calculated the ratio, R_i, between the number of low-paid and high-paid workers for each firm *i* in our sample population, given by:

$$R_i = \frac{number\ of\ workers\ in\ firm\ i\ with\ low-paid\ job}{number\ of\ workers\ in\ firm\ i\ with\ high-paid\ job} \tag{6}$$

Finally, each firm *i*'s ratio is compared with the median value of the ratio for *all* registered wage employees in the Netherlands.

Given that our binary instrument *Z* should tell us something about the distribution of wages across workers within each firm *i* as compared to the overall wage distribution, *Z* takes a value 1 if firm *i*'s ratio, R_i, is equal to or exceeds the median value of the ratio for all registered wages in the Netherlands, $\tilde{R}$, whereas it takes a value 0 if the firm *i*'s ratio, R_i, is smaller than the median value, $\tilde{R}$. That is,

$$Z_i = \begin{cases} 1\ if\ firm\ i's\ R_i \geq median\ value\ of\ \ all\ R_i\ (= \tilde{R}) \\ 0\ if\ firm\ i's\ R_i < \ median\ value\ of\ all\ R_i\ (= \tilde{R}) \end{cases} \tag{7}$$

In other words, $Z_i = 1$ if firm *i*'s ratio is larger than the overall median group ($\tilde{R}$), which means that firm *i* has either relatively more workers with low-paid jobs or relatively less workers with high-paid jobs as compared to the other firms in the Netherlands, such that $Z_i = 1$ may potentially be indicative of a family firm. Conversely, $Z_i = 0$ if firm *i*'s ratio is smaller than the overall median group, which means that firm *i* has either relatively less workers with low-paid jobs or relatively more workers with high-paid jobs as compared to other firms in the Netherlands, such that $Z_i = 0$ may potentially be indicative of a non-family firm. Figure 2 explains the procedure used in constructing our instrumental variable *Z*.

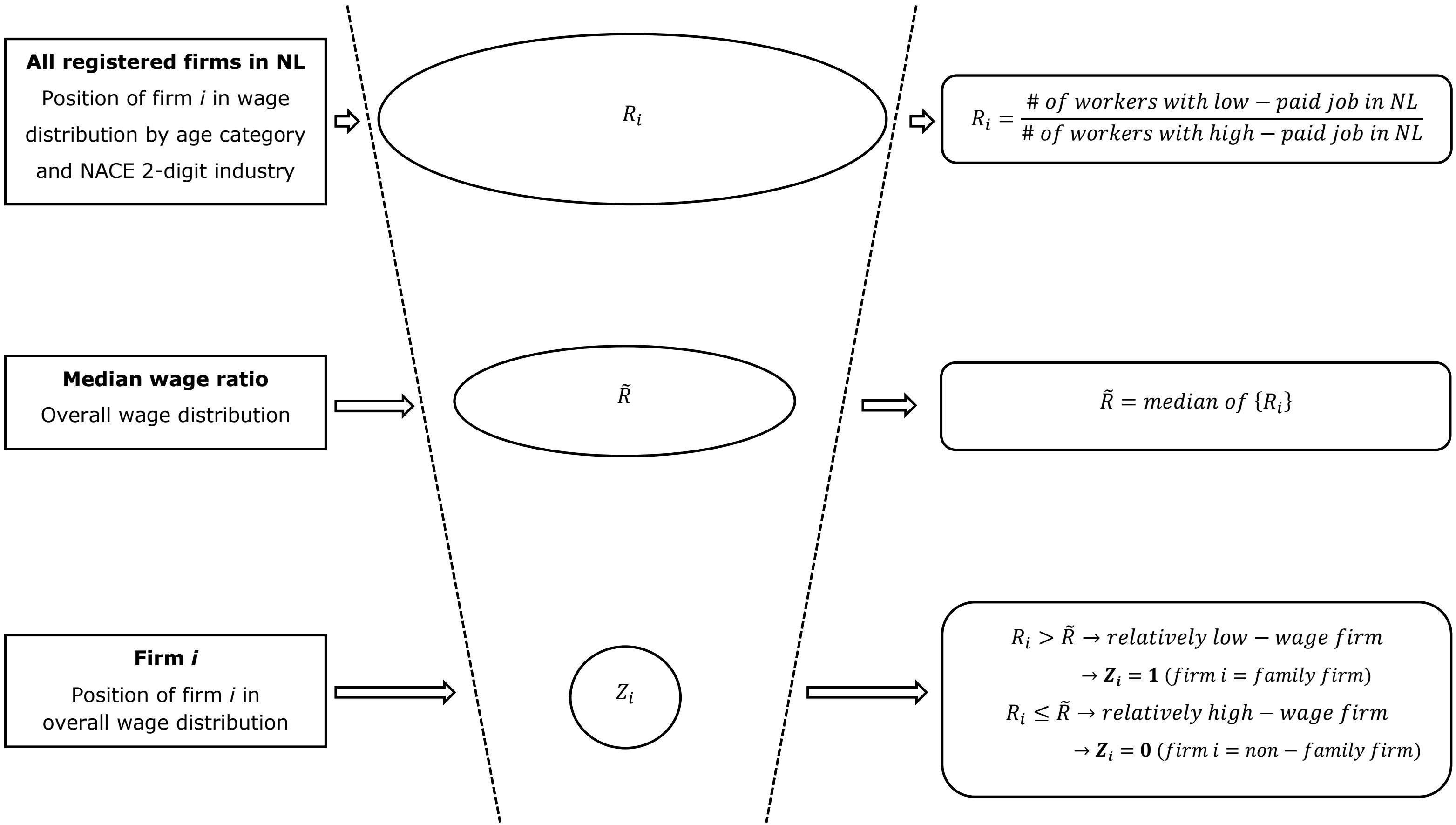

Figure 2: Construction of binary instrument *Z* for ownership structure indicator *D*

Is our instrument *Z* a valid instrument for the binary family ownership indicator *D*? We find that there is a significantly positive correlation of 0.1384 between family ownership *D* and our instrument *Z*. Thus, $Z_i = 1$ $(Z_i = 0)$ is likely to increase the probability of being a family (non-family) firm. More information about the validation of our instrument is provided in Appendix C. Further note that there are two types of firms in our sample: (i) firms that are family owned regardless of the value of the instrument $(D = 1 \; and \; Z = 0 \; or \; 1)$; and (ii) firms that are family owned only when the instrument is *Z* is equal to 1 $(D = 1 \; and \; Z = 1)$. We identify the treatment effects for this latter group, which is designated as the group of *compliers*, and which represents 8.9% of our total sample. In Table 5 we can find some descriptive statistics by the value of the instrument.

Table 5: Descriptive statistics by the value of the instrument

	$Z_i = 0$			$Z_i = 1$			
	N (1)	**mean** (2)	**Sd.** (3)	**N** (4)	**mean** (5)	**Sd.** (6)	**Difference** (7)
Labor productivity	1407	23750.49	191156.4	1999	21129.77	180712.6	
Log(materials/labor)	1407	4.85	3.49	2000	4.61	2.97	0.23**
Log(capital/labor)	1407	1.92	2.33	2000	1.49	2.54	0.43***
Log(labor)	1407	5.29	1.56	2000	5.13	1.58	0.16***
Family ownership	1407	0.21	0.41	2000	0.36	0.48	-0.15***
Log(firm age)	1407	7.33	0.78	2000	7.23	1.08	0.10***
Foreign ownership	1407	0.34	0.47	2000	0.24	0.43	0.10***
Exporting firm	1407	0.98	0.15	2000	0.97	0.17	0.01
Innovative firm	1407	0.55	0.50	2000	0.51	0.50	0.04**

*Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

4.3.3. Testing for endogeneity

Endogeneity of regressors can be tested by comparing the ordinary least squares (OLS) estimators with Instrumental Variable (IV) estimators. The most commonly used test is the Hausman test, which is used to determine whether or not the explanatory variable in a regression suffers from endogeneity. If the regressors are endogenous then these estimates will differ, whereas if the regressors are exogenous the two estimators will not differ. Thus large differences between OLS estimates and IV estimates can be interpreted as evidence of endogeneity. In the first-stage regression, the potentially endogenous regressor will be predicted by using the instrumental variable. The residuals of the potentially endogenous regressor, which is obtained by subtracting the predicted values from the observed values, are included in the initial OLS regression. This is called the second-stage regression. If the coefficient on the residuals is significant, the Hausman test rejects the null hypothesis of no endogeneity problem (C. A. Cameron & Trivedi, 2007; Larcker & Rusticus, 2010). We have applied the Durbin Wu Hausman test $(p < 0.000)$ on our OLS results and found that endogeneity of the family ownership dummy is a problem[35].

5. Estimation results

This section discusses the estimation results and establishes some basic facts concerning the nature of the productivity differences between family firms and non-family firms.

5.1. Estimated effects: mean regressions

The estimated *average treatment effects* (ATEs) of family ownership on labor productivity results are summarized in Table 6. Panel A of Table 6 shows the mean homogeneous effects from standard OLS and 2SLS, whereas panel B

[35] It is assumed in this chapter that if there is an endogeneity problem for the mean of the labor productivity distribution, it is also a problem for the quantiles of this distribution.

shows the average heterogeneous treatment effects from the Probit-2SLS, Probit-OLS, and Heckit estimators (Cerulli, 2014; Schroeder, 2010).

The results for *OLS* are reported in panel A of Table 6. The coefficient on the family ownership indicator is estimated at -0.066, which is not statistically significant at the 5% level ($p = 0.213$). The magnitude of this coefficient implies that the labor productivity of family firms is expected to be *on average* –or, at the mean– 6.39% $(= 100 \times (e^{-0.066} - 1))$ lower than the productivity of non-family firms, ceteris paribus. The OLS estimate has to be interpreted as the average productivity difference between family firms and non-family firms (average treatment effect, ATE).

The results for standardized 2SLS are reported in panel A of Table 6. Homogeneous preferences implies the assumption that causal effects are the same in the sub-population of treated and untreated units (Cerulli, 2014). We find that the family productivity discount becomes significant at the 1% significance level and equals to -3.851.

Table 6: Estimated mean effects of family ownership on log labor productivity

	Family ownership indicator		Point-wise percent change
	ATE	S.E.	
Average treatment effects (ATEs)	(1)	(2)	(3)
Panel A: homogeneous responses			
OLS	-0.066	0.053	-6.39%
2SLS	-3.851***	0.827	-97.87%
Panel B: heterogeneous responses			
Probit-2SLS	-0.432	0.271	-35.08%
Probit-OLS	-0.559**	0.266	-42.82%
Heckit	-0.537**	0.234	-41.55%
Number of observations	3407		

Notes: Mean effects (ATEs) from OLS and 2SLS are obtained using Stata's regress and ivreg2 command, respectively. Mean effects from Probit-2SLS, Direct-2SLS, Probit-OLS, and Heckit are obtained using Stata's ivtreatreg command (Cerulli, 2014).

*Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

The mean effects (ATEs) of family ownership on labor productivity obtained using traditional mean regressions with IV, assuming heterogeneous preferences can be found in panel B of Table 6. Three different estimators for heterogeneous responses are used, which have been extensively described by Cerulli (2014), namely Probit-2SLS, Probit-OLS and Heckit. The ivtreatreg Stata command provides consistent estimation of ATEs under the hypothesis of selection-on-unobservables by using an instrumental variable and a generalized Heckman-style selection model (Cerulli, 2014). The estimated coefficients on the firm ownership indicator measure the *average* productivity difference between family firms and non-family firms. It is significant and lies between -0.537 (-41.55%) and -0.559 (-42.82%).

All those estimated mean effects of family ownership on log labor productivity (Table 6) are unable to provide information as regards the heterogeneity of the impact of family ownership on labor productivity throughout the unconditional labor productivity distribution. Therefore, we go further to the quantile regression.

5.2. Estimated effects: quantile regressions

The estimated *unconditional quantile treatment effects* (UQTEs) –or local average treatment effects (LATEs)– of family ownership on labor productivity results are summarized in Table 7.

Table 7: Estimated quantile effects of family ownership on log labor productivity

Quantile treatment effects (UQTEs) for selected quantiles τ	ENDOGENEITY			EXOGENEITY		
	Family ownership indicator		Point-wise percent change	Family ownership indicator		Point-wise percent change
	UQTE	S.E.		UQTE	S.E.	
	(1)	(2)	(3)	(4)	(5)	(6)
0.05	-3.818	3.256	-97.80%	0.157	0.133	16.99%
0.10	-3.456*	1.958	-96.84%	0.154	0.103	16.65%
0.15	-3.312***	0.791	-96.36%	0.258***	0.073	29.43%
0.20	-2.888***	0.523	-94.43%	0.214**	0.097	23.86%
0.25	-2.861***	0.468	-94.28%	0.188**	0.090	20.68%
0.30	-2.845***	0.431	-94.19%	0.216***	0.084	24.11%
0.35	-2.834***	0.400	-94.12%	0.111	0.088	11.74%
0.40	-2.792***	0.366	-93.87%	-0.027	0.088	-2.66%
0.45	-2.904***	0.354	-94.52%	-0.077	0.084	-7.41%
0.50	-2.964***	0.331	-94.84%	-0.086	0.111	-8.24%
0.55	-2.940***	0.305	-94.71%	-0.168	0.110	-15.47%
0.60	-2.964***	0.286	-94.84%	-0.165*	0.096	-15.21%
0.65	-3.022***	0.289	-95.13%	-0.232**	0.094	-20.71%
0.70	-3.233***	0.605	-96.06%	-0.357***	0.083	-30.02%
0.75	-3.451***	0.466	-96.83%	-0.420***	0.086	-34.30%
0.80	-3.499***	0.430	-96.98%	-0.536***	0.134	-41.49%
0.85	-3.798***	0.352	-97.76%	-0.467*	0.281	-37.31%
0.90	-3.880***	0.286	-97.94%	-0.308	0.243	-26.51%
0.95	-4.020***	0.325	-98.21%	-0.867	0.636	-57.98%
Prop. of compliers	0.089					
Numb. of obs.	3407			3407		

Notes: Unconditional quantile treatment effects (UQTEs) are obtained using Stata's ivqte command (Frölich & Melly, 2010). The point-wise percent changes are calculated as $100 \cdot (e^{QTE} - 1)$ *for the 19 quantiles of the labor productivity distribution* ($\tau = 0.05, 0.10, \ldots, 0.95$)*. Smoothing parameters are set as follows: bandwidth* $h = \infty$ *and lambda* $\lambda = 1.0$*. Our parameter choice was based on 'leave-one-out-cross-validation', using Stata's locreg command, which uses a minimum MSE criterion. Furthermore, the Epanechikov kernel, which is the default choice in Stata's ivqte command, was used because the literature indicates that kernel choice has little practical influence on the results.*

*Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

This Table 7 provides only information about the UQTEs of family ownership on labor productivity. The reason for this is two-fold. First, the IV-UQTE estimator does not provide information on the relationship between the other covariates (controls) and labor productivity. This is not available because the unconditional quantile functions are one-dimensional functions (Frölich & Melly, 2013, p. 347). Second, the other covariates are likely to be both causes and effects of the firms' performance in terms of labor productivity, hence endogenous, such that their coefficients are generally biased and, therefore, do not necessarily have a causal interpretation. This should not be much of a concern, however, as the effects of the other covariates are not the primary object of interest in our study; they are merely included in the estimation because they are arguably correlated with both ownership structure and labor productivity, such that including them reduces potential correlation between ownership structure and the error term (Sraer & Thesmar, 2007) and, hence, could be helpful in both increasing the precision of the estimates and making consistency of the estimation more plausible (Frölich & Melly, 2013, p. 347). We do not need the covariates to be exogenous, that is the covariates can be correlated with the unobservables (Frölich & Melly, 2013, p. 348). Even when the covariates are endogenous, this does not lead to biased UQR results. The UQR method is only based on the outcome variable (i.e., labor productivity) and not on the covariates. In the case of UQR the covariates do not redefine the quantiles of the unconditional distribution of the outcome variable (Firpo et al., 2009).

5.3. Robustness checks

To ensure the robustness of our results, we conduct an additional analysis. In this section we check the sensitivity of the empirical results to alternative model specifications by experimenting with different smoothing parameters. A choice had to be made as to how much of the data should be used (i.e., how smooth the estimates should be). With local logistic regression, two smoothing parameters must be set, namely bandwidth $(0 \le \mathrm{h} \le \infty)$ and scale parameter lambda $(0 \le \lambda \le 1)$. When h is set to infinity and λ to 1, the entire dataset is used, and a global model is estimated. The IV-UQTE results reported in Table 7 and discussed above were based on the default values of the smoothing parameters, with bandwidth $\mathrm{h} = \infty$ and lambda $\lambda = 1$ (Porter, 2015).

Stata's locreg command (Frölich & Melly, 2010) allows us to find the optimal smoothing values for the IV-UQTE estimator, using a 'leave-one-out cross-validation' approach that seeks the smallest mean squared error (MSE). In leave-one-out cross-validation, values are first chosen for bandwidth and lambda. The sample is then split into a number of different datasets, where the local logistic regression model is estimated using the full sample except for one observation, after which the coefficients from the model are used with values of the independent variables from the remaining observation to make a prediction of the dependent variable. The predicted value is compared to the actual value, and the MSE is calculated across the datasets for this pair of smoothing values (Porter, 2015).

Specifically, we tested the values 0.2, 1 and infinity for bandwidth h and 0.2, 0.5 0.8 and 1 for lambda λ. These results are summarized in Table 8. Among the grid of values tested, the optimal bandwidth is 1 and the optimal lambda is 0.2 (shown in bold).

Table 8: Results of leave-one-out cross-validation

Bandwidth (h)	Lambda (λ)	MSE
0.2	0.2	0.17456801
0.2	0.5	0.17435502
0.2	0.8	0.17496005
0.2	1	0.17542529
1	**0.2**	**0.16934638**
1	0.5	0.17001616
1	0.8	0.17055364
1	1	0.17086917
infinity	0.2	0.17538151
infinity	0.5	0.17556439
infinity	0.8	0.17578853
infinity	1	0.17593439

Next, we compare the estimated IV-UQTEs for two different values of lambda and two different values of bandwidth: $h = \infty \; and \; \lambda = 0.2$ (model 1), $h = \infty \; and \; \lambda = 1$ (model 2), $h = 1 \; and \; \lambda = 0.2$ (model 3), and $h = 1 \; and \; \lambda = 1$ (model 4). The results are summarized in Table 9. We find that the differences between the four models are negligible. We can therefore safely conclude that the estimated UQTEs of family ownership on labor productivity throughout the labor productivity distributions are robust to changes in the optimal smoothing values for the IV-UQTE estimator.

Table 9: Sensitivity to smoothing parameters

	Family ownership dummy $h = \infty$ and $\lambda = 0.2$ (1)	**Family ownership dummy** $h = \infty$ and $\lambda = 1$ (2)	**Family ownership dummy** $h = 1$ and $\lambda = 0.2$ (3)	**Family ownership dummy** $h = 1$ and $\lambda = 1$ (4)
$q_{0.10}$	-2.999*** (0.374)	-2.999*** (0.374)	-2.998*** (0.374)	-2.999*** (0.374)
$q_{0.50}$	-1.988*** (0.253)	-0.1988*** (0.253)	-1.988*** (0.253)	-1.988*** (0.253)
$q_{0.75}$	-2.221*** (0.241)	-2.221*** (0.241)	-2.221*** (0.241)	-2.221*** (0.241)
$q_{0.90}$	-2.122 (1.316)	-2.122 (1.316)	-2.122 (1.316)	-2.122 (1.316)

*Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

6. Discussion

6.1. UQTEs under endogeneity

We begin our discussion with the estimated UQTEs under endogeneity presented in column 1 of Table 7. To visualize the outcomes, Figure 3 depicts the quantile plots of the UQTEs of family ownership on labor productivity under endogeneity. This quantile plot describes the way in which the impact of family ownership varies throughout the labor productivity distribution. The vertical axis measures the estimated UQTEs of family ownership on labor productivity; the horizontal axis marks 19 quantiles of the labor productivity distribution ($\tau = 0.05, 0.10, \dots, 0.95$). The shaded area represents the point-wise 95% confidence intervals. The graph in Figure 3 discloses a rather stable pattern, whereby the unconditional quantile effect of family ownership is negative and significant along almost all quantiles of the labor productivity distribution, assuming endogeneity. Based on these results, we can safely conclude that for the group of firms for which the strength of the instrument is high –for the *compliers*– family ownership has a substantially negative and significant effect on labor productivity.

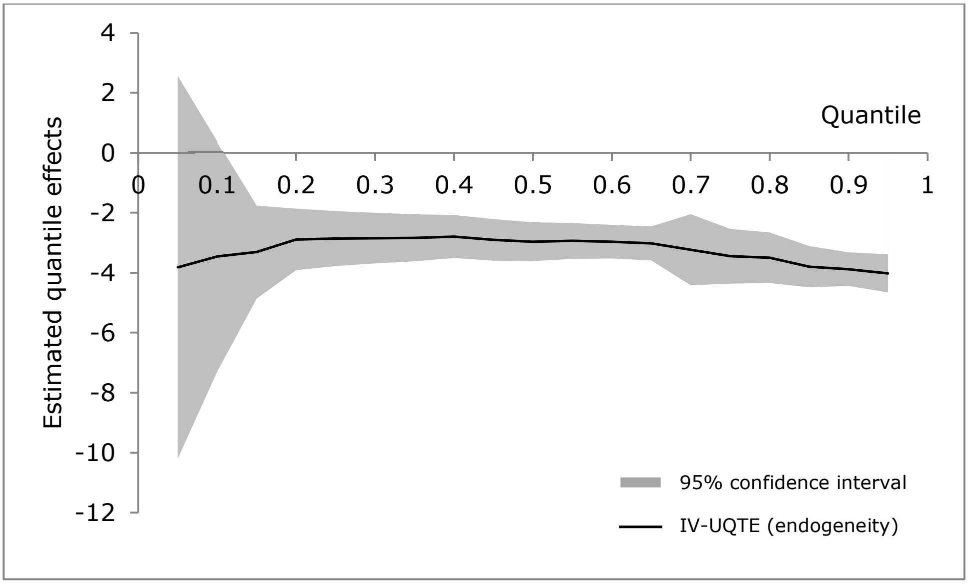

Figure 3: Estimated quantile effects of family ownership on log labor productivity under endogeneity

As with any IV estimate, care must be made in interpreting the results. The magnitudes of the UQTEs under endogeneity are unexpectedly large and, therefore, may seem exaggerated at first sight. However, three points should be taken into consideration when looking at the results.

First and foremost, UQTEs represent *local average treatment effects* (LATEs), where *'local'* refers to the sub-set of the population on which the treatment effect is estimated. In the context of IV, this is the group of firms, known as the *compliers* (i.e., the group of firms whose self-selection into family ownership is determined by the instrument), used to identify the UQTEs. This implies that LATEs are *marginal* effects, which are typically larger in size than the *average* treatment effects (ATEs) and cannot generally be directly compared with ATEs obtained using traditional mean regressions. More precisely, LATEs measure the marginal effect for those firms that are most likely to prefer family ownership – i.e., where the most weight is given to those firms for which the instrument *Z* is most influential (i.e., compliers), and no weight is given to those firms that do not prefer family ownership under any circumstances. That is, LATE is the local average treatment on the outcome (i.e., labor productivity) compared with no treatment for a random draw from the sub-population of compliers (Schroeder, 2010), where the firms who receive the most weight are those for whom the instrument is most influential (Stock & Watson, 2015). Conversely, ATEs place equal weight on *all* firms, regardless of whether they preferably self-select into family ownership. Stated differently, ATE is the average effect of *'treatment'* (i.e., family ownership) on the outcome (i.e., labor productivity) as compared with *'no treatment'* (i.e., no family ownership) for a *random draw* from the population (Schroeder, 2010). In other words, for some firms family ownership may be strongly beneficial and for some other firms it could be less beneficial – or even without any benefit. Thus, while the *average* causal effect in the population might be positive or negative, the IV estimator measures a *marginal* effect, not an average effect (Stock & Watson, 2015). In our application, the marginal effect is the effect of family ownership on those family firms for which the binary instrument *Z* is an important factor. But those firms could just be the ones heavily affected by preservation of SEW for which, on the margin, family ownership is a relatively beneficial choice. This may explain our finding that family ownership is relatively effective in preserving SEW for the marginal firm, not for the average firm for which it might not be effective. Given that a firm's decision to choose family ownership is based in part on their knowledge of how effective (beneficial) this will be for their SEW purposes, the LATE is likely to be *greater* than the ATE, and the IV-UQTE estimator used here is not generally a consistent estimator of the ATE. For more technical details, we refer to the good and accessible expositions in for example Schroeder (2010) and Porter (2012, 2015). The UQTEs obtained using Stata's ivqte command (Frölich & Melly, 2010) cannot be directly compared with the ATEs obtained using Stata's ivtreatreg command (Cerulli, 2014); both treatment effects have a clearly different interpretation.

Second, the point estimates in the lower part of the labor productivity distribution are less precise (i.e., have much wider confidence intervals), and are at some quantiles not significantly different from zero.

Finally, one should not myopically focus on the sizes of the estimated UQTEs, in a quantitative sense, but rather emphasize their qualitative implications –which are obviously clear.

6.2. Additional results with alternative IV estimator (= the same estimator with treatment exogeneity)

The estimated IV-UQTEs under endogeneity refer to the sub-population of compliers. However, in our study, compliers account for only 8.9% of the total sample, while we would like to know the effect for every firm, or at least for a larger sub-group of the sample of interest. This means we cannot conclude that family ownership has a negative impact on labor productivity for all firms in our sample. Instead, we should conclude that for the group of firms for which the strength of the instrument is high –for the *compliers*– family ownership has a substantially negative and significant effect on labor productivity. For example, we can say little about the effect of ownership structure on labor productivity for firms that would never be family owned despite how familiar and peculiar labor relations with their employees are. A very conservative firm may be hostile to non-family ownership and would always remain family owned regardless of the quality of labor relations within the firm.

To check the robustness of the results obtained using the (baseline) IV-UQTE estimator with covariates under endogeneity, we begin by checking the robustness of the results to the choice of an alternative IV estimator, namely the same estimator with treatment exogeneity (i.e., selection on observables) which is a special case[36] where $Z = D$. Finally, we also look at the observed differences between the raw quantiles for family firms and non-family firms[37]. Figure 4 compares the estimates obtained using the various estimators. The solid thick line labelled *'Baseline (with IV)'* is the same as that shown in Figure 3. The estimated impacts, when using the baseline IV-UQTE estimator, are uniformly negative when we assume that family ownership is endogenous.

[36] In this case, we can use family ownership as its own instrument and set $Z = D$ (Frölich & Melly, 2013). Note that in this situation every firm is a complier.
[37] See also summary statistics in Table 2.

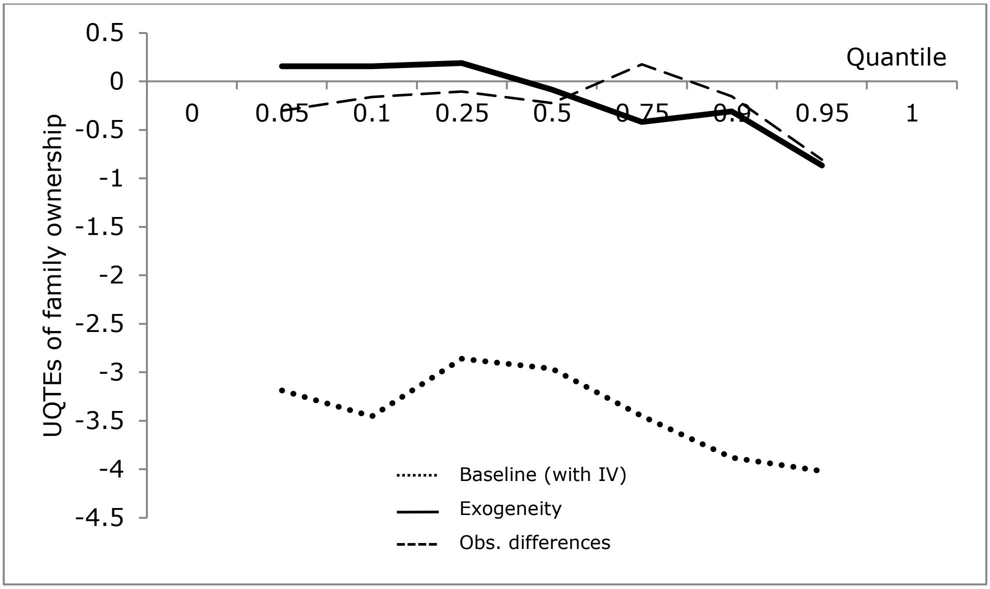

Figure 4: Robustness of results to choice of estimator – Comparison of estimates

The results obtained by using an alternative IV estimator (i.e., the same estimator with treatment exogeneity) can be found in column 4 of Table 7. In this case, we assume that family ownership is exogenous or conditionally exogenous (i.e., assuming selection on observables). What stands out is the appreciable heterogeneity in labor productivity differences throughout the distribution. The graph in Figure 5 discloses a clear overall pattern, whereby labor productivity differences between family firms and non-family firms change from being positive to being negative as we move upwards along the labor productivity distribution, where the switching point (where $UQTE = 0$) occurs around the 40th percentile of the distribution. The variability in UQTEs when using the alternative IV estimator is statistically significant (at two-sided 5% level) (though not always), where UQTEs are significantly positive between the 13th and 33rd percentile and mostly (though not always) significantly negative above the 56th percentile of the labor productivity distribution[38].

[38] The point estimates of the UQTEs below the 5th quantile and above the 95th quantile of the labor productivity distribution are rather unstable and statistically insignificant, which makes it difficult to provide meaningful economic interpretations.

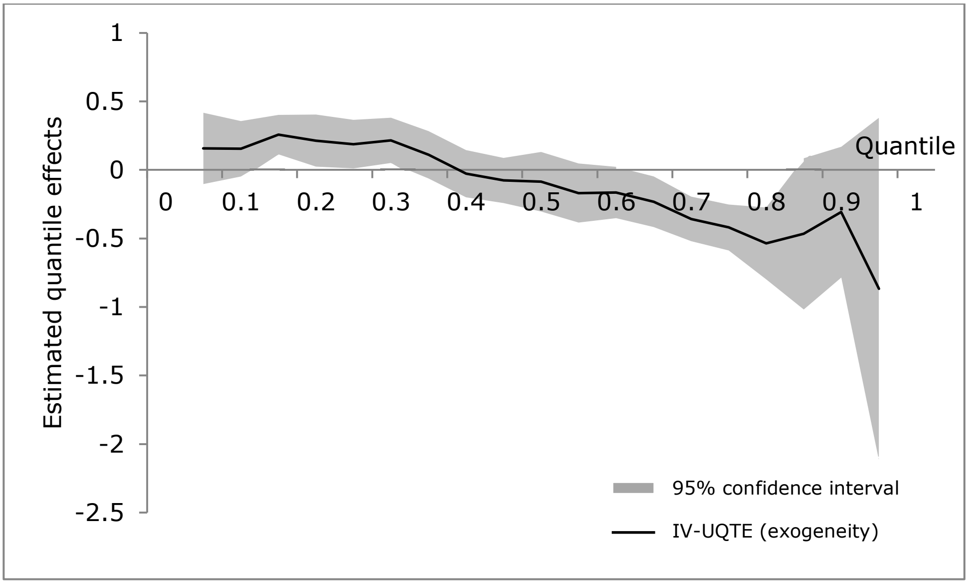

Figure 5: Estimated quantile effects of family ownership on log labor productivity under exogeneity

Based on these results, we can safely conclude that family ownership has a substantially positive (negative) and significant effect for the lowest (highest) quantiles of the labor productivity distribution. The finding that positive (negative) UQTEs, in case the alternative non-parametric IV estimator is used, dominate the lower (upper) part of the distribution is consistent with the SEW perspective, our hypothesis –*thinner tails and smaller dispersion for family firms versus thicker tails and larger dispersion for non-family firms*. Differences in the importance of particular SEW dimensions can lead to heterogeneous behavior by switching risk-averse preferences to risk-seeking preferences with regard to for example long-term investments. Concerning labor productivity, it can be stated that the short-term and long-term objectives of family firms manifest their role in the production process. The objective of the long-term survival of their business may induce family firms to forego investment strategies that could enhance productivity but that might also yield uncertain returns (Damiani, Pompei, & Ricci, 2016).

It is unwieldy to discuss the implications of each and every UQTE point estimate for the kurtosis and other features of the labor productivity distribution.

However, in an attempt to summarize the effects of family ownership on labor productivity, we calculated the averages of the UQTEs when using the alternative IV estimator over three segments of the labor productivity distribution. Specifically, we find that the bottom segment (average calculated over the 0.05-0.50 quantile range) of the distribution for family firms is 13% higher than the corresponding segment for their non-family counterparts, ceteris paribus, while the family firms' middle segment (average calculated over the 0.25-0.75 quantile range) and the top segment (average calculated over the 0.50-0.95 quantile range) segments are 7% and 29% lower, respectively. Figure 6 shows the implied percent changes across the $[0.05-0.50]$, $[0.25-0.75]$, and $[0.50-0.95]$ quantile ranges. It goes without saying that conventional mean regressions would not have been able to reveal the complex nature of the relationship between family ownership structure and labor productivity (distributional impacts).

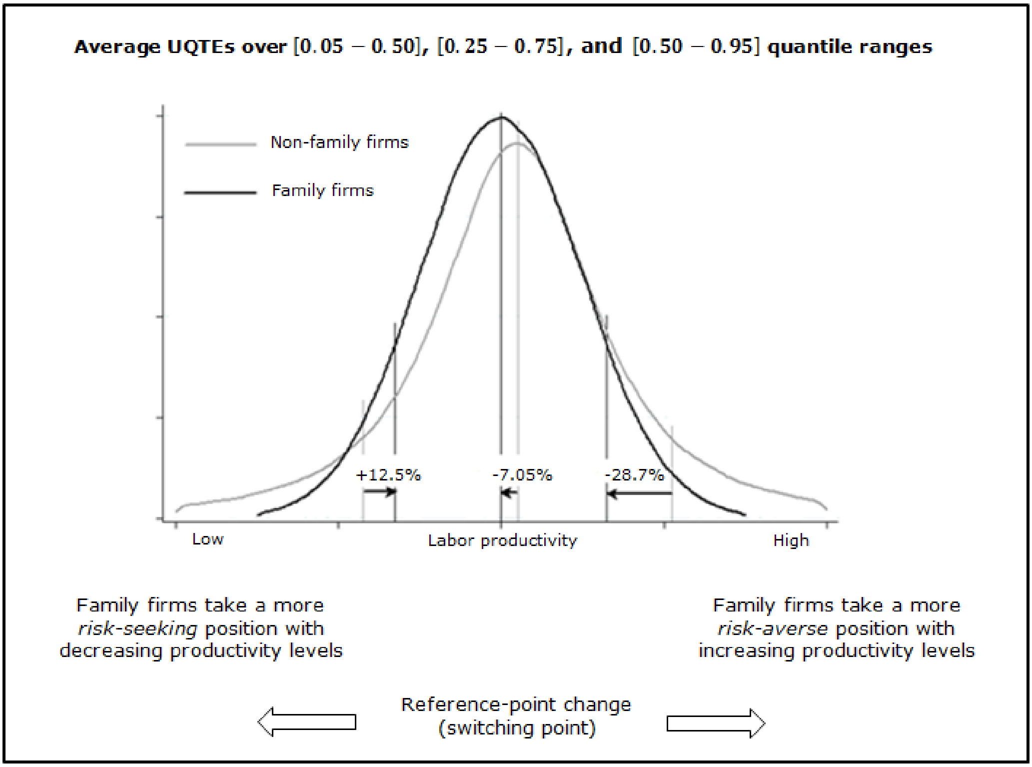

Figure 6: Implied (counterfactual) productivity distributions for family firm

Another way to conceptualize the quantile regression results is with a thought experiment, in which non-family firms suddenly become family firms[39]. In the case of OLS (see Table 6), if this occurred, mean labor productivity for non-family firms would decrease by 6.39%. In the case of the unconditional quantile regression results, we should think of the entire distribution of labor productivity shifting, as non-family firms become family firms. If this occurred, the left tail of the labor productivity distribution would shift to the right, where the right tail of the labor productivity distribution would shift to the left ceteris paribus. The shift on the right tail (-28.7%) is larger compared to the shift on the left tail (+12.5%).

Our empirical findings when using the alternative IV estimator are thus clearly in line with the observation that the SEW reference point varies with the family firm's initial labor productivity level, as extensively described in Section 2.2. They are in agreement with the unique feature that family firms face SEW trade-offs that non-family firms are not facing (Cruz & Arredondo, 2016). Specifically (roughly speaking), low productive family firms focus less on SEW goals and concentrate more on financial goals in an effort to grow back to an acceptable productivity level, whereas high productive family firms care less about (further) increasing the level of productivity by given priority to non-financial goals over financial goals and focus more on SEW goals to preserve the *'family jewels'* (Nordqvist, 2016).

7. Concluding remarks

7.1. Concluding notes

In estimating the impact of family ownership on labor productivity, we went beyond the conventional mean regressions by using the new (non-parametric) quantile treatment effect estimator, proposed by Frölich and Melly (2013). In doing so, we explicitly analyze the distributional impacts of family ownership and

[39] See Porter (2015) for a similar idea in their study on examining male-female differentials in faculty compensation.

explain how and why the differences in behaviors and risk attitudes in family firms and non-family firms change as one moves along the unconditional labor productivity distribution. The recent interest in the role of SEW has contributed to the understanding of the risk-taking propensities of family firms as compared to their non-family counterparts (Berrone, Cruz, Gomez-Mejia, & Larraza-Kintana, 2010; Gómez-Mejía et al., 2007; Gomez-Mejia et al., 2010). In this chapter, we add to this understanding by investigating the heterogeneity of family firms, especially as it applies to different productivity levels. This answers the call of, inter alia, Chrisman and Patel (2012) to take the heterogeneity of family firms more fully into account.

This study goes beyond the current state of the art in the theoretical and empirical literature on the impact of family ownership on labor productivity. We extend the previous research by joining the recent SEW debate developed by Martin and Gomez-Mejia (2016) regarding the relationship between socioemotional wealth and financial wealth. This kind of theoretical SEW perspective provides innovative insights into the productivity debate and could reconcile the puzzling evidence found in prior research. This study uses both the behavioral agency model and the SEW framework to investigate the variability in the behavior of family firms as compared to their non-family counterparts. Our study is different from previous work that analyses the relationship between family ownership and labor productivity at the mean value, using classical linear regression (i.e., OLS or different panel data estimators). In contrast, the UQR method generates average effects for each quantile of the labor productivity distribution. This implies that we can investigate the impact of family ownership on labor productivity at different levels of the labor productivity distribution (i.e., for low or high levels of labor productivity), which offers a comprehensive picture of firm productivity in distinct economic backgrounds. We believe that examining the effect of family ownership on labor productivity along the labor productivity distribution can add value to the existing puzzling evidence obtained via classical linear regression. Our empirical results have revealed the flexibility and usefulness of UQR, as well as its advantages over conditional mean regression. OLS leads to conclusions that are vastly oversimplified, so OLS is not really suitable as an analytical tool for examining the impact of family ownership on labor productivity.

Family firms typically focus on SEW goals in their decision-making process. The SEW reference point could change depending on the level of firm productivity. For example, Martin and Gomez-Mejia (2016) emphasize the two-way relationship between financial wealth and socioemotional wealth. This is really helpful to comprehend the circumstances under which family firms' decision makers prioritize non-financial goals over financial goals (or vice versa) (Nordqvist, 2016). Family firms do not ignore the financial aspect of decisions that are motivated by preservation of family SEW. Changes in SEW are likely to influence economic productivity levels (and vice versa) (Martin & Gomez-Mejia, 2016). In family firms, the loss or gain of socioemotional wealth is assumed to be the predominant reference point in decision-making (Berrone et al., 2012; Gomez-Mejia et al., 2010). However, Debicki et al. (2016) state that this reference point might shift depending on the importance of particular SEW benefits to the decision maker. The reference point is not only the loss of SEW but also the mere assertion of the socioemotional benchmark that the family decision maker will use. What really makes family owners unique is precisely that they face a socioemotional trade-off that other firms do not (Cruz & Arredondo, 2016).

Our main results under endogeneity show only weak evidence of SEW. The estimated UQTEs under endogeneity refer to the sub-population of compliers. However, we can see that the proportion of compliers in our sample is relatively limited (i.e., 8.9%). When using the UQTEs under endogeneity it is not possible to make a conclusion for the entire sample. In the current study, this means we should not conclude that family ownership has a significantly negative impact on labor productivity for the whole sample. Instead, we should conclude that for the group of firms for which the strength of the instrument is high –for the *compliers*– family ownership has a substantially negative and significant effect on labor productivity.

When using an alternative (non-parametric) IV estimator (i.e., the same estimator with treatment exogeneity), we find that among the least productive plants, family firms are associated with much higher labor productivity than their low productive non-family counterparts. Plants above the median gain less from family ownership. These results may resolve the mixed insights from prior studies. High productive family firms are less productive than high productive non-family firms due to the hyper-conservative strategies caused by the family's dominant focus on maintaining family control and thereby limiting career opportunities for non-family members. This conservative family firm behavior will result in a decline of employee motivation, commitment, morale and eventually productivity compared to non-family firms. In contrast, when family firms are confronted with disappointing firm productivity levels, they are willing to take more risk in an effort to save the company. Low productive family firms are more likely to provisionally change its traditional SEW goals and put more emphasis on financial goals. Low productive family firms perform better than low productive non-family firms because they tend to take more risk in an effort to increase productivity, use their labor and capital resources in a more efficient way, proper manage their survivability capital, and have higher levels of self-funding. These typical family firm characteristics increase employees' loyalty, long-term commitment, morale, which all lead to higher labor productivity compared to non-family firms. Family firms tend to be more resilient in times of economic downturn because of their conservative way of financing, their solid financial buffers, their long-term focus, and the trust of their employees (e.g., Amann & Jaussaud, 2012; Bauweraerts & Colot, 2013; Gueye & Simon, 2010; Jongkind, 2013; Kachaner, Stalk, & Bloch, 2012). Family firms don't earn as much money as companies with a more dispersed ownership structure during good economic times. However, when the economy falls down family firms perform better than non-family firms (Kachaner et al., 2012). Family owned firms seem to have found a way of reconciliation between tradition and modernity and provide a strong governance model in complex and changing environments (Gueye & Simon, 2010), which makes them a stabilizing factor in the economy.

Most of the empirical studies are concerned with mean effects, yet distributional effects are no less important. The distribution of the dependent variable may change in ways that are not revealed or are only incompletely revealed by an examination of averages (Firpo et al., 2009; Frölich & Melly, 2010; Rothe, 2010). For example, the labor productivity distribution can become more compressed or the upper-tail inequality may increase while the lower-tail inequality decreases. Therefore, policy makers are increasingly interested in distributional effects. The unconditional quantile regression technique provides more policy-relevant information, because it allows researchers to examine the impact of family ownership on labor productivity at different quantiles of the entire labor productivity distribution. Policy-makers and labor economists are particularly concerned with changes in the labor productivity distribution. The practical implications of this research point to the fact that family firms' most efficient choices are not necessarily the same as those of non-family firms, whereas those choices and their corresponding reference point depend on the labor productivity level of the firm. So, the effect of family ownership on labor productivity varies along the distribution of labor productivity.

7.2. Suggestions for future research

This study is subject to some limitations, which provide opportunities for future research.

First, the sample only consists of firms located in the Netherlands. So, we must be careful with the generalization of our findings. Countries have cultural differences, which may influence the productivity level and employee wage level of firms globally. Such an institutional perspective could add further insights on how the effect of family ownership on labor productivity varies across regional contexts and improves our understanding of the cultural context.

Second, this study uses a rather narrow definition of family firms that first of all did not allow us to further explore specific characteristics of family firms that might give a broader image of the productivity aspects. Besides that, our measure of family firms also does not allow us to distinguish between different types of family firms. Family firms have general unique characteristics, but at the same time there are a lot of important differences between family firms. Additional research is recommended using more fine-grained measures of family involvement to get a more comprehensive picture of what aspects of family involvement influence the productivity level, the employee wage level and the innovation level.

Finally, whether researchers should use the non-parametric IV estimator (i.e., the same estimator with treatment exogeneity) that assumes exogeneity, or an alternative approach that assumes endogeneity, will depend on the particular research question. From an econometric point of view further investigation is needed on the existence of endogeneity of family ownership on labor productivity. We have formally tested for endogeneity by applying the Durbin Wu Hausman test. Thereby we assumed that if there is an endogeneity problem for the mean of the labor productivity distribution, it is also a problem for the quantiles of this distribution. Furthermore, future research should try to perform the unconditional quantile regression method on panel data instead of using pooled cross section data. Work in this area is changing rapidly, so it is recommended to conduct a thorough literature review before using these techniques.

PART II

WAGE POLICIES – THE NETHERLANDS

CHAPTER 3

WAGES, WAGE POLICY AND THE FAMILY FIRM: FIRM-LEVEL EVIDENCE ON THE NETHERLANDS

1. Introduction

According to the human resource management and organizational behavior research, firms frequently indicate compensation issues as a significant concern. Compensation is a key management challenge for firms because it might influence the quality and effectiveness of human capital (Gupta & Shaw, 2014; Van der Merwe, 2009). For example, compensation influences the quality of the job applicants, the quality of those employed, the quality of those who stay with the firm, and the motivation and performance level of the workforce (Gupta & Shaw, 2014). The total compensation package consists of the base pay, variable cash incentives (bonus based on individual and/or firm performance) and non-monetary incentives (for example health insurance, a smartphone or a company car). In this chapter, compensation is considered as total annual cash compensation (base salary plus variable incentives).

Compensation policies might differ between firms according to their ownership structure. Werner, Tosi, and Gomez-Mejia (2005) examined owner-controlled firms, owner-managed firms, and manager-controlled firms and found that there are significant differences in the compensation practices that apply to all employees as a function of the ownership structure. Additionally, some authors expand this research strand by looking at compensation policies in family firms (e.g., Bassanini et al., 2013; Carrasco-Hernandez & Sánchez-Marín, 2007; Sraer & Thesmar, 2007). Family ownership is dominant in private businesses (IFERA, 2003; Westhead & Howorth, 2007) and makes a significant contribution to wealth creation and job generation (Westhead & Howorth, 2007). Moreover, family firms are an interesting context in which to examine compensation as the levels of management hierarchy are lower in those firms and the compensation costs at the operational level are subsequently even higher (Carrasco-Hernandez & Sánchez-Marín, 2007). Aronoff, McClure, and Ward (2011) point out that *"compensation is at the heart of more family business questions than any other topic except succession" (p. 3)*, so compensation issues are especially important for family firms.

The previous literature on compensation issues in family firms has mainly focused on executive compensation, indicating that top executives earn on average less in family firms than in non-family firms (e.g., Gomez-Mejia et al., 2003; McConaughy, 2000). Werner et al. (2005) conclude that ownership structure not only affects executive compensation, but also the compensation of all employees through substantial differences in the firm's compensation practices. However, only a small number of studies have dealt with employee compensation, even though employee compensation costs often exceed 80% of total operating expenses and represent a more realistic view (Carrasco-Hernandez & Sánchez-Marín, 2007). These few empirical studies on employee compensation show that family firms pay on average lower wages than non-family firms (e.g., Bassanini et al., 2013; Carrasco-Hernandez & Sánchez-Marín, 2007; Sraer & Thesmar, 2007). It is well documented in the empirical literature on wage differentials that observed and unobserved characteristics of workers and firms are important determinants of wages (e.g., Abowd et al., 1999; Goux & Maurin, 1999; Raposo, Portugal, & Carneiro, 2015; Woodcock, 2008).

The first step of this study is to quantify the contribution of an extensive set of worker-level and firm-level observable characteristics in explaining the family wage discount[40]. We use an employer-employee matched dataset in order to determine how much of the family wage discount can be explained by variation in observable worker and/or firm characteristics. More specifically, this study provides evidence on the employee compensation of family firms and non-family firms in the Netherlands over the 2010-2013 period. We have unique and extensive data and we believe the Netherlands example is of interest because the labor market setting in the Netherlands is representative for quite a few other industrial countries (e.g., Dobbelaere & Vancauteren, 2015). Even though the previous empirical studies on employee compensation try to control for observable worker and firm characteristics, there could still be some unobserved heterogeneity. Having time variation in our data allows us to figure out whether family firms and non-family firms have distinct observable characteristics, or whether the observed differences in wages between them are attributable to other unobserved heterogeneity. Unlike previous studies, we take into account both worker fixed effects and firm fixed effects. Therefore, our first research question is: "How much of the family wage discount can be explained by variation in (un)observable worker and/or firm characteristics?".

Furthermore, firms seem to be quite heterogeneous in terms of their market power and wage compensation policies (Raposo et al., 2015). Early research on wage differentials has highlighted the relevance of wage policies at firm-level. Additionally, the change in employee compensation level can be due to a change in the firm wage policy such that the same employee is paid in a different way in family firms and non-family firms. For example Bassanini et al. (2013) conclude that French family firms offer a specific compensation package to their employees involving lower wages but greater job security. Employees in non-family firms have lower job security than employees in family firms, which makes their pay more risky and thus may require a form of risk premium. The risks assumed by employees at all levels are personal ones, that of being fired (Carrasco-Hernandez & Sánchez-Marín, 2007). Viewed from an institutional labor setting, another wage policy determinant that may explain wage differentials between family firms and non-family firms is the role of unions. Following Breda (2015), we state that unions as an institution may affect the

[40] We define the family wage discount as the difference in wages between family firms and non-family firms, measured by the estimated negative effect of the family ownership dummy on wages.

structure of the wage policy. Wages might be determined according to an efficient bargaining process between employers and employees (Amoroso, Kort, Melenberg, Plasmans, & Vancauteren, 2010). Union-covered workers are paid more than their non-covered counterparts due to bargaining and rent extraction (Breda, 2015). More specifically, employees in unionized firms, in addition to other characteristics, belong to a family firm less often than non-unionized firms (H. M. Mueller & Philippon, 2011). Bassanini et al. (2013) and Holten and Crouch (2014) find empirical evidence of lower unionization rates in family firms. These lower unionization rates are a result of the family's ability to keep hostile labor out (H. M. Mueller & Philippon, 2011). Firstly, family owners with their typically large ownership stakes may be more willing to accept the costs of confronting hostile labor, while external non-family managers are more likely to prefer the *'quiet life'* (H. M. Mueller & Philippon, 2011). Secondly, given their longer time horizons family firms might benefit from sustaining implicit labor contracts. In return for these implicit labor contracts employees may engage in cooperative behavior (H. M. Mueller & Philippon, 2011).

After step 1 we know how much of the wage gap between family firms and non-family firms is due to heterogeneity in unobservables. However, in the next step we focus more on wage policy as an aspect of unobserved firm heterogeneity. In this second step, we use firm-level data in order to make the unobserved firm heterogeneity more explicit by looking at the union bargaining power within firms. We investigate whether institutional instruments, such as the role of unions, explain differences in wages between family firms and non-family firms. Therefore, our second research question is: "What is the role of the union bargaining power (as a part of wage policy) in explaining the family wage discount?".

Our study provides three significant contributions. First, we put emphasis on the role of unobserved heterogeneity on the individual pay level of all employees. Using the time variation in our data, we are allowed to estimate which part of the family wage discount is due to unobserved worker-level or firm-level heterogeneity. Unlike previous studies, we take into account both worker fixed effects and firm fixed effects, while controlling for other wage determinants. We have an extensive employer-employee dataset on wages, firm ownership, wage policy characteristics, workers' characteristics and firms' characteristics, which allows us to include more variables than previous studies have done so far. We are confident that by incorporating worker fixed effects and firm fixed effects we are able to provide redefined estimates of the corresponding sources of wage differences between family firms and non-family firms. Second, we contribute to the recent literature on the impact of misallocation of resources. We estimate simultaneously market imperfections in product and labor markets and investigate explicitly the role of family ownership. Only a small number of studies have simultaneously considered imperfections in the product and the labor market. By estimating both price-cost markups in the product market and the extent of rent sharing in the labor market, this study contributes to bridging the gap between the econometric literature on product market imperfections and that on labor market imperfections. Third, we examine the role of union bargaining power in explaining the family wage discount. To assess the impact of workers' bargaining power due to trade unionization on productivity, we use our Dutch firm-level dataset. We simultaneously estimate price-cost margins and union bargaining power to analyze how price setting and bargaining power are affected by ownership structure (i.e., family firms versus non-family firms). We derive a measure of union bargaining power without relying on trade union participation data.

The rest of the chapter is organized as follows. In section 2 we briefly revise the literature on employee compensation and wage policies in family firms. This literature review may help the reader in understanding the empirical results presented later in the chapter. In section 3, we describe the data used, the variables included in the empirical model, along with basic descriptive statistics and some distribution characteristics. Section 4 sets out the econometric framework with a focus on the wage equation with worker fixed effects and firm fixed effects and the production function with wage markups. Section 5 provides the results. In this section we also perform more in-depth analyses related to the role of human capital. More specifically, the union bargaining power in high-skilled firms may differ from the union bargaining power in low-skilled firms. We also further investigate the role of skills in the family firm context, supported by family firm literature. Further, this section contains some robustness checks. Section 6 contains a discussion of the main results, while section 7 formulates some concluding remarks.

2. Literature review

2.1. Employee compensation in family firms

Several authors (e.g., Schulze et al., 2003; Schulze et al., 2001) argued that family firms do face several sorts of agency costs. A family shareholder has a strong incentive to monitor and control employees to avoid that employees are not acting in the interests of the company (Ang et al., 2000; Jensen & Meckling, 1976). To mitigate the agency problems arising from the separation of ownership and control, principals have to incur an agency cost, and compensation can help them control and reduce agency problems and co-align the preferences between the parties (Fama & Jensen, 1983).

Research about the pay level of non-managerial employees in family firms is scarce. However, Carrasco-Hernandez and Sánchez-Marín (2007) analyze the process and the determining factors that influence the design of employee salaries in family firms. They have applied agency theory arguments to explain employee compensation and to understand how the principal-agent model, extended to a new scenario formed by employees, may serve to explain the compensation at this lower level. They find that the pay level is lower in family owned and managed firms than in both non-family firms and professionally managed family firms. The small size and lower professionalization of Spanish family owned and managed firms can explain their lower pay levels. Furthermore, using French matched employer-employee data Bassanini et al. (2013) conclude that family firms pay on average lower wages. This finding is confirmed by Sraer and Thesmar (2007), family firms run by both professionals and descendants are paying, on average, lower wages. Those studies indicate that the wage difference between family firms and non-family firms might be explained by differences in the applied wage policy. For example, family firms are characterized by lower job insecurity, as measured by lower dismissal rates (Bassanini et al., 2013; Sraer & Thesmar, 2007).

By explaining the wage discount of family firms versus non-family firms, two possible causal explanations can be found in the literature. Firstly, a natural explanation of the gap in average wages between family firms and non-family firms is that firms and/or workers might have different characteristics, which are decisive for the individual pay level in the firm (Bassanini et al., 2013; Sraer & Thesmar, 2007). We refer to Table E1 and Table E2 in Appendix E for some examples of observable worker and firm-level characteristics. Secondly, the wage discount could also be driven by other sources of heterogeneity across firms, which we cannot observe directly (Bassanini et al., 2013). Labor market outcomes are extremely heterogeneous. For example, observably equivalent individuals earn markedly different compensation and have markedly different employment histories (Abowd et al., 1999). On the one hand, workers can have different amounts of skills because of innate differences. Some examples of such innate differences, which are hard to observe (i.e., this is also known as unobserved worker heterogeneity), are cognitive skills, knowledge, willingness or attitude towards the job/firm. On the other hand, a worker may be paid less in monetary units because he/she is receiving part of his/her compensation in terms of other (hard-to-observe) characteristics of the job. This may include lower effort requirements, more pleasant working conditions or better amenities. Wage policies are relevant in explaining the wage differences between firms with dissimilar ownership structures. This means that the same employee is paid differently in firms with dissimilar ownership structures.

2.2. Wage policy in family firms

Family ownership is generally thought to improve the quality of labor relations within workplaces and family owners develop a peculiar relationship with all their employees. This could derive from special corporate practices and/or commitments (Belot & Waxin, 2015; H. M. Mueller & Philippon, 2011). For example, family firms develop close and trusting relationships with their employees (e.g., Bach, 2010; A. L. Christensen et al., 2014; Dyer, 2006; Karra et al., 2006), provide wage insurance (e.g., Bassanini et al., 2013; Sraer & Thesmar, 2007), promise to avoid downsizing (e.g., Block, 2010; Stavrou et al., 2007), and experience fewer labor conflicts (e.g., Belot & Waxin, 2015; H. M. Mueller & Philippon, 2011; Waxin, 2010). Those corporate practices, sometimes called *'wage policies'*, are decisive for the individual pay level (e.g., Bassanini et al., 2013; Sraer & Thesmar, 2007).

Previous research has suggested that employee compensation might be determined by various wage policy factors and cannot be reduced to simply the pay level (Bassanini et al., 2013). A first aspect of wage policy is the job security within the organization. Family firms are more and more praised for their ability to deliver security to their close stakeholders, be they suppliers or workers (Bach, 2010). The literature on labor relations across different types of firms indicates that family firms provide more employment and wage insurance than firms without family control (e. g., Bach, 2010; Bassanini et al., 2013; Ellul et al., 2014; H. M. Mueller & Philippon, 2011; Sraer & Thesmar, 2007). For example, employees are worried about job insecurity when there is a high probability that they will lose their job (Nickell, Jones, & Quintini, 2002). In addition, employees demand monetary compensation, in terms of higher wages, in exchange for higher levels of job insecurity at the establishment level (Böckerman, Ilmakunnas, & Johansson, 2011). Labor union bargaining power within an organization can be considered as an additional aspect of wage policy (Bassanini et al., 2013; Breda, 2015; H. M. Mueller & Philippon, 2011). Unions provide employees with bargaining power to negotiate collectively over wages and working conditions and to monitor the managers to ensure that they comply with the collective agreement (Shin, 2014).

2.2.1. Job security

Family firms are typically driven by the preservation of their socioemotional wealth, thereby pursuing the long-term well-being of the family, the firm and all its stakeholders (Berrone et al., 2012; Gómez-Mejía et al., 2007; Miller & Le Breton-Miller, 2014). In order to improve the survivability of the family firm, families prefer to build a good reputation with stakeholders and maintain long-term relationships with them. Not only the family will benefit from the related outcomes, but also the other stakeholders (Miller & Le Breton-Miller, 2014). For example, the risk of losing their job is lower for employees in family firms with respect to non-family firms. More particularly, some researchers assume that family firms are less likely to downsize compared to their non-family counterparts (Block, 2010; Stavrou et al., 2007). The stakeholder perspective, for example, considers employees as an important stakeholder group to family firms and sees them as the greatest asset for firms. As a consequence, family firms prefer not to downsize because they have a great willingness to care for their employees and their communities. In family owned and controlled firms downsizing might not match with the family values and goals, since it may disrupt the desired harmony, the stability and the reputation (Stavrou et al., 2007). This argument is confirmed by Block (2010) using the social identity theory in combination with the agency theory. He argues that the identification of family owners and managers with the firm is stronger compared to non-family owners and managers, which might explain why these family owners and managers attach more importance to corporate reputation. Family owners and managers try to avoid actions, like downsizing, that can harm the firm reputation and their own reputation. Therefore, downsizing should be less prevalent among family firms than among non-family firms (Block, 2010).

Due to their longer time horizons in comparison with non-family firms, family firms can offer such a compensation package, involving greater job security and a lower pay level. Family firms typically have a long-term management policy, which ensures them to invest less in booms and more in recessions and to focus on job preservation. In addition, family firms hoard labor in economic bad times and hire less in economic good times (Bassanini et al., 2013; Sraer & Thesmar, 2007). Prior research empirically tested job security in family firms and they investigated whether family firms rely less on dismissals than non-family firms do when they downsize. They find that family firms have on average lower dismissal rates. Furthermore, when hit by a negative shock that induces employment downsizing, family firms seem to rely less on dismissals and reduce hiring more than non-family firms in order to achieve the required staff adjustment. In conclusion, family firms do provide more job security to incumbent employees (Bassanini et al., 2013). As a consequence, family firms can promise that most employees will keep their job even if total sales decrease and thus building long-term employment relations. By doing so, family firms can afford to pay lower wages than non-family firms. Therefore, the compensation package will be different between family firms and non-family firms, as the latter have to offer higher wages in exchange for higher job insecurity (Block, 2010).

Previous empirical research has shown that there exist differences in the compensation wage policy between family firms and non-family firms. Firstly, Sraer and Thesmar (2007) empirically test how family firms are able to pay lower wages, even allowing for skill and age structure. They do this by looking at the sensitivity of firm employment to industry sales shocks. Their findings support that descendant-managed family firms pay on average lower wages and smooth out industry shocks, and the presence of implicit labor contracts can represent a theoretical explanation for that. Under implicit labor contracts, the firm offers employment insurance to its employees by promising that most employees will keep their jobs even during crises. In return for higher job security, the employees agree to receive a lower wage or to work harder for the same wage (Sraer & Thesmar, 2007). Family firms are more inclined to honor these implicit labor contracts because the long-term ownership and control gives the family the ability to win the trust of their employees, which offers the family a strong incentive to keep their promises about job security. Furthermore, family firms are less vulnerable to hostile takeovers and unexpected changes in control (Ellul et al., 2014; Sraer & Thesmar, 2007). Secondly, Bassanini et al. (2013) estimate cross-sectional individual wage equations and find that average gross hourly wages are lower in family firms than in non-family firms. This wage gap can be explained by, on the one hand differences in unobserved characteristics of employees across family firms and non-family firms, and on the other hand differences in wage policies being implemented by these firms. Bassanini et al. (2013) investigate the differences in wage policies between family firms and non-family firms and indicate that the same employee is paid differently in family firms and in non-family firms, at least for those employees who are likely to stay in the firm after a change in family ownership. When a non-family firm becomes family owned, it seems that employees benefit from greater job security to compensate the fact that wages decrease. In the other case, when there is a transition from family ownership to non-family ownership, those who stay with the firm face higher wages in exchange for reduced job security (Bassanini et al., 2013).

2.2.2. The role of union bargaining power

To what extent do labor market unions, as a major determinant of a wage policy, prevail within firms? Are there any differences in terms of prevalence between family firms and non-family firms? The rationale for the formation of unions arises from the asymmetry in contracting between individual employees and employers regarding both access to information and bargaining power (e.g., Aidt & Tzannatos, 2002, 2008; OECD, 2012). The literature on the bargaining power of labor unions starts from the idea that one type of misallocation of resources occurs when wages are not paid their marginal products. The potential costs associated due to the misallocation may be that firms accrue higher costs or become less efficient which can be counted against the potential benefits in the form of *'the union voice'* [41] whereby labor cost adjustment may be beneficial to both the labor force and the firm[42] (Aidt & Tzannatos, 2008; Amoroso et al., 2015; Freeman, 1976).

Labor unions can be defined as associations of employees who bargain collectively with their employer regarding the terms and conditions of employment (Farber, 2001). Unions are capable of creating compensation differentials and obtaining non-pecuniary benefits (e.g., health insurance, pensions) for their members, as collective bargaining forces employers to commit against an entity with market power instead of dealing with each employee individually (Vilares, 2013).

[41] A source of empowerment through which the employees can express their discontent without the fear of being fired (Freeman, 1976).
[42] Aidt and Tzannatos (2008); See Dobbelaere and Vancauteren (2015) for an application in comparing the Netherlands and Belgium; Amoroso, Melenberg, Plasmans, and Vancauteren (2015).

Ownership structure is an important determinant of labor relations[43] within firms (Belot & Waxin, 2015; Waxin, 2010). For example, Waxin (2010) investigated the relationship between founding family ownership and the quality of labor relations. Using 2004 workplace-level data from France, he found that family ownership significantly reduces the duration and the percentage of employees involved in major conflicts as well as the likelihood that a workplace experiences a strike (Waxin, 2010). There are several explanations for the presence of these good labor relationships in family firms (Belot & Waxin, 2015). First, family firms pursue a more long-term oriented strategy than non-family firms do, which is profitable to employees (Bertrand & Schoar, 2006; Burkart, Panunzi, & Shleifer, 2003). Due to their longer time horizons, family owners may have a competitive advantage at sustaining implicit labor contracts (Belot & Waxin, 2015) containing the promise that family owners will avoid downsizing (e.g., Bassanini et al., 2013; Sraer & Thesmar, 2007; Stavrou et al., 2007). These implicit contracts may be reciprocated by employees with cooperative behavior (H. M. Mueller & Philippon, 2011). Second, according to the resource-based view, the integration of the family and business creates several salient and unique resources such as social capital (Sirmon & Hitt, 2003). Indeed, the family develops reciprocal and trusting relationships outside the family with employees, customers, suppliers, and other stakeholders that generate goodwill and loyalty (Dyer, 2006). Third, family owners are likely to be emotionally attached to their firm (Berrone et al., 2012) and tend to have a sense of responsibility for the firm and its employees (Zellweger & Astrachan, 2008). For example, paternalistic leadership is often analyzed as a feature of family firms, whereby family owners take a personal interest in employees' off-the-job lives and attempt to promote employees' personal welfare (Belot & Waxin, 2015). This paternalism might have a positive impact on labor relations and lead to a stronger sense of loyalty and commitment among the employees (Waxin, 2010).

Existing studies, examining the extent to which unions and related institutional factors may matter for wages and may impact other forms of economic outcomes in the context of family firms versus non-family firms, include the

[43] *"Labor relations are the set of processes and activities that unions and employees develop and use to clarify, manage, reduce and resolve conflicts between employees and their representatives while accommodating the various goals of each" (Fossum, 2005, p. 1).*

work of H. M. Mueller and Philippon (2011), Holten and Crouch (2014), Bassanini et al. (2013), and Breda (2015). More specifically, these studies show that workers in unionized firms belong, in addition to other characteristics, to a family firm less often than non-unionized firms.

Using 2002 and 2004 survey data on French wages and workplace employment relations conducted by the Ministry of Labor, Breda (2015) finds evidence of a union wage premium. This is the wage differential between workers in firms where unions are recognized for bargaining purposes and firms where they are not. Union-covered workers might be paid more than non-union covered workers because (1) unions raise wages by means of bargaining and rent extraction (Breda, 2015), (2) union members might be more productive (Breda, 2015), (3) organized firms may have unobserved characteristics correlated with higher wages (Breda, 2015), and (4) union members' wage gains might be offset by losses in other areas (Breda, 2015). The author uses union membership rates as a proxy for unions' bargaining power at the establishment level. In a smaller sample[44], the union wage premium becomes statistically insignificant in a model with an extended set of standard control variables for observable employee and firm characteristics (like gender, tenure, age, listed/non-listed, full-time worker, ICT use, innovative management practices) including the control for family firms which confirms a negative and statistically significant effect on wages.

Holten and Crouch (2014) investigate the role of the family factor in determining the degree to which employees are union members. They targeted Danish and Italian SMEs in the textile and clothing sector for the period 2000-2001. Union membership is a binary variable equal to 1 if the employee was indicated to be a union member. Holten and Crouch (2014) find that family ownership reduces union membership. In other words: employees are less often union members in family firms compared to non-family firms. So, the authors have shown that the family factor does play a role in SME employees' union membership. Family firms create a typical family atmosphere in which employees are likely to identify themselves with the firm (Berrone et al., 2012; Holten & Crouch, 2014). This may have an impact on unionization, employment relations and working

[44] This dataset contains extensive information on industrial relations at workplace level and firms' organizational and technological structures (Breda, 2015).

conditions, since employees in family firms may not feel the need for external involvement by unions, as protection and support are provided through the familiar, trusting relationships within the family firm (Holten & Crouch, 2014).

Using French matched employer-employee data, Bassanini et al. (2013) show that union representatives are much less frequent in family firms than in non-family firms, thereby confirming the empirical evidence that unionization rates are lower in family firms. The authors mainly focus on the compensation packages in family owned firms and non-family owned firms. So, they have used descriptive statistics on cross-sectional establishment level data to show that the mean union representative is 0.495 for family firms and 0.807 for non-family firms. In other words: 49.5% of the family firms in this sample $(n = 538)$ have a union representative, while 80.7% of the non-family firms in this sample $(n = 844)$ have a union representative. Union representative is a binary variable equal to 1 if at least one union is representative in the establishment.

H. M. Mueller and Philippon (2011) performed logit and OLS regressions to provide limited micro-level evidence showing that family firms have lower unionization rates and experience fewer strikes than do non-family firms. Strikes are a specific source of the bargaining power of unions; in other words: unions are then capable of extracting a higher share of the firms' rents (Vilares, 2013). According to Belot and Waxin (2015) the lower prevalence of strikes might suggest that family owners succeed in setting up fair human resource practices that do not frustrate non-family employees. H. M. Mueller and Philippon (2011) obtained their results via survey-based evidence, where strike activity is a binary variable taking the value 1 if the firm witnessed strike(s) in the three years prior to 1998 and union density is the percentage of firm employees that are unionized. The authors find that family firms are particularly effective at coping with hostile labor relations by using cross-country data. There is ample evidence showing that due to their longer time horizons, family firms provide employees better working conditions in form of implicit long-term contracts in return for employees' loyalty. Family firms exhibit greater values in human interest, cooperation, and collectives. This is consistent with the socioemotional wealth dimension *'binding social ties'*. The family firms' sense of belonging, self and identity are often shared by non-family employees promoting a sense of stability and commitment to the firm (Berrone et al., 2012). This evidence may suggest that family firms are better able to keep hostile labor out because labor unions are assumed to instigate hostility between firms and workers. So, family firms can be considered as a natural response when labor relations are difficult. Also lower unionization rates may be indicative that employees and firms operate in less hostile circumstances (H. M. Mueller & Philippon, 2011). Indeed, while examining the relationship between family ownership and the quality of labor relations, H. M. Mueller and Philippon (2011) find that family ownership is more prevalent in countries in which labor relations are hostile. This result is robust even if the role of labor regulations under the form of employment protection and union bargaining power[45] are included in the model. However, controlling for these other determinants does not seem to have any impact in explaining family ownership.

In the Netherlands, there is no requirement for workers to be union members when a union is recognized in their firm. The bargaining power of labor unions in Dutch firms is rather high compared to other European countries, so unions are seen as powerful (see Table E3 in Appendix E). Bargaining in the Netherlands takes place at the national, industry and firm-level. And yet, labor relations are relatively less (more) hostile (productive) in this country. Strikes are rare and always quickly resolved with minimum economic losses. Hence, the Netherlands has strong yet cooperative labor unions. The hostile attitude of firms against unions is less relevant for the Netherlands. For further details on the labor market setting in the Netherlands, we refer to the next paragraph.

2.3. Labor market setting in the Netherlands

The Netherlands' regulated industrial relations system has much in common with many European countries. For example, there is a broadly regulated system of wage bargaining characterized by a dominance of industry-level wage bargaining, the existence of statutory minimum wages, and extension mechanisms guaranteeing that most workers belonging to the private sector are

[45] The bargaining power of workers is based on a survey of 4000 executives in 59 countries conducted by the World Economic Forum (Global Competitiveness Report) (H. M. Mueller & Philippon, 2011).

covered by collective agreements (Dobbelaere & Vancauteren, 2015). In the Netherlands, employee representation at the workplace only occurs through work councils. Those work councils should be present in all workplaces with at least 50 employees and more than 75% of workplaces of this size have them. Work councils are not directly union bodies, although union members often play a key role (Dobbelaere & Vancauteren, 2015; Fulton, 2015).

The OECD[46] reports that more than 80% of the workforce was covered by a collective labor agreement. By Dutch law, a collective agreement is binding for all workers in a firm, not just for the members of the union signing the agreement (Hartog, Leuven, & Teulings, 2002). With a union density[47] of approximately 18% (see Table E4 in Appendix E), the Netherlands has the 6th highest coverage rate and the 20th highest trade union density in the OECD. So, the Netherlands has a high collective bargaining rate despite relatively low trade union membership. A broad majority agrees with the unions policies even though the trade union density is low (Borghans & Kriechel, 2007; Dobbelaere & Vancauteren, 2015; Fulton, 2015; Johnston, 2009).

Industry-based unionism is typical for the Netherlands, since most employees in the Netherlands are covered by collective bargaining at industry-level (Dobbelaere, Kiyota, & Mairesse, 2015; Fulton, 2015). Every year, collective bargaining starts at a centralized level, where employer federations, trade unions and the government reach an agreement on the desirable development of wages which serves as an advice for actual negotiations on contracts and wages at the industry-level. Modest wage increases have been central in these negotiations. At both the central and industry-level, the government plays the role of an advisor, ensuring that agreements between unions and employers associations are based on consensus. As such, the collective bargaining system is conducive to social stability (Dobbelaere & Vancauteren, 2015; Johnston, 2009).

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[46] OECD Employment Outlook, 2004.

[47] The number of workers who are members of a union as a percentage of all workers, unionized and non-unionized (OECD, 2012).

However, very large companies negotiate their own deals, indicating that collective labor agreements are concluded at the company level. Negotiators usually follow the recommendations agreed at national level and recent pay increases have been moderate (Dobbelaere & Vancauteren, 2015; Fulton, 2015). The high rate of collective bargaining coverage in combination with the low trade union density might be explained by the existence and widespread use of extension procedures for industry-level wage agreements. This makes the agreements binding for all employers and employees within the industry even if some employers or trade unions did not directly sign the agreement (Dobbelaere & Vancauteren, 2015). Of all Dutch employees, 83% are covered by a collective contract: 69% by industry-level contracts and 14% by company contracts (Borghans & Kriechel, 2007). This centralized wage-setting process is complemented by the prevalent use of some type of incentive pay determining the position of an employee on the pay scale (Dobbelaere & Vancauteren, 2015).

3. Data, variables, and descriptive statistics

3.1. Data and data sources

We used several data sources combining data information on firm ownership type, labor productivity, employment and firm characteristics. The sampling frame was taken in the 2010-2013 period from a wider descriptive study investigating ownership, strategic issues, succession, governance and leadership issues in firms located in the Netherlands.

Starting point for the construction of the sample is the Elsevier TOP list of the 100 largest consolidated family firms in the Netherlands and the Elsevier TOP list of the 500 largest consolidated firms in the Netherlands that includes information of the family ownership status. Elsevier restricts itself to firms who actually produce, trade or provide services. This means that firms who only invest in other firms will not be included in this list. We have made a panel dataset of this TOP 500 list for the years 2010, 2011, 2012 and 2013 from which 530 parent companies are retrieved. These 530 parent companies are not necessarily the ultimate parent firm since foreign control is possible. Elsevier classified a firm as a family firm[48] if (1) the majority of ownership rests in the hands of a natural person and/or relatives of the family who has founded or has acquired the firm, (2) at least one representative of the family is formally involved in the management of the firm, and (3) at least the second generation has to be involved in the firm. The identification process for family firms is discussed in Table B1 in Appendix B.

The ownership criteria to matching subsidiaries with consolidated firms is essential in the construction of the final data sample. We start at the enterprise level of these 530 parent firms and then go down to the firm-level, which results in 1802 subsidiaries. The statistical unit in our sample are *'firms'* which can either be a subsidiary or a group enterprise located in the Netherlands or abroad or a firm itself in case there is one single firm. Note that we work at this firm-analysis level so to link the employee-employer, innovation, trade and registry data. We retrieved information on firms ownership structure to find the names and the direct ownership (expressed in percentage) of all their subsidiaries from the general business register (in Dutch: Algemeen Bedrijven Register, ABR), issued yearly by Statistics Netherlands. We only include firms that are fully (for 100%) controlled by their respective parent firm in the sample. The ownership criteria to matching the family ownership status to firms are essential in the construction of the sample. We assume that if the parent firm is family owned, the respective subsidiaries are also family owned because we only include subsidiaries that are fully controlled by their respective parent firm.

Table E5 in Appendix E reports the number of observations and type of firms by industry. With respect to industry composition, we find a relatively high proportion of firms in the food industry (7.17% of all firms), chemicals and pharmaceuticals (3.59%), rubber and plastics (3.64%), basic and fabricated metal products (5.13%), machinery and equipment (3.37%), retail & wholesale industry (30.41%), consultancy, architectural & engineering (15.95%), and administrative & other services (6.02%). Those percentages are rather

[48] We do not have detailed information on the family involvement, family ownership, and family control so we have to depend on the Elsevier lists of family firms. Nevertheless, all family firms in this dissertation meet the requirements of the (rather broad) operational definition.

representative for the Netherlands. However, the percentage retail and wholesale is much larger compared to other studies performed on Dutch data (e.g., Bartelsman et al., 2015; Dobbelaere & Vancauteren, 2015).

3.2. Employer-employee matched dataset

This study aims, first, to quantify the importance of a set of (un)observable worker and firm characteristics in explaining the family wage discount by using employer-employee matched dataset. The unit of analysis explaining wages are employees working in the manufacturing and service sectors in the Netherlands during the sample period. The employer-employee data that includes information on wages, worker and firm characteristics comes from several data sources. The Labour Force Survey (in Dutch: Enquête Beroepsbevolking, EBB) is the primary source that contains all the relevant information on persons, their labor market position, education, experience and other background characteristics. The employee population contains persons between the age of 15 until 74 years old. Also persons who were enrolled as full-time students are not taken into account in the analysis nor are employees who are employed in the public sector (2-digit NACE equal to 84). The EBB database is complemented with registration information from the Social Statistics Database (in Dutch: Stelsel van Sociaal-statistische Bestanden, SSB). The SSB database also collects data on employees and employee wages that is extracted from the tax declaration that employers submit. For the small proportion of persons who had more than one job we only consider the main job, which is the job providing the highest income (according to SSB data) and the largest working hours (according to the EBB data). The final dataset for the entire period (2010-2013) comprises 79016 individual panel worker observations. The database also includes a unique firm identifier, which allows us to match the vast majority of these jobs with firm-level data.

The dependent variable of Eq. (1) is the logarithm of standardized annual real wages expressed in full-time equivalent (Y). This real wage is calculated on the basis of the annual earnings during a calendar year (E), the part-time factor of that job during the calendar year (T), and the number of calendar days that the job has existed during the year (K): $Y = E \cdot \frac{1}{T} \cdot \frac{365}{K}$. The purpose of this measure is to compare the annual wage of jobs of different sizes and different durations[49] (Loog & Smits, 2014). In the analysis we have excluded from the sample workers having their wage in the first and last percentile of the hourly wage distribution.

The Labour Force Survey (EBB) contains information about the gender, age and ethnicity of the employee. Moreover, this survey provides us additional worker-level information, like the tenure[50] and educational background. We also know if the employee has a management function.

Compensation is significantly related to firm size (Bayo-Moriones & Merino-Díaz de Cerio, 2001; Carrasco-Hernandez & Sánchez-Marín, 2007). Indeed, it is expected that larger firms with greater growth opportunities are typically more complex and will therefore demand higher quality and more costly employees (Core, Holthausen, & Larcker, 1999). More innovative firms may attract more dynamic workers, who demand a higher wage (Bassanini et al., 2013; Cirillo, 2014). It is well established that exporting plants pay higher wages on average than non-exporting plants in the same industry (e.g., Bernard & Jensen, 1995; Schank, Schnabel, & Wagner, 2007). So, it is recommended to control for international trade in our wage equation. Even though only 5% of trading firms are foreign controlled, they carry out approximately half of the imports and exports (Ramaekers & Jaarsma, 2013). Foreign affiliates display higher productivity levels and pay higher wages than domestic firms (e.g., Benfratello & Sembenelli, 2006; Dunning & Lundan, 2008). The final set of variables and their corresponding definitions are given in Table E6 in Appendix E.

Table 10 reports the means and standard deviation of our main variables for estimating the wage functions by firm type. The sub-sample on family firms counts 1595 panel observations and the sub-sample of non-family firms has

[49] For example: assume that a job has existed for 6 months and there has been worked 4 days a week in that job. Also assume that this job is associated with an annual real wage of 10000 euros. The standardized annual real wage of this job is equal to $10000 \cdot (1/0.8) \cdot (365/183) = 25000\ euros$. This means that if this job has been a full-time job during the entire calendar year, the annual wage would have been about 25000 euros (Loog & Smits, 2014).

[50] The number of months the employee has worked since his/her 15th.

6539 panel observations. The mean values for each of the main variables are slightly larger for non-family firms. The mean values of *male*, *age*, *tenure*, *education*, *manager*, and *ethnicity* are respectively 0.55, 33.20, 84.27, 1.68, 0.04, and 0.06 for family firms, and are slightly different for the non-family firms which could reflect a dissimilar wage structure between both firm types. Workers in family firms are on average younger than workers in non-family firms. The proportion of males is on average slightly higher in non-family firms. Individuals working in family firms have on average lower tenures than their non-family counterparts. Regarding education, it seems that workers in non-family firms have on average a higher educational background. Family firms are on average smaller than non-family firms. Family firms are less likely to have a foreign mother company. Moreover, family firms are less likely to introduce new products or services compared to non-family firms. Furthermore, of particular interest for our study, we find that average wages are considerably higher at non-family firms than in family firms. The average annual wages is 24835 euros for family firms and 35954 euros for non-family firms.

Table 10: Descriptive wage statistics by firm type

	Variables	**Family firms (N=1595)**		**Non-family firms (N=6539)**	
		Mean	**Sd.**	**Mean**	**Sd.**
	Log_wages	10.12	0.63	10.49	0.70
	(Wages)	*(24835)*	*(1.88)*	*(35954)*	*(2.01)*
WORKER-LEVEL	Male	0.55	0.50	0.64	0.48
	Age	33.20	13.70	38.04	12.78
	Tenure	84.27	107.34	110.68	126.46
	Education	1.68	0.70	2.05	0.79
	Manager	0.04	0.20	0.07	0.26
	Ethnicity	0.06	0.25	0.09	0.29
FIRM-LEVEL	Firm size	7.68	1.53	8.18	1.90
	Foreign ownership	0.03	0.16	0.39	0.49
	Exporting firm	0.95	0.22	0.95	0.21
	Innovative firm	0.57	0.50	0.59	0.49

We start by graphing the empirical log wage distributions of workers employed in family firms versus non-family firms (see Figure F1 in Appendix F). It is clear that the wages of workers in family firms are lower. The overall shape of the log wage distribution can be better understood by looking at the distributions of worker fixed effects and firm fixed effects. Figure F2 depicts the empirical distribution of worker fixed effects. A high worker fixed effect (high wage worker) is an individual with total compensation higher than expected on the basis of unobservable regressors for a given job. From the comparison between family firms and non-family firms it is clear that those workers who are employed in family firms have unobserved characteristics that are associated with slightly lower wages. In Figure F3 we present the empirical distribution of firm fixed effects. A high firm fixed effect (high wage policy from the firm) is a firm with total compensation higher than expected on the basis of unobserved regressors, once we take into account observed and unobserved worker characteristics. The comparison between the two distributions shows that the wages between family firms and non-family firms are almost similar.

3.3. Firm-level dataset

We use a production function approach on firm-level data to examine the effect of the applied wage policy for about 1800 firms in the Netherlands. The firm-level data for estimating production functions are sourced from the Production Surveys (in Dutch: Productie Statistieken, PS) provided by Statistics Netherlands. We exclude from the sample firms producing for less than two consecutive years. Also, firms with missing data on one of the variables used in the empirical analysis are omitted. After some trimming[51] on x input shares in total revenue $(-50\% > x < 200\%)$ and output growth $(-90\% < x < 300\%)$, the resulting sample consists of 4160 observations (1802 firms) covering the period 2010-2013.

As an output measure, we use the deflated value of nominal sales $Y_{it} = \left(\frac{Q_{it}P_{it}}{P_t^j}\right)$ of each firm *i* in sector *j* in period *t* where P_t^j is equal to the industry-level gross

[51] A similar truncation can be found in the study of Amoroso et al. (2015).

output price index. Labor (L_{it}) refers to the average number of employees in each firm for each year, collected in September of that year. The corresponding wages (W_{it}) are equal to a firm's total labor costs (gross wages, social contributions, net taxes). The cost of intermediate inputs ($Z_{it}M_{it}$) include costs of energy, intermediate materials and services deflated by the industry-level intermediate consumption price index. The capital stock (K_{it}) is measured by the gross book value of tangible assets deflated by the industry-level gross fixed capital formation price index for all assets. The share of labor (s_{iLt}), material input (s_{iMt}) and capital (s_{iKt}) is constructed by dividing respectively the firm's total labor cost, undeflated intermediate consumption and undeflated capital stock by the firm's undeflated production and by taking the average of this ratio over adjacent years.

The firm-level dataset contains detailed firm information such as production function variables (capital, labor, materials). Table 11 reports the means, standard deviation and medians of our main variables for estimating the production functions by firm type.

Table 11: Descriptive production statistics by firm type

Panel A: Family firms (N=1255)	**Mean**	**Sd.**	**Median**
Log of firm's output sales q_{it}	10.396	1.648	10.295
Log of materials m_{it}	9.715	1.974	9.378
Log of labor l_{it}	4.644	1.550	4.454
Log of capital k_{it}	5.867	2.015	5.978
Labor share in nominal output $(\alpha_L)_i$	0.160	0.126	0.131
Materials share in nominal output $(\alpha_M)_i$	0.591	0.240	0.623
Capital share in nominal output $(\alpha_K)_i$	0.032	0.072	0.011
Panel B: Non-family firms (N=2905)	**Mean**	**Sd.**	**Median**
Log of firm's output sales q_{it}	11.108	1.909	11.092
Log of materials m_{it}	10.337	2.249	10.479
Log of labor l_{it}	5.111	1.643	5.041
Log of capital k_{it}	6.855	2.257	6.883
Labor share in nominal output $(\alpha_L)_i$	0.167	0.135	0.129
Materials share in nominal output $(\alpha_M)_i$	0.568	0.251	0.599
Capital share in nominal output $(\alpha_K)_i$	0.033	0.054	0.016

The average logarithm of real firm's output is 10.4 for family firms and 11.1 for non-family firms. The median values for each of the main variables are slightly larger for non-family firms. The mean share of labor, capital and intermediate inputs is respectively 16%, 59% and 3.2% for family firms, and is considerable similar for the non-family firms which could reflect a similar industrial production structure between both firm types. In line with what we would expect from firm-level data, there is some degree of dispersion in the data. Some minor differences exist between family firms and non-family firms in terms of dispersion. For example, differences between the median-mean material share is 12% and 3% respectively for family firms and non-family firms.

Figure F4 in Appendix F represents the kernel density estimates of the total factor productivity distributions by firm ownership type. When discussing the moments of these distributions, we take the standard normal distribution as the benchmark. In general, TFP is normally distributed if the value of skewness is zero and kurtosis is lower than 3. If skewness is zero, the distribution of TFP is symmetric. If the kurtosis is lower than 3, the tails of TFP distribution are thin and extreme values occur less often (Stock & Watson, 2015). We do observe a clear pattern with respect to the kurtosis of the TFP distribution across the two firm ownership types. Compared to a standard normal distribution with a kurtosis of 3, both distributions consistently have sharper peaks and heavier tails than a standard normal distribution in both ownership types. We find that the kurtosis is the highest in family firms and the lowest in non-family firms.

4. Empirical framework

A vast majority of empirical support is based on a family wage discount, indicating that family firms pay on average lower wages than non-family firms (e.g., Bassanini et al., 2013; Carrasco-Hernandez & Sánchez-Marín, 2007; Sraer & Thesmar, 2007). However, it is unclear why family firms pay on average lower wages. It is well documented in the empirical literature on wage differentials based on matched employer-employee data that on the one hand observed characteristics of workers and firms, and on the other hand unobserved characteristics of workers and firms (like wage policies) can be an explanation for wage differences (Bassanini et al., 2013; Cardoso, 2000; Raposo et al., 2015). Additionally, the aim of this study is twofold and the empirical framework contains two parts. First, we quantify the importance of a set of (un)observable worker and firm characteristics in explaining the family wage discount. Second, we investigate the influence of a different wage policy on the family wage discount. To do so, we use firm-level data in order to make the unobserved firm heterogeneity (i.e., wage policy) more explicit by looking at the union bargaining power within firms.

4.1. Step 1: estimation and decomposition of the family wage discount

The first step is to provide a detailed econometric analysis of estimating the family wage discount and to explain which factors deemed to be important in explaining this wage gap by using an employer-employee matched dataset. To do so, we build upon the methodology initially developed by Abowd et al. (1999) and Abowd, Creecy, and Kramarz (2002) and extended by Guimarães and Portugal (2010) to allow for estimation of wages explained by observed and unobserved characteristics of workers and firms. On the one hand, a specific employee can earn more than another employee on the basis of observable characteristics[52] or unobservable characteristics which are difficult to measure (like cognitive skills, knowledge, willingness). On the other hand, a firm can have higher compensation than other firms due to observable firm characteristics[53] or due to unobservable firm characteristics (like ability, history, culture). Until now, all empirical analyses on compensation differences between family firms and non-family firms were inadequate to identify separately the individual worker-level effect and the firm-level effect. Using a matched employer-employee panel dataset, we are able to estimate both worker and firm components of compensation determination, allowing for observable and unobservable characteristics in both dimensions. In order to estimate the independent contribution of worker and firm characteristics on the estimated family wage gap, we use the Gelbach's decomposition analysis. Using the omitted variable bias formula, Gelbach (2016) constructed a conditional

[52] Examples: see Table E1 in Appendix E.
[53] Examples: see Table E2 in Appendix E.

decomposition that accounts for various covariates' role in moving base regressors' coefficients. As an advantage, this decomposition yields consistent estimates of economically and econometrically meaningful population parameters (Gelbach, 2016).

4.1.1. Estimating wages

This study uses a unique matched employer-employee dataset which allows us to explicitly control for firm and worker characteristics. Considering only observable characteristics of workers and firms has been seen as a source of concern due to the omitted variable bias problem. For this purpose, a new iterative procedure that provides the exact ordinary least squares solution to a two way high dimensional fixed effects model will be employed.

The empirical model that will be used to test for wage differences between family firms and non-family firms is a level wage equation with controls for worker observed and unobserved heterogeneity, and firm observed and unobserved heterogeneity. Until now, all empirical analyses on compensation differences between family firms and non-family firms were inadequate to identify separately the individual worker-level effect and the firm-level effect. The wage equation to be estimated has the form:

$$\ln w_{ijt} = \gamma_1 X_{1,ijt} + \gamma_k X'_{k,ijt} + \theta_i + w_j + \tau_t + \varepsilon_{ijt} \tag{1}$$

where $\ln w_{ijt}$ is the natural logarithm of the real wage hour of worker *i* $(i = 1, \dots, N)$ working at firm j $(j = 1, \dots, J)$ at year t $(t = 1, \dots, T)$. The variable of interest is X_1, a dummy variable equals to one if the worker *i* is employed in year t in a firm that is defined as a family firm, $X_{k,ijt}$ is a vector of *k* observed exogenous variables that explain worker *i* wages, θ_i is the worker fixed effect, w_j is the firm fixed effect, τ_t is the year fixed effect, and ε_{ijt} is the error term which we assume to follow the standard assumption. The introduction of fixed effects is an interesting way of controlling for unobserved heterogeneity that is shared among groups of observations (Guimarães & Portugal, 2010). More specifically, controlling simultaneously for worker and firm specific effects requires the introduction of two high dimensional fixed effects in the linear regression model (Carneiro, Guimarães, & Portugal, 2012).

The identification of the model is discussed in Abowd et al. (1999), provided in greater detail in Abowd et al. (2002). The authors developed an algorithm to identify highly dimensional fixed effects based on graph theory. In essence, mutually exclusive groups of connected individuals and firms are formed. If there are a total of *G* groups with dimension $(g = 1, \dots, G)$, there are $N_g - 1$ worker fixed effects and $J_g - 1$ firm fixed effects that can be identified such that $N + J - G$ effects can be identified as a whole.

By applying least squares to estimate all parameters (worker fixed effects, firm fixed effects, and the parameters of all the observed worker and firm characteristics), this requires a procedure that involved the inversion of high dimensional matrices. Our identification procedure follows closely the one explored by Guimarães and Portugal (2010) for the estimation of linear regression models with two highly dimensional fixed effects. Their iterative procedure is based on a partition of an algorithm that provides an exact least squares solution whereby the explicit calculation of inverse highly dimensional matrices is not required[54]. For details on the iterative procedure and implementation in STATA, we further refer to Guimarães and Portugal (2010) and Carneiro et al. (2012).

The fixed effects in Eq. (1) were estimated using the complete dataset, which covers the employed population in the TOP 500 largest companies in the Netherlands for the entire period (2010-2013) and comprises 79016 individual panel workers. The identification of the two high dimensional fixed effects given by the worker and the firm effects was circumvented by applying the algorithm developed by Abowd et al. (2002) based on graph theory to determine mutually exclusive groups of connected individuals and firms. Connecting persons and firms requires that some of the individuals in the sample be employed at multiple employers. When a group of persons and firms is connected, the group

[54] Appendix G describes the procedure developed by Guimarães and Portugal (2010) that allows estimation of a two way high dimensional fixed effects model in order to obtain the estimates of worker and firm fixed effects.

contains all the workers who ever worked for any of the firms in the group and all the firms at which any of the workers were ever employed. In contrast, when a group of persons and firms is not connected to a second group, no firm in the first group has ever employed a person in the second group, nor has any person in the first group ever been employed by a firm in the second group. A connected group exists when at least one element of a worker and firm links the rest of the group (Abowd et al., 2002). Abowd et al. (2002) presented an algorithm, which is based on the iterative conjugate gradient method, that leads to the exact least square solution of a linear regression model with two fixed effects. These algorithms deal with the high dimensionality of the data by using sparse matrices (Abowd et al., 2002).

4.1.2. Decomposing the family wage discount

The subsequent objective is to calculate the contribution of the observed worker and firm characteristics as well as the unobserved worker and firm fixed effects in the wage gap between family firms and non-family firms. For this purpose, we will use the Gelbach's decomposition analysis (Gelbach, 2016). We estimate two wage equations (base and full model) at the worker-level.

As a first step we estimate a basic model whereby $\ln w_{ijt}$ is explained by a dummy on the family ownership status:

$$\ln w_{ijt} = \gamma_1^{base} X_{1,ijt} + \varepsilon_{ijt}^{base} \tag{2}$$

and $X_{1,ijt}$ comprises the matrix of the constant term and the indicator on the family ownership status. This basic model contains only the family dummy and delivers the unconditional wage discount for family firms. By excluding the worker and firm (un)observable characteristics, this equation suffers from omitted variable bias. Then, it is necessary to specify the full model.

Second, we extend the basic model by considering a large set of worker-level and firm-level observable and unobservable characteristics:

$$\ln w_{ijt} = \gamma_1^{full} X_{1,ijt} + \gamma_2^{full} W'_{ijt} + \gamma_3^{full} F'_{ijt} + \theta_i \ + w_j \ + \tau_t^{full} + \varepsilon_{ijt}^{full} \tag{3}$$

This full model constitutes an extended version of the traditional Mincerian wage equation[55] (Mincer, 1974). W_{ijt} and F_{ijt} are vectors of worker and firm control variables. Worker observables include gender, age, tenure, education, manager, and ethnicity. Firm-level observables include firm size, foreign ownership, export, and innovation. Finally, θ_i is the worker fixed effect and controls for observed and unobserved worker time-invariant characteristics, w_j is the firm fixed effect and controls for observed and unobserved firm time-invariant characteristics, and τ_t represents a set of year dummies that allows to control for time-specific trends, capturing macroeconomic effects. The procedure developed by Guimarães and Portugal (2010) to compute the exact OLS solution for the linear regression with two high dimensional fixed effects has a main advantage relatively to the standard Mincerian equation (i.e. the base model in Eq. (2)). By including the two fixed effects, we are controlling for time-invariant characteristics of workers and firms, including unobservables. If these unobserved specificities are correlated with the set of controls, the non-inclusion of the two fixed effects in the regression would result in biased estimates. Additionally, we are simultaneously taking into account both worker and firm fixed effects.

Gelbach's algorithm allows us to decompose the difference $\gamma_1^{base} - \gamma_1^{full}$ into the separate effect deriving from each excluded variable. The difference between the estimated coefficient of the unconditional family wage discount in the basic Eq. (2), $\hat{\gamma}_1^{base}$, and the estimated family wage discount in Eq. (3), $\hat{\gamma}_1^{full}$, indicates to what extent the estimated coefficient in Eq. (2) is over- or underestimated in case the additional covariates included in the vectors W_{ijt} and F_{ijt}, and in the unobserverd worker- and firm-level fixed effects are not included in the model. In other words, to what extent do the observed worker and firm characteristics and the unobserved worker and firm characteristics contribute to the uncontrolled wage difference between family firms and non-family firms. Given the estimate of the family wage discount, it is useful to decompose this outcome measure into its constituent mechanisms, namely to identify the contributions of

[55] See for example Heckman, Lochner, and Todd (2008) and Hartog and Gerritsen (2016).

employee and firm time-invariant heterogeneity. To this end, we adopt the conditional decomposition of Gelbach (2016).

Based on the Gelbach's decomposition method, we can measure the contribution of each (group of) *k* variables separately as follows:

$$\delta = \hat{\gamma}_1^{base} - \hat{\gamma}_1^{full} = \sum_k \hat{\beta}_k \hat{\Gamma}_k \qquad k = \{W_{ijt}, F_{ijt}, \theta_i, w_j\} \tag{4}$$

where $\hat{\gamma}_1^{base}$ is the least squares (LS) estimator of γ_1^{base} in Eq. (2), $\hat{\gamma}_1^{full}$ is the LS estimator of γ_1^{full} in Eq. (3), and $\hat{\Gamma}_k = (X'_1 X_1)^{-1} X'_1 X_k$. For instance, $\hat{\Gamma}_{\theta_i} \hat{\beta}_{\theta_i}$ is the part of the uncontrolled wage difference between family firms and non-family firms that can be explained by the worker fixed effects.

4.2. Step 2: the family wage discount and union bargaining power

In next part of this study, we use firm-level data in order to make the unobserved firm heterogeneity (i.e. wage policy) more explicit by looking at the role of union bargaining power. More specifically, we look whether wage determination differs in family firms versus non-family firms. We corroborate with the literature on efficient bargaining and merely focus on so called *wage markup*, which measures the wedge between a negotiated wage and the wage in a perfect competitive labor market.

Production theory states under perfect competition in product and factor markets, firms producing homogeneous products choose output levels so that price equals marginal cost, which also equals average cost under constant returns to scale. These conditions do not necessarily hold in a world of imperfect competition (Dobrinsky, Kőrösi, Markov, & Halpern, 2006). In reality, few if any markets are perfect in the sense that they satisfy the assumptions underlying textbook models of perfect competition or yield the performance of hypothetical perfectly competitive markets (Dobbelaere et al., 2015). Several authors assume that imperfections in both product and labor markets are possible and take into account that wages are no longer exogenous (e.g., Dobbelaere, 2004; Dobbelaere & Mairesse, 2013).

Standard collective bargaining models presume that employees possess a degree of market power when negotiating with the firm over wages and employment (Dobbelaere & Mairesse, 2013). The fact that unions bargain over wages and hence over a share of the firm's non-competitive rents necessitates the integration of labor market variables when investigating profit margins (Dobbelaere, 2004). Workers have a degree of market power when negotiating with the firm over wages and employment (Dobbelaere & Mairesse, 2013). Under this assumption, product and labor market imperfections generate a wedge between factor elasticities in the production function and their corresponding shares in revenue (Dobbelaere & Mairesse, 2013).

To estimate the bargaining union power effect, we consider an equation explaining wage policy characteristics (i.e. wage markups) in family firms versus non-family firms by using firm-level data. A production function approach provides a theoretical tool to conceptualize how union's bargaining power affects the family wage discount. We use a model to estimate the union bargaining power in order to circumvent the problems of data availability (i.e., we do not have specific union data on worker-level for firms located in the Netherlands). We rely on the framework of production functions to estimate simultaneously price-cost markups, wage markups and productivity. We focus on firm-level bargaining and estimate the effect of unions at firm-level over and above industry-level agreements. This section extends the theoretical framework for estimating production functions under imperfect competition in markets. To this end, we follow the study of Amoroso et al. (2015).

4.2.1. The standard setting

The standard starting point is a Cobb-Douglas production function, $Q_{it} = A_{it}F_i(K_{it}, L_{it}, M_{it})$, where Q_{it} is the gross output of firm *i* at time *t*, K_{it} denotes the stock of capital, L_{it} is the volume of total labor, and M_{it} intermediate goods, consisting of materials and energy. The variable A_{it} represents the Hicksian neutral efficiency level, and is defined as total factor productivity. Denoting the logarithm of Q_{it}, K_{it}, L_{it}, M_{it} and A_{it} by q_{it}, k_{it}, l_{it}, m_{it} and a_{it} respectively, taking natural logs of the production function results in a linear function:

$$q_{it} = \theta_0 + \theta_{iKt}k_{it} + \theta_{iLt}l_{it} + \theta_{iMt}m_{it} + a_{it} \tag{5}$$

where θ_{iKt}, θ_{iLt}, θ_{iMt} are the firms' elasticities of output with respect to capital, labor, and intermediate goods, respectively. The function F_i is assumed to be homogeneous of degree θ_{it} so that by the Euler rule this is equal to the sum of all output elasticities with respect to the three non-negative factor inputs, X_{ijt}, that is:

$$\theta_{it} \equiv \sum_{k\in\{K,L,M\}} \frac{\partial Q_{it}}{\partial X_{ikt}} \frac{X_{ikt}}{Q_{it}} \equiv \sum_{k\in\{K,L,M\}} \theta_{ikt} \tag{6}$$

4.2.2. Price markup

Firms operate under the assumption of imperfect competition in the labor market and the output market. Input coefficients might be biased if the firm-level price variation is correlated with the input choice. To see this, we express the deflated gross output as $Y_{it} \equiv \frac{Q_{it}(P_{it})P_{it}}{P_t^j}\exp(u_{it}^y)$, where P_{it} is the firm-level price, P_t^j is the price index of industry $j(\equiv j(i))$, and u_{it}^y represents the measurement error in Y_{it}. Taking natural logs, we have:

$$y_{it} = q_{it} + \left(p_{it} - p_t^j\right) + u_{it}^y \tag{7}$$

Substituting Eq. (5) into Eq. (7), and taking y_{it} as dependent variable, the unobserved firm-level price deviations $\left(p_{it} - p_t^j\right)$ will enter the production function as an extra error component. Furthermore by taking into account some structure on demand, the log deflated output Eq. (7) can be expressed as:

$$y_{it} = q_{it} + \frac{1}{\eta_j}\left(q_{it} - q_t^j\right) - \frac{1}{\eta_j}u_{it}^d + u_{it}^y \tag{8}$$

where u_{it}^d is an idiosyncratic firm-specific demand shock.

Combining Eq. (5) and Eq. (8), and defining the *price markup* as $\mu_j \equiv \eta_j/(1+\eta_j)$, where η_j is the price elasticity of demand for differentiated goods in sector j and $\eta_j < -1$, the deflated gross output can be written as:

$$y_{it} = \gamma_{i0t} + \gamma_{iKt}k_{it} + \gamma_{iMt}m_{it} + \gamma_{iLt}l_{it} - \frac{1}{\eta_j}q_t^j + \tilde{a}_{it} + \tilde{u}_{it} \tag{9}$$

where $\gamma_{i0t} \equiv \theta_0/\mu_j$, $\gamma_{iKt} \equiv \theta_{ikt}/\mu_j$, $k = K, L, M$ are the factor input elasticities, $\tilde{a}_{it} \equiv a_{it}/\mu_j$ the productivity shock, $\tilde{u}_{it} \equiv \tilde{u}_{it}^d + \tilde{u}_{it}^y$, where $\tilde{u}_{it}^d \equiv -u_{it}^d/\eta$ is the demand shock and $\tilde{u}_{it}^y$ is the measurement error in y_{it}.

4.2.3. Wage markup

Relaxing the assumption of perfect competition in the labor market, allowing both firms and employees' unions to have some market power. Thereby, assuming that the firm wages and level of employment are jointly determined according to an efficient bargaining scheme between the firm and its employees. In other words, employees in the firm bargain with the firm over both the levels of employment and the wage. In this case, the wage of employees is determined at a level which is higher than the firm's marginal revenue of labor. Employees in firms with some degree of market power on the output market can earn wages that are much higher than the competitive industry wage level. Short-run profit maximization allowing for bargaining power implies the following first-order condition with respect to wages:

$$W_{it} \rightarrow (1 - \varphi_{it})\frac{W_{it} - \overline{W}_{it}}{\pi_{it}} = \frac{\varphi_{it}}{L_{it}} \tag{10}$$

where $\varphi_{it} \in [0,1]$ is the degree of union bargaining power, W_{it} is the negotiated wage and π_{it} are short-run profits. By rewriting Eq. (10), we can express the bargained wage rate as a function of the bargaining parameter, φ_{it}, and the ratio between profits and cost of labor:

$$\frac{W_{it} - \overline{W}_{it}}{W_{it}} = \frac{\varphi_{it}}{1 - \varphi_{it}}\frac{\pi_{it}}{L_{it}W_{it}} \tag{11}$$

Defining $\mu_{it}^{W} \equiv \frac{W_{it}-\bar{W}_{it}}{W_{it}}$ as the *wage markup*, one can see how this is directly depending on the union's bargaining power. Eq. (11) summarizes the features of the efficient bargaining model. The wage wedge $W_{it} - \bar{W}_{it}$ is increasing with the bargaining power φ_{it} and with firm performance, measured as profit per employee π_{it}/L_{it}. From imperfect competition in both output and labor markets, it follows that the labor elasticity is a function of the labor share and the wage markup:

$$\gamma_{iLt} = s_{iLt}(1 - \mu_{it}^{W}) \tag{12}$$

At this stage, it is intuitively clear how the exclusion of frictions in the labor market (i.e., $\varphi_{it} = 0$ or $W_{it} = \bar{W}_{it}$) might lead to misestimating the firm's market power. When there is no imperfect competition in the labor market, firms set the wage at the lowest value possible, ultimately equal to the competitive wage, i.e., $W_{it} = \bar{W}_{it}$ (and, therefore, $\mu_{it}^{W} = 0$). For W_{it} that tends to $\bar{W}_{it}$, the wage markup decreases, given that the elasticity and the share of labor are constant, which is inversely related to the output markup μ_j.

Inserting the labor elasticity, as expressed in Eq. (12), in the deflated revenue function Eq. (9). The resulting estimating equation assuming labor market frictions can be expressed as:

$$y_{it} = \gamma_{i0t} + \gamma_{iKt}k_{it} + \gamma_{iMt}m_{it} + (1 - \mu_{it}^{W})s_{iLt}l_{it} - \frac{1}{\eta_j}q_t^j + \tilde{a}_{it} + \tilde{u}_{it} \tag{13}$$

4.2.4. Estimation approach

Estimation of Eq. (13) can be done following several estimation approaches, under appropriate corresponding distributional assumptions, which will be discussed below. Since the focus in this part of the study aims at comparing differences in terms of wage markups between family firms and non-family firms, our starting point is Eq. (13) which we estimate across two sub-samples: a sub-sample of family firms and a sub-sample of non-family firms. We compare average values of the parameters using Eq. (13), where $\tilde{a}_{it}$ represents the productivity shock and $\tilde{u}_{it}$ is the measurement error in y_{it}. In empirical applications of estimating production function equations, the usual problem is the potential correlation between $\tilde{a}_{it}$ and the inputs that are chosen at time t. The problem is therefore how to estimate the elasticity of inputs if productivity is known by the firm but unobserved by the econometrician. If firm *i* knows its productivity and chooses inputs accordingly, OLS estimation will yield biased estimates. Now, assuming that the unobserved productivity shock is constant over time ($\tilde{a}_{it} = \tilde{a}_i$), the potential endogeneity is controlled by exploiting the panel structure of the data, for instance, by using the fixed effect estimator. However, if unobserved productivity shocks are time-varying, other estimators have to be considered.

The literature that deals with production function estimation considers the Generalized Method of Moments (GMM) and the Control Function approach (CF) in dealing with correlation between $\tilde{a}_{it}$ and the inputs. Both approaches differ in the way lagged inputs are used as instruments for current input levels. The GMM approach relies on instrumental variables; the semi-parametric CF approach uses observed variables and economic theory to invert out productivity non-parametrically and hence to obtain an observable expression for productivity[56]. We follow the semi-parametric estimator or Control Function approach proposed by Olley and Pakes (1996), Levinsohn and Petrin (2003), Ackerberg, Caves, and Frazer (2006) and Wooldridge (2009) (referred to as W-LP) based on the arguments that we deal with a reasonably short time span with relatively high persistence in the inputs. Although the GMM IV approach has the advantage that it does not require the assumption of a control function, constant over firms and time, the cost of adopting this approach is that one does not allow for the possibility that the unobserved productivity could be correlated with past choices of inputs. In addition, the GMM structure usually includes lagged levels of the inputs after first-differencing the production function. However, because inputs tend to be persistent, lagged levels tend to be weakly correlated input changes (Blundell & Bond, 2000). Moreover, this may especially lead to unsatisfactory results when the time span is restricted to four years.

[56] Amoroso et al. (2015) and Eberhardt and Helmers (2010) survey the most popular parametric and semi-parametric estimators dealing with the endogeneity problems for Cobb-Douglas production functions.

As an alternative to the GMM method, Olley and Pakes (1996) (OP hereafter) propose a CF approach to estimate value added production functions where labor is the only endogenous input. It is assumed that investment i_{it} satisfies $i_{it} = j_t(\tilde{a}_{it}, k_{it})$ and is strictly increasing in $\tilde{a}_{it}$. It is then possible to invert the investment demand function. This yields a control function, expressing productivity as a function of investment, along with the other variables: $\tilde{a}_{it} = j_t^{-1}(i_{it}, k_{it})$. By substituting out the unobserved productivity $\tilde{a}_{it}$ using this control function, the resulting equation does not have endogeneity problems anymore. As investments in the data are often zero, as it is typical for small firms, Levinsohn and Petrin (2003) (LP hereafter) use intermediate inputs as the proxy variable for unobserved productivity (rather than investment as in OP): $m_{it} = f_t(\tilde{a}_{it}, k_{it})$. This yields an alternative control function: $\tilde{a}_{it} = f_t^{-1}(m_{it}, k_{it})$. The estimation in both the OP and LP method is based on a two-step stage procedure to achieve consistency of the coefficients. In the first stage, one estimates the labor elasticity using the regression, whereby the replacement function is approximated by a sufficient high number of polynomials in m_{it} and k_{it}. In the second stage, the elasticities of the remaining inputs of capital and labor are estimated under the assumption that $\tilde{a}_{it}$ follows a first-order Markov process.

Wooldridge (2009) approach uses a GMM estimation with moment conditions outlined in LP, in one stage. According to Levinsohn and Petrin (2003), the advantage of the Wooldridge, Levinsohn and Petrin (W-LP) estimator includes: obtaining efficient estimates and standard errors, and overcoming the collinearity problems described by Ackerberg et al. (2006) for the Cobb-Douglas production function[57]. We shall use the W-LP estimator related to the LP Control Function approach, this yields[58]:

$$y_{it} = \gamma_{i0} + \gamma_{iK}k_{it} + \gamma_{iM}m_{it} + \left(1 - \mu_i^W\right)s_{iLt}l_{it} - \frac{1}{\eta_j}q_t^j + h\underbrace{\left[g(l_{it-1}, m_{it-1}, k_{it-1})\right]}_{\tilde{a}_{it-1}} + \tilde{u}_{it} \tag{14}$$

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[57] Ackerberg et al. (2006) note that if the variable input labor l_{it} is chosen before the choice of materials m_{it} and capital k_{it} at time t, the labor elasticity coefficient in the first stage cannot be identified.
[58] For further technical details, we refer to Amoroso et al. (2015).

where g is a polynomial function in terms of $l_{it-1}, m_{it-1}, k_{it-1}$ and h is a univariate polynomial function. We estimate Eq. (13), with g and h specified as third order polynomials, and using as instruments the lagged inputs $l_{it-1}, m_{it-1}, k_{it-1}$, and their higher order and interaction terms, up to the third order. This choice of instruments in particular makes sense if there is some persistence over time in the inputs, for instance, via k_{it}. Given persistence in k_{it}, there will also be persistence in the other inputs, due to the (non-linear) dependence between the inputs.

5. Estimation results

5.1. Estimation and decomposition of the family wage discount

The introduction of fixed effects is an interesting way of controlling for unobserved heterogeneity that is shared among groups of observations (Guimarães & Portugal, 2010). More specifically, controlling simultaneously for worker and firm specific effects requires the introduction of two high dimensional fixed effects in the linear regression model (Carneiro et al., 2012). Our identification procedure follows closely the one explored by Guimarães and Portugal (2010) for the estimation of linear regression models with two highly dimensional fixed effects. Their iterative procedure is based on a partition of an algorithm that provides an exact least squares solution whereby the explicit calculation of inverse highly dimensional matrices is not required[59]. For details on the iterative procedure and implementation in STATA, we refer to Guimarães and Portugal (2010) and Carneiro et al. (2012).

5.1.1. Estimating wages

In this part of the chapter, we estimate four wage equations (see Table 12). The first model (I) contains only the family dummy. We observe that family firms

[59] We refer to Appendix G for further details on the procedure developed by Guimarães and Portugal (2010).

pay on average 36.4% lower wages than non-family firms. So, we might say that the unconditional family wage discount is 36.4%.

Table 12: Wage equations

Log_wages	**OLS (I)**	**OLS (II)**	**OLS (III)**	**OLS (IV)**
Family ownership	-0.364*** (0.018)	-0.295*** (0.015)	-0.155*** (0.012)	-0.147*** (0.013)
Male			0.094*** (0.011)	0.095*** (0.011)
Age			0.017*** (0.000)	0.017*** (0.001)
Tenure			0.000*** (0.000)	0.000*** (0.000)
Education			0.002*** (0.000)	0.002*** (0.000)
Manager			0.345*** (0.019)	0.342*** (0.019)
Ethnicity			-0.003 (0.018)	-0.008 (0.018)
Firm size				-0.000 (0.004)
Foreign ownership				0.025*** (0.012)
Exporting firm				-0.01 (0.026)
Innovative firm				-0.008 (0.011)
Worker Fixed Effect		1.001*** (0.0615)	1.003*** (0.055)	1.008*** (0.053)
Firm Fixed Effect		1.003*** (0.036)	0.997*** (0.018)	0.994*** (0.029)
Year dummies	Yes	Yes	Yes	Yes
Constant	10.388*** (0.01)	11.172*** (0.014)	9.666*** (0.040)	9.469*** (0.058)
N	8134	8134	8134	8134
R^2	0.091	0.42	0.557	0.589

*Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

The second model (II) takes into account the impact of unobservable worker-level and firm-level characteristics. We see that the family wage discount difference decreases by 7% if we control for worker fixed effects[60] and firm fixed effects[61]. The worker fixed effects and the firm fixed effects have a significantly positive effect on wages.

The third model (III) takes into account the impact of observable worker characteristics, unobservable worker-level, and unobservable firm-level characteristics. We see that the family wage discount difference decreases by 21% if we control for observable worker characteristics, worker fixed effects, and firm fixed effects. Worker observables include gender, age, tenure, education, management function, and ethnicity. All those observable worker characteristics have a significantly positive effect on wages, except for ethnicity which is insignificant. The worker fixed effects have a significantly positive effect on wages, and the impact of firm fixed effects on wages is also significantly positive.

Our final model (IV) encompasses the previous model and extends it by considering a large set of worker-level and firm-level observable characteristics. Worker observables include gender, age, tenure, education, management function, and ethnicity. Firm-level observables include firm size, foreign ownership, exporting firm, and innovative firm. We can conclude that the family wage discount difference decreases by 22% if we control for unobservable and observable worker and firm characteristics. All those observable worker characteristics have a significantly positive effect on wages, except for ethnicity which is insignificant. When looking at the firm characteristics, we see that foreign ownership has a significantly positive effect on wages. The other observable firm characteristics have an insignificant impact on wages. Furthermore, we observe a significantly positive effect of worker fixed effects and firm fixed effects on individual wages. In conclusion, the introduction of workers' and firms' observable and unobservable controls explains more than two-third of the unconditional wage discount.

[60] This term captures all the time-invariant unobserved workers' characteristics (like cognitive skills, knowledge, willingness).
[61] This term captures all the time-invariant unobserved firms' characteristics (like ability, history, culture).

5.1.2. Decomposing the family wage discount

The main goal of this chapter is to assess and compare the effects of family ownership in terms of workers' pay. Our analysis is based on the estimation of wage equations with a particularly large set of control variables, including worker fixed effects and firm fixed effects. In this section, the goal is to quantify the wage gap associated to two different sets of firms, characterized by family ownership or not.

The main result is found by applying the decomposition outlined in Section 4.1.2 to the *'base'* and *'full'* models in Table 13. In this table, we report a share of the total change in the wage gap when moving from the *'base'* to the *'full'* model. The question arises which characteristics contribute the most to the uncontrolled wage difference between family firms and non-family firms. Table 13 shows the results of the Gelbach's decomposition. We estimate two wage equations at the worker-level. The first *'base'* model contains only a dummy variable for family firms, and delivers the unconditional wage discount by ownership type. We find that once we control for family ownership, the unconditional wage discount paid by family firms is relatively large (0.364). The second *'full'* model encompasses the *'base'* model and extends it by adding simultaneously a large set of worker-level and firm-level observable characteristics as well as worker and firm fixed effects.

The coefficients can be interpreted as a share of the total change in the wage gap when moving from the *'base'* to the *'full'* model. Employers might pay a lower wage to a worker because of the worker's educational background, experience, age, etc. Worker-level observables also play a role, with the main role played by education. The variation in the education variable explains 6.8 percentage points of the family wage discount. This means that the wage difference between family firms and non-family firms is 6.8 percentage points lower when we control for education. Experience and management function play a substantially smaller role, a total of 0.4 percentage points and 1.2 percentage points respectively. The other observable worker characteristics (gender, age and ethnicity) account for 7.1 percentage points of the wage gap. Additionally, worker fixed effects, capturing all the time-invariant unobserved workers' characteristics, have a significantly positive impact of 4.4 percentage points on the wage gap. More specifically, family firms hire workers that are overwhelmingly more able than the average (coefficient worker fixed effects is significantly positive).

Table 13: Family wage discount – Decomposition

	Family wage discount	
Coëfficiënt base model	-0.364	
Coëfficiënt extended model	-0.147	
Differences explained by covariates	0.217	
	Contribution	**S.E.**
Education	0.068***	0.000
Tenure	0.004***	0.000
Job characteristics (Manager)	0.012***	0.001
Other persons characteristics	0.071***	0.007
Firm characteristics	0.028***	0.000
Worker Fixed Effects	0.044***	0.006
Firm Fixed Effects	-0.011***	0.001

Note: The decomposition shows how much each set of the control variables contributes to the difference between base and the extended specification.
Stars ***, ** and * give the significance at the 1%, 5% and 10%.

In the case of family firms, firm-level observables (firm size, foreign ownership, trade, innovation) account for 2.8 percentage points of the wage gap. Furthermore, family firms are also different in terms of unobserved time-invariant firm characteristics. The allocation of family and non-family ownership to firms of different quality (i.e. firm fixed effects) accounts for 1.1 percentage points of the family wage gap. If we control for firm fixed effects, the wage discount between family firms and non-family firms is 1.1 percentage points higher. Firm fixed effects represent observed and unobserved human resources' choices or unobserved compensation policy's choices which influence the total compensation of workers. The Gelbach's decomposition shows that a family firm sees its total compensation policy severely changed, meaning that the presence of family ownership is associated with the way the firm compensates the workers. The sign is negative: the wage level of family firms is lower because those firms are on average less able. The fact that the inclusion of firm fixed effects contributes to increasing the wage gap of family firms, simply accounts for the evidence that workers in family firms tend to sort themselves into firms that pay, on average, lower wages. We make the unobserved firm heterogeneity more explicit in the second step of this study. Then, we investigate the influence of a different wage policy (in terms of bargaining power of unions) on the family wage discount.

5.2. The family wage discount and union bargaining power

In this section, we present the results for the entire sample over the period 2010-2013. The tables in this section are organized per estimation approach: fixed effects (Within-FE) and Wooldridge's (2009) estimations of the Levinsohn and Petrin (2003) model (W-LP).

5.2.1. Union bargaining power

Table 14 reports the estimated parameters of interest of the production function for the whole sample, namely the output and wage markups, the bargaining power, and the input elasticities. The information is split up into the total sample $(N = 4160)$ and the two sub-samples: (1) family firms $(panel\ observations = 1255)$ and (2) non-family firms $(panel\ observations = 2905)$.

Within our total sample, the price-cost markup is strongly significant when entering the models. The Within-FE (W-LP) estimate of the model, containing all firms, points to a significant price-cost markup of 1.068 (1.094). This shows some evidence of imperfect competition on the output market because the markup is significantly and fairly larger than 1. We find a significant estimate for the wage markup parameter. The variable which accounts for union bargaining power is strongly significant when entering the models. This means that workers' union has a degree of bargaining power, which erodes the existing monopoly rents (Amoroso et al., 2015). The Within-FE (W-LP) estimate of the model, containing all firms, points to a significant union bargaining power of 0.219 (0.225) on a scale going from 0 to 1. This result rejects the statement that workers have no influence over employment, which is consistent with the idea that wages are bargained off the conventional labor demand curve. In conclusion, our analysis rejects the fact that union bargaining power does not affect the labor share. Since unions raise wages by means of bargaining and rent extraction, the wage difference between unionized and non-unionized firms increases with union bargaining power in these firms. A higher proportion of union members in a firm where a union is recognized reflects greater union support and hence greater bargaining power for the union (Breda, 2015). The wage setting process in Europe typically depends on factors such as the monetary policy regime, the existence of collective agreements and the bargaining power of unions and employers (Abraham, Konings, & Vanormelingen, 2009).

Table 14: Total sample regression results by firm type, 2010-2013

	All firms		Family firms		Non-family firms	
Coefficients	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*
$\hat{\theta}_L$	0.194***	0.280***	0.292**	0.331***	0.163***	0.260***
	(0.051)	(0.026)	(0.122)	(0.049)	(0.053)	(0.021)
$\hat{\theta}_K$	0.081***	0.096***	0.079**	0.128***	0.087***	0.093***
	(0.018)	(0.022)	(0.038)	(0.045)	(0.022)	(0.027)
$\hat{\theta}_M$	0.667***	0.689***	0.598***	0.650***	0.678***	0.627***
	(0.107)	(0.061)	(0.051)	(0.167)	(0.127)	(0.062)
$\hat{\theta}$	0.890***	1.066***	1.036***	1.051***	0.950***	0.981***
	(0.124)	(0.073)	(0.302)	(0.231)	(0.164)	(0.059)
$\hat{\mu}$	1.068***	1.094***	1.101***	1.225***	1.078***	1.094***
	(0.153)	(0.050)	(0.313)	(0.080)	(0.184)	(0.051)
$\hat{\mu}^W$	0.365***	0.322***	0.304***	0.315***	0.402***	0.385***
	(0.066)	(0.056)	(0.064)	(0.096)	(0.061)	(0.076)
$\hat{\varphi}$	0.219***	0.225***	0.218***	0.254***	0.368***	0.294***
	(0.043)	(0.030)	(0.051)	(0.051)	(0.083)	(0.033)
$\hat{\alpha}$ (in logs)	3.021***	1.890***	2.694***	1.740***	3.127***	2.697***
st. dev.	(0.721)	(0.510)	(0.440)	(0.539)	(0.753)	(0.510)
Hansen J-test	$p = 0.195$		$p = 0.120$		$p = 0.150$	

Note: Robust standard errors in parentheses. Dependent variable: log gross deflated sales. The estimated parameters are retrieved as the following: $\hat{\theta}_L$*: sample mean of* $\hat{\mu}(1-\hat{\mu}^W)s^j_{Lt}$, $\hat{\theta}_M = \hat{\mu}\hat{\gamma}_M$, $\hat{\theta}_K = \hat{\mu}\hat{\gamma}_K$, $\hat{\theta} = \hat{\theta}_K + \hat{\theta}_L + \hat{\theta}_M$, $\hat{\mu} = 1/(1+1/\hat{\eta})$, $\hat{\varphi}$ *sample mean of* $(\hat{\mu}^W W_{it}L_{it})/(\pi_{it} + \hat{\mu}^W W_{it}L_{it})$, $\hat{\alpha}_{it}$ *is calculated as a residual as:* $\mu_j\left[y_{it} - \left(\hat{\gamma}_{i0} + \hat{\gamma}_{iK}k_{it} + \hat{\gamma}_{iM}m_{it} + (1-\hat{\mu}^W_i)s_{iLt}l_{it} - \frac{1}{\hat{\eta}_j}q^j_t\right)\right]$.

*Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

We investigate the heterogeneity of the sample by studying the firms' production behavior for different ownership structures. For each of the two ownership structures (i.e. family firms versus non-family firms), we estimate Eq. (13) with the Within-FE estimation approach and the W-LP estimation approach. When comparing family firms with non-family firms, using firstly the Within-FE estimation approach we find that the price-cost markup of family firms and non-family firms is very similar (1.101 for family firms versus 1.078 for non-family firms). Moreover, family firms indicate less imperfect competition in the labor market (the wage markup is found to be 0.304 versus 0.402 for non-family firms and workers' bargaining power is 0.218 versus 0.368 for non-family firms). Secondly, using the W-LP estimation approach we find that family firms indicate more imperfect competition on the output market (the price-cost markup is found to be 1.225 versus 1.094 for non-family firms) and less imperfect competition in the labor market (the wage markup is found to be 0.315 versus 0.385 for non-family firms and workers' bargaining power is 0.254 versus 0.294 for non-family firms). Furthermore, we find no evidence against constant returns to scale ($\hat{\theta}$)[62] in family firms as well as in non-family firms for both estimation approaches. $\hat{\theta}$ measures the scale economies. $\hat{\theta} = 0$ indicates that there are constant returns to scale, while $\hat{\theta} < 0$ indicates decreasing returns to scale. $\hat{\theta} > 0$ indicates that there are increasing returns to scale. Under perfect competition in efficient product and factor markets market, firms producing homogeneous products set their prices at their marginal costs which, under constant returns to scale, also equal their average costs. Put differently, under perfect competition firms adjust their output level and cost structure so that to set their marginal costs equal to the exogenous price level. Our results show that family firms have on average lower productivity ($\hat{\alpha}$)[63] compared to non-family firms for both estimation approaches. This corresponds to the results in Chapter 2, where we found an average family productivity discount of 6.39% by using the OLS estimation technique.

Given the evidence of sectoral specificity of capital and labor (Ramey & Shapiro, 2001), we investigate the heterogeneity of the manufacturing industry by studying across-industry firms' production behavior. For the eight most prevalent sectors in this sample, we estimate Eq. (13) with the Within-FE

[62] In Chapter 2 scale economies are defined as θ'_{it}.
[63] $\hat{\alpha}$ represents the Hicksian neutral efficiency level or the conventional measure of total factor productivity (TFP).

estimation approach and the W-LP estimation approach. Table E7 in Appendix E reports the relevant parameters, namely wage markup and union bargaining power. When comparing family firms with non-family firms in the chemicals and pharmaceutical sector, basic and fabricated metal sector, and machinery and equipment sector, using firstly the Within-FE estimation approach we find that family firms indicate more imperfect competition in the labor market. While the workers' bargaining power is higher in family firms than in non-family firms for the three sectors. Secondly, using the W-LP estimation approach we find that family firms indicate more imperfect competition in the labor market, while the workers' bargaining power is lower in family firms than in non-family firms, except for the basic and fabricated metal sector.

5.2.2. Human skills: high-skilled versus low-skilled firms

There may be omitted variables from the model in Table 14. There is omitted variable bias when a variable, which affects the dependent variable and is correlated with one or more explanatory variables, is omitted from the regression (Stock & Watson, 2015). The union bargaining power in high-skilled firms may differ from the union bargaining power in low-skilled firms. Indeed, the union bargaining power parameter might also capture the influence of skills. Unions are institutions created as a response to particular forms of market failures or contract incompleteness. Unions exist because they provide some benefits, either to the society as a whole, or simply to some group of workers and they do so by imposing wage compression across workers with different skills (Acemoglu, Aghion, & Violante, 2001). Indeed, unions are reported to focus on low-paid workers and to reduce wage inequality between low-skilled and high-skilled workers (Dumont, Rayp, & Willemé, 2012). Acemoglu et al. (2001) have argued that skill-biased technological change may weaken the position of unions and the coalition within unions between low-skilled and high-skilled workers. By widening the productivity differentials, it improves the outside option (i.e., the competitive market return) of high-skilled workers. As the more productive employees face improved outside opportunities, wage compression becomes harder to sustain, and these workers quit unions (Acemoglu et al., 2001). To sum, high-skilled workers are more powerful because of these increased outside options and because they are harder to replace than low-skilled workers (Acemoglu et al., 2001; Dobbelaere, 2004). One of the main sources of selection bias is high-skilled workers not being covered, thereby underestimating the union differential (Hartog et al., 2002). Even though this is not the core of this chapter, we take into account the role of human capital.

A breakdown of labor by skill type is central in the literature on wage inequality, considering heterogeneity of workers. An estimation of bargaining power by skill level requires wage and employment data broken down by skill level (Dumont et al., 2012). Evidence suggests that the level of education, technological intensity, wage levels, occupation and experience tend to be valid characteristics that define skills (Dobbelaere & Vancauteren, 2015; Doms, Dunne, & Troske, 1997). Our approach of defining skill heterogeneity is based on the concept of knowledge workers (Horwitz, Heng, & Quazi, 2003), where we rely on classifying jobs into low-paid and high-paid level classifications according to certain threshold values based on the entire wage distribution[64].

The data on which the skill composition of the workforce is based are sourced from the Social Statistics Database (SSB) and the Labor Force Study (EBB). EBB is the primary source that contains all the relevant information on persons, their labor market positions, education, experience and other background characteristics. The employee population contains persons between the age of 15 until 74 years old. Also persons who were enrolled as full-time students are not taken into account in the analysis, nor are employees who are employed in the public sector. The SSB database also collects data on employees and employee wages that is extracted from the tax declaration that employers submit. For the small proportion of persons who had more than one job we only consider the main job, which is the job providing the highest income (according to SSB data) and the largest working hours (according to EBB data). The database also includes a unique firm identifier, which allows us to match the vast majority of these jobs with firm-level data.

[64] See Groot et al. (2014) for an application of this approach on regional labor market effects.

A worker is defined as being highly skilled if his/her wage is in the 81st percentile or higher for all registered jobs by age category and NACE 2-digit industry. Aspects of this latter data can be found in Dobbelaere and Vancauteren (2015) in a different setting. In order to measure the ratio of high-skilled workers per firm, we took the ratio of employees with a high-paid job to the total employment. Following Dobbelaere and Vancauteren (2015) we define a firm to be high-skilled if its ratio of high-skilled (i.e. high paid) employees is equal to or exceeds the within group median value of the ratio of high-skilled employees in firm class *s*[65] of industry *j* (NACE 2-digit classification) to which the firm *i* belongs in year *t,* whereas it is defined to be low-skilled if its ratio high-skilled employees is lower than the aforementioned median value.

Table 15: Total sample regression results by skill type, 2010-2013

	High-skilled firms		**Low-skilled firms**	
Coefficients	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*
$\hat{\theta}_L$	0.130*** (0.049)	0.243*** (0.014)	0.140** (0.058)	0.303*** (0.015)
$\hat{\theta}_K$	0.071*** (0.023)	0.046 (0.029)	0.103*** (0.028)	0.147*** (0.032)
$\hat{\theta}_M$	0.773*** (0.1867)	0.701*** (0.048)	0.632*** (0.121)	0.620*** (0.071)
$\hat{\theta}$	0.975*** (0.110)	0.990*** (0.054)	0.877*** (0.137)	1.074*** (0.074)
$\hat{\mu}$	1.220*** (0.142)	1.032*** (0.006)	1.043*** (0.156)	1.026*** (0.005)
$\hat{\mu}^W$	0.382*** (0.070)	0.276*** (0.055)	0.504*** (0.087)	0.446*** (0.098)
$\hat{\varphi}$	0.111* (0.060)	0.183*** (0.022)	0.152* (0.087)	0.193*** (0.037)
$\hat{\alpha}$ (in logs) st. dev.	3.170*** (0.569)	2.316*** (0.551)	2.823*** (0.466)	2.069*** (0.468)

Note: Robust standard errors in parentheses. Dependent variable: log gross deflated sales. The estimated parameters are retrieved as the following: $\hat{\theta}_L$*: sample mean of* $\hat{\mu}(1-\hat{\mu}^W)s^j_{Lt}$, $\hat{\theta}_M = \hat{\mu}\hat{\gamma}_M$, $\hat{\theta}_K = \hat{\mu}\hat{\gamma}_K$, $\hat{\theta} = \hat{\theta}_K + \hat{\theta}_L + \hat{\theta}_M$, $\hat{\mu} = 1/(1+1/\hat{\eta})$, $\hat{\varphi}$ *sample mean of* $(\hat{\mu}^W W_{it} L_{it})/(\pi_{it} + \hat{\mu}^W W_{it} L_{it})$, $\hat{\alpha}_{it}$ *is calculated as a residual as:* $\mu_j \left[y_{it} - \left(\hat{\gamma}_{i0} + \hat{\gamma}_{iK} k_{it} + \hat{\gamma}_{iM} m_{it} + (1-\hat{\mu}^W_i) s_{iLt} l_{it} - \frac{1}{\hat{\eta}_j} q^j_t \right) \right]$.

Stars ***, ** *and* * *give the significance at the 1%, 5% and 10%.*

[65] We consider 7 *s* firm classes: $number\ of\ employees\ (L) < 19$, $L \in [20{,}50]$, $L \in [50{,}100]$, $L \in [100{,}250]$, $L \in [250{,}500]$, $L \in [500{,}1000]$, $L > 1000$.

We investigate the heterogeneity of the sample by studying the firms' production behavior for different skill types. For each of the two skill types (i.e. high-skilled firms versus low-skilled firms), we estimate Eq. (13) with the Within-FE estimation approach and the W-LP estimation approach. The results can be found in Table 15. Our results show that high-skilled firms have on average higher productivity ($\hat{\alpha}$) compared to low-skilled firms for both estimation approaches. This can also be seen in Figure F5 in Appendix F, where the average TFP is higher for more competent (i.e. high-skilled) firms. For both estimation techniques, we find that high-skilled firms indicate less imperfect competition in the labor market (i.e. the significant wage markup is higher in low-skilled firms). While the workers' bargaining power is lower in high-skilled firms than in low-skilled firms.

5.2.3. Human skills and family firms

According to the resource-based view, family firms and non-family firms can be differentiated based on several resources, such as human capital. Human capital is created by changes in individuals that bring about skills, knowledge and capabilities that make them able to act in new ways and contribute to his/her productivity (J. S. Coleman, 1988). Family firms are often characterized by close proximity of dual relationships. That is, family members participate simultaneously in both business and family relationships in their professional and personal lives. The duality of these relationships increases their complexity and creates a unique context for human capital (both positive and negative) compared to non-family firms (Sirmon & Hitt, 2003). On the one hand, the quantity and quality of human capital in family firms might be limited. For example, family firms often have difficulties in attracting and retaining highly qualified employees. Highly skilled and qualified managers may avoid family firms due to limited potential for professional growth, exclusive succession and limitations on wealth transfer (Sirmon & Hitt, 2003). Family firms lack necessary skills and abilities due to a small labor pool, lack of talent, or inadequate training (Bresciani, Thrassou, & Vrontis, 2013; Dyer, 2006; Llach & Nordqvist, 2010). A family firm's productivity may be constrained by the limited number of skilled employees and their demanding roles, as human capital theory posits a positive correlation between human capital and productivity (Danes, Stafford, Haynes, & Amarapurkar, 2009). A higher ratio of value added per employee would not only be driven by an increase in the ratio of physical capital per employee (C. Peeters & van Pottelsberghe de la Potterie), but also by the development of certain capabilities associated with human capital. On the other hand, the unique context for human capital in family firms might also have some beneficial outcomes, like extraordinary commitment, close relationships with stakeholders, and the potential for deep firm-specific tacit knowledge (Danes et al., 2009; Sirmon & Hitt, 2003).

Our results in Table 16 show that high-skilled family firms have on average lower productivity compared to high-skilled non-family firms for both estimation approaches. For both estimation techniques, we find that high-skilled family firms indicate less imperfect competition in the labor market (i.e. the significant wage markup is rather higher in high-skilled non-family firms). While the workers' bargaining power is lower in high-skilled family firms than in high-skilled non-family firms. These results are in line with the results we found in Table 14.

Our results in Table 16 show that low-skilled family firms have on average lower productivity compared to low-skilled non-family firms for both estimation approaches. For both estimation techniques, we find that low-skilled family firms indicate less imperfect competition in the labor market (i.e. the marginally significant wage markup is rather higher in low-skilled non-family firms). While the workers' bargaining power is higher in low-skilled family firms than in low-skilled non-family firms. So, the bargaining power is strongly present in low-skilled family firms, but it is less determinative for setting the wage levels. For low-skilled family firms, the wage markup is only significant at the 10% level. The difference between the wage markup for low-skilled family firms and low-skilled non-family firms is rather negligible for the W-LP estimation.

Table 16: Total sample regression results by firm and skill type, 2010-2013

	High-skilled family firms		High-skilled non-family firms		Low-skilled family firms		Low-skilled non-family firms	
Coefficient	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*
$\hat{\theta}_L$	0.320*	0.268***	0.170**	0.243***	0.273**	0.275***	0.255***	0.314***
	(0.189)	(0.024)	(0.083)	(0.016)	(0.121)	(0.022)	(0.091)	(0.021)
$\hat{\theta}_K$	0.037*	0.065	0.080**	0.039	0.108	0.153***	0.095***	0.137***
	(0.019)	(0.056)	(0.039)	(0.0332)	(0.072)	(0.050)	(0.028)	(0.040)
$\hat{\theta}_M$	0.524**	0.744***	0.817***	0.691***	0.652***	0.677***	0.597***	0.587***
	(0.237)	(0.069)	(0.223)	(0.0537)	(0.203)	(0.092)	(0.146)	(0.096)
$\hat{\theta}$	0.882**	1.078***	1.068***	0.973***	1.035***	1.091***	0.945***	1.039***
	(0.431)	(0.093)	(0.289)	(0.059)	(0.276)	(0.112)	(0.174)	(0.096)
$\hat{\mu}$	1.159**	1.081***	1.249***	1.061***	1.040***	1.026***	1.015***	1.028***
	(0.567)	(0.002)	(0.333)	(0.001)	(0.270)	(0.007)	(0.188)	(0.007)
$\hat{\mu}^W$	0.219**	0.249***	0.390***	0.418***	0.553*	0.445*	0.621*	0.459**
	(0.096)	(0.078)	(0.090)	(0.077)	(0.336)	(0.255)	(0.327)	(0.217)
$\hat{\varphi}$	0.084	0.078*	0.127	0.220***	0.260***	0.265***	0.116***	0.142**
	(0.060)	(0.041)	(0.086)	(0.021)	(0.063)	(0.034)	(0.023)	(0.061)
$\hat{\alpha}$ (in logs)	4.577***	1.536***	3.099***	2.521***	2.402***	1.762***	3.034***	2.421***
st. dev.	(0.655)	(0.509)	(0.647)	(0.569)	(0.365)	(0.394)	(0.501)	(0.491)

Note: Robust standard errors in parentheses. Dependent variable: log gross deflated sales. The estimated parameters are retrieved as the following: $\hat{\theta}_L$*: sample mean of* $\hat{\mu}(1-\hat{\mu}^W)s_{Lt}^j$, $\hat{\theta}_M = \hat{\mu}\hat{\gamma}_M$, $\hat{\theta}_K = \hat{\mu}\hat{\gamma}_K$, $\hat{\theta} = \hat{\theta}_K + \hat{\theta}_L + \hat{\theta}_M$, $\hat{\mu} = 1/(1+1/\hat{\eta})$, $\hat{\varphi}$ *sample mean of* $(\hat{\mu}^W W_{it}L_{it})/(\pi_{it} + \hat{\mu}^W W_{it}L_{it})$, $\hat{\alpha}_{it}$ *is calculated as a residual as:*
$\mu_j\left[y_{it} - \left(\hat{\gamma}_{i0} + \hat{\gamma}_{iK}k_{it} + \hat{\gamma}_{iM}m_{it} + \left(1-\hat{\mu}_i^W\right)s_{iLt}l_{it} - \frac{1}{\hat{\eta}_j}q_t^j\right)\right]$

*Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

5.3. Robustness checks

To ensure the robustness of our initial wage regression results, we conduct 6 additional analyses. There may be omitted variables from the model. There is omitted variable bias when a variable, which affects the dependent variable and is correlated with one or more explanatory variables, is omitted from the regression (Stock & Watson, 2015). Wages in family firms may differ from wages in non-family firms in ways that are not easily measured. Even though we include the major determinants of wages, our measures will be crude and their inclusion in the model will not sufficiently remove the correlation between family ownership and the error term, which leads to bias in the estimate of the effect of family ownership.

According to the human capital theory, unique **skills** lead to higher wages (Castanias & Helfat, 1991) and high-skilled workers are harder to replace (Dobbelaere, 2004). Highly qualified employees are more often and to a larger extent paid above the contractual wage, since quits of this group would be relatively costly (Jung & Schnabel, 2009). Some authors state that family firms lack necessary skills and abilities due to a small labor pool, lack of talent, or inadequate training (e.g., Bresciani et al., 2013; Dyer, 2006; Llach & Nordqvist, 2010). Family firms often have difficulties in attracting and retaining highly qualified employees. Highly skilled and qualified employees may avoid family firms due to limited potential for professional growth, exclusive succession and limitations on wealth transfer (Sirmon & Hitt, 2003). Therefore, we test explicitly if our initial results are essentially driven by the fact that high-skilled workers are more prominent in non-family firms than in family firms. The point estimate on the family ownership dummy in column I of Table 17 is -0.126 if we only include high-skilled employees in our sample. However, if we only include low-skilled employees in our sample, we find that family firms pay on average 15.1% less than non-family firms controlling for worker (un)observables and firm (un)observables (see column II of Table 17). The robustness regression results in column I and II of Table 17 are comparable to the results presented in Table 12, which provides further support for the initial results of our study. So, our initial estimate of the family wage discount is quite robust because the wage gap we detect also holds for high-skilled or low-skilled employees.

Family firms are generally smaller than non-family firms (Barbera & Moores, 2013); in other words, family ownership becomes more common when **firm size** decreases (Anderson, Mansi, & Reeb, 2003). Most family firms can be categorized as small or medium-sized enterprises (e.g., Corbetta & Montemerlo, 1999; Donckels & Fröhlich, 1991; Voordeckers, Van Gils, & Van den Heuvel, 2007). Compensation is significantly related to firm size (Bayo-Moriones & Merino-Díaz de Cerio, 2001; Carrasco-Hernandez & Sánchez-Marín, 2007). It is expected that larger firms with greater growth opportunities are typically more complex and will therefore demand higher quality and more costly employees (Core et al., 1999). So, one could think that our results are essentially driven by the fact that family firms are especially prevalent among small and medium-sized enterprises, which are generally known for their lower payments to their employees (e.g., Bayo-Moriones & Merino-Díaz de Cerio, 2001; Carrasco-Hernandez & Sánchez-Marín, 2007; Core et al., 1999). Following Bassanini et al. (2013), we check if our initial results are robust to the elimination of small firms. Therefore, we rerun our regressions on only small or medium-sized enterprises (i.e., SMEs)[66]. Our findings (see column III of Table 17) are virtually unchanged, thus suggesting that the wage gap we detect also holds for SMEs. The robustness regression results in Table 17 are comparable to the initial family wage discount presented in Table 12, which provides further support for the initial results of our study.

Due to the strong family culture, a family shareholder might decide to appoint **managers** from within his/her kinship network instead of more talented professional managers (Bertrand & Schoar, 2006). The lower skill levels among family managers instead of professional managers may reduce a firm's productivity level (e.g., Barth et al., 2005; Classen et al., 2014). This recruitment type used in family firms might limit the opportunities for qualified employees to get the chance of occupying high corporate positions inside the

[66] Following the European Commission's definition of SMEs, SMEs are defined as enterprises which employ fewer than 250 employees and which have an annual turnover not exceeding 50 million euros, and/or an annual balance sheet total not exceeding 43 million euros (European Commission, 2003).

company (Miller & Le Breton-Miller, 2014). Furthermore, large family shareholders are more prone to remain active in management even if they are no longer competent or qualified to run the firm (e.g., Anderson & Reeb, 2003; Flören, 1998). The long tenure of family shareholders and/or managers could lead to a lack of flexibility and creativity in these organizations (Flören, 1998). As family members are entrenched in their managerial positions, less top managerial positions will be available for employee promotion or outside experts (Charbel et al., 2013). Following Bassanini et al. (2013), we test explicitly if our initial results are essentially driven by the fact that career opportunities, in particular for managers, are more important in non-family firms than in family firms. If this were the case, higher wages in non-family firms could be due to the fact that a larger proportion of managers are employed in jobs at the very top of the hierarchy (Bassanini et al., 2013). Our results are rather similar if we exclude all managers from the sample. The point estimate on the family ownership dummy in column V of Table 17 is then -0.155 if we exclude managers. This might indicate that the initial family wage discount we detect in Table 12 also holds for non-managerial positions. The robustness regression results in Table 17 are comparable to the results presented in Table 12, which provides further support for the initial results of our study.

The composition and quality of jobs within a firm are also likely to vary across firms. To deal with potential sources of composition bias in wage levels and control for job characteristics, we included in our model a set of occupation dummies. Controlling for occupation (i.e., job title) heterogeneity enhances the wage flexibility (Carneiro et al., 2012). There are compensating differentials for certain occupations involving risks of accidents, stressful working conditions, or complexity of tasks (Raposo et al., 2015). We are reluctant to include these occupational controls in the wage equation because it is likely correlated with unobserved heterogeneity explaining wages (e.g., knowledge absorption, efficiency). The last column of Table 17 displays the corresponding results and shows that sign and significance of the family ownership dummy remains once occupation has been controlled for.

Table 17: Explaining wages and family firms - Robustness check

Log_wages	High-Skilled (I)	Low-Skilled (II)	SME (III)	Large (IV)	Non-managers (V)	Occupation control (VI)
Family ownership	-0.126*** (0.030)	-0.151*** (0.015)	-0.208*** (0.041)	-0.140*** (0.014)	-0.155*** (0.014)	-0.103*** (0.014)
Male	0.159*** (0.027)	0.074*** (0.012)	0.189*** (0.040)	0.088*** (0.011)	0.092*** (0.011)	0.087*** (0.012)
Age	0.020*** (0.001)	0.017*** (0.000)	0.017*** (0.001)	0.017*** (0.000)	0.017*** (0.000)	0.017*** (0.001)
Tenure	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)
Education	0.002*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Manager	0.278*** (0.032)	0.371*** (0.024)	0.206*** (0.058)	0.356*** (0.020)		
Ethnicity	-0.047 (0.036)	-0.009 (0.019)	-0.069 (0.055)	-0.003 (0.018)	-0.007 (0.018)	-0.003 (0.018)
Firm size	0.012* (0.004)	-0.003* (0.004)	0.017* (0.021)	0.000 (0.004)	0.000 (0.003)	0.009** (0.003)
Foreign ownership	0.036* (0.021)	0.000 (0.013)	0.013 (0.034)	0.023* (0.012)	0.028** (0.012)	0.035*** (0.011)
Exporting firm	0.122 (0.092)	0.024 (0.026)	0.006 (0.119)	0.015 (0.026)	0.017 (0.026)	-0.012 (0.024)
Innovative firm	-0.043* (0.025)	-0.001 (0.012)	0.009 (0.038)	-0.007 (0.012)	-0.005 (0.011)	0.003 (0.011)
Worker Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Occupational dummies	No	No	No	No	No	Yes
Constant	9.239*** (0.142)	9.610*** (0.061)	9.239*** (0.142)	9.579*** (0.063)	9.579*** (0.063)	9.668*** (0.058)
N	2617	5593	1705	6505	7157	8210

Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.

6. Discussion

6.1. Estimation and decomposition of the family wage discount

We find that family firms pay on average lower wages than non-family firms, by estimating an unconditional family wage discount of 36.4%. The family wage discount is 14.7% if we control for unobservable and observable worker and firm characteristics. Then, we evaluated the sources of the wage gap by combining a two way high dimensional fixed effects model with the decomposition of Gelbach (2016), in which the two dimensions considered are the worker's unobserved ability and the firm's unobserved characteristics. After controlling for worker and firm observable characteristics and worker and firm unobservable characteristics we find that the wage differences between family firms and non-family firms are lower but still significant. So, these differences can be partly explained by background characteristics from worker and employer. The inclusion of worker fixed effects allows us to control for all the observed and unobserved time-invariant characteristics of an individual which influence his/her wage. Two workers with the same observable characteristics might be paid different wages because of other hard-to-observe characteristics. For example, the unobserved permanent characteristics might capture the ability of the worker. We may conclude that, on average, the abilities of workers in family firms are higher than those working in non-family firms. The observed and unobserved permanent characteristics of firms which influence the compensation payments are accounted for by including firm fixed effects (Abowd et al., 1999). The firm fixed effects represent observed and unobserved human resources' choices or unobserved compensation policy choices which influence the total compensation of workers (e.g., Addison, Portugal, & Vilares, 2017; Fitzenberger, Kohn, & Lembcke, 2013; Vilares, 2013). By using the Gelbach's decomposition we find that workers in family firms tend to sort themselves into firms with less generous remuneration policies. In other words, workers in family firms earned lower wages because those family firms exhibited a less generous wage policy.

Family owners manage their businesses not to maximize financial returns but to preserve or increase the socioemotional endowments they derive from the business (Gómez-Mejía et al., 2007). These extended SEW priorities might include investing in a firm to enhance a family's reputation with stakeholders and forming sustaining relationships with partners to increase the chances of firm survival (Miller & Le Breton-Miller, 2014). These priorities encompass benefits that go beyond the family and may be more of a long-term nature (Miller & Le Breton-Miller, 2014). Family firms typically have a long-term management policy, which ensures them to invest less in booms, more in recessions, and to focus on job preservation (Sraer & Thesmar, 2007). Indeed, family firms hoard labor in economic bad times and hire less in economic good times compared to non-family firms (Sraer & Thesmar, 2007). For example, family firms offer employees job security in exchange for a lower wage like Bassanini et al. (2013) found. Job security leads to increased employee morale, commitment and loyalty (K. Cameron & Huber, 1997).

Exploiting a possible contribution in unobserved firm characteristics will become more concrete as a second step in this study. It then progresses to investigate the influence of a different wage policy (in terms of bargaining power) on the family wage discount.

6.2. The family wage discount and union bargaining power

The Dutch economy is a corporative economy in which the government, employers' associations and trade unions are focused on deliberation and consensus (Borghans & Kriechel, 2007). The government, the employers' associations and the trade unions negotiate about economic goals (Borghans & Kriechel, 2007). Although the Dutch institutional setting recommends quite strict and similar wage developments within sectors, there can be more wage flexibility in practice. On the one hand, centrally bargained agreements typically have an influence on the wage scales and wage grades that companies use. On the other hand, the flexible and divergent development in pay can be explained by the use of incentive pay. This incentive pay is linked to either quantitative performance measures or qualitative evaluations, and therefore depends on objective or subjective evaluations of performance (Borghans & Kriechel, 2007).

The economic benefits of unions could be found in the worker-manager cooperation (Amoroso et al., 2015).

Since unions raise wages by means of bargaining and rent extraction, the wage difference between unionized and non-unionized firms increases with union bargaining power in these firms. A higher proportion of union members in a firm where a union is recognized reflects greater union support and hence greater bargaining power for the union (Breda, 2015). Employees in unionized firms, in addition to other characteristics, belong to a family firm less often than non-unionized firms (H. M. Mueller & Philippon, 2011). Bassanini et al. (2013) and Holten and Crouch (2014) find empirical evidence of lower unionization rates in family firms. As a result, we take the explicit assumption that union coverage is less prevalent among family firms.

Our analyses reveal differences between family firms and non-family firms in terms of wage policies. We find that family firms indicate less imperfect competition in the labor market. The presence of trade unions is arising from the asymmetry in contracting between individual workers and employers. The alternative to a unionized labor market is one characterized by a perfectly competitive structure that ensures the workers may choose whether or not to work, by comparing the given perfectly competitive wage with the marginal utility of not working (Amoroso et al., 2015).

We express the bargained wage rate (i.e., wage markup) as a function of the bargaining parameter and the ratio between profits and cost of labor. According to this Eq. (11), the wage markup is directly depending on the union's bargaining power. The wage wedge $W_{it} - \bar{W}_{it}$ is increasing with the bargaining power φ_{it} and with firm performance $\frac{\pi_{it}}{L_{it}W_{it}}$. We find that family firms seem to have a lower wage markup. On the one hand, the bargaining power in family firms is lower than in non-family firms which implies that the role of unions in family firms is rather limited. Our analysis further reveals that these results only hold for high-skilled firms. On the other hand, the results concerning the profit ratio are sensitive to the estimation technique.

Firstly, we discuss the results using the **Within-FE estimation approach**. When comparing the estimation results of family firms with non-family firms, we notice an increase in both wage markup as well as union's bargaining power. Going from family firm to non-family firm, the proportional increase in bargaining power is larger than the proportional increase in wage markup. So, the profit ratio must cause an adverse-effect, which means that the change in profits from family firm to non-family firm must be negative. This suggests that family firms have, on average, a higher profit ratio than non-family firms. Theoretically, several arguments can be put forward in explaining why family firms perform better than non-family firms. On the one hand, the agency-type problem in the context of the conventional owner-manager conflict can be reduced (Berle & Means, 1932) because more concentrated owners have higher incentives and have the power to monitor the managers (Shleifer & Vishny, 1986). On the other hand, family firms can be viewed as stable investors with a view to long-term competitiveness and enhancement of value rather than short-term profitability (Anderson & Reeb, 2003). Empirical studies of Anderson and Reeb (2003), Maury (2006) and Barontini and Caprio (2006) report that family firms perform better than non-family firms.

Secondly, we discuss the results using the **W-LP estimation approach**. When comparing the estimation results of family firms with non-family firms, we notice an increase in both wage markup as well as union's bargaining power. Going from family firm to non-family firm, the proportional increase in bargaining power is slightly smaller than the proportional increase in wage markup, but the difference between them is relatively small. The profit ratio must also cause a slightly positive effect. This suggests that family firms have, on average, a lower profit ratio than non-family firms. Family firms could lead to poor performance if the controlling family shareholders take advantage of their position. On the one hand, the family shareholders can extract private benefits at the expense of the minority shareholders due to their controlling position (Demsetz, 1983; Villalonga & Amit, 2006). On the other hand, the family could use its controlling power to select managers from within their kinship network instead of more competent (external) managers (Anderson & Reeb, 2003; Bertrand & Schoar, 2006; Dyer, 2006). There are also some empirical papers indicating that family firms appear to underperform compared to non-family firms (e.g., Bloom & Van Reenen, 2007; Claessens, Djankov, & Lang, 2000; Cronqvist & Nilsson, 2003).

These contradictory results are not surprising, since prior theoretical and empirical studies have not reached a consensus regarding the relation between firm performance and family ownership. Miller et al. (2007) conclude that the superiority of family firm performance depends on which definition of a family firm is used and on the source of the data on which the results are based. Barbera and Moores (2013) state that the conflicting results among studies might be due to different definitions of a family firm, time periods, estimation methods, methodologies and datasets.

7. Concluding remarks

7.1. Concluding notes

We confirm the common idea that family firms pay on average lower wages than non-family firms. More specifically, we show that the wages in family firms are on average 14.7% lower than in non-family firms. This chapter provides a detailed decomposition of the wage discount between family firms and non-family firms into its most important dimensions –worker and firm characteristics. Part of the family wage gap that we find is due to differences in observed characteristics of workers. But another part is due to different unobserved firm characteristics, like different wage policies. A worker might be paid less in monetary units because he/she is receiving part of his/her compensation in terms of other unobservable characteristics of the job, which may include lower effort requirements, more pleasant working conditions, better amenities. We find that workers in family firms tend to sort themselves into firms with less generous remuneration policies. The explanation for this can be found in the incentive debate. The family logic often overrides business reasoning because families also have non-economic goals (Gómez-Mejía et al., 2007; Karra et al., 2006). Family owners are likely to have a long-term perspective: they tend to be very motivated to help the company they founded to succeed and hand over to the next generation (Gómez-Mejía et al., 2007).

Family firms also have unique resources. The interaction between the family and the business may determine how resources are managed and deployed in family firms (Sirmon & Hitt, 2003). In particular, the *'family-like'* atmosphere in family firms is likely to extend to other non-family workers (Firfiray et al., 2016). The boundaries of *'family'* within the family firm are not objective and static, but rather negotiated and fluid. Through social connections, the development of a quasi-family based on distant kinship and ethnicity can ameliorate agency costs by aligning the interests of quasi-family members. Quasi-family is conceptualized as a set of relations that overlap and are intertwined with the biological family (Karra et al., 2006). For example, family firms offer employees job security in exchange for a lower wage like Bassanini et al. (2013) found.

We made the unobserved firm characteristics more concrete by investigating whether institutional instruments, such as the role of unions, explain differences in wages between family firms and non-family firms. We find that the bargaining power in family firms is lower than in non-family firms which implies that the role of unions in family firms is rather limited. Union-covered workers are paid more than their non-covered counterparts due to bargaining and rent extraction (Breda, 2015). So, this limited role of unions in family firms might give us an indication of why employees in family firms are on average paid less than in non-family firms. Our analysis further reveals that these results only hold for high-skilled firms.

The practical implications of this research point to the fact that, instead of saying that employees in family firms earn on average less than in non-family firms, employees in family firms may benefit from other non-monetary incentives. Thus, instead of simply looking at the monetary incentives or the total compensation package, it is better to look beyond the pay mix. The risks assumed by employees at all levels are personal ones, that of being fired (Carrasco-Hernandez & Sánchez-Marín, 2007). Family firms could potentially derive lower wages by increasing the effectiveness of their unique wage policies, like increasing the job security or by lowering the bargaining power of unions.

7.2. Suggestions for future research

This study is subject to some limitations, which provide opportunities for future research.

Our compensation measure is limited to the total annual cash compensation (base salary plus variable incentives). Investigating potential differences between base pay, variable cash incentives and non-monetary incentives appears to be a promising avenue for future research.

The generalizability of our results may be limited, as we exclusively observed firms in the Netherlands. As a result, it would be useful to expand the scope of this investigation to other countries in order to extent our findings and evaluate whether our results might be country-specific. Expanding the geographical area would be interesting and beneficial in developing our knowledge of compensation practices in firms. However, the Dutch case is a good example of a European corporatist labor market (Hartog et al., 2002). Corporatism is a structure of well-organized interaction and consultation between union federations, employer federations, and the national government on all issues of social economic policies, including labor legislation and social protection (Hartog et al., 2002).

This study uses a rather narrow measure of family firms that first of all did not allow us to further explore specific characteristics of family firms that might give a broader image of the wage aspects. Besides that, our measure of family firms also does not allow us to distinguish between different types of family firms. Family firms have general unique characteristics, but at the same time there are a lot of important differences between family firms. Future research should include more fine-grained family business variables to get a more comprehensive picture of what aspects of family involvement influence the employee wage level. The unique resources of family firms could influence some of the findings of this study. We therefore encourage future research to explore this possible influence.

Due to problems of data availability, our measure for union bargaining power is estimated by using a production function approach. Investigating other measures of union bargaining power would be a promising avenue for future research.

First, we relied on embedding the efficient bargaining framework into standard production function theory to recover rent-sharing parameters. This approach uses econometric production functions as a tool for testing the competitiveness of labor and product markets and for assessing their degree of imperfection (Dobbelaere & Mairesse, 2013). The productivity approach requires only standard production data to recover rent-sharing parameters. Furthermore, there is no need to measure the user cost of capital or the alternative wage, nor is it necessary to assume a constant-returns-to-scale production function (Dobbelaere & Mairesse, 2015). Measuring the user cost of capital has proven to be difficult and necessitates ad hoc assumptions on capital markets and on how firms depreciate their assets whilst imposing constant returns to scale assumes that every increase in inputs leads to a proportional increase in output (Dobbelaere & Mairesse, 2015). However, it could also be interesting to use the labor economics approach. In the labor economics approach, a wage equation[67] is estimated taking into account unobserved worker and firm heterogeneity. From the estimated industry-specific wage-profit elasticities, industry-specific rent-sharing parameters are retrieved (Dobbelaere & Mairesse, 2015). The labor economics approach has the advantage of being compatible with worker-firm negotiations that differ in terms of bargaining scope and puts no restrictions on the functional form of the production function (Dobbelaere & Mairesse, 2015).

Second, we suggest to investigate the *'wage cushion'* as measurement for union bargaining power. Whatever the wage floor agreed upon for each category of

[67] Dobbelaere and Mairesse (2015) use the 5th percentile value of the worker wage distribution of the employing firm *i* at time *t* in order to estimate the alternative wage $\bar{w}_{it}$.

worker at the collective bargaining table, firms are free to pay higher wages[68], and they often deviate from that benchmark, adjusting to firm-specific conditions (Fitzenberger et al., 2013; Raposo et al., 2015). This difference between the levels of actual and contractual wages is called *'wage cushion'* (e.g., Cardoso & Portugal, 2005; Deelen & Euwals, 2014; Jung & Schnabel, 2009). The presence of a wage cushion and the fraction of firms affected provide some information on the relative importance of collective wage bargaining by trade unions and employers associations on the one hand and of the determination of actual wages by individual firms on the other hand. Actual wages will be higher than stipulated in sectoral agreements if the economic situation and the ability to pay of the plant are better than assumed in sectoral bargaining and/or if the bargaining position of employees at plant level is better than at sectoral level. This explanation assumes that firms are forced to pay higher wages by the bargaining power of their employees. According to bargaining theory, the existence of a works council with substantial bargaining power in many areas should result in a higher wage cushion (Jung & Schnabel, 2009).

[68] Collectively agreed norms are minimum standards, which means that firms bound by (sectoral- or firm-level) collective agreements cannot undercut, but only improve upon these terms and conditions. For instance, they may offer longer holidays or they pay higher wages than stipulated in the collective agreements, which leads to a wage cushion (Jung & Schnabel, 2009).

PART III

INNOVATION – BELGIUM

CHAPTER 4

DATA COLLECTION

1. Introduction

Firms can distinguish themselves from their major competitors in terms of innovation, since innovation is generally considered as a way of improving the competitiveness, productivity, and the probability of survival of firms (e.g., Cefis & Marsili, 2006; Dabla-Norris et al., 2012; Hall et al., 2009). Indeed, innovation is an important determinant of productivity (Syverson, 2011). The purpose of this chapter is to get insights in the innovative behavior of private Belgian firms. In this chapter, we explicate the development of the survey instrument as well as the data collection process. Further details of the sample selection are provided, together with some general descriptive statistics regarding the corresponding private Belgian firms.

2. Recruitment

The focus of this study is on the innovative behavior of private Belgian firms. For testing our research questions an observational, cross-sectional study design was applied by using a survey sent by post. In addition, we complement the existing cross-sectional dataset with financial data from the Bel-First database, which is a publicly available financial database supplied by Bureau Van Dijk and contains detailed financial information on all Belgian firms. This database was also used to construct our survey population.

2.1. Population

Several predetermined criteria are employed to determine the survey population. All firms must be private companies, located in Belgium (the Flemish Region, the Walloon Region or the Brussels-Capital Region with Dutch or French as the official language). We require a minimum of 10 employees to exclude the micro organizations, because they strongly tend towards a high degree of informality in their organizational structure and management (Gray & Mabey, 2005). To ensure comparability and consistency, we further exclude all non-profit associations, public institutions, educational institutions, the agricultural sector, and the financial sector (i.e. financial services, banks and insurance companies). The survey population contains a total of 8786 Belgian firms which met the proposed criteria during September of 2015. Table H1 in Appendix H gives a comprehensive overview of the criteria used to determine the survey population.

2.2. Sample

In order to make the sample representative of the population of private Belgian firms, firms are selected through a random stratified sample according to firm size and sector classification (Nieto, Santamaria, & Fernandez, 2015). After manually deleting all double records[69], we dispose of a remaining selection of 3914 Belgian firms (see Table 18). We then distributed a paper version of the survey by post to the target group by the beginning of November 2015, which resulted in a response of 202 completed surveys. Two of the postal surveys returned to us due to incomplete or incorrect addresses. In February 2016, a second reminder on paper was eventually sent. This reminder resulted in an added 118 completed surveys and 14 returned to us due to incomplete or incorrect addresses. After a two-wave sending by post, a total of 320 surveys were obtained, which yields a response rate of 8.18%. This response rate is comparable with previous studies of privately held firms (Classen, Van Gils, Bammens, & Carree, 2012; Graham & Harvey, 2001; Vandekerkhof, Steijvers,

[69] Double records are two or more firms that hold a different registered organizational number, but have the same company address, the same ownership composition, the same CEO, and the same contact information (e-mail address). When two or more companies are considered to be the same, we delete the youngest (date of incorporation) or the smallest (FTE employees) one.

Hendriks, & Voordeckers, 2014). The final sample includes limited liability companies (85% public limited companies (in Dutch: nv), 10% private limited liability companies (in Dutch: bvba), and 5% cooperative companies with limited liability (in Dutch: cvba)).

Table 18: Sample selection

Population	8786
Stratification (firm size and sector)	4579
Deleting double records	293
Final sample	*3914*

3. Survey design

A survey (see Appendix J) was developed based on the questions used in other research in this area. To safeguard the relevance of the questions and maintain understandable language, the survey was developed in conjunction with a family business researcher of the Research Center for Entrepreneurship and Family Firms (RCEF). Before disputing the survey, multiple family business researchers and entrepreneurial practitioners pre-tested the survey and suggested a few modifications. This pre-test resulted in some rephrasing, adding a few extra options for answering selected questions and expanding the survey with other relevant questions. Since we are targeting all Belgian firms, a French survey was also developed in conjunction with a translation agency. To clarify the aim of our research and encourage the CEO to participate, the survey was preceded by a covering letter thereby assuring confidentiality of the disclosed information. Furthermore, we provided the possibility for a follow-up report of the results. A self-addressed postage paid reply envelope was also included.

The final survey comprised seven sections. The **first** section contained questions exploring the general firm characteristics, like the percentage export, being part of an enterprise group, sole ownership, firm considered as a family firm, family ownership, being a family firm in the past. The **second** section contained more specific questions about the CEO himself, namely sex, age, educational background, the number of experience gained (sub-divided into the number of years in the function of CEO, in the current firm and in the same industry), and the percentage of ownership in hands of the CEO. Additionally, we also collected some general information on the top management team, namely the number of family managers and non-family managers during the 2013-2015 period. The **third** section contained fourteen innovation questions which describe the following seven dimensions: (1) R&D expenditure, (2) entrepreneurial orientation capturing the firm's innovation, (3) product innovation, (4) process innovation, (5) organizational innovation, (6) innovation performance, and (7) open innovation. The **fourth** section contained four questions eliciting information on the debt financing of firms, also including a specific question on discouraged borrowers. These are good borrowers who do not apply for a bank loan because they feel they will be rejected (Kon & Storey, 2003). A firm in need of financing that is discouraged from applying for finance could be mistaken for a SME that does not need finance (Voordeckers & Steijvers, 2006). The **fifth** section must be completed by only the family firms because it contained questions on the family influence, namely the generation(s) in control of management, the generation(s) in control of ownership, the level of socioemotional wealth (on a five point Likert scale), having a family forum, having a family charter, and the willingness to change (on a seven point Likert scale). The **sixth** section contained questions getting more in depth information on the board of directors, namely the number of members on the board, and the specific composition of the board during the 2013-2015 period (internal directors, family directors working in the firm, family directors not working in the firm, affiliated directors, external directors with or without share capital). The **final** section contained questions about the shareholder structure, namely if there was a transfer of shares during the last ten years, the reason for this transfer of shares, and the specific composition of shareholder structure during the 2013-2015 period (non-family managers, family managers, family members not belonging to the management team, investment companies, employees, other shareholders).

4. Descriptive statistics

4.1. Controlling for non-response bias

Non-response bias can be tested by comparing characteristics of respondents who returned completed surveys and non-respondents who failed to return a completed survey (Whitehead, Groothuis, & Blomquist, 1993). In line with previous research, we checked for a potential non-response bias by comparing early respondents with late respondents. Late respondents, or those that respond after several attempts, are theorized to have some similarities with non-respondents (Graham & Harvey, 2001; Kanuk & Berenson, 1975). We conducted several independent t-tests to compare the mean for multiple variables included in the analyses (i.e. firm size, firm age, turnover, percentage export, CEO age, CEO tenure, percentage shares of CEO, R&D expenditures, size of management team, size of board of directors). The t-tests revealed that early and late respondents did not differ significantly with respect to any of the variables included in the study. This suggests that the chance for response bias in the results is very small.

4.2. Controlling for common method bias

4.2.1. Procedural remedies

Common method bias can be controlled through procedural remedies (ex-ante), which identify what the measures of the predictor and criterion variables have in common and eliminate or minimize it through the design of the study (Podsakoff, MacKenzie, & Lee, 2003). During the design and administration stage of the survey respondents were assured of confidentiality of the study. Due to this confidentiality, respondents will be less likely to modify their answers according to social desirability or how they think the researchers may expect them to answer (Chang, van Witteloostuijn, & Eden, 2010; Podsakoff et al., 2003). We have also improved the scale items by defining ambiguous or unfamiliar terms, avoiding vague concepts, keeping the questions simple and specific, avoiding complicated syntax and double-barreled questions (Podsakoff et al., 2003).

4.2.2. Statistical remedies

First, as suggested by Podsakoff et al. (2003) we carried out Harman's one-factor test. This technique assumes that if a substantial amount of common method variance is present, either (a) a single factor will emerge from the exploratory factor analysis, or (b) one general factor will account for the majority of the covariance among the measures (Podsakoff et al., 2003). We use an exploratory factor analysis where all variables are loaded onto a single factor and constrained so that there is no rotation. Following our analysis, the single factor accounts for only 27.496% of the total variance, which is below the 50% threshold (Podsakoff & Organ, 1986). In addition, we performed an exploratory factor analysis with all our items of the independent, dependent, and control variables, which leads to a six-factor solution and accounts for 68.912% of the total variance. The first factor explains 27.496% of the variance and the items of the dependent variable load on another factor than the items of the independent variable. All of this provides evidence that common method bias is not a major concern since no single factor accounts for the majority of variance.

Second, we controlled for the effect of a single unmeasured latent method factor. This second technique introduces a new latent variable in such a way that all manifest variables are related to it, those paths are constrained to be equal and the variance of the common factor is constrained to be 1. Items are allowed to load on their theoretical constructs, as well as on a latent common methods variance factor, and the significance of the structural parameters is examined both with and without the latent common methods variance factor in the model. In this way, the variance of the responses to a specific measure is partitioned into three components: (a) trait, (b) method, and (c) random error (Podsakoff et al., 2003). The common variance is estimated as the square of the common factor of each path before standardization. The common heuristic is to set the threshold to 50% (Eichhorn, 2014). According to our analyses, shared variance is between 12.96% and 29.16%. Taken together, the results of our tests suggest that common method bias is not a significant problem in this study.

4.3. General characteristics of the sample firms

4.3.1. Family definition

The focus group of our survey is family firms. As we cannot identify family firms ex ante, the survey included questions which enable us to assess whether the firm can be considered a family firm or not. A typical family firm is marked as an organization controlled and usually managed by multiple family members, whereby the uniqueness of a family firm is determined by the family's involvement in the business (Chua et al., 1999; Miller et al., 2007). Therefore, the family firm definition used in this research is based on frequently selected criteria of ownership (Anderson & Reeb, 2003; Chua et al., 1999) and the CEO's perception of being a family firm (Barbera & Moores, 2013; Westhead & Cowling, 1998). Accordingly, we define a firm as a family firm if (1) member(s) of a single family own(s) at least 50% of the shares and/or (2) the firm is perceived as a family firm by the CEO. According to this definition, our final sample consists of 187 (59%) family firms and 128 (41%) non-family firms.

4.3.2. General firm characteristics

Figure 7 below represents all respondent firms per geographical location in Belgium per region and Table 19 represents all respondent firms per province in Belgium.

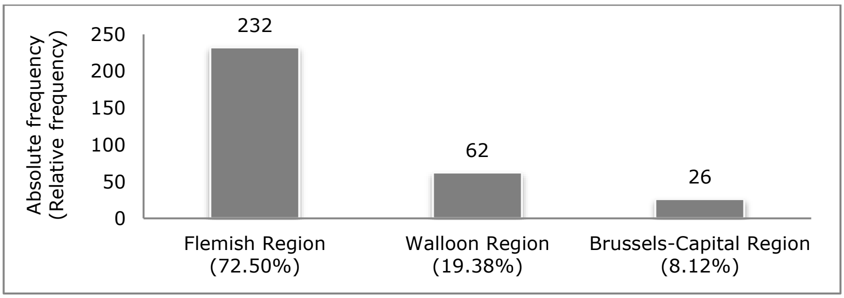


Figure 7: Firm location, region (N=320)

Table 19: Firm location, province

	Absolute frequency	Relative frequency
Antwerpen	75	23.44%
Limburg	49	15.31%
Oost-Vlaanderen	40	12.50%
Vlaams-Brabant	26	8.12%
West-Vlaanderen	42	13.13%
Flemish Region	***232***	***72.50%***
Henegouwen	15	4.69%
Luik	30	9.38%
Luxemburg	2	0.62%
Namen	6	1.88%
Waals-Brabant	9	2.81%
Walloon Region	***62***	***19.38%***
Brussels-Capital Region	***26***	***8.12%***

The majority of the sample firms are located in Flanders, which is responsible for 72.50% of the sample. This response sample is representative for our population, since there were 2530 (65%) Flemish firms, 847 (22%) Walloon firms and 537 (13%) firms situated in Brussels. These numbers largely correspond to the sample percentages. Figure 8 below represents all respondent firms per industry classification (based on the Bel-First database). The majority of the sample firms are manufacturing and service firms.

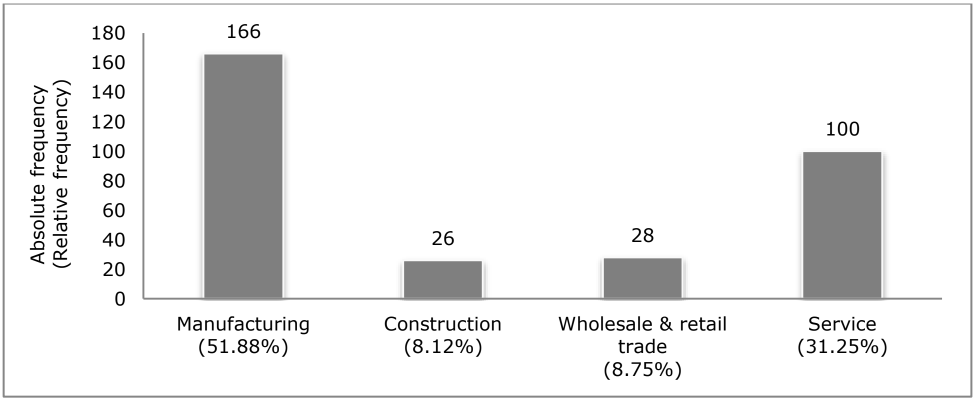


Figure 8: Firm industry (N=320)

Table 20 represents one-way Anova tests for equality of means for specific firm characteristics between firms located in the Flemish Region, the Walloon Region, or the Brussels-Capital Region. SPSS One-Way Anova tests if the means on a continuous variable for three or more populations are all equal.

Table 20: One-Way Anova for equality of means for firm characteristics by region (Flemish Region vs. Walloon Region vs. Brussels-Capital-Region)

	N	F	Sig.
Firm size	320	1.187	0.307
Firm age	320	0.182	0.834
Turnover	319	0.032	0.969
% Export	310	0.364	0.695
Age CEO	314	0.032	0.968
# managers	315	0.302	0.739
# product innovations	293	0.518	0.596
# patents	304	0.066	0.936
R&D 2015	271	1.228	0.294

The results show that the means for all those firm characteristics do not significantly differ between the Flemish Region, the Walloon Region, or the Brussels-Capital Region. Based on these firm characteristics, it is not possible to distinguish significantly different profiles between the three regions.

Table 21 shows that the average firm in our sample is 30 years old (the oldest being 95 years old, the youngest was founded in 2012) and has on average 154 employees (with a minimum of 10 and a maximum of 8212). The graphs below represent a sub-division of our sample in size- respectively age- categories. Concerning firm size, we created three size-categories in compliance with the official European definition: small (10-49 employees), medium (50-249 employees) and large (250 and more employees). As shown by Figure 9, the majority of the sample firms are small businesses. As for firm age, the majority of the sample firms are between 20 and 49 years in business (see Figure 10).

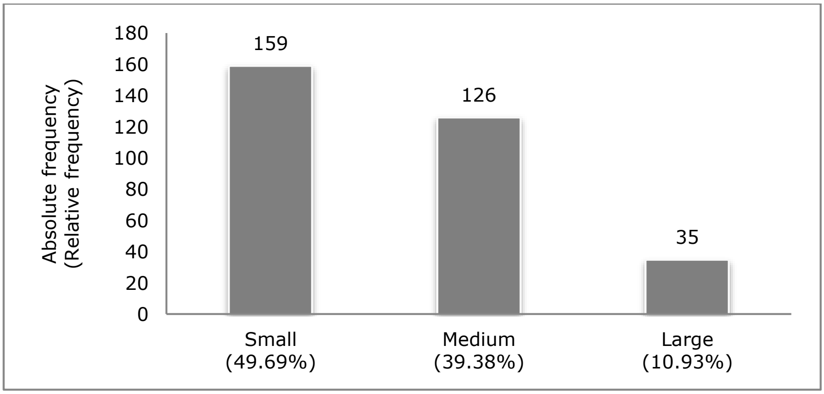


Figure 9: Firm size (N=320)

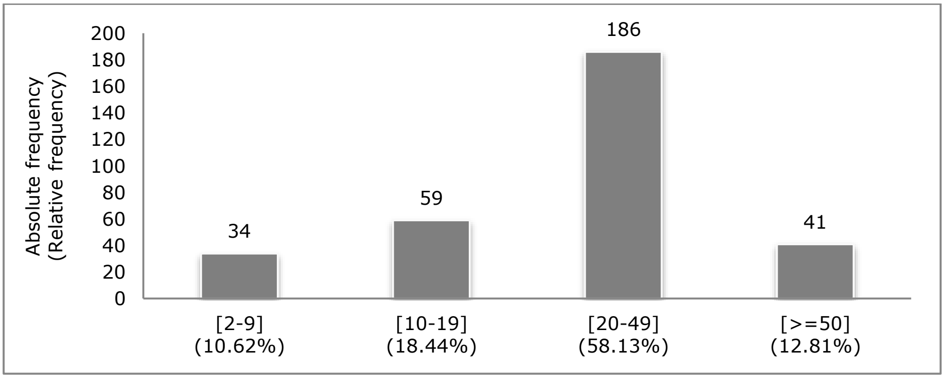


Figure 10: Firm age (N=320)

Table 21: Firm characteristics

	Min	Max	Mean	Sd.	N
Firm size	10	8212	153.75	528.45	320
Firm age	2	95	30.21	18.36	320
Turnover	0	6514918000	84401793.34	428334381.6	319
% export	0	100	40.99	37.49	310
R&D percentage	0	100	4.09	8.76	300

4.3.3. General CEO characteristics

Next, the survey contained more specific questions about the characteristics of the CEO himself. They are on average 53 years old (with a minimum of 34 and a maximum of 79). Over 96% of the CEOs in our sample are male, which is in line with previous studies in private firms (Lennon, 2014). Table 22 outlines the years of professional experience of the CEOs in our sample. We asked about the number of years the CEO is active in his current function, the firm he is now working in, and the industry he is currently active in. On average, the CEOs are working for over 22 years in this industry, 17 years in this firm and 13 years as a CEO. Figure 11 shows the highest educational level of the respondent CEOs. The majority of the sample CEOs have a university master degree.

Table 22: CEO age & tenure

	Min	Max	Mean	Sd.	N
Age CEO	34	79	52.83	7.454	314
Number of years active in the function of CEO	1	55	13.09	10.606	315
Number of years active in the firm	1	55	17.62	11.569	308
Number of years active in the industry	1	55	22.37	11.067	278

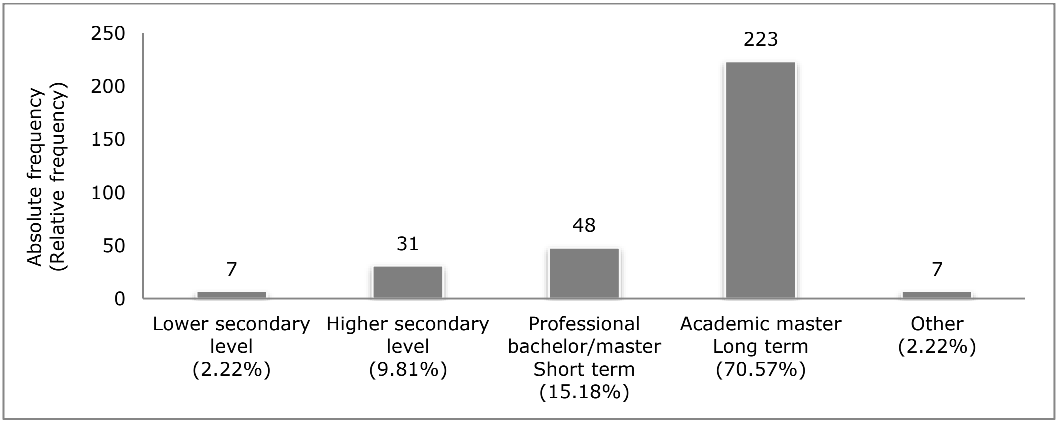


Figure 11: CEO education (N=316)

Table 23 below represents the CEO share ownership of our respondent CEOs. About 23% of the CEOs in our sample hold the majority of shares (>50%), this is mainly for family firms. In family firms, 40 CEOs do not own any shares of the firm, while this number is much larger in non-family firms (89 CEOs). 24 CEOs own all the shares in family firms.

Table 23: CEO ownership per ownership type (N=298)

% shares CEO	Family firms	Non-family firms
0%	40	89
1-25%	32	24
26-50%	40	4
51-75%	17	0
76-99%	28	0
100%	24	0

Following Villalonga and Amit (2006), family firm CEOs can be classified in three groups based on their relation with the owning family. The first group contains the first generation family CEOs or the founder CEOs. The second group contains the descendant CEOs (second or later generation), while the third group contains the external non-family CEOs. Our sample consists of 29 founders, 85 descendant CEOs and 43 non-family CEOs. Figure 12 gives an overview of these types of CEO in family firms. In Table 24 we can see that in our sample no external CEO owns 100% of the shares in a family firm. 41 descendant CEOs own more than 50% of the shares in family firms.

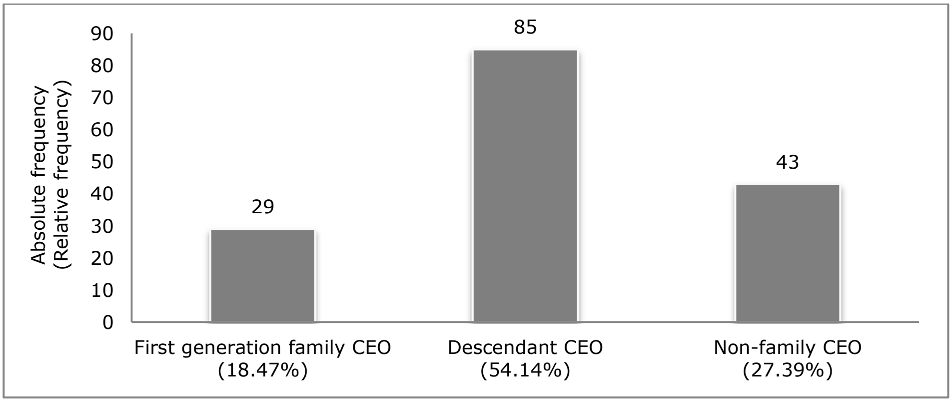


Figure 12: Types of family firm CEOs (N=157)

Table 24: CEO ownership per type of family firm CEO

% shares CEO	1st generation family CEO	Descendant CEO	Non-family CEO
0%	2	7	27
1-25%	2	11	12
26-50%	8	24	2
51-75%	5	6	1
76-99%	4	22	0
100%	8	13	0

4.3.4. Corporate governance

Table 25 provides some insights in the management team composition of the firms in the dataset. The average firm had a management team in 2015 that consists out of 5.50 managers. Of these firms, the CEO is also the chairman of the board of directors in 52.47% of the cases[70] (see Figure 13). In 2014 (2013), the average firm had a management team that consists out of 5.416 (5.412) managers.

Table 25: Average management team composition

	2015	2014	2013
Number of managers in management team	5.50 (N=315)	5.416 (N=308)	5.412 (N=306)

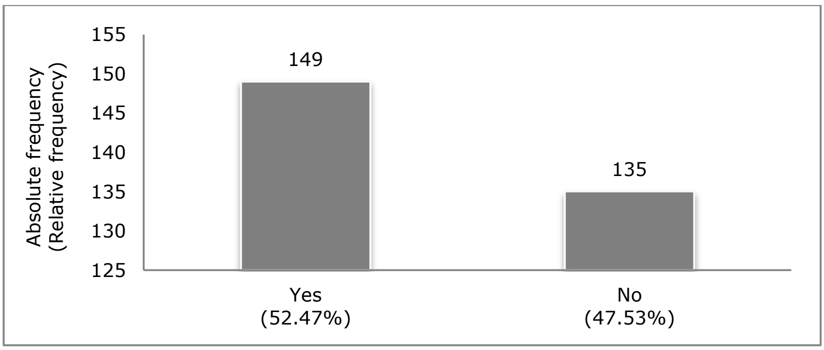
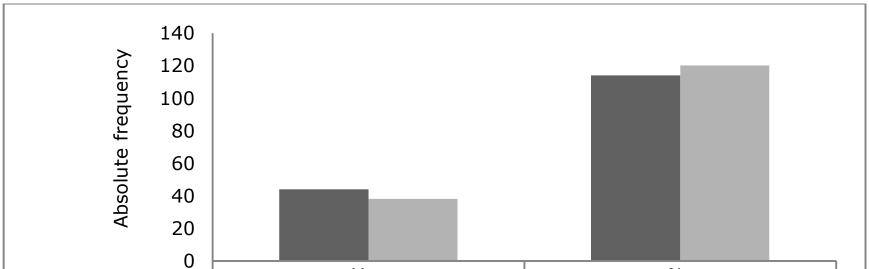


Figure 13: CEO is chairman of board of directors

[70] Called CEO duality.

In order to manage supervision and control, family firms need special governance mechanisms, which consider the multiple roles that family members play within the family and the firm (Mustakallio, Autio, & Zahra, 2002). According to Suess (2014), *"family governance consists of voluntary mechanisms established by the business family with the primary aim of governing and strengthening relations between the family and the business, as well as the relationships between the members of the business family itself"* (p. 139). Examples of governance mechanisms within the family firm are a family forum and/or a family charter.

A family forum (also referred to as a family meeting) is a platform on which family members can discuss business and/or family issues and resolve family conflicts before they affect the firm (Habbershon & Astrachan, 1997; Suess, 2014). A family charter (also referred to as a family constitution or family code of conduct) is a document which clarifies fundamental principles, guidelines, and rules regarding the relationship of the family to the firm. For example, fundamental governance issues such as the sale/purchase of shares or hiring/firing family members are documented in the family charter. The main goal of a family charter, which is developed by a wide group of family members, is to improve the communication process and strengthen the commitment to the same norms and values in order to enhance the cohesiveness of the owning family (Berent-Braun & Uhlaner, 2010; Suess, 2014). 27.85% of the sub-group of family firms has established a family forum and 24.05% had formulated a family charter (24 family firms have both a forum and a charter, see Figure 14).



	Yes	No
Family forum	44	114
Family charter	38	120

Figure 14: Family governance mechanisms (N=158)

4.3.5. Debt financing

Figures 15, 16 and 17 provide some insights in the debt financing of firms in the dataset. 47.62% of the firms in our sample has requested for debt financing during the last 3 years. Only 16 firms in our sample did not apply during the last 3 years when the firm needed credit because they thought their application would be turned down. This is known as discouraged borrowers, which are good borrowers who do not apply for a bank loan because they feel they will be rejected (Kon & Storey, 2003). Access to finance is for 184 sample firms (59.16%) not considered as a problem for the operation and growth of their business, while only 6 firms consider access to finance as a major obstacle.

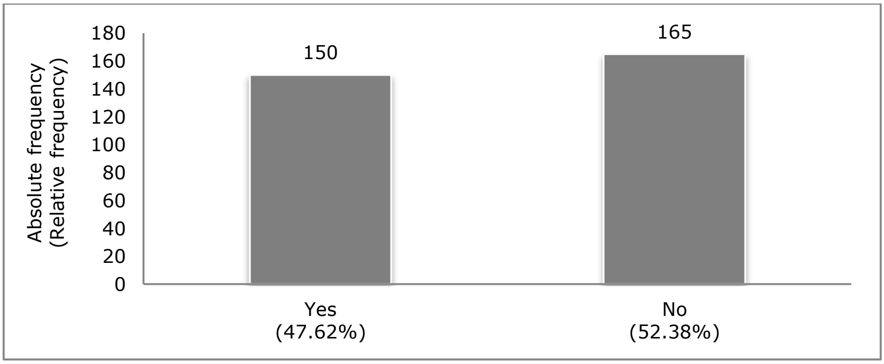


Figure 15: Request for debt financing during 2013-2015 (N=315)

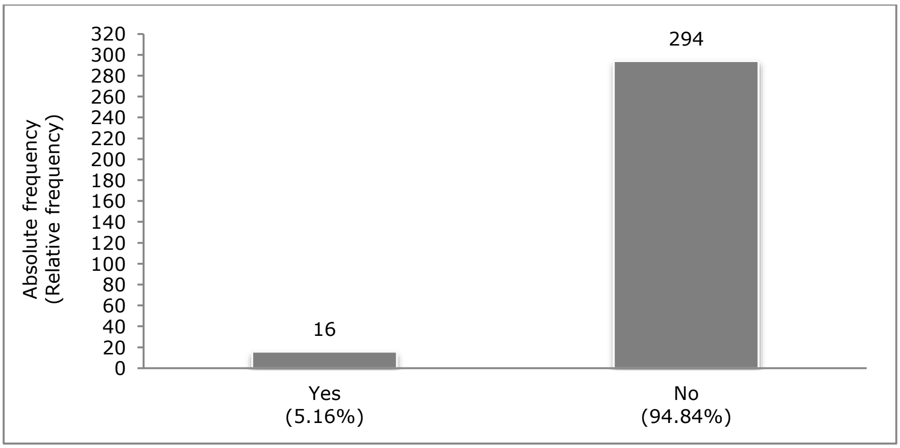


Figure 16: Discouraged borrowers during 2013-2015 (N=310)

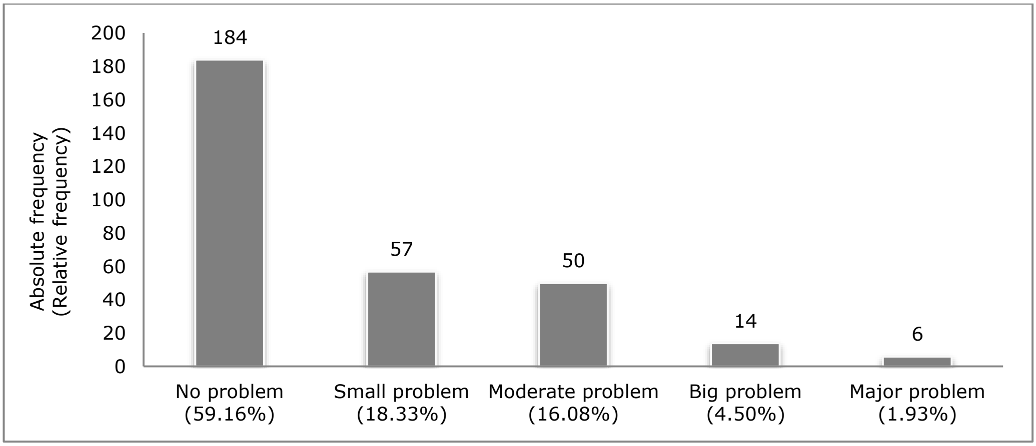
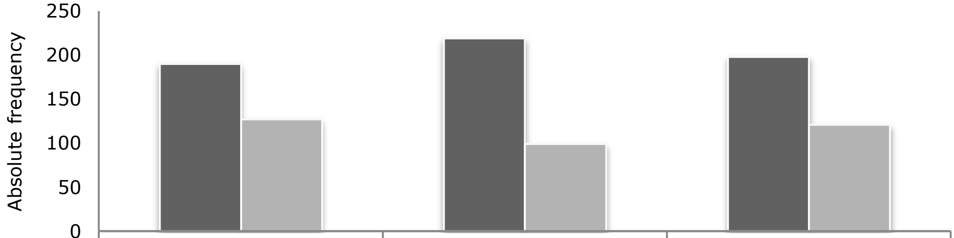


Figure 17: Access to finance is a problem (N=311)

4.3.6. Innovation

When we scrutinize the dataset of private Belgian firms regarding three innovation types, we can see a relatively equal representation concerning the different innovation types, which is illustrated in Figure 18. The data on these three innovation types is based on the question asked in the Community Innovation Survey[71] (CIS). More specifically, 59.94% of the sample firms introduced new or significantly improved goods and/or services during the three years 2013-2015. More than 71% of those product innovations were realized through active participation with other enterprises or non-commercial institutions. 68.87% of the sample firms introduced new or significantly improved processes and/or methods during the three years 2013-2015. 62.07% of the sample firms introduced new or significantly improved knowledge management systems, changes in the management structure and/or changes in relations with other firms or public institutions during the three years 2013-2015.

[71] The CIS is an official survey of the European Commission and Eurostat and conducted in several European Union Member States. It develops insights into private organizations' innovative behavior.



	Product innovation	Process innovation	Organizational innovation
Yes	190	219	198
No	127	99	121

Figure 18: Types of innovation

We have specified the three types of innovations by using items which are based on a scale of Zahra et al. (2000). The response format of each item consisted of a five-point Likert scale, ranging from *'not relevant'* (1) to *'relevant'* (5). If we look at the means of the average scores of the items in each of the three innovation types, we find that our results are in line with the previous study of Zahra et al. (2000) in US manufacturing companies. Only the mean value of organizational innovation is slightly divergent.

A large number of the respondents (43.08%) reported to either *'rather relevant'* (26.42%) or *'relevant'* (16.66%) that their firm is the first in the industry to introduce new products to the market. This result is in line with the following questions "our firm creates radically new products for sale in the firm's existing markets", "our firm commercializes new products" and "our firm invests heavily in cutting edge product-oriented R&D". The response pattern of "our firm creates radically new products for sale in new markets" is different, since the majority of respondents (50.79%) reported to either *'not relevant'* or *'rather not relevant'*. The results are provided in detail in Table 26.

The responses on the three last items on process innovation show a similar pattern, with the majority of the responses reporting *'neutral'*. This is a rather surprising finding, since the last question is reverse coded. This means that its response pattern should be reversed compared to the other scale items. Additionally, the first question indicates how much emphasis the firm puts on investing heavily in cutting edge process technology-oriented R&D. For this item, the majority of respondents (103) reported *'rather relevant'*. The results are provided in detail in Table 27.

The response patterns of all four organizational innovation scale items are very similar, with the majority of the respondents reporting *'neutral'*. This is also confirmed by the histograms (see Appendix I). Only a minority of the respondents report *'relevant'* to the organizational innovation questions. The results are provided in detail in Table 28.

Table 26: Product innovation

Question	Not relevant	Rather not relevant	Neutral	Rather relevant	Relevant
Our firm is the first in our industry to introduce new products to the market	45 (14.15%)	58 (18.24%)	78 (24.53%)	84 (26.42%)	53 (16.66%)
Our firm creates radically new products for sale in new markets	82 (25.87%)	79 (24.92%)	63 (19.87%)	68 (21.45%)	25 (7.89%)
Our firm creates radically new products for sale in the firm's existing markets	45 (14.24%)	51 (16.13%)	55 (17.41%)	110 (34.81%)	55 (17.41%)
Our firm commercializes new products	53 (16.72%)	48 (15.14%)	79 (24.92%)	98 (30.92%)	39 (12.3%)
Our firm invests heavily in cutting edge product-oriented R&D	71 (22.4%)	54 (17.04%)	65 (20.5%)	89 (28.07%)	38 (11.99%)

Table 27: Process innovation

Question	Not relevant	Rather not relevant	Neutral	Rather relevant	Relevant
Our firm invests heavily in cutting edge process technology-oriented R&D	45 (14.15%)	67 (21.07%)	81 (25.47%)	103 (32.39%)	22 (6.92%)
Our firm is the first in the industry to develop and introduce radically new technologies	73 (22.96%)	59 (18.55%)	96 (30.19%)	58 (18.24%)	32 (10.06%)
Our firm is a pioneer in the creation of new process technologies	79 (24.84%)	72 (22.64%)	95 (29.87%)	56 (17.62%)	16 (5.03%)
Our firm copies other firms' process technologies	86 (27.22%)	69 (21.84%)	103 (32.6%)	52 (16.46%)	6 (1.88%)

Table 28: Organizational innovation

Question	Not relevant	Rather not relevant	Neutral	Rather relevant	Relevant
Our firm is the first in the industry to develop innovative management systems	84 (26.42%)	68 (21.38%)	108 (33.96%)	51 (16.04%)	7 (2.2%)
Our firm is the first in the industry to introduce new business concepts and practices	76 (23.98%)	73 (23.03%)	104 (32.81%)	57 (17.98%)	7 (2.2%)
Our firm changes the organizational structure in significant ways to promote innovation	61 (19.12%)	66 (20.69%)	95 (29.78%)	84 (26.33%)	13 (4.08%)
Our firm introduces innovative human resource programs to spur creativity and innovation	72 (22.86%)	74 (23.49%)	95 (30.16%)	61 (19.37%)	15 (4.12%)

Figure 19 gives us information about the R&D expenditure. We can see that 54 firms have not invested in R&D, while only 6 firms indicate that they have invested more than 20% of turnover in R&D. The average R&D expenditure for our sample respondent firms is 4.09% with a standard deviation of 8.76. This average is slightly higher than the average R&D expenditures in Belgium found in other studies (e.g., Duguleană & Duguleană, 2011; Hurduzeu & Lazar, 2016; Piekut, 2013).

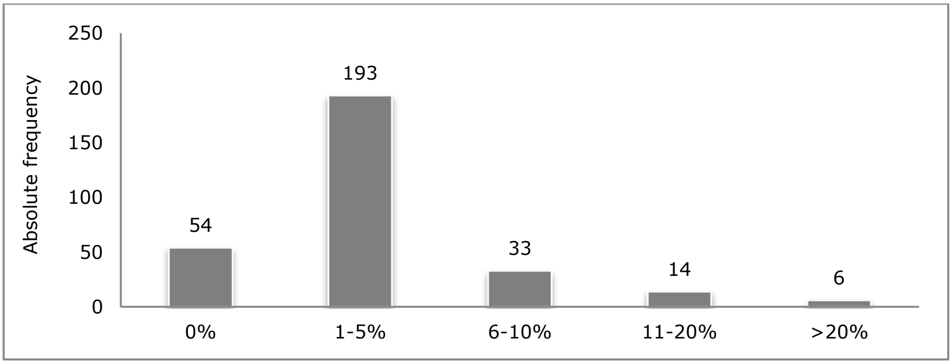


Figure 19: R&D expenditure as percentage of the turnover (N=300)

There is a limited creation of knowledge-based assets in the form of patents: the majority of firms (81.91%) have never filed a patent during the 2013-2015 period (see Figure 20). This result is in line with the previous study of Wright, De Massis, Scholes, Hughes, and Kotlar (2016) in UK family companies.

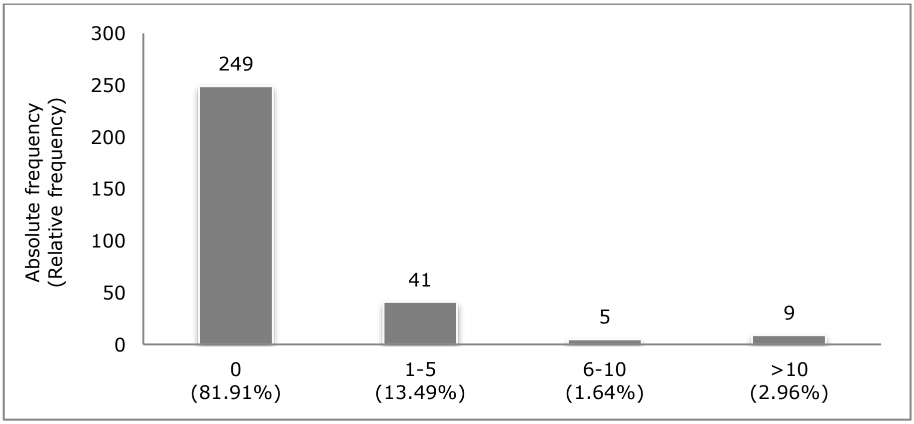


Figure 20: Innovation performance - patents filed (N=304)

Almost 57% of our respondent firms did introduce new or significantly new products and/or services during 2013-2015 (see Figure 21). More than 71% of these firms had realized these new products and/or services through active collaboration with external partners (see Figure 22). Firms can benefit from a collaborative innovation strategy, since it might give them access to contemporary know-how and assets that would not be accessible otherwise. Furthermore, collaborating on joint innovation projects allows firms to share some of the risks and costs with these partners (Lambrechts et al., 2017; Pop, Roijakkers, Coita, & Constantin, 2015).

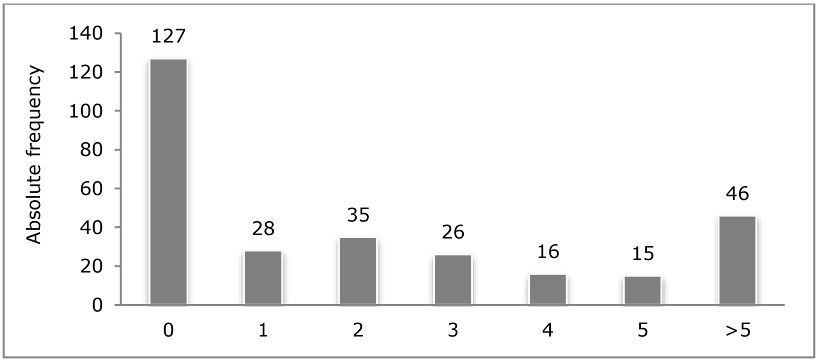


Figure 21: Number of new products/services introduced during 2013-2015

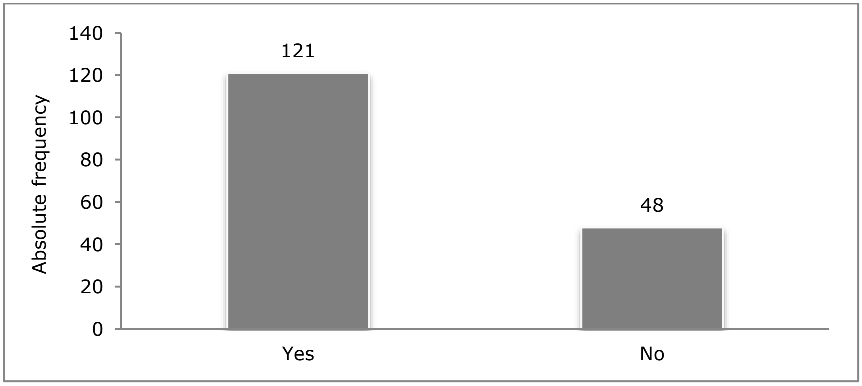


Figure 22: Active collaboration with external innovation partners

Table 29 provides an overview of the open innovation activities in our sample in terms of the spread in their use of different types of open innovation partners, i.e. other enterprises within the enterprise group, suppliers, clients, competitors, consultants, universities, and government. From this table we can infer that the preferred open innovation partners (in terms of frequency of use) of our sample firms are their suppliers and clients. Competitors and government/public research institutions are perceived as a less-established source of joint innovation projects for many firms in our sample.

Table 29: Innovation partners

Type of innovation partner	Yes	No
Other enterprise(s) within your enterprise group	54	66
Suppliers of equipment, materials, components or software	78	43
Clients or customers	67	52
Competitors or other enterprises in your sector	16	104
Consultants, commercial labs, or private R&D institutes	48	71
Universities or other higher education institutions	53	67
Government or public research institutes	30	89

4.3.7. Generational involvement in family firms

As illustrated in Figure 23 and Figure 24, our findings offer important insights about the generational involvement of family members. Within the group of family firms, the first and second generation own the majority of shares in almost three-quarters of the respondent firms. Only 46 longer-standing family firms are owned by the third or later generation in this sample. Almost a quarter of the sampled family firms are run by the first generation and about 50% of the sampled family firms is managed by the second generation. In this sample, there were 46 cases of family firms where the third or later generation is involved in management.

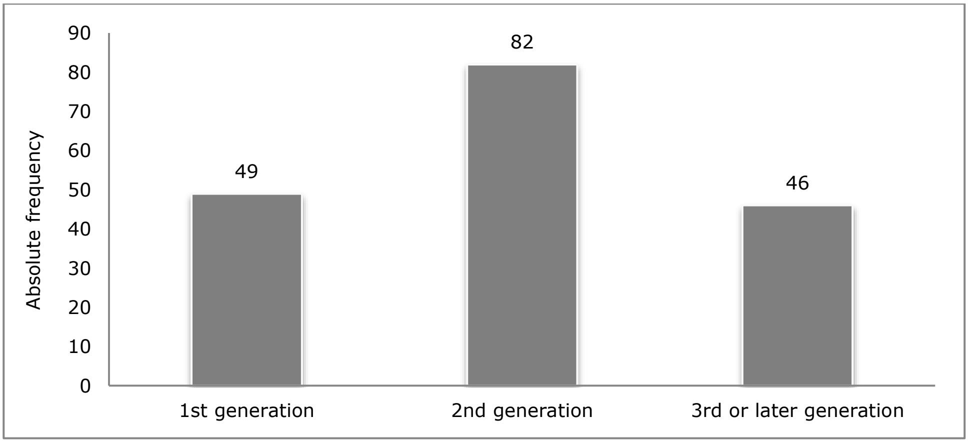


Figure 23: Number of generations involved in the ownership of the firms

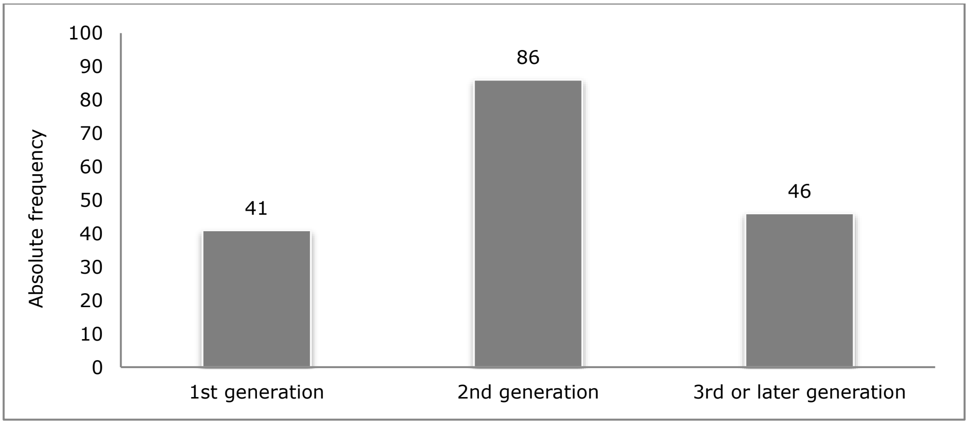


Figure 24: Number of generations involved in the management of the firms

4.3.8. Differences between family firms and non-family firms

Table 30 represents independent samples t-tests for equality of means for the firm characteristics between the family firms and non-family firms in our sample. The results show that the family firms in our sample are on average smaller (i.e., they have less full-time equivalent employees) as compared to their non-family counterparts and they have on average lower turnover. Additionally, the percentage of turnover realized in foreign markets (i.e., export rate) is on average lower in family firms in comparison with non-family firms. Family firm

CEOs have significantly more experience within the function, the firm, and the industry. These figures are similar to the ones found by Lambrecht and Molly (2011) in their study about the economic importance of family businesses in Belgium. Family firm CEOs generally have much more share ownership –CEOs of family firms own on average 45.68%–, whereas CEOs of non-family firms own on average 4% of the shares. Non-family firms have on average more managers in their management team. Concerning firm age, CEO age, number of product innovations introduced, R&D expenditures in 2015, and R&D expenditures in 2014 there are no significant differences between both groups.

Ownership structure should be considered as a key determinant of the firm's innovation level (P. M. Lee & O'Neill, 2003). The way through which ownership rights are distributed within the business is known as the ownership structure. The central element shaping the ownership structure of a business is the degree of concentration of equity ownership (Belloc, 2012). Concentrated ownership can be an efficient solution for agency conflicts (Shleifer & Vishny, 1997). Innovation creates wealth and accordingly releases new business opportunities. Family firms might be motivated to adopt a more proactive innovation approach due to the positive impact of innovation on productivity growth and competiveness (e.g., Classen et al., 2014; Nieto et al., 2015).

The question whether family ownership has a positive or negative effect on innovation is still open. Moreover, the empirical evidence is mixed. A first part of the empirical literature finds a negative relationship between family involvement and innovation, indicating that family firms are on average less innovative than non-family firms (e.g., H.-L. Chen & Hsu, 2009; Tanewski, Prajogo, & Sohal, 2003). The relationship between family firms and innovation might be expected to be negative since family firms might have some characteristics that harm innovation, like their resistance to change, their conservatism and their risk aversion (e.g., H.-L. Chen & Hsu, 2009; Nieto et al., 2015).

However, a second part of the empirical literature observes a positive relationship between family involvement and innovation (e.g., Classen et al., 2014; Gudmundson, Tower, & Hartman, 2003)[72] by arguing that innovation is associated with the survival instinct and the long-term orientation of family firms (e.g., Classen et al., 2014; Nieto et al., 2015). Innovation creates wealth and accordingly releases new business opportunities. Family firms might be motivated to adopt a more proactive innovation approach due to the positive impact of innovation on growth and competiveness (e.g., Classen et al., 2014; Nieto et al., 2015).

Regarding innovation, we find differences in mean values between family firms and non-family firms. This could reflect a dissimilar innovation structure/behavior between family firms and non-family firms. Family firms indicate to engage, on average, more in product, process and organizational innovation compared to non-family firms. Family firms are often regarded as an amicable environment for entrepreneurial activities and as a major source of technological innovations (Chu, 2009). Zahra and Filatotchev (2004) indicate that the sharing of information, tacit knowledge in particular, is facilitated by strong personal and stable relationships that are embedded in trust, which are typical characteristics of family firms. Moreover, we find that family firms introduce on average less new or significantly improved products and/or services than non-family firms. Furthermore, we also find that family firms are more likely to collaborate actively with external innovation partners. Most innovation nowadays requires extensive knowledge and resources to cope with issues that arise in the various stages of the innovation process. So, opening their boundaries and collaborating are essential for innovation success (Lambrechts et al., 2017).

However, family firms' R&D policies seem more diverse than those of non-family firms in general (Chrisman & Patel, 2012). We find that the average R&D expenses in family firms (3.9%) are lower than in their non-family counterparts (4.45%). Chrisman and Patel (2012) confirm our finding that family firms generally invest less in R&D, which they attribute to family owners' and managers' attempts to avoid perceived threats to their socioemotional wealth.

[72] Family firms implement more innovations in comparison with non-family firms (Gudmundson et al., 2003). Classen et al. (2014) find that family SMEs are more likely to adopt a positive but less intensive innovation investment than non-family SMEs.

Investments in R&D are sunk costs that have a longer payoff horizon and entail substantial risk (P. M. Lee & O'Neill, 2003). Failed R&D attempts might damage a firm's reputation and reduce the SEW of the owning family due to the strong link between the firm and the family name (Dyer & Whetten, 2006). Moreover, investments in R&D require substantial financial investments (Chrisman & Patel, 2012). A family firm may be reluctant to dilute their control of their firm by seeking outside equity (Sirmon & Hitt, 2003). Furthermore R&D projects also involve specialized human capital investments (Chrisman & Patel, 2012). The quantity and quality of human capital in family firms might be limited. For example, family firms often have difficulties in attracting and retaining highly qualified employees. Highly skilled and qualified managers may avoid family firms due to limited potential for professional growth, exclusive succession and limitations on wealth transfer (Sirmon & Hitt, 2003). Family firms lack necessary skills and abilities due to a small labor pool, lack of talent, or inadequate training (Bresciani et al., 2013; Dyer, 2006; Llach & Nordqvist, 2010). These managerial capacity constraints (Carney, 2005) might limit family firms' ability to manage the R&D process and increase the hazards associated with making such investments (Chrisman & Patel, 2012).

Table 30: T-tests for equality of means for firm characteristics by ownership type

	Family firms			Non-family firms			
	N	Mean	**Sd.**	**N**	**Mean**	**Sd.**	**t-score**
Firm size	187	82.36	112.49	128	252.63	809.46	2.364**
Firm age	187	31.1	17.1	128	28.79	20.17	-1.095
Turnover	186	33143816.89	98667165.79	128	158743162.1	659780785.1	2.137**
% export	186	37.81	35.03	120	45.68	40.33	1.753*
Age CEO	186	52.8	7.9	124	52.65	6.65	-0.165
% shares CEO	181	45.98	38.05	117	3.18	7.71	-14.682***
# managers	186	4.99	2.77	125	6.27	3.71	3.298***
# product innovations	172	7.57	40.5	117	7.87	46.39	0.059
R&D	156	2684291.67	18003780.57	110	6925913.64	48042304.92	0.883
R&D percentage	175	3.9	9.76	120	4.45	7.29	0.526

Note: We used the Levene's test to check if the variances between the averages are equal. If the null hypothesis of equal variances is rejected, we performed a two-sample t-test with unequal variances; otherwise we performed a two-sample t-test with equal variances.
*Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

CHAPTER 5

THE ROLE OF EXTERNAL FINANCIAL CONSTRAINTS IN EXPLAINING INNOVATIVE BEHAVIOR OF PRIVATE FAMILY FIRMS

1. Introduction

Innovation is a key management challenge for family firms, as it increases productivity, performance, competiveness and long-term survival of family firms (e.g., Cefis & Marsili, 2006; Dabla-Norris et al., 2012; Hall et al., 2009; Price et al., 2013). Family firms are typically driven by the preservation of their socioemotional wealth, for example their intentions for transgenerational control, the need for family control and their desire to maintain the family dynasty for a long time (Berrone et al., 2012; Gómez-Mejía et al., 2007). As a consequence, it is important that family firms develop an innovative mindset that allows them to renew the firm, enhance their competitive advantage, stimulate growth and create new employment opportunities (Hayton & Kelley, 2006; Nieto et al., 2015). Given the central role a family plays in determining the strategic direction of the firm (Chua et al., 1999), the firm’s innovative behavior might be influenced by family involvement, since innovation is an important element of the strategic direction of firms (Sirmon & Hitt, 2003; Stieglitz & Heine, 2007). However, it is not clear whether the family involved is a help or a hindrance to the successful family firm’s innovative behavior (Kellermanns, Eddleston, Sarathy, et al., 2012). Given this inconsistent evidence, it is important that the study of family firms moves forward and focuses on explaining variations in innovative behavior between family firms. Therefore, this study investigates why some family firms are more successful in performing innovative behavior compared to others.

Family firms typically have two unique family-based characteristics (i.e. ability and willingness), which can help them to engage in particularistic behavior, such as innovation (e.g., Chrisman, Chua, De Massis, Frattini, & Wright, 2014; Gómez-Mejía et al., 2007; Naldi, Nordqvist, Sjöberg, & Wiklund, 2007; Zahra, 2005). Chrisman, Chua, Pearson, and Barnett (2012) suggest that family involvement in ownership, management and governance offers the family the ability to engage in particularistic behavior. Ability can be defined as the owners' discretion to direct, allocate, add to or dispose of firm's resources (Chrisman et al., 2014; Chrisman et al., 2012; De Massis et al., 2014). However, De Massis et al. (2014) indicate that ability alone is not enough for family firms to engage effectively in that particularistic behavior. The behavior of family firms is determined by the combination of ability and willingness of its owners, managers and board members to pursue specific goals, policies and strategies (De Massis et al., 2014). Willingness is considered as the disposition of the family owners to engage in distinctive behavior based on goals, intentions and motivations (Chrisman et al., 2014; De Massis et al., 2014). Given the heterogeneous nature of family firms and their diverse characteristics, it is important to note that the different goals of family firms are a driving force in directing the firm behavior (Llach, Marquès, Bikfalvi, Simon, & Kraus, 2012). Thus, no particular organizational behavior will be exhibited in a firm with family involvement, unless the family involved is both able and willing to engage in it (De Massis et al., 2014). De Massis et al. (2014) focus in their study on the behavior among firms with family involvement that, if it exists, is idiosyncratic when compared with that of firms without family involvement and, thus, differentiates the two types of organizations. This behavior has been called family-oriented particularistic behavior.

We consider innovation to be an essential example of this family-oriented particularistic behavior, since innovation is a central part of the strategic direction of firms (e.g., Sirmon & Hitt, 2003; Stieglitz & Heine, 2007) and it is a vital component of the entrepreneurial behavior of firms (Miller, 1983). It is generally expected that family firms will have a different innovative behavior in comparison with non-family firms, because of different goals, risk taking, investment horizon (e.g., Chrisman et al., 2012; Gómez-Mejía et al., 2007), and the capability of developing distinctive resources (Habbershon & Williams, 1999). For example, family firms and non-family firms can have different innovation strategies and might organize the innovation process in another way (De Massis, Frattini, Pizzurno, & Cassia, 2015). Ownership structure is a key determinant of the firm’s innovation strategy (P. M. Lee & O'Neill, 2003). Innovation might be influenced by the unique characteristics of family firms, including specific advantages and disadvantages to their particular agency situation (Matzler, Veider, Hautz, & Stadler, 2015). Therefore, we apply the family-oriented particularistic behavior model of De Massis et al. (2014) on innovative behavior by saying that no innovative behavior will be exhibited in a firm with family involvement, unless the family involved is both able and willing to engage in it.

However, having the ability and willingness to innovate does not guarantee family firms to engage effectively in innovative behavior. The literature on family-oriented particularistic behavior in combination with ability and willingness seems to focus only on family-based resources (Chrisman et al., 2014; De Massis et al., 2014), thereby ignoring the vital role of financial resources. According to the resource-based view (Newbert, 2007; Sirmon & Hitt, 2003), families need adequate financial funds in order to manage the unique family resources (S. Coleman & Carsky, 1999; Koropp, Grichnik, & Kellermanns, 2013). Financial resources allow the pursuit of creative and innovative strategies (Sirmon & Hitt, 2003). Limited financial resources may hinder the family firm’s innovation level (Czarnitzki & Hottenrott, 2011; Hottenrott & Peters, 2012; Scopelliti, Cillo, Busacca, & Mazursky, 2014). These financial resources are important yet overlooked resources, because they can explain the inconsistent evidence concerning the impact of family involvement on innovative behavior in family firms. The financial resources used to fund innovation projects might be affected by the characteristics of financial capital in family firms (De Massis et al., 2015). More specifically, financial resources can offer an explanation why some family firms, who have the ability and willingness to innovate, eventually do not engage in innovative behavior. For example, The lack of external financing funds may hinder the family's capability to manage the resources in order to attain a competitive advantage in terms of innovation. Financial constraints are expected to play an important role in the gap between ability and willingness to innovate and the actual innovative behavior of family firms. Relying and drawing on the resource-based view, we investigate the moderating role of financial constraints on family firm's innovative behavior.

Our study has several important contributions to the literature. First, we add to the family firm field by extending the literature on innovation in family firms. In particular, we present a framework useful for understanding what factors can explain whether family firms succeed or fail in innovative behavior. The framework is based on two drivers of family-oriented particularistic behavior – ability and willingness– and the paradox[73] that they cause in family firms as they try to manage the innovation process. Second, we add to the literature on financial constraints in family firms by considering financial constraints as a moderator that strengthens the gap between ability and willingness to innovate and actual innovative behavior. The relationship between ability and willingness to innovate and innovative behavior appears to be more complex than currently assumed. We expand the resource-based view to family firm innovative behavior by introducing the overlooked financial resources, while previous studies mainly used the agency theory and stakeholder theory in predicting family firm behavior. Finally, we put emphasis on measuring the two separate but interrelated family involvement engendered theoretical constructs: ability and willingness. Unlike previous studies, we find theoretical and empirical evidence that it is rational to conceptualize and measure the socioemotional wealth index by a formative construct[74]. We suggest Partial Least Squares Structural Equation Modeling (PLS-SEM) as an advanced estimation method because it allows us to review all of the constructs' conceptualizations and specify them as formative or

[73] The ability and willingness paradox in family firm innovation argues that family firms have superior ability yet lower willingness to engage in innovation (Chrisman et al., 2014).
[74] Formative measurement model is a type of measurement model setup in which the direction of the arrows is from the indicator variables to the construct, indicating the assumption that the indicator variables cause the measurement of the construct (Hair, Hult, Ringle, & Sarstedt, 2014).

reflective[75], avoiding misspecification of the model. Using PLS-SEM allows us to take into account the multidimensional aspect of socioemotional wealth.

The rest of the chapter is organized as follows. In section 2, we give a brief overview of the literature on innovative behavior in family firms, which may help the reader in appreciating the empirical results presented later in the chapter. In section 3, we describe the data used and the variables included in the empirical model. Section 4 presents the empirical model and our estimation strategy, with a focus on Partial Least Squares Structural Equation Modeling. Section 5 contains an overview of the main results, followed by some in-depth analyses and robustness checks. Section 6 discusses and summarizes the results, while section 7 formulates some concluding remarks.

2. Literature review

Innovation is generally considered as a way of improving the competitiveness, growth and probability of survival of family firms (e.g., Habbershon & Pistrui, 2002; Naldi et al., 2007). Innovation refers to the action of generation, acceptance and implementation of new ideas, processes, products or services (Thompson, 1965). However, the decision to engage in innovative behavior is not always simple for family firms. The pursuit of two, sometimes conflicting, goals can inhibit family firms from effectively implementing innovation (Kellermanns, Eddleston, Sarathy, et al., 2012). Family firms can find it difficult to attract highly skilled non-family managers who have high opportunity costs[76] because family firms may not be able to credibly guarantee career progression of these managers to positions of strategic seniority (e.g., Bhaumik & Dimova, 2015; Raposo et al., 2015). For example, the family firm might attempt to be financially successful while simultaneously managing the family's affective needs, like maintaining family traditions or creating jobs for the family (Kellermanns, Eddleston, Sarathy, et al., 2012). In addition, the decision to

[75] Reflective measurement model is a type of measurement model setup in which the direction of the arrows is from the construct to the indicator variables, indicating the assumption that the construct causes the measurement of the indicator variables (Hair et al., 2014).
[76] Opportunity cost is the evaluation placed on the most highly values of the rejected alternatives or opportunities (Buchanan, 1991).

engage in innovative behavior might be influenced by the unique characteristics of family firms because the values, desires and motives of the family involved are key determinants of the goals and strategies of a family business (e.g., Arregle, Hitt, Sirmon, & Very, 2007; Arregle, Naldi, Nordqvist, & Hitt, 2012; Berrone et al., 2012; Melin & Nordqvist, 2007; Sirmon, Arregle, Hitt, & Webb, 2008).

While some family firms seem to be conservative, resistant to change, averse to risk and less innovative (e.g., H.-L. Chen & Hsu, 2009; Nieto et al., 2015), other family firms are likely to have a culture that supports innovation (e.g., Classen et al., 2014; Nieto et al., 2015). The family firm's innovation culture is formed by a combination of the ability and willingness of the family involved. Ability and willingness are of major importance in family firms, because these firms typically have exceptional discretion to act and unique influences that affect their innovative behavior (De Massis et al., 2014). Some family firms have greater ability to innovate because of personalized control, long-term investment horizons and interest alignment between owners and managers (Chrisman et al., 2014). Family firms are motivated by, and committed to, the preservation of their socioemotional wealth. Gains or losses in socioemotional wealth represent the fundamental frame of reference that family firms use to make major strategic decisions (Berrone et al., 2012; Gómez-Mejía et al., 2007). Therefore, in examining innovative behavior in family firms, a family-oriented particularistic behavior perspective that considers the family's ability and willingness to innovate is necessary.

Accordingly, our model, presented in Figure 25, reflects the ability and willingness that are expected to contribute to innovative behavior. This figure is based on family-oriented particularistic behavior models as described by Chrisman et al. (2012) and De Massis et al. (2014). The work of De Massis et al. (2014) emerges as an extension of the study of Chrisman et al. (2012) by indicating that the presence of both ability and willingness is required in family firms to engage effectively in family-oriented particularistic behavior. We extend this reasoning to the case of innovation. We propose that both ability to innovate and willingness to innovate heavily influence family firm's innovation decision-making since family involvement determines the particularistic behavior and related strategic decisions, and therefore has an impact on all the innovation decisions. More specifically, we examine the relationship of willingness to innovate (conditional on high ability to innovate) on innovative behavior. In other words, we investigate the impact of the family's willingness to innovate on their innovative behavior for family firms with high ability to innovate. However, ability and willingness to innovate will not always lead to innovative behavior in family firms. Drawing on the resource-based view (S. Coleman & Carsky, 1999; Koropp et al., 2013; Newbert, 2007; Sirmon & Hitt, 2003), we argue that family firms also need sufficient financial resources to manage the unique resources, in order to attain a strategic competitive advantage. Therefore, we also examine the moderating role of external financial constraints. Hence, our model is aligned with research that reveals how different sources and levels of ability and willingness influence innovative behavior of family firms (Chrisman et al., 2014; De Massis et al., 2014).

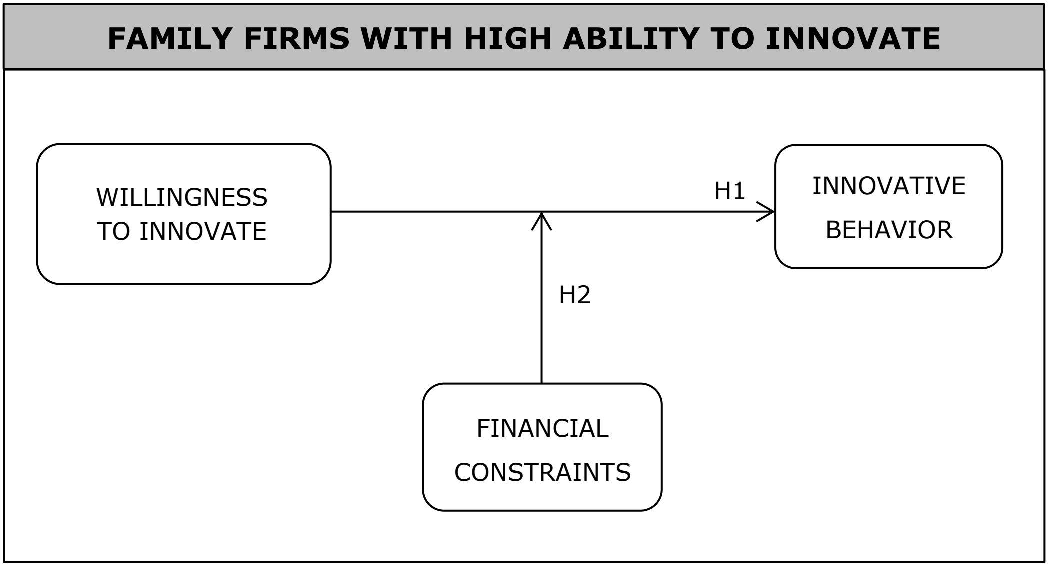


Figure 25: The conceptual framework of our hypotheses

2.1. The direct relationship between willingness to innovate and innovative behavior for family firms with high ability to innovate

We consider innovation to be an essential example of family-oriented particularistic behavior, as innovation is a central part of the strategic direction of firms (Sirmon & Hitt, 2003; Stieglitz & Heine, 2007). Thus, we apply the family-oriented particularistic behavior model of De Massis et al. (2014)[77] on innovative behavior by saying that no innovative behavior will be exhibited in a firm with family involvement, unless the family involved is both able and willing to engage in it.

Families stimulate their strategic firm performance mainly through family resources and family goals (Dyer, 2006; Habbershon & Williams, 1999). By explaining innovative behavior of family firms in terms of ability and willingness, the literature only focuses on these family resources and family goals (De Massis et al., 2014).

First, the literature defines the concept **ability** in terms of **family resources**, by saying that ability refers to the owners' discretion to direct, allocate, add to or dispose of a firm's resources (De Massis et al., 2014). Hambrick and Finkelstein (1987) describe owners' discretion as the owners' decision-making power in determining the organizational goals and in choosing among a range of feasible strategic, structural and tactical options. This discretion is formed from the owners' power and legitimacy and is the extent to which the owners are able to envision and create future courses of action (Mitchell, Hart, Valcea, & Townsend, 2009). More specifically, in private family firms, the family's power and discretion to direct, allocate, add to or dispose of a firm's resources is reflected in the dominance due to owning the business and controlling the firm through management and/or governance participation by the family (Klein, Astrachan, & Smyrnios, 2005). Ability to innovate is an important determinant of the family firm's actual innovative behavior. In order to reach their objectives and goals, the controlling family within an organization attempts to influence organizational decision-making and strategy. The family's power, legitimacy and ability to

[77] The sufficiency condition for the family involved to engage in family-oriented particularistic behavior in a firm requires the presence of both ability and willingness.

engage in innovative behavior grows as the family's involvement in the organization increases (Chrisman et al., 2012). In addition, family firms may have a great level of discretion to decide the firm's strategic development (Arregle et al., 2012; De Massis et al., 2014), due to long-term investment horizons (e.g., Anderson & Reeb, 2003), patient capital (e.g., Bertrand & Schoar, 2006), interest alignment between managers and owners (Fama & Jensen, 1983) and altruism (e.g., Schulze et al., 2003). Moreover, family firms are likely to have more ability to behave idiosyncratically in terms of innovation (Chrisman et al., 2014).

Second, **willingness** is defined as the disposition of the family owners to engage in distinctive behavior based on the **goals**, intentions and motivations that drive the owners to influence the firm's behavior in directions diverging from those of non-family firms or the institutional norms among family firms (De Massis et al., 2014). In family firms, the business decisions are based on a combination of family-oriented goals and business-oriented goals (Mahto, Davis, Pearce, & Robinson, 2010). Family-oriented goals are likely to be an important determinant for decisions about business strategy, innovation, financial strategy and management practices (Cassia, De Massis, & Pizzurno, 2011). Willingness to innovate is a key factor of the family firm's actual innovative behavior. The non-financial factors which affect the willingness to innovate in family firms might also be embedded in the concept socioemotional wealth (SEW). Gómez-Mejía et al. (2007) define socioemotional wealth as *"non-financial aspects of the firm that meet the family's affective needs such as identity, the ability to exercise family influence, creating jobs for family members and the perpetuation of the family dynasty" (p. 106)*. When making decisions, family firms have a strong emphasis on preserving their socioemotional wealth. So, families are willing to make decisions which are not economically logical instead of risking the socioemotional wealth. As a consequence, family firms would be willing to put the firm at risk if this results in preserving socioemotional wealth (Berrone et al., 2012). For example, family firms tend to stay independent in the long-term, in order to preserve their socioemotional wealth (Gómez-Mejía et al., 2007). Therefore, innovation might be a key interest for family firms in achieving their long-term goals (Cassia et al., 2011; Kraiczy, Hack, & Kellermanns, 2014). In Chapter 2 we introduced the socioemotional wealth perspective to explain differences in productivity between family firms and non-family firms on the unconditional productivity level, while in this chapter we look at socioemotional wealth in more detail and discuss the different empirical impacts of the various socioemotional wealth dimensions on innovation.

Intention models can be used to explain and predict family firm's innovative behavior. Ability and willingness to innovate can be considered as intentions, because they indicate on the one hand how much of an effort firms are planning to exert and on the other hand how hard firms are willing to try in order to perform the specific behavior (Ajzen, 1991; Fishbein & Ajzen, 1972, 1975; Godin, Conner, & Sheeran, 2005; Schwarzer, 2008; Sniehotta, Scholz, & Schwarzer, 2005). Based on the intention models (Ajzen, 1991; Fishbein & Ajzen, 1972, 1975; Godin et al., 2005; Schwarzer, 2008; Sniehotta et al., 2005) and in line with the study of De Massis et al. (2014), we argue that the family firm's ability and willingness to innovate give us essential insights into the underlying process that determines innovative behavior.

Ability and willingness may be important factors that distinguish innovative family firms from their less innovative counterparts, because we argue that the presence of both ability and willingness is required in family firms to engage effectively in innovative behavior. It is considered as a general rule that the stronger the intention to engage in a behavior, the more likely should be its performance (Ajzen, 1991). For example, Chrisman and Patel (2012) show that although family owners have the power to commit a superior level of resources to R&D in comparison with non-family firms, they must not do so and whether they do or not depends on willingness to innovate. The tendency among family firms to innovate or not depends on the amount of ownership held by the family and their level of involvement in firm governance. It is also partially a function of the sources of willingness since family firms have a variety of economic and non-economic goals that can lead to substantially different behaviors (Chrisman et al., 2014). While some management theories assume that ability is usually accompanied by willingness, this is not always true (Chrisman et al., 2014). Both, the socioemotional and economic foundations of willingness can vary considerably from family firm to family firm. Consequently, the willingness and ability propensities of family firms with respect to innovation may be more heterogeneous than those of non-family firms (Chrisman et al., 2014). Therefore, we suggest that a family firm’s ability and willingness to innovate are essential drivers of their actual innovative behavior. Hence, in line with De Massis et al. (2014) we propose the following baseline hypothesis:

> **Hypothesis 1**: *For family firms with high ability to innovate, the family’s willingness to innovate is positively related with their innovative behavior.*

2.2. The moderating role of financial constraints

The literature on family-oriented particularistic behavior based on ability and willingness suggests that family firms only engage in particularistic behavior if they have both the ability and the willingness to engage actively in it or passively allow it (De Massis et al., 2014). By using the concepts ability and willingness to explain and predict family-oriented particularistic behavior, the literature does not take into account the fact that ability and willingness together are not always fully transformed into that specific behavior. Firms are not always capable of completely translating intended strategies into realized strategies (Godin et al., 2005; Mintzberg, 1978; Mintzberg & Waters, 1985; Schwarzer, 2008; Sniehotta et al., 2005). More precisely, in terms of family firm’s innovative behavior, other variables may be important in the transition from ability and willingness to innovate into actual innovative behavior. Indeed, several factors might hinder the direct relationship between ability and willingness to innovate and innovative behavior in family firms.

Sufficient financial resources are an integral part to the innovative behavior of family firms. Family firms must manage their innovation process and this requires well-developed financial systems. In order to achieve successful innovation projects, family firms need adequate investments in, for example, R&D, marketing and external resourcing to attract and retain talented scientists and entrepreneurs (Lodh, Nandy, & Chen, 2014). Minority investors in family firms run the risk that controlling owners may use their control rights to expropriate private benefits of control at their expense (Shleifer & Vishny, 1997). Ownership concentration reduces the probability of bidding by other agents, thereby depressing the value of the firm (Barclay & Holderness, 1989). These factors suggest that family control imposes a capital constraint (Carney, 2005). These capital constraints can prevent a family firm from effectively investing in innovation (Kellermanns, Eddleston, Sarathy, et al., 2012), thereby impeding the firm's growth (Carney, 2005). For example, some innovation projects may not be started, delayed or abandoned because the firm does not get loans or does not find external investors. Accordingly, financial constraints may affect the degree to which the combination of ability to innovate and willingness to innovate contribute to the innovative behavior of family firms. Innovation can lead managers to operate in domains where results are difficult to predict, and the need for external financial resources is necessarily greater (Chrisman et al., 2014).

2.2.1. Innovative behavior of family firms: perspectives from the resource-based view

In the resource-based view, firms are considered as a pool of resources that can generate a competitive advantage and superior performance (Barney, 1991; Chisholm & Nielsen, 2009; Habbershon & Williams, 1999; Newbert, 2007; Sirmon & Hitt, 2003). The strategic decisions, which allow for higher firm performance levels, are determined by the specific firm resources. Since innovation is a central part of the strategic direction of firms (Sirmon & Hitt, 2003; Stieglitz & Heine, 2007), innovation can be considered as an essential determinant of a firm's capability to develop competitive advantages (Greve, 2009). The interaction between the family and the business may determine how resources are managed and deployed in family firms (Sirmon & Hitt, 2003).

Nevertheless, the literature suggests to capture the family's ability and willingness to engage in family-oriented particularistic behavior by family resources (De Massis et al., 2014), thereby ignoring the fact that some other resource-based component might influence the direct relationship with behavior. The ability and willingness of firms to engage in some specific activities, routines, or business processes might be restricted by the resources and capabilities they control (Ray, Barney, & Muhanna, 2004). Newbert (2007) states that possessing valuable, rare, inimitable, non-substitutable resources is not sufficient for firms to attain a competitive advantage. In addition, firms must also exhibit the ability to manage those unique resources and goals in such a way that their full potential is realized (Newbert, 2007; Sirmon & Hitt, 2003). In order to manage the unique family resources and family goals, families need adequate financial funds. The lack of resources will typically decrease innovative efforts (Llach et al., 2012). Without securing the required capital, family firms are destined to stay small, thereby limiting their ability to attain a competitive advantage, to produce goods, to create services, to generate jobs and to launch innovations in the marketplace (S. Coleman & Carsky, 1999). For example, even if a family firm is able and willing to innovate it might not always result in actual innovative behavior. Indeed, the family firm's innovation level will be limited due to the absence of external financial funds (Czarnitzki & Hottenrott, 2011; Hottenrott & Peters, 2012).

2.2.2. Financial constraints

Financial decision making is a key challenge for firms, as appropriate and sufficient financial capital is central to firm growth and survival (S. Coleman & Carsky, 1999; Koropp et al., 2013). The literature on financial constraints examines the relationship between corporate financial decisions and corporate investment decisions (e.g., Carpenter & Petersen, 2002; D'Espallier, Huybrechts, & López Iturriaga, 2011; D'Espallier, Vandemaele, & Peeters, 2008; Fazzari, Hubbard, & Petersen, 1988). When a firm faces capital market imperfections the firm will depend mainly on internal funds because access to external funding sources can be severely limited due to transaction costs, tax advantages, agency problems, costs of financial hardship and asymmetric information (e.g., Carpenter & Petersen, 2002; Fazzari et al., 1988). In the presence of asymmetric information, for example, some firms, especially those that are small and young, may face credit rationing because lenders are unable to identify the quality of their assets in place and new growth opportunities (Dang, 2013). In case of imperfect capital markets, firms need to pay a higher premium for external sources of investment finance than for internally generated funds (e.g., Bond, Elston, Mairesse, & Mulkay, 2003; Cleary, Povel, & Raith, 2007). This creates a cost wedge between internal funding sources and external funding sources due to agency costs, which result from informational asymmetries between investors and the firm (e.g., Andres, 2011; Carpenter & Petersen, 2002; D'Espallier et al., 2011; D'Espallier et al., 2008; Devos, Dhillon, Jagannathan, & Krishnamurthy, 2012). This creates restricted access to outside funds for some firms (Andres, 2011). This may prevent these firms from using debt as a source of capital and they would primarily rely on internal financing to fund projects (Devos et al., 2012). We consider these firms to be financially constrained, since access to finance is more difficult and they face higher financing costs (e.g., Beck, Demirgüç-Kunt, Laeven, & Maksimovic, 2006; D'Espallier et al., 2011; D'Espallier et al., 2008; Hope, Thomas, & Vyas, 2011). Being financially constrained is characterized as a situation in which the firm may be unable to obtain external financing due to its high cost, mainly as a consequence of asymmetric information about firms' projects, being the firm directed to rely on internally generated funds to undertake their investment projects (Crisóstomo, López Iturriaga, & González, 2014).

Financially constrained firms are unable to obtain sufficient external financing in order to grow or to fund positive net present value projects, due to its high agency costs arising from information asymmetries between shareholder and investor (e.g., S. Coleman & Carsky, 1999; Crisóstomo et al., 2014; D'Espallier et al., 2011; D'Espallier et al., 2008; Dang, 2013). Under asymmetric information, a firm may face credit rationing because lenders cannot easily evaluate the firm's quality and the quality of its investments. Similarly, some firms are too risky to be able to obtain a bank loan or issue bonds (Dang, 2013). More specifically, Fama and Jensen (1983) expected family ownership to be effective in dealing with traditional agency conflicts between shareholders and managers, since the shares are in the hands of the managers. However, some authors disagree with the effectiveness of family ownership to cope with agency conflicts. They indicate that family firms have to deal with typical agency conflicts arising from self-control, asymmetric altruism and conflicts of interest between family members in different roles, conflicts of interest between family and non-family members and conflicts of interest between dominant and minority shareholders (Schulze et al., 2002, 2003; Schulze et al., 2001). Family ownership and/or family members holding powerful positions might lead to lower shareholder-debtholder agency conflicts due to the long-term orientation of the owners, which generates trust between firm and lenders and reduces the cost of debt financing (Anderson et al., 2003; Steijvers & Voordeckers, 2009). The agency conflicts between shareholder and debtholder can even be higher in private family firms, due to self-control problems and extracting private benefits which increase the probability of risk-shifting behavior. This may result in more stringent lending conditions, like a higher interest rate and collateral requirements (Hope et al., 2011; Steijvers & Voordeckers, 2009). For example, owner-managed firms have more difficult access to external funds. This may be because the lower agency costs, if any, in owner-managed firms are offset by the increased costs due to entrenchment of some owner-managers. Moreover, banks could be concerned about the weaker boundaries of asset ownership in owner-managed firms and fear the possibility of less scrupulous owner-managers manipulating their assets to increase the risk of debt-holders (Bopaiah, 1998).

The relative importance of ability and willingness to innovate in the prediction of innovative behavior is expected to vary across family firms due to financial constraints. Being a family owned firm may affect financing conditions. The characteristics of family firms suggest that investment decisions are potentially influenced by the incentives associated with this ownership structure (Andres, 2011). Family owned firms may have an advantage in external capital cost since they more often have a close and long-established relationship with their house bank (Hottenrott & Peters, 2012). However, family firms show a low affinity towards external funding, which decreases the resources available for innovation (Llach et al., 2012). Thus, they perceive themselves as constrained and postpone or cancel innovation projects if these projects cannot be funded by internal funds (Hottenrott & Peters, 2012).

More specifically, financial constraints can have a large negative impact on innovative actions due to asymmetric information problems, thereby reducing significantly the likelihood that a firm will effectively implement innovative projects (e.g., Czarnitzki & Hottenrott, 2011; Hottenrott & Peters, 2012; Mohnen, Palm, van der Loeff, & Tiwari, 2008; Savignac, 2006; Tiwari, Mohnen, Palm, & van der Loeff, 2007). Hottenrott and Peters (2012) empirically show that financial constraints hold back innovation activities. Information asymmetries can arise because of the complexity, specificity, high degree of uncertainty of innovation projects and the reluctance of firms to give details of the innovation project to external investors (Hajivassiliou & Savignac, 2008; Hottenrott & Peters, 2012; Mohnen et al., 2008). As a result, it will be challenging for outsiders to evaluate the potential value of the innovation project. Therefore, using external funds to finance innovation might be more expensive compared to other investments (Hottenrott & Peters, 2012). Difficulty in obtaining external financial funds may impede the creative innovation potential of firms (J. L. Christensen, 2007). Therefore, some innovation projects may not be started, delayed or abandoned due to financial constraints (Canepa & Stoneman, 2002; Mohnen et al., 2008). Internal sources of financing are thus crucial for the implementation of innovation projects. However, internal funds are not inexhaustible either. Cash flow is naturally limited and raising new equity may be costly and often unwanted (Hottenrott & Peters, 2012).

According to the resource-based view and the literature among financial constraints, we argue that financial resources might clarify the inconsistent evidence concerning the impact of family involvement on their innovative behavior. The existing studies on family-oriented particularistic behavior assume that all resources are available when defining the concepts ability and willingness. However, the lack of financial resources may affect the degree to which ability and willingness to innovate contribute to innovative behavior in family firms. Financial resources allow the pursuit of creative and innovative strategies (Sirmon & Hitt, 2003). Besides, the lack of financial funds may restrict family firm’s innovation level (Czarnitzki & Hottenrott, 2011; Hottenrott & Peters, 2012). Therefore, we argue that financial constraints facilitate the family firm’s innovative behavior by acting as a moderator on the relationship between willingness to innovate and innovative behavior for family firms with high ability to innovate.

Hypothesis 2: *For family firms with high ability to innovate, external financial constraints will moderate the relationship between a family firm's willingness to innovate and their innovative behavior. Specifically, a high ability family firm's willingness to innovate will have a less positive effect on their innovative behavior when the level of external financial constraints increases.*

3. Data, variables, and descriptive statistics

3.1. Data and data sources

The population for this study contains all private firms located in Belgium (the Flemish Region, the Walloon Region or the Brussels-Capital Region with Dutch or French as the official language). We require a minimum of 10 employees to exclude the micro organizations, because they strongly tend towards a high degree of informality in their organizational structure and management (Gray & Mabey, 2005). To ensure comparability and consistency, we further exclude all non-profit associations, public institutions, educational institutions, the agricultural sector, and the financial sector (i.e. financial services, banks and insurance companies). Considering these criteria, we held a selection frame of 8786 Belgian firms, which was drawn from the Bel-First database of Bureau Van Dijk containing a complete list of private companies in Belgium.

In order to make the sample representative of the population of Belgian firms, firms are selected through a random stratified sample according to firm size and sector classification (Nieto et al., 2015). After manually deleting all double records[78], we dispose of a remaining selection of 3914 Belgian firms. We then distributed a paper version of the survey by post to the target group by the beginning of November 2015, which resulted in a response of 202 completed surveys. Two of the postal surveys returned to us due to incomplete or incorrect

[78] Double records are two or more firms that hold a different registered organizational number, but have the same company address, the same ownership composition, the same CEO, and the same contact information (e-mail address). When two or more companies are considered to be the same, we delete the youngest (date of incorporation) or the smallest (FTE employees) one.

addresses. In February 2016, a second reminder on paper was eventually sent. This reminder resulted in an added 118 completed surveys and 14 returned to us due to incomplete or incorrect addresses. After a two-wave sending by post, a total of 320 surveys were obtained, which yields a response rate of 8.18%. This response rate is comparable with previous studies of privately held firms (e.g., Classen et al., 2012; Graham & Harvey, 2001; Vandekerkhof et al., 2014).

For more detailed information regarding the survey method, and an extensive overview of general sample firm and CEO characteristics, we refer to Chapter 4. In Chapter 4, we explicated the development of the survey instrument as well as the data collection process. Further details of the sample selection (i.e., non-response bias, sample selection bias and common method bias) are provided, together with some general descriptive statistics regarding the corresponding private Belgian firms. The complete questionnaire is attached as an appendix to this dissertation (see Appendix J).

The focus group of our survey is family firms. As we cannot identify family firms ex ante, the survey included questions which enable us to assess whether the firm can be considered as a family firm or not. A typical family firm is marked as an organization controlled and usually managed by multiple family members, whereby the uniqueness of a family firm is determined by the family's involvement in the business (Chua et al., 1999; Miller et al., 2007). Therefore, the family firm definition used in this research is based on frequently selected criteria of ownership (Anderson & Reeb, 2003; Chua et al., 1999) and the CEO's perception of being a family firm (Barbera & Moores, 2013; Westhead & Cowling, 1998). Accordingly, we define a firm as a family firm if (1) member(s) of a single family own(s) at least 50% of the shares and/or (2) the firm is perceived as a family firm by the CEO. According to this definition, our final sample consists of 187 (59%) family firms and 128 (41%) non-family firms. We focus only on the sub-group of family firms, so after excluding the non-family firms our sample consists of 187 family firms. Finally, we estimated a PLS moderating model on the sub-group of family firms with high ability to innovate[79], so after excluding the low ability family firms (i.e. $power\ scale = 2$) and after removing cases with missing values, our analyses are based on a final sample of 110 privately-held family firms situated in Belgium.

3.2. Variables and measures

This study examines the degree to which innovative behavior in family firms is influenced by the combination of ability and willingness to innovate, and also considers financial constraints as a moderator. This section lists the definitions of the dependent, independent, and control variables that are used in the present study. A summary is provided in Table K1 in Appendix K.

3.2.1. Innovative behavior

Innovation can take several forms, such as R&D expenditures, which is sometimes a precursor to innovation and is also known as innovation input, but may also occur in the form of innovation output, like product innovation, process innovation and organizational innovation. The quantity of resources needed for each type of innovation is different and the perceived level of risk associated with them is different as well (Llach et al., 2012). Therefore, we consider these three types of innovation output separately.

In order to measure innovative behavior in terms of product innovation, process innovation, and organizational innovation, we asked the respondents 13 related questions. These items are based on a scale of Zahra et al. (2000) and the response format of each item consisted of a five-point Likert scale, ranging from *'not relevant'* (1) to *'relevant'* (5) (see Table 31 for an overview of the items). Zahra et al. (2000) assumes that the innovation construct consists of three underlying sub-constructs and each sub-construct is measured using certain number of items using a questionnaire. In the course of indicator reliability assessment (Sarstedt, Ringle, Smith, Reams, & Hair Jr, 2014), the fourth item of

[79] We have chosen to focus only on the sub-group of family firms with high ability to innovate, because the variance in ability is low in our sample. There are only a few family firms with a power score from 50% to 100%, indicating weak family power/ability. A small variance indicates that data points are close to the mean (Stock & Watson, 2015). The disadvantage of a variable with a low variance is that it does not vary a lot and we will also find few statistically significant differences or relationships.

process innovation was removed from the initial model due to the low loading of this item. Negatively worded (i.e. reverse-coded) items are used by some researchers to reduce the potential effects of response pattern bias. Reverse-coded items require respondents to engage in more controlled, as opposed to automatic, cognitive processing. Unfortunately, once respondents establish a pattern of responding to a questionnaire, they might fail to recognize that some items are reverse coded. Thus, negatively worded items may be a source of method bias (Podsakoff et al., 2003).

Table 31: Scale innovative behavior

Item	Question
Product innovation	
PROD1	Our firm is the first in our industry to introduce new products to the market
PROD2	Our firm creates radically new products for sale in new markets
PROD3	Our firm creates radically new products for sale in the firm's existing markets
PROD4	Our firm commercializes new products
PROD5	Our firm invests heavily in cutting edge product-oriented R&D
Process innovation	
PROC1	Our firm invests heavily in cutting edge process technology-oriented R&D
PROC2	Our firm is the first in the industry to develop and introduce radically new technologies
PROC3	Our firm is a pioneer in the creation of new process technologies
PROC4	Our firm copies other firms' process technologies (reversed)*
Organizational innovation	
ORG1	Our firm is the first in the industry to develop innovative management systems
ORG2	Our firm is the first in the industry to introduce new business concepts and practices
ORG3	Our firm changes the organizational structure in significant ways to promote innovation
ORG4	Our firm introduces innovative human resource programs to spur creativity and innovation

Source: Zahra et al. (2000)

* *We have deleted this reverse-coded item of process innovation due to the low loading of this item.*

3.2.2. Ability

According to De Massis et al. (2014) family involvement in ownership, management and governance will only lead to family-oriented particularistic behavior when the family involved has on the one hand the ability in terms of discretion to act idiosyncratically and on the other hand the willingness in terms of intention or commitment to pursue family-oriented particularistic ends. More specifically, innovation depends on how the family's decision-making authority influences business decisions and the family's commitment to engage in innovative behavior based on the goals, intentions and motivations that drive family owners. These factors enable innovation to take place in the family firm (Wright et al., 2016).

Decision-making authority is the family owners' power to direct, allocate or dispose of a firm's resources (Wright et al., 2016). Power determines the ability to pursue goals (Chrisman, Fang, Kotlar, & De Massis, 2015). Therefore, in order to measure the family's ability to engage in innovative behavior, we adopted the power scale which was developed by Klein et al. (2005). Power refers to dominance exercised through financing the business and through leading and/or controlling the business through management and/or governance participation of the family (Klein et al., 2005). The power scale consists of three questions, measuring (i) the percentage of family share ownership, (ii) the percentage of family managers on top management team and (iii) the percentage of board seats held by the family (Klein et al., 2005). Although a generally accepted scale for ability has not been developed to date, researchers have measured ability as discretion in terms of family ownership control, family governance and family management (De Massis et al., 2014). In addition, our measurement scale measures the variation in ability among family firms building on the three main items of the power sub-scale (Klein et al., 2005). A principal component factor analysis revealed a single power factor. All factor loadings are higher than 0.624 with an eigenvalue of 1.687 and explain 56.239% of the variance among the items. The Cronbach's alpha for this 3-item scale was 0.609.

The power score, based on the F-PEC scale (Klein et al., 2005), is calculated for each family firm with the following formula (Giovannini, 2010; Jaskiewicz, González, Menéndez, & Schiereck, 2005):

$$Power = \left(\frac{EQfam}{EQtot}\right) + \left(\frac{BoDfam}{BoDtot}\right) + \left(\frac{TMTfam}{TMTtot}\right) \tag{1}$$

The first part of Eq. (1) defines the equity of share owned by the family ($EQfam$) over total equity ($EQtot$); the second part defines the percentage of family members on the board of directors ($BoDfam$); and the third part represents the percentage of family members on the top management team ($TMTfam$)

(Giovannini, 2010; Jaskiewicz et al., 2005). The power score is used to classify family firms into sub-groups. A power score from 0% to 50% indicated no family power/ability. Firms with a power score from 50% to 100% are classified as weak family power/ability, those with power scores from 100% to 150% are considered as normal family power/ability, while firms with power scores larger than 150% are seen as strong family power/ability (Giovannini, 2010; Jaskiewicz et al., 2005). We decided to exclude all firms with a power score of less than 50%, because those firms are considered to be non-family firms.

3.2.3. Willingness

Commitment concerns the disposition of the family owners to engage in distinctive innovative behavior based on the goals, intentions and motivations that drive these owners to influence the firm's behavior in directions diverging from those of non-family firms (Wright et al., 2016). In order to measure willingness we use some different socioemotional wealth scale based on some items proposed by Berrone et al. (2012), because family-oriented goals in family firms are likely to be an important determinant for decisions about business strategy, innovation, financial strategy and management practices (Cassia et al., 2011). It seems that the desire of family shareholders to build a lasting legacy for their offspring and to perpetuate socioemotional wealth (Gómez-Mejía et al., 2007) promotes the general willingness to allocate funds to innovation (Classen et al., 2014). Thus, the willingness to innovate in family firms might also be embedded in the concept socioemotional wealth.

Although a generally accepted scale for willingness has not been developed to date, researchers have measured willingness in terms of the family's intention towards transgenerational succession, the family's commitment to the business, the family's preservation of socioemotional wealth (De Massis et al., 2014). Several proxies have been used to measure socioemotional wealth (e.g., ownership, family presence in board, CEO family status) but most of these proxies did not capture the multidimensionality of the construct. As such, Berrone et al. (2012) developed the FIBER model in which socioemotional wealth is divided in five larger dimensions: family control and influence, family members’ identification with the firm, building social ties, emotional attachment, and renewal of family bonds to the firm through dynastic succession. The authors proposed a set of items that may serve as a base for conducting surveys in order to capture each dimension of the FIBER model. In this study, we selected the most suitable item per dimension to measure the socioemotional wealth construct: “Preservation of family control and independence of this family firm are important goals”; “Family members have a strong sense of belonging to this family firm”; “In this family firm, non-family members are treated as part of the family”; “In this family firm, the emotional bonds between family members are very strong”; and “Successful business transfer to the next generation is an important goal for this family firm”. A principal component factor analysis revealed a single power factor. All factor loadings are higher than 0.567 with an eigenvalue of 2.224 and explain 44.483% of the variance among the items. The Cronbach’s alpha for this 5-item scale was 0.681. In addition, our measurement scale serves the purpose of the current study as it is a concise measure of the variation in willingness among family firms building on the five main items of the socioemotional wealth scale. This approach of socioemotional wealth measurement is in line with the study of Vandekerkhof (2015). The overall socioemotional wealth construct will vary from 1 to 5 ranging from 1 (high level of socioemotional wealth) to 5 (low level of socioemotional wealth).

We use a different approach for measuring socioemotional wealth since we consider it as a formative scale while previous researchers assume that it is a reflective scale (e.g., Debicki et al., 2016; Hauck et al., 2016). Given that socioemotional wealth is, according to the multidimensional perspective, formed as a combination of theoretically specified dimensions, it is not uncommon for socioemotional wealth to be referred to as a formative measurement model. Formative measurement models employ explanatory combinations of indicators as the basis for creating the latent construct. In formative measurement modeling the latent construct is modeled as being produced by its measures. When the presumed direction of causality is from the measures to the construct, formative measurement models are appropriate. In formative measurement models the measures are not interchangeable, but rather, each is taken to represent an essential part of the conceptual domain of the latent construct.

Formative measures have no assumed or inherently desirable correlation with one another and therefore internal consistency assessments are not appropriate for such measures (Hair et al., 2014).

Three theoretical considerations can be used to decide whether the socioemotional wealth measurement model is formative or reflective (Coltman, Devinney, Midgley, & Venaik, 2008):

Consideration 1: the nature of the construct. According to Berrone et al. (2012), socioemotional wealth does not exist as an independent entity. Rather, it is a composite measure of socioemotional wealth that includes: family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members, and renewal of family bonds through dynastic succession. Any change in one or more of these components/dimensions is likely to cause a change in a family firm's socioemotional wealth score. However, if a family firm's socioemotional wealth increases, this would not necessarily be accompanied by an increase in all five dimensions. Omitting an indicator is omitting a part of the socioemotional wealth construct (Diamantopoulos & Winklhofer, 2001). Formative measures only capture the entire conceptual domain as a group (MacKenzie, Podsakoff, & Jarvis, 2005).

Consideration 2: the direction of causality between the latent construct and its indicators. In formative models, the indicators are identified as causing the construct (Hair et al., 2014). As discussed by Berrone et al. (2012) the construct of socioemotional wealth has no inherent meaning independent of its indicators, which are commonly conceived of as the FIBER dimensions. When we think of the socioemotional wealth construct, we think of dimensions that contribute or cause the socioemotional wealth. Notably, the causal flow is from the dimensions we associate with socioemotional wealth to the construct.

Consideration 3: the characteristics of the indicators used to measure the construct**.** If the relevant indicators are not interchangeable, a formative measurement model may be called for (Hair et al., 2014). Because of the multidimensional nature of socioemotional wealth, sometimes there may be a conflict among its dimensions (Firfiray et al., 2016). For example, the indicators of family control and influence may have little in common with the renewal dimension, although they may collectively contribute to the socioemotional wealth construct. The pursuit of two, sometimes conflicting, goals can influence effective innovation implementation in family firms in the opposite direction (Kellermanns, Eddleston, Sarathy, et al., 2012). First, family firms tend to stay independent in the long-term (i.e., socioemotional wealth R-dimension) in order to preserve their socioemotional wealth (Gómez-Mejía et al., 2007). Therefore, innovation might be a key interest for family firms in achieving their long-term goals (Cassia et al., 2011; Kraiczy et al., 2014). Second, family firms might be reluctant to innovate and hire the knowledge and capabilities of an external non-family manager because they want to maintain family control and family traditions (i.e. socioemotional wealth F-dimension) (Kellermanns, Eddleston, Sarathy, et al., 2012). The five diverse socioemotional wealth dimensions are unlikely to intercorrelate highly. The multidimensional characteristic of socioemotional wealth implies that each of the FIBER dimensions may evolve differently (Cruz & Arredondo, 2016). In other words, it is reasonable that these FIBER dimensions may be distinct and could influence family behaviors and outcomes differently (Berrone et al., 2012). Indeed, Cruz and Arredondo (2016) expect to find different behaviors depending on the predominant dimension of socioemotional wealth.

The three theoretical considerations indicate that it is rational to conceptualize and measure the socioemotional wealth index by a formative model.

3.2.4. Moderator: external financial constraints

We investigate the moderating role of the level of external financial constraints, measured as the scale previously used by Beck et al. (2006) and Hope et al. (2011) consisting of one item. The CEOs of the surveyed family firms were asked to rate how problematic financing is for the operation and growth of their business. This single-item question was measured with a five-point Likert-type scale, with 1 being no obstacle and 5 being a major obstacle.

3.2.5. Control variables

Several variables are used to control for country-, industry-, and firm-specific characteristics. Our first control variable is the size of the firm, since larger firms tend to have more resources to innovate and are generally considered to be more innovative (Schumpeter, 1934). Firm size is measured using the logarithm of the number of full-time employees. Second, we also control for firm age, because younger firms are generally more innovative (e.g., Huergo & Jaumandreu, 2004). Firm age is measured using the logarithm of the number of years since the founding date. We included a dummy variable to control for export by asking if the company is active on international markets. The innovation literature has indicated that firms operating in an international environment are more likely to innovate (e.g., Altomonte, Aquilante, Békés, & Ottaviano, 2013; Craig, Pohjola, Kraus, & Jensen, 2014; Roper & Love, 2002).

3.3. Basic descriptive statistics

Table 32 reports the descriptive statistics (mean and standard deviation) of our main variables for estimating innovative behavior in family firms. The average family firm included in our sample indicates a relatively high ability to innovate. The average family firm included in our sample considers financing as rather a small problem for the operation and growth of their business. On a scale from 1 (no problem) to 5 (major problem), a mean value of 1.63 was found with a standard deviation of 0.994. Besides this, the average family firm in our sample is 28 years old and has 49 full-time equivalent employees.

Table 32: Descriptive statistics

Variables	**N**	**Min**	**Max**	**Mean**	**Sd.**
Our firm is the first in our industry to introduce new products to the market *(PROD1)*	110	1	5	2.95	1.344
Our firm creates radically new products for sale in new markets *(PROD2)*	110	1	5	2.48	1.254
Our firm creates radically new products for sale in the firm's existing markets *(PROD3)*	110	1	5	3.13	1.335
Our firm commercializes new products *(PROD4)*	110	1	5	2.96	1.306
Our firm invests heavily in cutting edge product-oriented R&D *(PROD5)*	110	1	5	2.77	1.366
Our firm invests heavily in cutting edge process technology-oriented R&D *(PROC1)*	110	1	5	2.91	1.289
Our firm is the first in the industry to develop and introduce radically new technologies *(PROC2)*	110	1	5	2.73	1.263
Our firm is a pioneer in the creation of new process technologies *(PROC3)*	110	1	5	2.47	1.155
Our firm is the first in the industry to develop innovative management systems *(ORG1)*	110	1	4	2.43	1.096
Our firm is the first in the industry to introduce new business concepts and practices *(ORG2)*	110	1	5	2.53	1.131
Our firm changes the organizational structure in significant ways to promote innovation *(ORG3)*	110	1	5	2.66	1.221
Our firm introduces innovative human resource programs to spur creativity and innovation *(ORG4)*	110	1	5	2.53	1.147
Family control	110	1	5	2.08	1.174
Identification	110	1	5	2.06	1.291
Building social ties	110	1	5	2.46	1.01
Emotional attachment	110	1	5	1.98	0.967
Renewal family bonds	110	1	5	1.95	1.14
Level of external financial constraints	110	1	5	1.63	0.994
Firm size	110	10	596	49.09	2.48
Firm age	110	6	86	28.45	1.71
Export dummy	110	0	1	0.88	0.324

The correlation tables can be found in Tables 33, 34 and 35. The correlation matrix for product innovation, presented in Table 33, shows significant effects of particular product innovation items on the socioemotional wealth dimension emotional attachment. Moreover, export is positively related to all items of product innovation. Based on the values in our correlation table, we found no indication of multicollinearity among the independent variables. The correlation matrix for process innovation, presented in Table 34, shows significant effects of process innovation on the socioemotional wealth dimension emotional attachment. The level of external financial constraints is significantly (negative) correlated with the third process innovation item, "Our firm is a pioneer in the creation of new process technologies". Moreover, export is positively related to all items of process innovation. Based on the values in our correlation table, we found no indication of multicollinearity among the independent variables. The correlation matrix for organizational innovation, presented in Table 35, shows significant positive correlations between organizational innovation on the socioemotional wealth dimension identification for the following items, "Our firm is the first in the industry to develop innovative management systems" and "Our firm introduces innovative human resource programs to spur creativity and innovation". We find a significant negative correlation between the organizational innovation item "Our firm is the first in the industry to introduce new business concepts and practices" on the socioemotional wealth dimension renewal of family bonds through dynastic succession. Based on the values in our correlation table, we found no indication of multicollinearity among the independent variables.

Table 33: Correlation table Product innovation

	1a.	1b.	1c.	1d.	1e.	2a.	2b.	2c.	2d.	2e.	3.	4.	5.	6.
1a. Our firm is the first in our industry to introduce new products to the market	1													
1b. Our firm creates radically new products for sale in new markets	0.596**	1												
1c. Our firm creates radically new products for sale in the firm's existing markets	0.638**	0.599**	1											
1d. Our firm commercializes new products	0.632**	0.498**	0.776**	1										
1e. Our firm invests heavily in cutting edge product-oriented R&D	0.619**	0.664**	0.620**	0.597**	1									
2a. Family control	0.049	-0.002	-0.077	0.020	0.012	1								
2b. Identification	0.049	0.035	0.060	0.072	0.064	0.275**	1							
2c. Building social ties	0.096	-0.051	0.045	0.034	0.049	0.185	0.283**	1						
2d. Emotional attachment	0.239*	0.128	0.151	0.072	0.282**	0.308**	0.361**	0.412**	1					
2e. Renewal family bonds	-0.044	-0.110	-0.116	-0.125	-0.114	0.421**	0.276**	0.261**	0.324**	1				
3. Level of external financial constraints	0.001	-0.053	0.064	0.088	0.025	0.207*	0.045	0.006	0.041	0.152	1			
4. Ln_Firm Size	-0.133	-0.094	-0.007	-0.020	-0.009	0.053	0.165	0.120	0.084	-0.013	-0.075	1		
5. Ln_Firm Age	-0.107	-0.082	-0.045	-0.049	0.038	-0.081	-0.034	0.041	-0.006	-0.038	-0.129	0.154	1	
6. Export	0.324**	0.254**	0.311**	0.380**	0.374**	-0.023	0.016	-0.031	0.081	-0.216*	0.118	0.111	0.106	1

*Note: ** correlation is significant at the 1% level (2-tailed).*

*Note: * correlation is significant at the 5% level (2-tailed).*

Table 34: Correlation table Process innovation

	1a.	1b.	1c.	2a.	2b.	2c.	2d.	2e.	3.	4.	5.	6.
1a. Our firm invests heavily in cutting edge process technology-oriented R&D	1											
1b. Our firm is the first in the industry to develop and introduce radically new technologies	0.560**	1										
1c. Our firm is a pioneer in the creation of new process technologies	0.633**	0.787**	1									
2a. Family control	0.023	-0.102	-0.063	1								
2b. Identification	0.113	0.004	0.063	0.275**	1							
2c. Building social ties	0.060	-0.010	-0.044	0.185	0.283**	1						
2d. Emotional attachment	0.190*	0.259**	0.221*	0.308**	0.361**	0.412**	1					
2e. Renewal family bonds	-0.028	-0.042	-0.085	0.421**	0.276**	0.261**	0.324**	1				
3. Level of external financial constraints	0.016	-0.038	-0.205*	0.207*	0.045	0.006	0.041	0.152	1			
4. Ln_Firm Size	0.041	-0.071	-0.047	0.053	0.165	0.120	0.084	-0.013	-0.075	1		
5. Ln_Firm Age	-0.077	-0.043	-0.071	-0.081	-0.034	0.041	-0.006	-0.038	-0.129	0.154	1	
6. Export	0.237*	0.324**	0.248**	-0.023	0.016	-0.031	0.081	-0.216*	0.118	0.111	0.106	1

*Note: ** correlation is significant at the 1% level (2-tailed).*

*Note: * correlation is significant at the 5% level (2-tailed).*

Table 35: Correlation table Organizational innovation

	1a.	1b.	1c.	1d.	2a.	2b.	2c.	2d.	2e.	3.	4.	5.	6.
1a. Our firm is the first in the industry to develop innovative management systems	1												
1b. Our firm is the first in the industry to introduce new business concepts and practices	0.749**	1											
1c. Our firm changes the organizational structure in significant ways to promote innovation	0.664**	0.688**	1										
1d. Our firm introduces innovative human resource programs to spur creativity and innovation	0.680**	0.597**	0.678**	1									
2a. Family control	0.022	0.057	-0.013	0.002	1								
2b. Identification	0.197*	0.156	0.163	0.197*	0.275**	1							
2c. Building social ties	0.005	-0.067	0.043	-0.090	0.185	0.283**	1						
2d. Emotional attachment	0.051	0.051	0.158	0.100	0.308**	0.361**	0.412**	1					
2e. Renewal family bonds	-0.157	-0.198*	-0.106	-0.013	0.421**	0.276**	0.261**	0.324**	1				
3. Level of external financial constraints	-0.071	0.030	-0.029	0.085	0.207*	0.045	0.006	0.041	0.152	1			
4. Ln_Firm Size	0.112	0.087	0.117	0.117	0.053	0.165	0.120	0.084	-0.013	-0.075	1		
5. Ln_Firm Age	0.024	-0.093	0.046	0.034	-0.081	-0.034	0.041	-0.006	-0.038	-0.129	0.154	1	
6. Export	0.169	0.146	0.130	0.120	-0.023	0.016	-0.031	0.081	-0.216*	0.118	0.111	0.106	1

*Note: ** correlation is significant at the 1% level (2-tailed).*

*Note: * correlation is significant at the 5% level (2-tailed).*

4. Empirical framework

Structural Equation Modeling (i.e. SEM) is an analysis method which can be used to simultaneously examine a series of interrelated dependence relationships between a set of constructs, represented by several variables, while accounting for measurement error. The Partial Least Squares SEM method has been designed to estimate very complex models in a reliable way by using only few observations without imposing distributional assumptions on the data (Sarstedt et al., 2014). PLS-SEM can be very useful in family business research which has to deal with increasing complexity of theories and cause-effect models, over-surveyed respondents and decreasing response rates (Sarstedt et al., 2014).

The hypotheses were tested using a Partial Least Squares approach to Structural Equations Modeling (PLS-SEM). More specifically, the SmartPLS version 2 software package was used. PLS is the preferred approach in our study for at least two reasons. First, PLS-SEM is capable of handling data inadequacies such as non-normal data and can be used when sample sizes are rather small (Henseler et al., 2014; Sarstedt et al., 2014). It makes practically no assumptions about underlying data, like data distributions. The estimating procedure for PLS-SEM is an ordinary least squares (OLS) regression-based method. PLS-SEM uses available data to estimate the path relationships in the model with the objective of minimizing the error terms. In other words, PLS-SEM estimates coefficients that maximize the R^2 values of the endogenous constructs (Hair et al., 2014). Second, PLS path modeling allows us to estimate measurement models that include both formative and reflective indicators (Henseler et al., 2014; Sarstedt et al., 2014). This feature is particularly relevant as we have indicated that our model includes both types of measures. To assess the statistical significance of the parameter estimates, we constructed percentile bootstrap confidence intervals based on 5000 samples (Hair et al., 2014). We estimated our PLS models on the sub-group of privately-held family firms with high ability to innovate.

Hypothesis 1 We want to explore whether willingness exerts a significant effect on innovative behavior for family firms with high ability to innovate. We operationalize willingness using 5 formative indicators, measured on a 5-point Likert scale. The starting point of our analysis is the simple model with only the constructs willingness, innovation, and the control variables (i.e., size, age, export). The model used to test our first hypothesis can be viewed in Figure 26. To test our first hypothesis and draw a conclusion, we ran the standard PLS-SEM algorithm and the bootstrapping procedure with 110 cases and 5000 samples.

Hypothesis 2 We want to explore whether external financial constraints moderate the relationship between high ability family firm's willingness to innovate and their innovative behavior. External financial constraints is operationalized using a single-item measure. Because of willingness' formative measurement model, we use the two-stage approach. The starting point of our analysis is the simple model (see Figure 27) with only the constructs willingness, innovation, and the control variables (i.e., size, age, export). We first include the moderator variable external financial constraints as a new construct in our model. We draw a path from the moderator variable and assign the single item to the construct. Next, we ran the standard PLS-SEM algorithm. The purpose of this first step is to obtain the latent variable scores, which we are going to use as input for stage 2 (Hair et al., 2014). The model used in the first stage can be viewed in Figure 27.

Stage 2 of the two-stage approach only includes latent variable scores. Therefore, we needed to remove all prior indicators from the model and assign the indicators as single-item measures to the corresponding constructs (Hair et al., 2014). The resulting model is shown in Figure 28. To test our hypothesis and draw a conclusion, we ran the standard PLS-SEM algorithm and the bootstrapping procedure with 110 cases and 5000 samples.

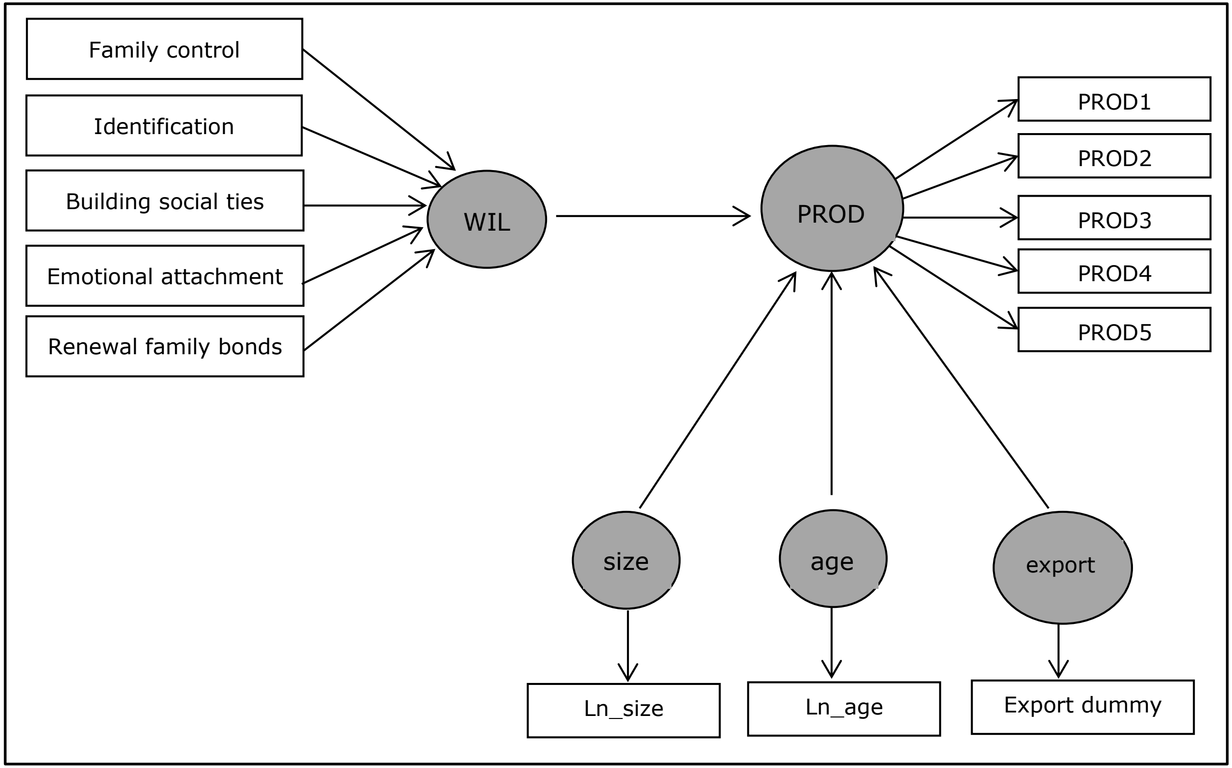


Figure 26: PLS model 1

Note: WIL: willingness to innovate; PROD: product innovation; PROD1: Our firm is the first in our industry to introduce new products to the market; PROD2: Our firm creates radically new products for sale in new markets; PROD3: Our firm creates radically new products for sale in the firm's existing markets; PROD4: Our firm commercializes new products; PROD5: Our firm invests heavily in cutting edge product-oriented R&D.

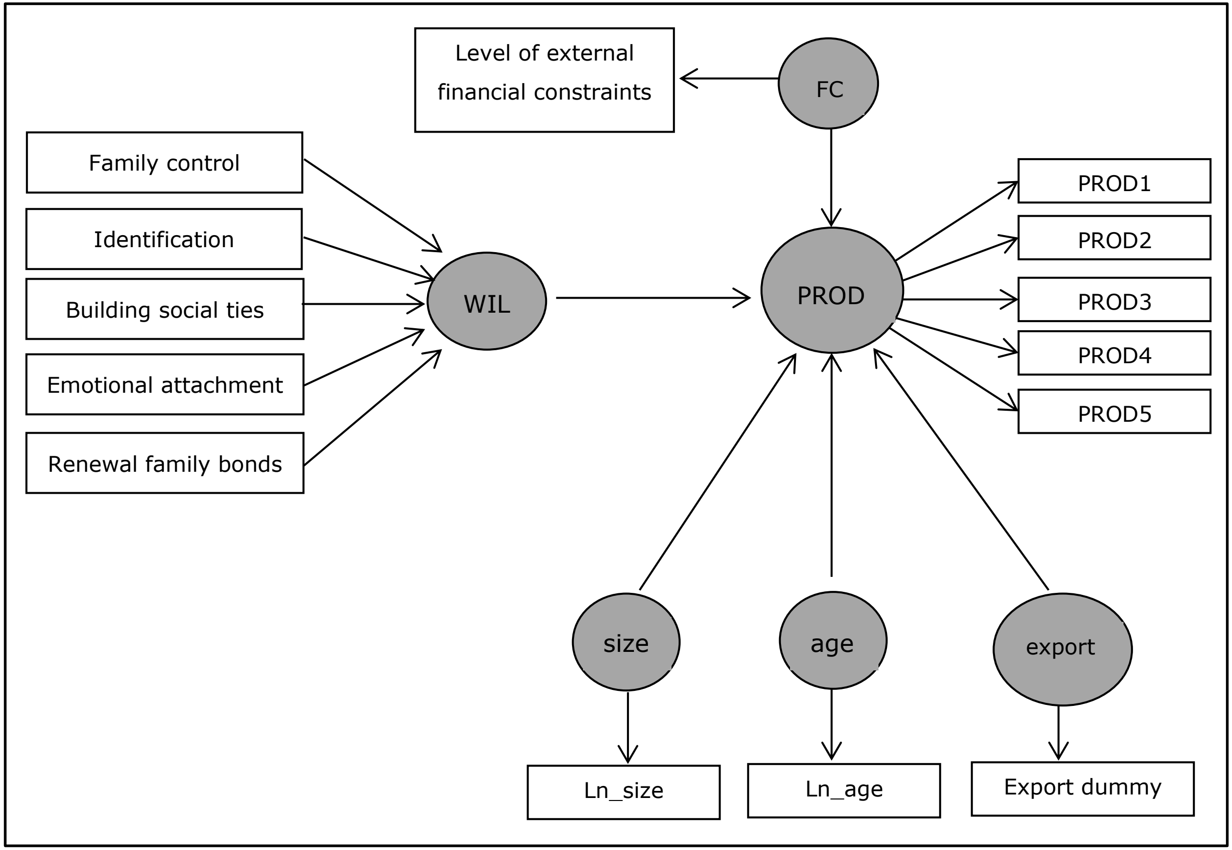


Figure 27: PLS model 2 Two-Stage Approach - Stage 1

Note: WIL: willingness to innovate; FC: level of financial constraints; PROD: product innovation; PROD1: Our firm is the first in our industry to introduce new products to the market; PROD2: Our firm creates radically new products for sale in new markets; PROD3: Our firm creates radically new products for sale in the firm's existing markets; PROD4: Our firm commercializes new products; PROD5: Our firm invests heavily in cutting edge product-oriented R&D.

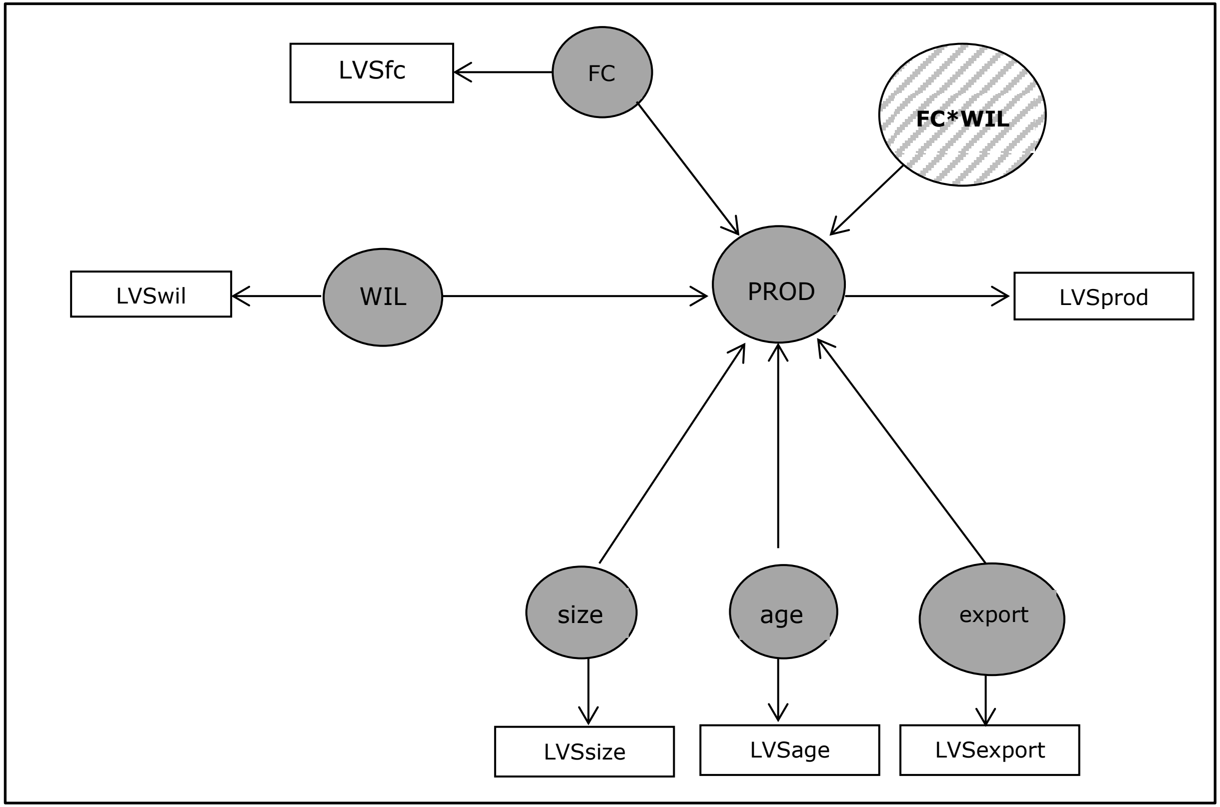


Figure 28: PLS model 2 Two-Stage Approach - Stage 2

Note: WIL: willingness to innovate; FC: level of financial constraints; PROD: product innovation; LVS: latent variable score.

4.1. Measurement model assessment

In evaluating the reliability and validity of the scales used in this study, it is crucial to distinguish between reflective and formative measurement models.

For **reflective** measurement models the key reliability and validity criteria include unidimensionality, internal consistency reliability, item validity, within-method convergent validity, and discriminant validity, respectively (Hair et al., 2014; Sarstedt et al., 2014). Unidimensionality was assessed following the procedure suggested by Karlis, Saporta, and Spinakis (2003). Internal consistency reliability is typically evaluated using Jöreskog (1971) composite reliability. Item validity was established by looking at the magnitude and significance of the item loadings. Next, convergent validity measures the extent to which a construct converges in its indicators by explaining the items' variance. Convergent validity is assessed by average variance extracted (AVE) for all items associated with each construct (Fornell & Larcker, 1981). Discriminant validity determines the extent to which a construct is empirically distinct from other constructs in the path model. We use the Fornell and Larcker (1981) criterion to evaluate discriminant validity. The method compares each construct's AVE value with the squared interconstruct correlation (i.e., a measure of shared variance) of that construct with all other constructs in the structural model.

Table 36: Analysis reflective measurement model

Item loading		**Item loading**		**Item loading**	
PROD1	0.841	PROC1	0.788	ORG1	0.898
PROD2	0.791	PROC2	0.917	ORG2	0.888
PROD3	0.861	PROC3	0.925	ORG3	0.862
PROD4	0.836			ORG4	0.830
PROD5	0.849				
Reliability & validity criteria		**Reliability & validity criteria**		**Reliability & validity criteria**	
λ_1	3.498 (>1)	λ_1	2.325 (>1)	λ_1	3.029 (>1)
λ_2	0.577 (<1)	λ_2	0.470 (<1)	λ_2	0.416 (<1)
AVE	0.6989 (>0.5)	AVE	0.7728 (>0.5)	AVE	0.7562 (>0.5)
Composite reliability	0.9206 (>0.6)	Composite reliability	0.9103 (>0.6)	Composite reliability	0.9253 (>0.6)
Discriminant validity	AVE >0.2971^2	Discriminant validity	AVE >0.3312^2	Discriminant validity	AVE >0.3159^2

Note: PROD1: Our firm is the first in our industry to introduce new products to the market; PROD2: Our firm creates radically new products for sale in new markets; PROD3: Our firm creates radically new products for sale in the firm's existing markets; PROD4: Our firm commercializes new products; PROD5: Our firm invests heavily in cutting edge product-oriented R&D; PROC1: Our firm invests heavily in cutting edge process technology-oriented R&D; PROC2: Our firm is the first in the industry to develop and introduce radically new technologies; PROC3: Our firm is a pioneer in the creation of new process technologies; ORG1: Our firm is the first in the industry to develop innovative management systems; ORG2: Our firm is the first in the industry to introduce new business concepts and practices; ORG3: Our firm changes the organizational structure in significant ways to promote innovation; ORG4: Our firm introduces innovative human resource programs to spur creativity and innovation.

λ_1 and λ_2 *= eigenvalues that are used to evaluate unidimensionality of the scale.* ***AVE*** *= Average Variance Extracted, which is used to evaluate within method convergent validity. An AVE value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators (Hair et al., 2014).* ***Composite reliability*** *= the internal consistency reliability and varies between 0 and 1, with higher values indicating higher levels of reliability. Composite reliability values of 0.60 are acceptable in exploratory research (Hair et al., 2014).* ***Discriminant validity*** *= the extent to which a construct is truly distinct from other constructs by empirical standards. The Fornell-Larcker criterion is used to assess discriminant validity. It compares the square root of the AVE values with the latent variable correlations. Specifically, the square root of each construct's AVE should be greater than its highest correlation with any other construct (Hair et al., 2014).*

The **reflective** measurement model was assessed for its reliability and validity. All relevant criteria for evaluating the reliability and validity of the reflective innovation indicators are presented in Table 36. Our analysis confirms our three innovation constructs as reliable and valid.

With regard to the **formative** scales, appropriate reliability and validity criteria encompass item validity and discriminant validity (Hair et al., 2014). Concerning item validity, statistical significance is sufficient to conclude whether a formative indicator is valid or not (Diamantopoulos & Winklhofer, 2001). Evidence for discriminant validity was obtained by evaluating whether an absolute value of 1 falls within two standard errors of the latent variable correlations (MacKenzie et al., 2005).

The **formative** construct willingness is evaluated. For item validity, indicators that do not have a significant loading on the construct can be considered for elimination. Nevertheless, formative indicators should never be discarded simply on the basis of statistical outcomes. If the theory-driven conceptualization of the construct strongly supports retaining the indicator, it should be kept in the formative measurement model (Hair et al., 2014). MacKenzie, Podsakoff, and Podsakoff (2011) point out that *"it is important to remember that sub-dimensions should not be eliminated unless all of the essential aspects of the focal construct domain are captured by the remaining sub-dimensions" (p. 316)*. So, we have decided to keep all five sub-dimensions of socioemotional wealth in our model. Evidence for discriminant validity was obtained by examining whether an absolute value of 1 falls within two standard errors of the latent variable correlations (MacKenzie et al., 2005). Table 37 indicates that there is evidence of discriminant validity in our formative construct. High levels of collinearity between formative indicators are a crucial issue because they have an impact on the estimation of weights and their statistical significance (Hair et al., 2014). To assess the level of collinearity, we have computed the tolerance, which represents the amount of variance of one formative indicator not explained by the other indicators in the same block. Furthermore, we have computed the variance inflation factor. In the context of PLS-SEM, a tolerance value of 0.20 or lower and a VIF value of 5 and higher respectively indicate a potential collinearity problem (Hair et al., 2014). Table 38 displays the collinearity values and we can conclude that collinearity is not a major problem for our formative scale (i.e., willingness). The abovementioned tests assure item validity and discriminant validity of our formative willingness scale. The two empirical validity tests (i.e., item validity and discriminant validity) indicate that it is rational to conceptualize and measure the socioemotional wealth index by a formative model.

Table 37: Discriminant validity of formative construct

Confidence intervals	
	Willingness
Product Innovation	$[0.1133; 0.4809]$
Process Innovation	$[0.1496; 0.5128]$
Organizational Innovation	$[0.1333; 0.4985]$

Note: The discriminant validity of the formative construct can be evaluated by testing whether the construct is less than perfectly correlated. Evidence for discriminant validity was obtained by examining whether an absolute value of 1 falls within two standard errors of the latent variable correlations $(i.e., CI: [latent\ variable\ correlation\ \pm 2se];\ \ if\ |1|\ lies\ in\ the\ CI\ this\ means\ no\ discriminant\ validity)$ *(MacKenzie et al., 2005).*

Table 38: Testing for collinearity

Item	**R^2**	**TOL (>0.2)**	**VIF (<5)**
Family control	0.224	0.776	1.29
Identification	0.188	0.812	1.23
Building social ties	0.203	0.797	1.26
Emotional attachment	0.281	0.719	1.39
Renewal family bonds	0.242	0.758	1.32

*Note: **TOL** = tolerance, which is used to assess the level of collinearity. Tolerance represents the amount of variance of one formative indicator not explained by other indicators in the same block. TOL can be obtained in two steps: (1) take the formative indicator, regress it on all remaining indicators in the same block, and calculate R^2; (2) compute the tolerance using $1 - R^2$. Each indicator's tolerance value should be higher than 0.20 (Hair et al., 2014). **VIF** = variance inflation factor, which is a related measure of collinearity and is defined as the reciprocal of the tolerance $(i.e., VIF = 1/TOL)$. Each indicator's VIF value should be lower than 5 (Hair et al., 2014).*

4.2. Structural model assessment

After the construct measures have been confirmed as reliable and valid, the next step is to assess the structural model results. Structural model performance was assessed by constructing R^2 bootstrap percentile confidence intervals for each endogenous construct. The examination of the endogenous innovation constructs' predictive power shows that product innovation has a substantial R^2 value of 0.2223 (for the model in Figure 26) or 0.2232 (for the moderator model in Figure 28). Process innovation has a R^2 of 0.1903 (for the model in Figure 26) or 0.2078 (for the moderator model in Figure 28). Organizational innovation has a R^2 of 0.115 (for the model in Figure 26) or 0.1213 (for the moderator model in Figure 28). The final step of the structural model analysis considers the significance and relevance of the structural model relationships. This will be discussed in the next section.

5. Estimation results

5.1. Analyses

Hypothesis 1 Results from the bootstrapping procedure (110 cases, 5000 samples) reveal that only one structural relationship is significant. The results in Table 39 highlight the significantly positive impact of export on product or process innovation. The effect of willingness on innovative behavior is not significant, so hypothesis 1 is not supported.

Hypothesis 2 Results from the bootstrapping procedure (110 cases, 5000 samples) on product innovation reveal that only two structural relationships are significant at the 5% significance level. The results in Table 40 highlight the significantly positive impact of export on product innovation and the significantly positive impact of willingness on product innovation. The moderating effect of external financial constraints is not significant, so hypothesis 2 is not supported. Results from the bootstrapping procedure (110 cases, 5000 samples) on process innovation reveal that two structural relationship are significant at the 5% significance level. The results in Table 40 highlight the significantly positive impact of export on process innovation. Moreover, we find a significantly positive impact of willingness on process innovation. However, the moderating effect of external financial constraints is not significant, so hypothesis 2 is not supported. Results from the bootstrapping procedure (110 cases, 5000 samples) on organizational innovation reveal that only one structural relationship is significant. The results in Table 40 highlight the significantly positive impact of willingness on organizational innovation at the 5% significance level. The moderating effect of external financial constraints is not significant, so hypothesis 2 is not supported.

Table 39: Results structural model – Part 1

$R^2=0.2223$	Willingness -> Product innovation	ln_size -> Product innovation	ln_age -> Product innovation	Export -> Product innovation
Coefficient	*0.222*	*-0.112*	*-0.080*	*0.365***
95% CI	-0.383 0.438	-0.275 0.059	-0.259 0.109	0.192 0.497
90% CI	-0.346 0.414	-0.249 0.032	-0.228 0.083	0.221 0.475
$R^2=0.1903$	**Willingness -> Process innovation**	**ln_size -> Process innovation**	**ln_age -> Process innovation**	**Export -> Process innovation**
Coefficient	*0.287*	*-0.068*	*-0.083*	*0.278***
95% CI	-0.423 0.500	-0.246 0.116	-0.278 0.088	0.115 0.415
90% CI	-0.391 0.476	-0.217 0.088	-0.249 0.060	0.135 0.392
$R^2=0.115$	**Willingness -> Organizational innovation**	**ln_size -> Organizational innovation**	**ln_age -> Organizational innovation**	**Export -> Organizational innovation**
Coefficient	*0.284*	*0.075*	*-0.018*	*0.097*
95% CI	-0.435 0.468	-0.103 0.237	-0.236 0.186	-0.435 0.468
90% CI	-0.405 0.446	-0.069 0.212	-0.197 0.153	-0.405 0.446

*Note: Stars ** and * give the significance at the 5% and 10%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level. If the value zero lies outside the 90% confidence interval (CI), the coefficient is statistically significant at the 10% significance level (Stock & Watson, 2015).*

Table 40: Results structural model – Part 2

$R^2=0.2232$	**Willingness -> Product innovation**	**Willingness *Financial Constraints -> Product innovation**	**Financial Constraints -> Product innovation**	**ln_size -> Product innovation**	**ln_age -> Product innovation**	**Export -> Product innovation**
Coefficient	*0.218*****	*0.026*	*-0.011*	*-0.109*	*-0.087*	*0.370*****
95% CI	0.023	-0.153	-0.213	-0.280	-0.281	0.216
	0.386	0.178	0.167	0.061	0.100	0.518
90% CI	0.053	-0.124	-0.181	-0.253	-0.251	0.242
	0.359	0.151	0.137	0.037	0.069	0.497
$R^2=0.2078$	**Willingness -> Process innovation**	**Willingness *Financial Constraints -> Process innovation**	**Financial Constraints -> Process innovation**	**ln_size -> Process innovation**	**ln_age -> Process innovation**	**Export -> Process innovation**
Coefficient	*0.268***	*0.040*	*-0.124*	*-0.074*	*-0.120*	*0.300***
95% CI	0.064	-0.135	-0.330	-0.261	-0.319	0.140
	0.441	0.232	0.075	0.107	0.086	0.455
90% CI	0.095	-0.109	-0.299	-0.232	-0.289	0.168
	0.414	0.200	0.045	0.081	0.052	0.433
$R^2=0.1213$	**Willingness -> Organizational innovation**	**Willingness *Financial Constraints -> Organizational innovation**	**Financial Constraints -> Organizational innovation**	**ln_size -> Organizational innovation**	**ln_age -> Organizational innovation**	**Export -> Organizational innovation**
Coefficient	*0.287***	*0.085*	*0.025*	*0.084*	*-0.037*	*0.104*
95% CI	0.112	-0.114	-0.157	-0.088	-0.257	-0.076
	0.448	0.275	0.210	0.254	0.171	0.267
90% CI	0.145	-0.085	-0.130	-0.063	-0.223	-0.047
	0.420	0.246	0.185	0.225	0.136	0.244

*Note: Stars ** and * give the significance at the 5% and 10%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level. If the value zero lies outside the 90% confidence interval (CI), the coefficient is statistically significant at the 10% significance level (Stock & Watson, 2015).*

5.2. In-depth analysis: multidimensional aspect of willingness

Although an often-mentioned advantage of the one-dimensional measurement method is its simplicity and ease of implementation, many researchers have pointed out that socioemotional wealth is too complex to be captured by a one-dimensional measurement method (e.g., Berrone et al., 2012; Debicki et al., 2016; Hauck et al., 2016; Miller & Le Breton-Miller, 2014). As a response to this critique, so-called multi-dimensional approaches have been put forth, which consider socioemotional wealth as consisting of several interrelated dimensions (Berrone et al., 2012). It is important to take into account this multidimensional aspect of socioemotional wealth, since individually and in combination, the relative importance of control, survival, profitability, intra-family succession, identity, emotional attachment, and social ties (Berrone et al., 2012) may lead to different amounts and types of innovation activities (Chrisman et al., 2014). The multidimensional characteristic of socioemotional wealth implies that each of the FIBER dimensions may evolve differently (Cruz & Arredondo, 2016). Cruz and Arredondo (2016) expect to find different behaviors depending on the predominant dimension of socioemotional wealth. For example, the objective of keeping *'family control and influence'* may hamper innovation activities, whereas *'dynastic succession intentions'* imply a long-term orientation, continuity, and growth, which are more likely to be achieved by greater investments in innovation (Lambrechts et al., 2017). In other words, it is reasonable that these FIBER dimensions may be distinct and could influence innovative behavior differently (Berrone et al., 2012). Therefore, we have run the models presented in Figure 26 and Figure 28 separately for each socioemotional wealth dimension. The socioemotional wealth items per dimension can be found in Table 41. We followed the same procedure to test the first hypothesis as described in section 4 –Empirical framework. Further, to test hypothesis 2 we used the two-stage approach as explained in section 4 –Empirical framework.

Table 41: SEW items per dimension

SEW dimension	First item	Second item
F: family control and influence	Preservation of family control and independence of this family firm are important goals	In this family firm, family members exert control over the company's strategic decisions
I: identification of family members with the firm	Family members have a strong sense of belonging to this family firm	Family members are proud to tell others that they are part of the family firm
B: binding social ties	In this family firm, non-family members are treated as part of the family	In this family firm, contractual relationships are mainly based on trust and norms of reciprocity
E: emotional attachment of family members	In this family firm, the emotional bonds between family members are very strong	Protecting the welfare of family members is critical to the family firm, apart from personal contributions to the firm
R: renewal of family bonds through dynastic succession	Successful business transfer to the next generation is an important goal for this family firm	Family owners are likely to evaluate their investment on a long-term basis

Product innovation. First, we tested the direct relationship between willingness and product innovation, whereby willingness was measured as a formative construct and we controlled for firm size, firm age and export. This model was run separately for each socioemotional wealth FIBER dimension. The results for product innovation can be found in Table 42. When willingness was measured as F dimension, I dimension, B dimension, or R dimension we only find a significantly positive effect of export on product innovation. However, when using emotional attachment of family members (i.e., E dimension) as measurement for willingness, we get some interesting results. We find a significant positive effect of export on product innovation and additionally we also find support for our first hypothesis. To sum, we can conclude that we do find statistical evidence that for family firms with high ability to innovate the effect of willingness, measured as emotional attachment of family members, on product innovation is significantly positive. The E dimension will vary from 1 to 5 ranging from 1 (totally agree with statements in Table 41) to 5 (totally disagree with statements in Table 41). So, when the E dimension is high this means that family owners disagree strongly with the statements "In this family firm, the emotional bonds between family members are very strong" and "Protecting the welfare of family members is critical to the family firm, apart from personal contributions to the firm”. The positive relationship between the E dimension and product innovation, means that when family owners place less value on emotional bonds between family members but put the firm first, the innovation level will be higher.

Second, we need to include the interaction term between willingness and external financial constraints. These moderating analyses can be found in Table 43. We do not find support for a significant moderating effect of external financial constraints on the relationship between willingness and product innovation for family firms with high ability to innovate, regardless of which FIBER dimension is used. These results are comparable to the results presented in Table 40.

Table 42: Regression results product innovation for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Product innovation	ln_size -> Product innovation	ln_age -> Product innovation	Export -> Product innovation
F	*Coefficient*	*-0.065*	*-0.086*	*-0.084*	*0.410*****
	95% CI	-0.260 0.211	-0.258 0.091	-0.276 0.116	0.244 0.556
I	*Coefficient*	*0.073*	*-0.108*	*-0.084*	*0.416*****
	95% CI	-0.168 0.284	-0.286 0.076	-0.275 0.114	0.260 0.563
B	*Coefficient*	*0.175*	*-0.135*	*-0.079*	*0.395*****
	95% CI	-0.101 0.383	-0.316 0.049	-0.266 0.107	0.231 0.540
E	*Coefficient*	*0.243*****	*-0.129*	*-0.088*	*0.372*****
	95% CI	0.098 0.431	-0.300 0.034	-0.260 0.120	0.206 0.514
R	*Coefficient*	*-0.141*	*-0.089*	*-0.085*	*0.398*****
	95% CI	-0.310 0.323	-0.268 0.089	-0.270 0.102	0.249 0.541

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

Table 43: Regression results product innovation – moderating effect for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Product innovation	Willingness* Financial Constraints -> Product innovation	Financial Constraints -> Product innovation	ln_size -> Product innovation	ln_age -> Product innovation	Export -> Product innovation
F	*Coefficient*	*-0.069*	*0.030*	*-0.038*	*-0.090*	*-0.093*	*0.413***
	95% CI	-0.239 0.101	-0.138 0.196	-0.231 0.153	-0.258 0.085	-0.296 0.112	0.242 0.566
I	*Coefficient*	*0.065*	*0.076*	*-0.046*	*-0.112*	*-0.103*	*0.422***
	95% CI	-0.134 0.232	-0.117 0.238	-0.231 0.137	-0.287 0.069	-0.304 0.101	0.264 0.568
B	*Coefficient*	*0.185*	*0.060*	*-0.020*	*-0.143*	*-0.085*	*0.403***
	95% CI	-0.003 0.394	-0.144 0.276	-0.200 0.168	-0.326 0.032	-0.275 0.111	0.238 0.553
E	*Coefficient*	*0.282***	-0.061	-0.076	*-0.138*	*-0.076*	*0.374***
	95% CI	0.102 0.462	-0.269 0.142	-0.264 0.140	-0.300 0.029	-0.266 0.123	0.213 0.518
R	*Coefficient*	*-0.149*	*0.037*	*-0.021*	*-0.093*	*-0.085*	*0.397***
	95% CI	-0.334 0.028	-0.185 0.244	-0.222 0.193	-0.250 0.084	-0.276 0.106	0.240 0.548

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

Process innovation. First, we tested the direct relationship between willingness and process innovation, whereby willingness was measured as a formative construct and we controlled for firm size, firm age and export. This model was run separately for each socioemotional wealth FIBER dimension. The results for process innovation can be found in Table 44. When willingness was measured as F dimension, I dimension, B dimension, or R dimension we only find a significant positive effect of export on process innovation. However, when using emotional attachment of family members (i.e., E dimension) as measurement for willingness, we get some interesting results. We find a significantly positive effect of export on process innovation and additionally we also find support for our first hypothesis. To sum, we can conclude that we do find statistical evidence that for family firms with high ability to innovate the effect of willingness, measured as emotional attachment of family members, on process innovation is significantly positive.

Second, we need to include the interaction term between willingness and external financial constraints. These moderating analyses can be found in Table 45. We do not find support for a significant moderating effect of external financial constraints on the relationship between willingness and process innovation for family firms with high ability to innovate, regardless of which FIBER dimension is used. These results are comparable to the results presented in Table 40. When willingness was measured as I dimension or E dimension, we find additionally a significantly negative effect of the level of external financial constraints on process innovation. Moreover, when willingness was measured as B dimension or E dimension we find additionally a significantly positive effect of willingness on process innovation.

Table 44: Regression results process innovation for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Process innovation	ln_size -> Process innovation	ln_age -> Process innovation	Export -> Process innovation
F	*Coefficient*	*-0.082*	*-0.046*	*-0.096*	*0.320***
	95% CI	-0.296 0.172	-0.249 0.149	-0.302 0.109	0.149 0.483
I	*Coefficient*	*0.086*	*-0.064*	*-0.089*	*0.331***
	95% CI	-0.189 0.304	-0.251 0.137	-0.287 0.119	0.154 0.494
B	*Coefficient*	*0.210*	*-0.102*	*-0.085*	*0.298***
	95% CI	-0.201 0.415	-0.286 0.075	-0.282 0.105	0.123 0.454
E	*Coefficient*	*0.234***	*-0.081*	*-0.086*	*0.300***
	95% CI	0.070 0.431	-0.273 0.110	-0.287 0.111	0.133 0.453
R	*Coefficient*	*0.130*	*-0.049*	*-0.095*	*0.317***
	95% CI	-0.269 0.338	-0.245 0.151	-0.286 0.108	0.147 0.477

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

Table 45: Regression results process innovation – moderating effect for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Process innovation	Willingness* Financial Constraints -> Process innovation	Financial Constraints -> Process innovation	ln_size -> Process innovation	ln_age -> Process innovation	Export -> Process innovation
F	*Coefficient*	*-0.077*	*0.063*	*-0.163*	*-0.064*	*-0.115*	*0.336***
	95% CI	-0.258 0.112	-0.2025 0.263	-0.352 0.030	-0.257 0.121	-0.325 0.094	0.156 0.503
I	*Coefficient*	*0.075*	*0.111*	*-0.193***	*-0.089*	*-0.130*	*0.348***
	95% CI	-0.130 0.260	-0.115 0.299	-0.378 -0.012	-0.280 0.100	-0.335 0.081	0.164 0.516
B	*Coefficient*	*0.217***	*0.088*	*-0.129*	*-0.121*	*-0.107*	*0.329***
	95% CI	0.032 0.437	-0.119 0.364	-0.331 0.092	-0.300 0.054	-0.306 0.094	0.148 0.491
E	*Coefficient*	*0.233***	*0.077*	*-0.193***	*-0.096*	*-0.121*	*0.326***
	95% CI	0.029 0.416	-0.107 0.251	-0.377 -0.019	-0.288 0.095	-0.328 0.079	0.149 0.489
R	*Coefficient*	*0.109*	*-0.023*	*-0.146*	*-0.064*	*-0.112*	*0.335***
	95% CI	-0.093 0.300	-0.228 0.224	-0.355 0.075	-0.251 0.121	-0.317 0.088	0.155 0.498

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

Organizational innovation. First, we tested the direct relationship between willingness and organizational innovation, whereby willingness was measured as a formative construct and we controlled for firm size, firm age and export. This model was run separately for each socioemotional wealth FIBER dimension. The results for organizational innovation can be found in Table 46. We can conclude that we do not find statistical evidence that for family firms with high ability to innovate the effect of willingness on organizational innovation is significantly positive, regardless of which FIBER dimension is used.

Second, we need to include the interaction term between willingness and external financial constraints. These moderating analyses can be found in Table 47. We do not find support for a significant moderating effect of external financial constraints on the relationship between willingness and organizational innovation for family firms with high ability to innovate, regardless of which FIBER dimension is used. These results are comparable to the results presented in Table 40. When willingness was measured as I dimension, B dimension, E dimension we find additionally a significantly positive effect of willingness on organizational innovation. However, when using the R dimension as measurement for willingness, we find a significantly negative effect of willingness on organizational innovation if we control for external financial constraints. The R dimension will vary from 1 to 5 ranging from 1 (totally agree with statements in Table 41) to 5 (totally disagree with statements in Table 41). This dimension is in line with the patient capital and the longer term planning horizon idea for family firms. One would expect that family firms that attach a high value to dynastic succession would be more inclined to invest in innovation. The negative relationship between the R dimension and organizational innovation, means that when family owners are likely to evaluate their investment on a long-term basis, the organizational innovation level will be higher. Innovation might be a key interest for family firms in achieving their long-term goals (Cassia et al., 2011; Kraiczy et al., 2014), like the successful business transfer to the next generation. Having a long-term orientation could benefit innovativeness by increasing tolerance toward the type of experimentation (Lumpkin, Brigham, & Moss, 2010), thus expanding the time for creativity and the achievement of long-term goals (Llach et al., 2012).

Table 46: Regression results organizational innovation for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Organizational innovation	**ln_size -> Organizational innovation**	**ln_age -> Organizational innovation**	**Export -> Organizational innovation**
F	*Coefficient*	*0.107*	*0.094*	*-0.039*	*0.167*
	95% CI	-0.223 0.319	-0.095 0.275	-0.276 0.178	-0.034 0.358
I	*Coefficient*	*0.198*	*0.075*	*-0.026*	*0.149*
	95% CI	-0.126 0.378	-0.101 0.246	-0.250 0.184	-0.066 0.338
B	*Coefficient*	*0.181*	*0.079*	*-0.017*	*0.127*
	95% CI	-0.259 0.382	-0.112 0.267	-0.238 0.184	-0.065 0.309
E	*Coefficient*	*0.171*	*0.088*	*-0.013*	*0.118*
	95% CI	-0.036 0.370	-0.099 0.266	-0.237 0.200	-0.083 0.304
R	*Coefficient*	*-0.166*	*0.114*	*-0.045*	*0.128*
	95% CI	-0.351 0.259	-0.071 0.298	-0.264 0.175	-0.062 0.304

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

Table 47: Regression results organizational innovation – moderating effect for family firms with high ability to innovate (N=110) – FIBER dimensions

		Willingness -> Organizational innovation	Willingness* Financial Constraints -> Organizational innovation	Financial Constraints -> Organizational innovation	ln_size -> Organizational innovation	ln_age -> Organizational innovation	Export -> Organizational innovation
F	*Coefficient*	*0.102*	*0.098*	*-0.025*	*0.087*	*-0.047*	*0.162*
	95% CI	-0.095 0.288	-0.111 0.280	-0.210 0.186	-0.096 0.260	-0.268 0.151	-0.033 0.345
I	*Coefficient*	*0.194*****	*0.083*	*-0.019*	*0.075*	*-0.043*	*0.152*
	95% CI	0.023 0.362	-0.113 0.256	-0.195 0.182	-0.103 0.246	-0.265 0.159	-0.045 0.336
B	*Coefficient*	*0.202*****	*0.130*	*0.030*	*0.066*	*-0.019*	*0.145*
	95% CI	0.008 0.386	-0.052 0.291	-0.158 0.216	-0.125 0.245	-0.214 0.168	-0.043 0.327
E	*Coefficient*	*0.227*****	-0.103	-0.038	*0.083*	*-0.019*	*0.112*
	95% CI	0.015 0.453	-0.317 0.105	-0.254 0.196	-0.103 0.253	-0.240 0.179	-0.086 0.298
R	*Coefficient*	*-0.180*****	*0.046*	*-0.003*	*0.111*	*-0.042*	*0.122*
	95% CI	-0.360 -0.001	-0.191 0.257	-0.229 0.211	-0.070 0.277	-0.263 0.148	-0.062 0.300

*Note: F: family control and influence; I: identification of family members with the firm; B: binding social ties; E: emotional attachment of family members; R: renewal of family bonds through dynastic succession. Stars ** give the significance at the 5%. If the value zero lies outside the 95% confidence interval (CI), the coefficient is statistically significant at the 5% significance level (Stock & Watson, 2015).*

5.3. Robustness checks

We have checked the robustness of the empirical findings to alternative model specifications by experimenting with different sets of variables.

First, we used some other proxies for innovative behavior, like number of product innovations, dummy product innovation (i.e., did your firm introduce new or significantly improved goods and/or services during the period 2013-2015), dummy process innovation (i.e., did your firm introduce new or significantly improved processes and/or methods during the period 2013-2015) and dummy organizational innovation (i.e., did your firm introduce new or significantly improved knowledge management systems, changes in the management structure and/or changes in your relations with other firms or public institutions). Regression results are comparable to the results presented in Table 39 and Table 40, which provides further support for the results of our study. In sum, we found that our results are quite robust to changes in model specification.

Second, we have also tested some proxies for ability, such as percentage of external directors, percentage family ownership, percentage family managers and dummy external CEO. Regression results are comparable to the results presented in Table 39 and Table 40, which provides further support for the results of our study. In sum, we found that our results are quite robust to changes in model specification.

6. Discussion

Firms with family involvement are expected to have their own values, desires and motives to behave in their own particular, idiosyncratic way, different from firms that do not have family involvement (Carney, 2005). The particular behavior of family firms is not predetermined; it depends on the willingness of the involved family to take decisions –based on goals, intentions and motivations of the family involved– which influence the firm's behavior in directions that are different from those pursued by firms without family involvement (De Massis et al., 2014). Firms with the same level of family involvement in ownership, governance and/or management can have different sources and levels of willingness just as firms with the same intention and level of commitment can have different abilities (De Massis et al., 2014). In this sense, we answer to the call of De Massis et al. (2014) to develop a model in which ability and willingness of family firms are simultaneously taking into account when examining their idiosyncratic behavior. Considering ability and willingness should allow us to assess more accurately the differences in the behavior and performance of firms with and without family involvement as well as the heterogeneity that exists among firms with family involvement. We estimated the ability determined and willingness determined simultaneously to measure its effect on innovative behavior. De Massis et al. (2014) indicate that there is theoretical evidence that ability and willingness must both be present for family-oriented particularistic behavior to be observed among family firms. We extended this reasoning to the case of innovation. However, we do not find any empirical statistical evidence. Indeed, the results are not supporting our first hypothesis. Our measure willingness has no significant effect on innovative behavior for family firms with high ability to innovate. This indicates that, although the family-oriented particularistic behavior theory indicates the importance of the sufficiency condition, it might not be applicable for our small sample of private Belgian family firms.

Socioemotional wealth is the most important differentiator of family firms, and can explain why they behave distinctively than non-family firms (e.g., Berrone et al., 2012; Gómez-Mejía et al., 2007; Gomez-Mejia et al., 2010). Our in-depth results confirm that it is important to take into account the multidimensional aspect of socioemotional wealth. Chrisman et al. (2014) find that the relative importance of family control, identification, building social ties, emotional attachment, and renewal of family bonds leads to different amounts and types of innovation activities. The multidimensional characteristic of socioemotional wealth implies that each of the FIBER dimensions (Berrone et al., 2012) may evolve differently (Cruz & Arredondo, 2016). In other words, it is reasonable that these FIBER dimensions may be distinct and could influence innovative behavior differently (Berrone et al., 2012). Indeed, we find different innovative behaviors depending on the predominant dimension of socioemotional wealth, used to measure willingness in our study. More specifically, we get some interesting results when we use emotional attachment in order to measure willingness, while the results are insignificant for all the other FIBR dimensions.

We find statistical evidence that for family firms with high ability to innovate the effect of willingness, measured as emotional attachment of family members, on product innovation is significantly positive. This effect is the same when we consider process innovation. Emotional attachment deals with the affective content of socioemotional wealth and refers to the role of emotions in the family business context (Berrone et al., 2012). Depending on the specific values and interest on which family ownership is based, some dominant family actors may for instance be more focused on maintaining full control and entertaining their emotional attachment, rather than improving innovation and growth by, for example, giving up control to external investors (Nordqvist, 2016). When family members feel emotional ownership of the firm (Björnberg & Nicholson, 2007), they might act as aligned agents of their families and implement the strategies according to the preference of family owners. The decision-making process in family firms might be influenced by emotions (Baron, 2008), as emotions permeate the organization through the blurred boundaries among family and business (Berrone et al., 2010).

Furthermore, our study illustrates how a researcher may utilize PLS-SEM to investigate the interrelationships between family business theories and theories in other disciplines, such as marketing, strategy, psychology. The use of PLS-SEM enabled us to review all of the constructs' conceptualizations and specify them as formative or reflective, avoiding misspecification of the model. Although the socioemotional wealth scale is previously seen as a reflective scale (e.g., Debicki et al., 2016; Hauck et al., 2016), we find theoretical and empirical evidence that it is rational to conceptualize and measure the socioemotional wealth index by a formative model. Socioemotional wealth can be seen as a combination of five dimensions, without any assumptions as to the patterns of intercorrelation between these dimensions. The distinction between formative and reflective measures is important because proper specification of a measurement model is necessary to assign meaningful relationships in the structural model (Coltman et al., 2008).

According to De Massis et al. (2014) additional research is needed on how ability as discretion and willingness interact with resources and capabilities to influence the firm's effectiveness and performance. As an answer to this call, we took a closer look at the role of financial resources. According to the resource-based view and the literature among financial constraints, we argue that financial resources might clarify the inconsistent evidence concerning the impact of the family involved on their innovative firm behavior. The existing studies on family-oriented particularistic behavior assume that all resources are available when defining the concept ability. However, the lack of financial resources may affect the degree to which willingness to innovate contribute to innovative behavior in family firms with high ability to innovate. However, we do not find statistical support for the moderating role of financial constraints.

By distinguishing between product, process and organizational innovative behavior we paint a more nuanced and comprehensive picture of the relationship between ability and willingness and innovative behavior. Lumping together measures of product, process and organizational innovation performance may obscure the true processes and effects that are going on in family firms. We can observe that the sign of some particular variables differ according to the innovation measure used. The interacting effect of ability and willingness is negative, but insignificant, in case of product and process innovation. While, the effect of willingness on organizational innovation is positive for family firms with high ability to innovate, but not statistically significant. We expected a positive correlation between willingness and the innovation measure, since we assume that ability and willingness must both be present for family-oriented particularistic behavior to be observed among family firms. We view organizational innovation as a type of innovation, next to product innovation and process innovation.

Organizational innovation is a particular type of innovation and concerns *"new programs in management and administration and in human resource planning and management"* (Zahra et al., 2000, p. 958), or in other words *"changing the way work is organized"*. Compared with other types of innovation, organizational innovation takes a long time to implement. It is important to keep the process going and to put a lot of effort into demonstrating the organizational innovation (Boer & During, 2001). The sufficiency condition may have a stronger effect on the long-term because several changes have to be made within the firm. This could be a reason why we only find a positive (but insignificant) interacting effect of ability and willingness on organizational innovation. Llach et al. (2012) state that different types of innovation require different levels and types of investments, imply a different level or risk, rely differently on internal or external resources and capabilities, and build on different types of social capital. In the case of organizational innovation, Llach et al. (2012) argue that this type of innovation requires a lower technological investment than product or process innovation. In addition, organizational innovation depends on internal and controllable resources (Llach et al., 2012). Family firms are more likely to apply organizational innovation, since they depend more on internal resources (Hottenrott & Peters, 2012) and are more conservative when it comes to product and process innovation (H.-L. Chen & Hsu, 2009; Llach et al., 2012; Nieto et al., 2015). Organizational innovation may go beyond the boundaries of the firm, since it is related to customers, suppliers or other stakeholders. For example, more and new ways of cooperating along the value chain can also be considered to be a type of organizational innovation (Llach et al., 2012). Llach et al. (2012) argue that family firms have some advantages over non-family firms in this type of intangible innovation, because they are better positioned to build social capital with other stakeholders (Carney, 2005; Dyer, 2006). Cooperation is a relevant way to look for complementary resources and capabilities and is used as a way to achieve higher degrees of innovation. This could encourage family firms to invest more in organizational innovation (Llach et al., 2012).

7. Concluding remarks

7.1. Concluding notes

Prior studies on the impact of family involvement on innovation have not reached a consensus on whether some family firms are more or less innovative compared to other family firms, or the circumstances under which certain family firms are more successful in performing innovative behavior. A first strand of literature observes some family firms as conservative, resistant to change, averse to risk and less innovative (e.g., H.-L. Chen & Hsu, 2009; Nieto et al., 2015). A second strand of literature reports that other family firms are likely to have a culture that supports innovation (e.g., Classen et al., 2014; Nieto et al., 2015). No convincing conclusion can be drawn from prior innovation studies in family firms. Therefore, it is important that the study of family firms moves forward and focuses on explaining variations in innovative behavior between family firms.

De Massis et al. (2014) argue that the models commonly used to examine family firms, especially when applied to differentiate the behaviors of firms with and without family involvement, need to be enlarged by a sufficiency condition requiring the presence of both ability and willingness. Thus, by incorporating ability and willingness into theory and research, it can be possible to reconcile the conflicting propositions about family firm innovation. This may help to advance the development of a theory of the family firm. We developed a model in which ability and willingness of family firms are simultaneously taking into account when examining their innovative behavior. Even though De Massis et al. (2014) indicate that there is theoretical evidence that ability and willingness must both be present for family-oriented particularistic behavior to be observed among family firms, we do not find any empirical evidence in line with the innovation types considered.

The mixed findings regarding family firms and innovation might be due to the duality of their objectives. On the one hand, their long-term orientation and interest alignment between owners and managers allows dedicating resources to innovation (e.g., Classen et al., 2014; Nieto et al., 2015). On the other hand, their conservative nature to preserve the firm's reputation and wealth might hinder innovation (e.g., H.-L. Chen & Hsu, 2009; Nieto et al., 2015). It is important to take into account the multidimensional aspect of socioemotional wealth, which is confirmed by our robustness checks. We find different innovative behaviors depending on the predominant dimension of socioemotional wealth, used to measure willingness in our study. More specifically, we get some interesting results when we use emotional attachment in order to measure willingness, while the results are insignificant for all the other FIBR dimensions. More specifically, we find statistical evidence that for family firms with high ability to innovate the effect of willingness, measured as emotional attachment of family members, on product innovation or process innovation is significantly positive. This dimension is particularly useful in understanding why, under certain circumstances, family members take the opportunity to be altruistic to each other (e.g., Berrone et al., 2012; Schulze et al., 2003). Unlike employees in non-family firms, family firm members have the dual role of being a family member and a family firm employee, which may complicate the responsibilities of fulfilling both family and business expectations (Berrone et al., 2012). Each of these two roles has its own norms, value structures, and organizational structures. Problems arise because the roles in the family and business can become confused as the same individual has to fulfill obligations in both roles. In addition, the firm itself has to operate according to sound business practices and principles, while at the same time meeting family needs for employment, identity, and income (Gersick et al., 1997).

The current study attempts to broaden our understanding of the processes underlying successful innovation in family firms by studying not only ability and willingness but also the role of financial constraints as drivers of innovative behavior. According to the resource-based view and the literature among financial constraints, we argue that financial resources might clarify the inconsistent evidence concerning the impact of the family involved on their innovative firm behavior. However, we do not find any statistical evidence for the moderating role of financial constraints.

Nowadays most policy makers have innovation high on the agenda. Innovation acts as a path towards achieving crucial business goals and constitutes an important driving force of firm-level productivity, competitiveness, and sustainable economic growth (e.g., Habbershon & Pistrui, 2002; Hottenrott & Peters, 2012; Naldi et al., 2007). Several resources are needed to be successful in actually performing innovative behavior. The ability and willingness to innovate alone are not enough to actually perform innovative behavior. Consequently, it is a concern for both policy makers and industry practitioners that financial constraints due to imperfections in capital markets reduce investments in innovation below desired levels (Hottenrott & Peters, 2012). Hence, policy makers should stimulate the provision of risk-taking external capital and provide public funding (Hottenrott & Peters, 2012).

7.2. Suggestions for future research

Aside from its contributions, our study has several limitations that not only represent the boundaries of insights but also provide opportunities for future research.

First, the generalizability of our results may be limited, as we exclusively observed privately-held family firms in Belgium. As a result, it would be useful to expand the scope of this investigation to other countries in order to extent our findings and evaluate whether our results might be country-specific.

Second, a longitudinal design should be implemented for more thorough analyses, along with a follow-up study. In this way, researchers can get practical insights into what hinders family firms to innovate or what makes them successful in innovating.

Third, investigating other measures of financial constraints, like credit rationing, would be a promising avenue for future research. In addition, it would be interesting to also have a look at the demand side of financial constraints. In imperfect capital markets, a firm's capital structure is determined not only by its ability to raise funds externally (i.e., the supply side), but also by its demand for capital (Dang, 2013). Does a firm have zero leverage as a consequence of financial constraints or because of a strategic decision to mitigate underinvestment incentives and preserve financial flexibility (Dang, 2013)? Firms might eschew debt financing because unlevered firms are managed by entrenched managers who abstain form debt financing. Entrenched managers choose low levels of leverage either to reduce firm-specific risk and protect their human capital, or to consume private benefits by reducing interest payments and increasing the resources under their control (e.g., Devos et al., 2012; Strebulaev & Yang, 2013). More specifically, family firms are less inclined to raise new equity because a rise in share capital will weaken their equity stake and eventually undermine their controlling position (Andres, 2011).

CHAPTER 6

CONCLUSION

The objective of this dissertation was to enrich the understanding of productivity differences between family firms and non-family firms. Through the bundling of three independent studies, this dissertation adds to current literature by identifying and filling several gaps related to this topic. This final chapter summarizes the empirical findings of each of these studies and, accordingly, it discusses the main theoretical and practical implications of this dissertation. The conclusion chapter is structured as follows. Section 1 summarizes the main empirical findings of each of the chapters. Theoretical implications are presented in section 2, providing an interpretation of the results by relating the findings to extant theory. In section 3, methodological implications of the dissertation are presented, while in section 4 the practical implications of the dissertation are presented. Finally, section 5 concludes with some suggestions for future research.

1. Summary of empirical findings

PART I – PRODUCTIVITY (THE NETHERLANDS: SAMPLE OF DUTCH FIRMS)

"IS THE PRODUCTIVITY RELATIONSHIP BETWEEN FAMILY FIRMS AND NON-FAMILY FIRMS DIFFERENT FOR HIGH PRODUCTIVE VERSUS LOW PRODUCTIVE FIRMS?"

Chapter 2 Our goal is to exploit variations of labor productivity distributional characteristics and labor productivity effects according to ownership status. We used a micro-level approach to study the role of family ownership in shaping firms' labor productivity distributions. Specifically, we examined the distributional differences in labor productivity between family firms and non-family firms. To achieve this goal, we used a dataset containing information on 1802 firms located in the Netherlands during the period 2010-2013. The identification of distributional differences was accomplished by using the non-parametric instrumental variable quantile regression estimator either assuming endogenous treatment selection or exogenous treatment selection (Frölich & Melly, 2010, 2013). By doing this, we allow labor productivity differences among family firms and non-family firms to vary at different points of the unconditional labor productivity distribution.

Under the assumption of endogeneity, we find a clear overall pattern whereby the estimated labor productivity difference between family firms and non-family firms is significantly negative along the entire labor productivity distribution. Based on these results, we can safely conclude that for the group of compliers[80], family ownership has a substantially negative and significant effect for all quantiles of the labor productivity distribution.

However, when assuming exogeneity our main finding is that the least-performing at lower quantiles (best-performing at higher quantiles) family firms show a productivity premium (discount) as compared to their compeers in the population of non-family firms. Put differently, family firms are less likely to exhibit extreme labor productivity outcomes at the lower and upper ends of the distribution (i.e., probability mass concentrated in the center), whereas non-family firms more frequently show extreme outcomes (i.e., more probability mass in the tails). Our findings provide strong empirical support to the socioemotional wealth perspective and labor productivity, as extensively described in Firfiray et al. (2016). Our model predicts a very distinct pattern of heterogeneous productivity responses that depend not only on the type of ownership status but also on the firm's initial, random productivity draw.

[80] The group of firms for which the strength of the instrument is high.

Our hypothesis –*thinner tails and smaller dispersion for family firms versus thicker tails and larger dispersion for non-family firms* is supported under the assumption of exogeneity. These results may resolve the mixed insights from previous studies. While agency theory proposes a negative impact of family ownership on productivity, the stakeholder perspective presumes the opposite. We utilize arguments from the socioemotional wealth perspective to reconcile these two seemingly opposing views. We argue that family firms will base their major business decisions on socioemotional wealth goals especially when the productivity level is high. However, if the family firm faces disappointing financial results their focus will be less on socioemotional wealth but more on increasing productivity in order to save the company and maintain the firm reputation. Family firms tend to be more resilient in times of economic downturn because of their conservative way of financing, their solid financial buffers, their long-term focus, and the trust of their employees (e.g., Amann & Jaussaud, 2012; Bauweraerts & Colot, 2013; Gueye & Simon, 2010; Jongkind, 2013; Kachaner et al., 2012). Family firms don't earn as much money as companies with a more dispersed ownership structure during good economic times. However, when the economy falls down family firms perform better than non-family firms (Kachaner et al., 2012). Family owned firms seem to have found a way of reconciliation between tradition and modernity and provide a strong governance model in complex and changing environments (Gueye & Simon, 2010), which makes them a stabilizing factor in the economy.

As such, this chapter contributes to the literature in several ways. First, our study contributes to theory by suggesting the importance of considering how variations in goals might influence family firm behavior. We contribute to the theoretical productivity debate by joining the recent debate cited by Martin and Gomez-Mejia (2016) on the interaction between socioemotional wealth and financial wealth (FW). This alternative theoretical perspective provides more insights into the explanation of the family productivity premium and can be helpful in reconciling the seemingly conflicting findings from studies using the agency theory or stakeholder theory. While classical agency and stakeholder theories focus on maximizing shareholder wealth (Tosi et al., 2003), this assumption may need to be relaxed in family firms to include both monetary and non-monetary benefits (Chrisman et al., 2007). This study builds further on the theoretical debate of Martin and Gomez-Mejia (2016) by empirically testing the interaction between SEW and FW over the whole productivity distribution. Second, we provide empirical insights into the context of labor productivity analysis using unconditional quantile regression. UQR enables us to assess the impact of the family ownership at different quantiles of the unconditional, or marginal, distribution of the productivity level. The UQR method allows us to reveal differences of the impact of family ownership on labor productivity between low- and high-productive firms. Such important differences would have remained unnoticed if we had used conventional mean regressions. The use of UQR will help to bring out the full productivity differences between family firms and non-family firms. Finally, studies of the relationship between family versus non-family ownership and productivity (either labor productivity or total factor productivity) could potentially suffer from endogeneity problems. The ownership type of a firm is a decision variable (i.e., family firms and non-family firms are not randomly plucked out of the air), which may be correlated with unobservables that could affect productivity as well (e.g., due to different priorities). Therefore, standard regression techniques (OLS) are very likely to produce biased and inconsistent estimates. To control for potential endogeneity, we use the IV-UQTE estimator, recently proposed by Frölich & Melly (2010, 2013). This new estimator aims at estimating *unconditional quantile treatment effects (UQTEs)* when the *treatment* (i.e., firm ownership type) selection is *endogenous*. To implement this estimator, we use an instrumental variable (IV) to solve for the endogeneity of the binary treatment variable (=1 if family firm, and =0 if non-family firm).

PART II – WAGE POLICIES (THE NETHERLANDS: SAMPLE OF DUTCH FIRMS)

"HOW MUCH OF THE FAMILY WAGE DISCOUNT CAN BE EXPLAINED BY VARIATION IN (UN)OBSERVABLE WORKER AND/OR FIRM CHARACTERISTICS?"

"WHAT IS THE ROLE OF UNION BARGAINING POWER (AS AN ASPECT OF WAGE POLICY) IN EXPLAINING THE FAMILY WAGE DISCOUNT?"

Chapter 3 This chapter focused on wage differences between family firms and non-family firms. The wage differences between family firms and non-family firms might be influenced by observable worker and/or firm characteristics or other sources of heterogeneity across workers and/or firms.

We first identified and quantified several factors that are deemed to be important in explaining the family wage discount. In particular, we quantified the contribution of an extensive set of worker-level and firm-level observable and unobservable characteristics in explaining the family wage discount. The main research question to be addressed was: "How much of the family wage discount can be explained by variation in (un)observable worker and/or firm characteristics?". We were able to employ a purpose-built employee-employer matched dataset with annual data from 2010 through 2013 that includes firm's family owned status, worker's wages, socio-demographic and job type characteristics, firm's international trade activities, as well as firm's engagement in product and/or process innovation. We confirm that family firms pay on average lower wages, with a discount that lies around 15% once we control for (un)observed worker and firm characteristics. Our results reveal that worker and/or firm fixed effects can be attributed in explaining the family wage discount. Indeed, we find that worker fixed effects partially explain the family wage discount with about 4.4% points. On the other hand, firm fixed effects contribute to an increasing wage gap of family firms. This may be explained by the fact that workers in family firms tend to sort themselves into firms that pay on average lower wages.

In the subsequent part of the chapter, the influence of a different wage policy on the family wage discount was investigated. To do so, we used firm-level data in order to make the unobserved firm heterogeneity more explicit by looking at the union bargaining power within firms. We investigated whether institutional instruments, such as the role of unions, explain differences in wages between family firms and non-family firms. The second research question to be addressed was: "What is the role of the union bargaining power (as an aspect of wage policy) in explaining the family wage discount?". Our analyses reveal differences between family firms and non-family firms in terms of wage policy when using a wage markup approach on firm-level data. The bargaining power in family firms appears to be lower, which implies that the role of unions in those firms is rather limited. Our analysis further reveals that these results hold only for high-skilled firms.

As such, this chapter provides three significant contributions. First, we put emphasis on the role of unobserved heterogeneity on the individual pay level of all employees. Using the time variation in our data, we were allowed to estimate which part of the family wage discount is due to unobserved worker-level or firm-level heterogeneity. Unlike previous studies, we took into account both worker fixed effects and firm fixed effects, while controlling for other wage determinants. We have an extensive employer-employee dataset on wages, firm ownership, wage policy characteristics, workers' characteristics and firms' characteristics, which allowed us to include more variables than previous studies have done so far. We are confident that by incorporating worker fixed effects and firm fixed effects we are able to provide redefined estimates of the corresponding sources of wage differences between family firms and non-family firms. Second, we contribute to the recent literature on the impact of misallocation of resources. We estimated simultaneously market imperfections in product and labor markets and investigated explicitly the role of family ownership. Only a small number of studies have simultaneously considered imperfections in the product and the labor market. By estimating both price-cost markups in the product market and the extent of rent sharing in the labor market, this study contributes to bridging the gap between the econometric literature on product market imperfections and that on labor market imperfections. Third, we examined the role of union bargaining power in explaining the family wage discount. To assess the impact of workers' bargaining power due to trade unionization on productivity, we used a Dutch firm-level dataset. We simultaneously estimated price-cost margins and union bargaining power to analyze how price setting and bargaining power are affected by ownership structure (i.e., family firms versus non-family firms). We derived a measure of union bargaining power without relying on trade union participation data.

PART III – INNOVATION (BELGIUM: SAMPLE OF BELGIAN PRIVATE FAMILY FIRMS)

"WHY ARE SOME FAMILY FIRMS MORE SUCCESSFUL IN ACTUALLY PERFORMING INNOVATIVE BEHAVIOR THAN OTHERS?"

Chapter 4 Firms can distinguish themselves from their major competitors in terms of innovation, since innovation is generally considered as a way of improving the competitiveness, productivity, and the probability of survival of firms (e.g., Cefis & Marsili, 2006; Dabla-Norris et al., 2012; Hall et al., 2009). Indeed, innovation is an important determinant of productivity (e.g., Syverson, 2011). The purpose of this chapter was to get insights into the innovative behavior of private Belgian firms. In this chapter, we found differences in the innovation mean values between family firms and non-family firms. This could reflect a dissimilar innovation structure and behavior between family firms and non-family firms. Family firms indicate to engage, on average, more in product innovation, process innovation and organizational innovation compared to non-family firms. However, the average R&D expenses in family firms (3.9%) are lower than in their non-family counterparts (4.45%). Family firms introduce on average less new or significantly improved products and/or services than non-family firms. Furthermore, we also found that family firms are more likely to collaborate actively with external innovation partners than non-family firms.

Chapter 5 In this chapter, we investigated why some family firms are more successful in performing innovative behavior compared to others. Family firms typically have two unique family-based characteristics –ability and willingness–, which can help them to engage in particularistic behavior, such as innovation (e.g., Chrisman et al., 2014; Gómez-Mejía et al., 2007; Naldi et al., 2007; Zahra, 2005). However, having the ability and willingness to innovate does not guarantee family firms to engage effectively in innovative behavior. The literature on family-oriented particularistic behavior in combination with ability and willingness seems to focus only on family-based resources (Chrisman et al., 2014; De Massis et al., 2014), thereby ignoring the vital role of financial resources. Therefore, we have studied the moderating role of financial constraints on this relationship. We formulated two hypotheses concerning the innovative behavior in family firms (see Table 48), which were tested using a sample of 110 private Belgian family firms which have a high ability to innovate. Our initial results are not supporting our hypotheses (see Table 49). This indicates that, although the family-oriented particularistic behavior theory indicates the importance of the willingness concept, it might not be applicable for our sample of private Belgian family firms. Additionally, we do not find support for the moderating role of financial constraints. For researchers, practitioners and policy-makers it is essential to no longer view family firms as a form of business that fails to innovate. Family firms may in fact successfully compensate in other innovation domains, for instance, by means of creating an innovative-supportive culture and stimulating employee creativity (Classen, 2013).

However, our in-depth analyses indicate that it is important to take into account the multidimensional aspect of socioemotional wealth. We found different innovative behaviors depending on the predominant dimension of socioemotional wealth, used to measure willingness in this study (see Table 49). Indeed, we found some interesting results when emotional attachment was used to measure willingness, while the results are insignificant for all the other FIBR dimensions. More specifically, we found statistical evidence that for family firms with high ability to innovate the effect of willingness, measured as emotional attachment of family members, on product innovation or process innovation is significantly positive. Unlike employees in non-family firms, family firm members have the dual role of being a family member and a family firm employee, which may complicate the responsibilities of fulfilling both family and business expectations (e.g., Berrone et al., 2012; Gersick et al., 1997). Each of these two roles has its own norms, values, and organizational structures. Problems arise because the roles in the family and business can become confused as the same individual has to fulfill obligations in both roles. In addition, the firm itself has to operate according to sound business practices and principles, while at the same time meeting family needs for employment, identity, and income (Gersick et al., 1997).

As such, this chapter has several important contributions to the literature. First, we add to the family firm field by extending the literature on innovation in family firms. In particular, we presented a framework useful for understanding what factors can explain whether family firms succeed or fail in innovative behavior. The framework is based on two drivers of family-oriented particularistic behavior –ability and willingness– and the paradox[81] that they cause in family firms as they try to manage the innovation process. Second, we add to the literature on financial constraints in family firms by considering financial constraints as a moderator that strengthens the gap between ability and willingness to innovate and actual innovative behavior. The relationship between ability and willingness to innovate and innovative behavior appears to be more complex than currently assumed. We expand the resource-based view to family firm innovative behavior by introducing the overlooked financial resources, while previous studies mainly used the agency theory and stakeholder theory in predicting family firm behavior. Finally, we put emphasis on measuring the two separate but interrelated family involvement engendered theoretical constructs: ability and willingness. Unlike previous studies, we found theoretical and empirical evidence that it is rational to conceptualize and measure the socioemotional wealth index by a formative construct. We suggest Partial Least Squares Structural Equation Modeling (PLS-SEM) as an advanced estimation method because it allowed us to review all of the constructs' conceptualizations and specify them as formative or

[81] The ability and willingness paradox in family firm innovation argues that family firms have superior ability yet lower willingness to engage in innovation (Chrisman et al., 2014).

reflective, avoiding misspecification of the model. Using PLS-SEM allowed us to take into account the multidimensional aspect of socioemotional wealth.

Table 48: Overview hypotheses

Hypothesis
H1: For family firms with high ability to innovate, the family's willingness to innovate is positively related with their innovative behavior.
H2: For family firms with high ability to innovate, external financial constraints will moderate the relationship between a family firm's willingness to innovate and their innovative behavior. Specifically, a high ability family firm's willingness to innovate will have a less positive effect on their innovative behavior when the level of external financial constraints increases.

Table 49: Summary of results

Willingness	**Product innovation**	**Process innovation**	**Organizational innovation**
SEW – FIBER	H1: not supported H2: not supported	H1: not supported H2: not supported	H1: not supported H2: not supported
SEW – F *(Family control)*	H1: not supported H2: not supported	H1: not supported H2: not supported	H1: not supported H2: not supported
SEW – I *(Identification)*	H1: not supported H2: not supported	H1: not supported H2: not supported	H1: not supported H2: not supported
SEW – B *(Building social ties)*	H1: not supported H2: not supported	H1: not supported H2: not supported	H1: not supported H2: not supported
SEW – E *(Emotional attachment)*	**H1: supported** H2: not supported	**H1: supported** H2: not supported	H1: not supported H2: not supported
SEW – R *(Renewal family bonds)*	H1: not supported H2: not supported	H1: not supported H2: not supported	H1: not supported H2: not supported

2. Theoretical implications

This dissertation focused on (1) whether a family firm is an effective organizational structure in producing better than non-family firms, and (2) what characteristics explain these productivity differences between family firms and non-family firms. To make sense of the complex and seemingly mixed productivity results in family firm context, different methodologies and theoretical frameworks were used throughout the dissertation. As such, this dissertation offers a varied look into the productivity potential of family firms. The literature on productivity in family firms has been rather inconclusive. On the one hand, the agency theory predicts a negative impact of family ownership on productivity. On the other hand, the stakeholder theory supposes that family firms are more productive than non-family firms. Given these conflicting theoretical views regarding the impact of family ownership on productivity, this dissertation tried to tackle the conflicting findings theoretically as well as empirically.

From a theoretical viewpoint, our research contributes to the literature on productivity differences between family firms and non-family firms. The findings of this doctoral dissertation also advance the SEW framework in order to explain productivity differences between family firms and non-family firms. This theoretical perspective provides additional insights into the productivity debate. We used arguments from the socioemotional wealth perspective to reconcile two seemingly opposing views based on the agency theory or stakeholder theory. While classical agency and stakeholder theories focus on maximizing shareholder wealth (Tosi et al., 2003), this assumption may need to be relaxed in family firms to include both monetary and non-monetary benefits (Chrisman et al., 2007). Focusing on the SEW framework, it sheds new light on the role of ownership structure in shaping firms' productivity distributions and how and why family firms display particularistic behaviors. The study in Chapter 2 used both the behavioral agency model and the SEW framework[82] to investigate the variability in the productivity behavior of family firms as compared to their non-family counterparts. Based on SEW, we argue that the effect of family ownership on labor productivity is not constant for all values of labor productivity; in other words, the SEW reference point varies with the family firm's labor productivity level. Family firms face SEW trade-offs that non-family firms are not facing (Cruz & Arredondo, 2016). Specifically, low productive family firms focus less on SEW goals in making strategic decisions and concentrate more on financial goals in an effort to return to acceptable productivity levels, whereas high productive family firms care less about (further) increasing the level of productivity by

[82] We extend the previous research by joining the recent SEW debate developed by Martin and Gomez-Mejia (2016) regarding the two-way relationship between socioemotional and financial wealth. Martin and Gomez-Mejia (2016) developed a more complete theory of wealth concerns that may inform family firm decision-making by looking into the interaction of both financial goals and socioemotional goals.

giving priority to non-financial goals over financial goals and focus more on SEW goals to preserve the *'family jewels'* (Nordqvist, 2016). Low productive family firms are willing to temporarily change its traditional goals and put more emphasis on financial goals.

In Chapter 3, we contribute to the recent literature on the impact of misallocation of resources. We estimated simultaneously market imperfections in product and labor markets and investigated explicitly the role of family ownership. Only a small number of studies have simultaneously considered imperfections in the product and the labor market. By estimating both price-cost markups in the product market and the extent of rent sharing in the labor market, this study contributes to bridging the gap between the econometric literature on product market imperfections and that on labor market imperfections (Dobbelaere & Mairesse, 2013).

In Chapter 5 we link the resource based view to the family-oriented particularistic behavior theory to explain innovative behavior in family firms. The literature on family-oriented particularistic behavior in combination with ability and willingness seems to focus only on family-based resources (Chrisman et al., 2014; De Massis et al., 2014), thereby ignoring the vital role of financial resources. Financial resources can offer an explanation why some family firms, who have the ability and willingness to innovate, eventually do not engage in innovative behavior. Therefore, we investigate the moderating role of financial constraints on family firm's innovative behavior by relying and drawing on the resource-based view.

3. Methodological implications

From a methodological point of view, this dissertation has some additional remarkable contributions. We used the unconditional quantile regression as an advanced estimation method new to the literature on productivity differences between family firms and non-family firms. Our study in Chapter 2 is different from previous work that analyses the relationship between family ownership and labor productivity at the mean value, using classical linear regression (OLS or different panel data estimators). In contrast, the unconditional quantile regression method generates average effects for each quantile of the labor productivity distribution. This implies that we can investigate the impact of family ownership on labor productivity at different levels of the labor productivity distribution (i.e., for low or high levels of labor productivity). The UQR method allows us to reveal considerable differences of the impact of family ownership on labor productivity between low- and high-productive firms. Such important differences would have remained unnoticed if we had used conventional mean regressions. We believe that examining the effect of family ownership on labor productivity along the labor productivity distribution can add value to the existing puzzling evidence obtained via classical linear regression. The use of UQR will help to bring out the full productivity difference between family firms and non-family firms. To sum, our study contributes to a more nuanced understanding of the productivity differences between family firms and non-family firms by going beyond overly simplistic disputes about average productivity-performance differences.

In estimating the impact of family on productivity, we went beyond the conventional mean regressions by using the new non-parametric quantile treatment effect estimator (IV-UQTE), proposed by Frölich and Melly (2010, 2013). Using this IV-UQTE estimator allows us to control for possible endogeneity between family ownership status and productivity. This IV-UQTE estimator aims at estimating unconditional treatment effects when the treatment (i.e., family ownership status) selection is endogenous. To implement the UQTE estimator, we use an instrumental variable to solve for the endogeneity of the binary treatment variable. It is essential to make sure that the empirical model is not influenced by endogeneity, because it causes parameter estimators to become biased and inconsistent. In our case, a Hausman test confirmed the endogeneity problem in Chapter 2. By using the IV-UQTE estimator, we are the first to explicitly analyze the distributional impacts of family ownership and to explain how and why differences in behaviors and risk attitudes in family firms and non-family firms change as one moves along the unconditional productivity distribution. Our aim is to identify and estimate productivity differences between family firms and non-family firms, and most importantly, to see how these differences vary throughout the entire unconditional productivity distribution – with particular focus on the distribution's tail behavior.

There is an upcoming need for methods capable of handling more complex model structures, since theories and models in family business research become more extensive. Therefore, and in response to a call for research that uses PLS-SEM to test theories in family business research (Sarstedt et al., 2014), we used PLS-SEM in Chapter 5 to examine the innovative behavior of family firms. PLS-SEM provides researchers with more flexibility in terms of data requirements, model complexity and relationship specification. PLS-SEM can be used when sample sizes are small and models are rather complex. For example, PLS-SEM can handle estimating models with many constructs, structural model relationships and multiple indicators per construct (Henseler et al., 2014; Sarstedt et al., 2014). It can be used to simultaneously study multiple interrelated dependence relationships between a set of constructs. PLS-SEM can be very useful in family business research which has to deal with increasing complexity of theories and cause-effect models, over-surveyed respondents and decreasing response rates (Sarstedt et al., 2014). We suggest Partial Least Squares Structural Equation Modeling (PLS-SEM) as an advanced estimation method because it allows us to review all of the constructs' conceptualizations and specify them as formative or reflective, avoiding misspecification of the model. Using PLS-SEM allows us to take into account the multidimensional aspect of the formative construct socioemotional wealth.

4. Practical implications

This dissertation also holds important practical implications. Most of the empirical studies are concerned with mean effects, yet distributional effects are no less important. The distribution of the dependent variable may change in ways that are not revealed or are only incompletely revealed by an examination of averages (e.g., Firpo et al., 2009; Frölich & Melly, 2010; Rothe, 2010). For example, the productivity distribution can become more compressed or the upper-tail inequality may increase while the lower-tail inequality decreases. Therefore, policy makers are increasingly interested in distributional effects[83]. The unconditional quantile regression technique provides more policy-relevant information, because it allows researchers to examine the impact of family ownership on productivity at different quantiles of the entire productivity distribution. Policy-makers and labor economists are particularly concerned with changes in the productivity distribution. The practical implications of this Chapter 2 point to the fact that family firms' most efficient choices are not necessarily the same as those of non-family firms, whereas those choices and their corresponding reference point depend on the productivity level of the firm. So, the effect of family ownership on labor productivity varies along the distribution of labor productivity.

Reading Chapter 3 can be useful for practitioners as it includes suggestions of how family firms can use their compensation policies in order to lower wages and increase productivity. The practical implications of this Chapter 3 point to the fact that, instead of saying that employees in family firms earn on average less than in non-family firms, employees in family firms may benefit from other non-monetary incentives. Thus, instead of simply looking at the monetary incentives or the total compensation package, it is better to look beyond the pay mix. The risks assumed by employees at all levels are personal ones, that of being fired (Carrasco-Hernandez & Sánchez-Marín, 2007). Family firms could potentially derive lower wages by increasing the effectiveness of their unique wage policy, like increasing the job security or by lowering the bargaining power of unions.

Nowadays most policy makers have innovation high on the agenda. Innovation acts as a path towards achieving crucial business goals and constitutes an important driving force of firm-level productivity, competitiveness, and sustainable economic growth (e.g., Habbershon & Pistrui, 2002; Hottenrott & Peters, 2012; Naldi et al., 2007). Several resources are needed to be successful in actually performing innovative behavior. The ability and willingness to

[83] From a policy perspective, an intervention that helps to raise the lower tail of an income distribution is often more appreciated than an intervention that shifts the median, even if the average treatment effects of both interventions are identical (Frölich & Melly, 2013, p. 346).

innovate alone are not enough to actually perform innovative behavior. Consequently, the practical implications of this Chapter 5 point to the fact that it is a concern for both policy makers and industry practitioners that financing constraints due to imperfections in capital markets reduce investments in innovation below desired levels (e.g., Hottenrott & Peters, 2012). Hence, policy makers should stimulate the provision of risk-taking external capital and provide public funding (Hottenrott & Peters, 2012).

5. Avenues for future research

5.1. Concluding note

In summary, we reach with this dissertation our objective to gain deeper insights into (1) the measurement of the family productivity premium and (2) explaining the productivity differences between family firms and non-family firms. We did this by providing the answer on our research questions in four different studies. First, we revealed how the family productivity premium/discount varies at different quantiles of the labor productivity distribution. Second, we focused on wage differences between family firms and non-family firms, which might be influenced by observable worker and/or firm characteristics or other sources of heterogeneity across workers and/or firms. Here, we found that family firms pay on average lower wages than non-family firms. More specifically, workers in family firms tend to sort themselves into firms with less generous remuneration policies, and the abilities of workers in family firms are higher than those working in non-family firms. In addition, we found that the bargaining power in family firms is lower than in non-family firms which implies that the role of unions in family firms is rather limited. Third, we investigated the moderating role of financial constraints on family firm's innovative behavior. We found no support for our hypotheses, but we found different innovative behaviors depending on the predominant dimension of socioemotional wealth, used to measure willingness in our study. This indicates the importance of taking into account the multidimensional aspect of socioemotional wealth. Moreover, we found theoretical and empirical evidence that it is rational to conceptualize and measure the socioemotional wealth index by a formative model.

5.2. Suggestions for future research

There are several limitations that restrict the conclusions that can be drawn from the studies reported in this dissertation. We believe our results are inspiring and hope future research will build on our way of thinking.

The first limitation concerns data limitations regarding the definition of a family firm. Whereas the dataset used in Chapter 4 and Chapter 5 contains extensive information about family involvement, family ownership, family control, and CEO perception, the dataset used in Chapter 2 and Chapter 3 comprises less precise information on this matter. Chapter 2 and Chapter 3 relied on a rather narrow measure of family firms[84], which did not allow us to further explore specific characteristics of family firms that might give a broader image of the productivity and wage aspects. Besides that, our measure of family firms also does not allow us to distinguish between different types of family firms. Indeed Chapter 2 and Chapter 3 of this dissertation have compared family firms and non-family firms, even though family firms are not homogeneous (e.g., Westhead & Howorth, 2007). Family firms have general unique characteristics, but at the same time there are a lot of important differences between family firms. Additional research is recommended using more fine-grained measures of family involvement to get a more comprehensive picture of what aspects of family involvement influence the productivity level, the employee wage level and the innovation level[85].

Second, future studies may disentangle the specific effects of particular types of family relations between owners on productivity, employee wage level and innovation. For example, compensation and appraisal programs reflect non-

[84] Elsevier classified a firm as a family firm if (1) the majority of ownership (directly or indirectly) rests in the hands of a natural person and/or relatives of the family who has founded or has acquired the firm, (2) at least one representative of the family or kin is formally involved in the management of the firm, (3) at least the second generation has to be involved in the firm.
[85] The recent interest in the role of SEW has contributed to the understanding of the risk-taking propensities of family firms as compared to their non-family counterparts (Berrone et al., 2010; Gómez-Mejía et al., 2007; Gomez-Mejia et al., 2010). In Chapter 2, we added to this understanding by investigating the heterogeneity of family firms, especially as it applies to different productivity levels.

economic criteria such as fulfilling family obligations, contributing to the harmony of the family or supporting the family’s goals. Extra information about precise family or founder involvement may further enhance our understanding of employee wage level in family firms. The unique resources of family firms could influence some of the findings of this dissertation. We therefore encourage future research to explore this possible influence. Additional work is also necessary to investigate how changes in family ownership increase or decrease productivity level, employee wage level and innovation over time.

Third, the studies included in this dissertation are based on evidence collected from a specific geographical region, i.e. the Netherlands and Belgium. In how far these findings are generalizable to other regions, remains to be explored in future research. Countries have cultural differences, which may influence the productivity level, employee wage level and the innovation level of firms globally. Such an institutional perspective could add further insights on how the effect of family ownership on productivity, employee wage level and innovation varies across regional contexts and improves our understanding of the cultural context.

Fourth, studies of the relationship between family ownership and labor productivity could potentially suffer from endogeneity problems. From an econometric point of view further investigation is needed on the existence of endogeneity of family ownership on labor productivity. We have formally tested for endogeneity by applying the Durbin Wu Hausman test. Thereby we assumed that if there is an endogeneity problem for the mean of the labor productivity distribution, it is also a problem for the quantiles of this distribution. In order to tackle the potential endogeneity problem, we used in Chapter 2 an IV estimator for unconditional quantile regression when the main focus of interest is the effect of a binary treatment variable, and a credible binary instrument for the treatment exists. Data limitations prevent us from using instruments that are similar to the common ones used in earlier studies of the relationship between productivity and ownership structure. For example, importance of control of the firm, time length of family involvement in the firm, family members as working directors or proprietors of the family firm are used to predict the family dummy in the first stage (e.g., Barbera & Moores, 2013; Barth et al., 2005). While Chapter 2 uncovers and discusses an instrumental binary variable, future research is needed to arrive at a more complete picture. Such research should use other instrumental variables or use another estimation method, which accounts for endogeneity and which is useful for panel data.

Next, our compensation measure in Chapter 3 is limited to the total annual cash compensation (base salary plus variable incentives). Investigating potential differences between base pay, variable cash incentives and non-monetary incentives appears to be a promising avenue for future research.

Finally, Chapter 5 is one of the first in its domain to provide empirical evidence that socioemotional wealth is a formative measurement construct. Yet, as this is grounded research, there is a definite need for a follow-up study to confirm the exploratory results.

APPENDICES

Appendix A: Details variables

Table A1: List of variables

Variable	Definition	Source
Dependent variable		
Labor productivity	(nominal sales divided by the industry gross level output price index)/(number of employees)	Production Statistics, CBS
Independent (control) variables		
Family ownership	= 1 if (i) the majority of ownership rests in the hands of a natural person and/or relatives of the founding family, (ii) at least one representative of the family or kin is formally involved in the management of the firm, and (iii) at least the second generation has to be involved in the firm = 0 otherwise	Bureau van Dijk, Elsevier
Labor	Number of employees in September of a given year	Production Statistics, CBS Bureau van Dijk
Capital	Depreciation of fixed assets deflated by the industry-level gross fixed capital formation price index for all assets	Production Statistics, CBS
Materials	Intermediate consumption deflated by the industry-level intermediate consumption price index	Production Statistics, CBS
Log(firm age)	Natural logarithm of age of the firm at time t	ABR (Population registry), CBS
Foreign ownership	= 1 if firm is foreign owned = 0 if firm is in the hands of a Dutch company	ABR (Population registry), CBS
Exporting firm	= 1 if the firm had trade activities in either goods and/or services = 0 otherwise	Trade Statistics, CBS
Innovative firm	= 1 if firm is engaged in product[86] and/or process[87] innovation and/or invested in R&D = 0 if firm did not engage in product or process Innovation or R&D investment	Community Innovation Surveys (2010-2014); CBS

[86] A product innovation is the market introduction of a new good or service or a significantly improved good or service with respect to its capabilities, such as improved software, user friendliness, components or sub-systems (CIS).
[87] A process innovation is the implementation of a new or significantly improved production process, distribution method, or support activity for your goods or services (CIS).

Appendix B: Identifying family firms

Table B1: Identification family firms through information from various data sources

Year	Source for identifying family firms
2013	Elsevier TOP 500 list for 2013 The Elsevier TOP 500 list for the year 2013 indicates already which firms are family firms. For defining the family firms in their dataset Elsevier uses the Reach database[88], information on the company's website, and they asked the companies for some additional information. Much has been published about family businesses and it is rather comprehensive, which makes it difficult to find an unambiguous definition of a family firm. However, a typical family firm is marked as an organization controlled and usually managed by multiple family members, whereby the uniqueness of a family firm is determined by the family's involvement in the business (Chua et al., 1999; Miller et al., 2007). Therefore, Elsevier selected family firms based on ownership and management control criteria and classified a firm as a family firm if (1) the majority of ownership (directly or indirectly) rests in the hands of a natural person and/or relatives of the family who has founded or has acquired the firm, (2) at least one representative of the family or kin is formally involved in the management of the firm. This is also consistent with the GEEF[89] definition (European Commission, 2009; Flören et al., 2010; Kansikas et al., 2011). Elsevier decided to tighten the GEEF definition by adding an extra criteria, namely (3) at least the second generation has to be involved in the firm[90].
2012	Elsevier TOP 100 family firms list 2012-2013 We have used the Elsevier list of the 100 largest consolidated family firms (according to the aforementioned definition) based on their return situated in the Netherlands for the period 2012-2013. The firms which appear in both lists (TOP 500 and TOP 100 family firms), are indicated as family firms in 2012. When a TOP 500 firm is not included in the Elsevier TOP 100 family firms for the period 2012-2013, we assume this firm to be a non-family firm in 2012. Please note that there is an overlap between the TOP 100 family firms and the TOP 500; in other words, the TOP 100 family firms covers the entire TOP 500. The final dataset includes more than 500 parent companies, because we have chosen to also incorporate the Elsevier TOP 100 family firms which do not belong to the TOP 500 largest companies of the Netherlands (i.e., 70 family firms are found in the TOP 500, but we also include the other 30 family firms).

[88] This database bundles the annual accounts of all companies with disclosure requirements by the Dutch national bank and is a publicly available financial database supplied by Bureau Van Dijk.
[89] European Group of Owner Managed and Family Enterprises.
[90] We have used another definition of family firms than the one used in Chapter 4 and Chapter 5 (i.e., we do not have detailed information on the family involvement, family ownership, and family control so we are dependent on the Elsevier lists and their corresponding family firm definition). In this chapter we use the same definition as is used in Chapter 3.

2011	Elsevier TOP 100 family firms list 2011-2012 We have used the Elsevier list of the 100 largest consolidated family firms (according to the aforementioned definition) based on their return situated in the Netherlands for the period 2011-2012. The firms which appear in both lists (TOP 500 and TOP 100 family firms), are indicated as family firm in 2011. When a TOP 500 firm is not included in the Elsevier TOP 100 family firms for the period 2011-2012, we assume this firm to be a non-family firm in 2011.
2010	Since only second or later generation family firms are included in the Elsevier TOP 100 family firms, we presume that in case the Elsevier TOP 100 family firms indicates that a firm is a family firm in 2011, the firm was as well a family firm in 2010.

Appendix C: Validation instrumental variable

While instrumental variables can be used to account for endogeneity, current practice requires that all five assumptions (Porter, 2012) should be met in order to credibly estimate the causal effect of a treatment. If any one of them is not satisfied, then the IV coefficients cannot be interpreted as causal effects. The assumptions are (Porter, 2012):

i. Stable unit treatment value assumption;
ii. Random assignment;
iii. Exclusion restriction;
iv. Nonzero average causal effect of instrument on treatment;
v. Monotonicity.

1. <u>Stable Unit Treatment Value Assumption (SUTVA)</u>

A key assumption is no interference between units. The potential outcome on one unit should be unaffected by the particular assignment of treatments to the other units. In our example, the change in ownership structure in firm A may not depend on whether or not firm B is family owned. A violation of SUTVA is one possible explanation for null findings (Porter, 2012). However, we do not have insignificant findings, so we consider SUTVA to be irrelevant in our case.

2. <u>Random assignment</u>

The instrument is *as good as* randomly assigned; it is independent of the vector of potential outcomes and potential treatment assignments. *As good as* means that once a set of covariates has been taken into account, the instrument should be unrelated to potential outcomes (Porter, 2012). For assumption 2 to hold, we must ask ourselves the question: can we consider the within-firm wage dummy as being randomly distributed across firms? In other words, we want to know if our instrument is exogenous. This assumption is fulfilled in our study, because we have not only sample data but also data about the entire population of Dutch employees. In other words, we use wage information of all firms in the Netherlands (i.e., the population) in order to measure our instrument.

3. Exclusion restriction

Only one causal path can exist between an instrument and the dependent variable of interest, and that path must pass through the endogenous regressor (Porter, 2012). This means that our instrument *Z* is not a determinant of labor productivity, so there is no direct relation between within-firm wage dummy and labor productivity. The relationship between wage distributional characteristics and firm performance can be explained by the tournament theory or the equity theory. On the one hand, from an economic point of view the tournament theory predicts a positive effect of wage inequality on firm performance. On the other hand, equity theory employs a behavioral point of view on wage inequality and predicts a negative effect on firm performance.

The tournament theory (TT) is based on a game theoretic view of principal-agent relations and is originally used to explain the large differences between the salary of the CEO and other top executives[91] (Lazear & Rosen, 1981). TT assumes that managers will be motivated when they are individually rewarded for their efforts. Employers set compensation policies based on ranking within an organization and these policies serve as an incentive to encourage effective competition among individuals (Conyon, Peck, & Sadler, 2001; Lazear & Rosen, 1981; Lin, Yeh, & Shih, 2013). Managers will make more effort to be promoted to a higher position when there is the prospect of higher compensation. Large pay gaps provide strong incentives to highly qualified managers, leading to greater effort and improved firm performance (Lin et al., 2013).

The equity theory (ET) is supported by the deprivation theory, which examines how individuals will respond to perceived unfair reward distributions (Greenberg, 1987). Managers compare their personal compensation with the compensation of other team members in terms of hierarchical rank level. If they perceive that they receive less compensation than they deserve, they feel deprived and are less committed to the goals of the CEO. This is also harmful for the team

[91] *"On the day that a given individual is promoted from vice-president to president, his salary may triple. It is difficult to argue that his skills have tripled in that 1-day period" (Lazear & Rosen, 1981, p. 847).*

performance because perceived inequality will undermine the cooperation and communication within the team (Vieito, 2012).

These two seemingly opposing theories, which aim to explain the impact of wage distributional characteristics on firm performance, are mainly applied on teams within firms. An application of both theories is the compensation difference between the CEO and other top executives[92]. However, we do not limit our study to the top management team but we take into account the wages of *all employees* in the firm. Our instrument is not about comparing wages for employees classified at high-paid jobs to wages for employees at low-paid jobs, but rather about the distribution of wages across all employees within a given firm. In other words, we use data about the entire population of Dutch employees in order to measure our instrument. Since we do not only focus on wages of top management teams, we assume that the arguments of TT and ET are less relevant in our case. Working with wages of all employees in a specific firm allows us to reject the TT and ET arguments and conclude that within-firm wage dummy is not a determinant of labor productivity.

4. <u>Nonzero average causal effect of instrument on treatment</u>

The instrument must be correlated with the endogenous regressor, and hopefully highly correlated (Porter, 2012). Stock and Yogo (2005) define weak instruments as the supposed minimal first-stage *F*-statistic value of 10 is not reached. We find a F-statistic[93] of 38.08 (>10), so we can say that assumption 4 is fulfilled.

5. <u>Monotonicity</u>[94]

As the instrument changes it either does not affect whether a unit is treated or affects all units the same way for those that are affected. It is useful to think about the compliance behavior of the different units, that is how they respond to different values of the instrument in terms of the treatment received. The

[92] Horizontal dispersion is pay dispersion within the team.
[93] This is calculated when family dummy is regressed on a constant and the three year dummies.
[94] Absence of defiers.

concept is often illustrated with four behavioral groups: always-takers, never-takers, compliers, and defiers (Porter, 2012). Table C1 summarizes the information about compliance behavior from observed treatment status and instrument.

Table C1: Compliance type by treatment and instrument

Instrument Z	Treatment D *(family ownership dummy)*	
	0	1
0	Compliers / never-takers	Always-takers / defiers
1	Never-takers / defiers	Compliers / always-takers

Monotonicity requires that if $Z = 1$, we should have $D = 1$, while $D = 0$ is not allowed (in contrast, if $Z = 0$, we can have both $D = 0$ or $D = 1$). Compliers fall across the diagonal, because they decline treatment when the instrument is zero, and agree to treatment when the instrument is one. Defiers are firms who do the opposite of their treatment assignment. The group of defiers should not exist and the proportion of compliers should be large. So, we have to be sure that the proportion compliers is representative for the sample. Quantile IV only yields the causal effect for a sub-group of the population, namely the compliers (Porter, 2012, 2015).

Table C2: Proportion of firms who are compliers due to within-firm wage dummy

	Assigned to treatment $P[Z = 1]$	Received treatment $P[D = 1]$	Compliers $P[D_1 > D_0]$	Compliers among treated $P[D_1 > D_0 \mid D = 1]$	Compliers among controls $P[D_1 > D_0 \mid D = 0]$
Z	0.587	0.302	0.149	0.291	0.089

Table C2 provides the proportion of firms who are compliers due to within-firm wage dummy. The probability of being assigned to treatment by the instrument is simply the proportion within-firm wage dummy, 0.587. The probability of treatment is the proportion of family firms, 0.302. Having less high wage workers than the median value and holding the nominator fixed $(Z = 1)$

increases the probability of being family owned by 14.9 percentage points. The strength of the instrument is measured by the probability mass of the compliers (firms that respond in the intended way to a change in Z). The proportion of observations which are compliers is 0.089.

Appendix D: UQR RIF-REG Regression

1. Going beyond mean effects with quantile regressions

From OLS over CQR to UQR

Ordinary least squares (OLS) is a widely-used tool for conducting studies on productivity in family firms. The classical linear regression coefficient tells us the effect of the independent variable on the mean of the outcome variable, other things being equal. However, since OLS focuses only on the mean, it is not well suited to explain the changes in the overall distribution of the outcome variable (Porter, 2015). *'On the average'* has never been a satisfactory statement with which to conclude a study on heterogeneous populations. If we acknowledge that firms are heterogeneous, we have reasons to suspect that the difference in productivity between family firms and non-family firms does not need to be the same for all firms (Powell & Wagner, 2014). For example, it might be the case that the productivity difference between family firms and non-family firms is higher for firms at the lower or upper end of the productivity distribution. Quantile regression allows the researcher to understand how an independent variable affects the entire distribution of an outcome, rather than just the average. Quantile regression is more powerful than linear regression due to its insensitivity to outliers on the outcome variable and its ability to see how the entire distribution of the outcome variable changes when the independent variable changes rather than just seeing how the mean changes (Porter, 2015).

First type of quantile regression is the *conditional quantile regression (CQR)*[95] developed by Koenker and Bassett (1978) to examine how the family productivity premium varies across the conditional distribution of productivity. The interpretation of the CQR coefficient is in relation to the quantiles of the distributions defined by the covariates, rather than the unconditional distribution of the outcome variable (Porter, 2015). In CQR, the quantiles are defined conditional on the control variables (Borgen, 2016; Killewald & Bearak, 2014).

[95] For further technical details on the CQR, we refer to Koenker and Bassett (1978) and Koenker and Hallock (2001).

Specifically, CQR focuses on the conditional quantile of an individual firm, which is its position in a virtual distribution in which all firms are assumed to have the same observed characteristics (Fournier & Koske, 2012).

Since estimation and correct interpretation of conditional quantiles can be difficult, many researchers have turned to unconditional quantile regression models (Porter, 2015). When considering the literature about previous CQR studies, we find that many researchers have unintentionally misused conditional quantile regression by interpreting the results as if they came from an unconditional quantile regression model. We found several examples in the literature where researchers have interpreted their quantile coefficients as if they were reflecting the effects on the quantiles of the unconditional distribution of the outcome variable *Y*, rather than the effects on the quantiles of some *'within-group'* distribution of *Y* defined on the basis of the specific values taken by the covariates (Killewald & Bearak, 2014; Porter, 2015). Comparing CQR and UQR, Maclean, Webber, and Marti (2014) find that both techniques estimate different objects that are not directly comparable. Besides the differences that occur in the magnitude of the coefficients estimated using CQR and UQR, the interpretation of the coefficients is entirely different as well (Maclean et al., 2014; Porter, 2015).

To overcome the limitations of both OLS and CQR, this chapter uses the method of *unconditional quantile regression*[96] introduced by Firpo et al. (2009). The UQR method perfectly matches our theoretical purpose and research question of the chapter, namely to look for systematic variation in the effect of family productivity premia across the productivity distribution. UQR obeys the law of iterated expectation, so that it allows one to directly assess the impact of an explanatory variable X on the τth quantile of the unconditional distribution, $F_Y(\cdot)$, of the outcome variable Y; that is, $dF_Y(y)/dX$, all else held constant and irrespective of the set of covariates included. The transformed outcome variable (i.e., the RIF) is defined preregression. Thus, unlike CQR, including any control variables does not change the definition of the quantile (Borgen, 2016). This is a major advantage of UQR over CQR, as the estimated effects on Y of incremental

[96] For further technical details on the UQR, we refer to Firpo et al. (2009).

changes in X can be directly interpreted; i.e., adding control variables or changing the set of control variables does not change the interpretation of the parameter of interest[97] (Maclean et al., 2014; L. Peeters et al., 2017; Porter, 2015). The interpretation of the UQR coefficient directly measures how a marginal change in the level of one variable will affect the distribution of productivity in the population, keeping the distribution of other characteristics equal. So, the interpretation is not within groups, as with the CQR. The UQR will estimate a separate regression model for every specific quantile (Porter, 2015).

2. <u>RIF-REG Regression</u>

Unconditional quantile regression is based on a transformation of the dependent variable into the recentered influence function (RIF):

$$RIF(y; q_\tau) = q_\tau + \frac{\tau - 1\{y \leq q_\tau\}}{f_Y(q_\tau)} \tag{1}$$

where τ indicates a specific quantile, q_τ is the value of the dependent variable at that specific quantile, $1\{y \leq q_\tau\}$ is a function that equals 1 when an observation's value of y is less than or equal to the value of the dependent variable at quantile τ, 0 otherwise, and $f_Y(q_\tau)$ is the density of y at quantile τ (Firpo et al., 2009; Porter, 2015). For example, for the 25th percentile of the unconditional distribution, the feasible RIF would be computed as:

$$\widehat{RIF}(y; \hat{q}_{0.25}) = \hat{q}_{0.25} + \frac{0.25 - 1\{y \leq \hat{q}_{0.25}\}}{\hat{f}_Y(\hat{q}_{0.25})} \tag{2}$$

An interesting feature of the RIF of the dependent variable Y is that its expectation (mean value) equals the specified quantile, $E[RIF(y; q_\tau)] = q_\tau$. Firpo et al. (2009) have further shown that if the RIF of Y is conditioned on a set of covariates X, it follows that $E_X\{E[RIF(y; q_\tau)|X]\} = q_\tau$. If we model the conditional expectation of $RIF(y; q_\tau)$ as a function of covariates X, we obtain the unconditional quantile regression (UQR) model given by $E[RIF(y; q_\tau)|X] = X'\beta_\tau$, where β_τ measures the change in the τ-th quantile of the unconditional

[97] This characteristic does not hold for CQR, for the simple reason that observations, say, at the top of a conditional distribution may be at the bottom of the unconditional distribution.

distribution of Y resulting from a marginal change in the covariate of interest X_1, holding all the other covariates constant at $X_2 = x_2$. The estimation of the UQR model can be implemented as a conventional OLS regression, called the RIF-REG regression, where the dependent variable Y is simply replaced by the $RIF(y; q_\tau)$ for each quantile q_τ of interest.

The RIF transformation in Eq. (1) has the useful characteristic that UQR combines the attractive features of both OLS and quantile regression. That is, UQR allows the marginal effects to be estimated at different points of the distribution, which is the *'quantile part'*. At the same time, UQR has the quality of respecting the law of iterated expectation[98], which is the *'OLS part'*. This means that UQR allows for the estimation of the effect of the covariate X at each point of the distribution outcome variable Y, everything else being equal. Therefore, the estimates obtained using UQR have a direct (simple and clear) interpretation, much the same as the estimates resulting from conventional OLS.

3. Empirical results

The *UQR RIF-REG*[99] regression results are presented in Table D1 and graphically in Figure D1. The figure displays the family/non-family differential for the 1st through the 99th quantiles, plotted as the black line. The horizontal green line plots the OLS estimate of the differential, which is constant across the quantiles because OLS yields only one estimate of the differential. The grey shaded area represents the 95% confidence interval for the UQR RIF-REG estimators.

The family coefficients in Table D1 are estimated for five percentiles of the unconditional distribution of labor productivity. The UQR tells us the effect of family ownership on the unconditional distribution of labor productivity. In other words, if family ownership increases by 1 unit, how much does the distribution of labor productivity change? The UQR estimates of the family dummy coefficient display a rather stable pattern except for the tails. The UQR effect of family

[98] The OLS counterpart of this property is the known result that $E_X[E(Y|X)] = E(Y)$, which implies that the conditional and unconditional values of Y have equal expectation.
[99] UQR was estimated using Stata's *'rifreg'* procedure, which is available at http://faculty.arts.ubc.ca/nfortin/datahead.html. This command computes first the RIF and then includes this RIF as an outcome variable in *'regress'* along with any right-hand side variables.

ownership is negative at the tails. Additionally, the family productivity premium is significantly negative in the middle range of the distribution, yielding a coefficient at the median of -0.152 (which is significant at the 1% level). At the low end of the distribution, the family/non-family differential is about -7.5%, going to -14.1% at the median and then to +4.19% at the 90th percentile. By uncovering the non-uniform labor productivity response to changes in ownership type, the advantages from using UQR become utterly clear, while a singular focus on the mean of the labor productivity distribution using OLS would not have revealed the positive effect of family ownership around the 30th and 80th percentile.

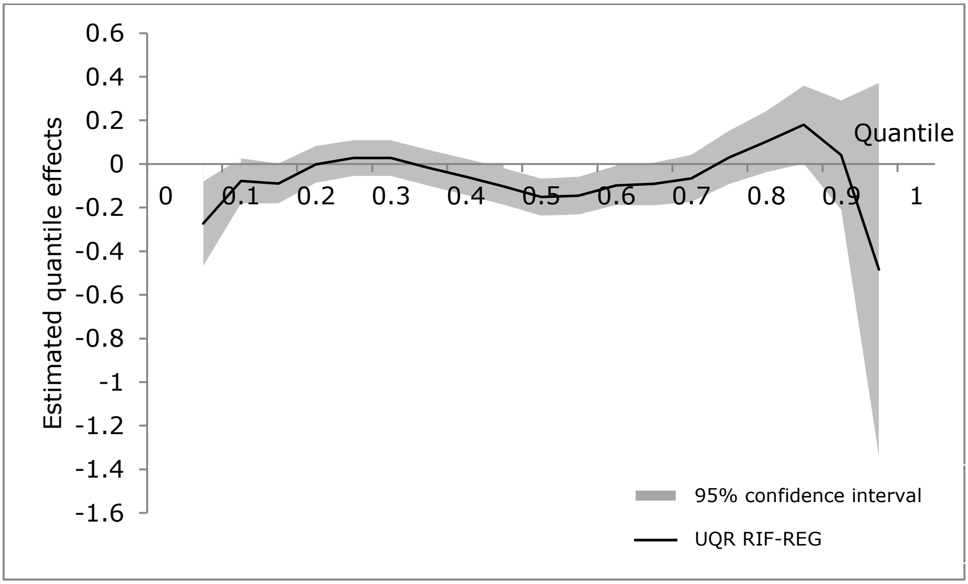


Figure D1: UQR RIF-REG

Table D1: Estimation results obtained using UQR RIF-REG

Log labor productivity	Unconditional Quantile Regression (RIF-REG)				
	$q_{0.10}$	**$q_{0.25}$**	**$q_{0.50}$**	**$q_{0.75}$**	**$q_{0.90}$**
Log(materials/labor)	0.131*** (0.011)	0.128*** (0.007)	0.157*** (0.007)	0.228*** (0.011)	0.403*** (0.027)
Log(capital/labor)	0.036*** (0.010)	0.036*** (0.008)	0.040*** (0.008)	0.089*** (0.013)	0.231*** (0.033)
Log(labor)	-0.116*** (0.021)	-0.072*** (0.013)	-0.079*** (0.012)	-0.133*** (0.017)	-0.318*** (0.036)
Log(firm age)	0.057** (0.025)	-0.003 (0.017)	0.020 (0.018)	0.033 (0.026)	0.112** (0.045)
Family ownership	-0.078 (0.053)	0.027 (0.042)	-0.152*** (0.043)	0.029 (0.062)	0.041 (0.128)
Foreign ownership	0.190*** (0.048)	0.229*** (0.039)	0.134*** (0.042)	0.187*** (0.066)	0.267* (0.138)
Exporting firm	-0.026 (0.157)	0.030 (0.113)	0.148 (0.114)	0.189 (0.142)	-0.195 (0.291)
Innovative firm	0.110** (0.045)	0.138*** (0.036)	0.051 (0.038)	-0.160*** (0.058)	-0.172 (0.124)
Intercept	4.589*** (0.279)	5.274*** (0.187)	5.603*** (0.184)	4.506*** (0.266)	5.041*** (0.533)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
N	3407	3407	3407	3407	3407
R^2	0.2694	0.2917	0.3522	0.3429	0.2584

*Note: Stars ***, ** and * give the significance at the 1%, 5% and 10%.*

Appendix E: Additional tables

Table E1: Overview of possible wage discount indicators: worker characteristics

Indicator	References	Definition/measurement	Rationale
Occupation	- Bassanini et al. (2013) - Sraer and Thesmar (2007)	– Grouped into 4 groups: managers, supervisors and technicians, clerks, blue-collars. – The fraction of managers, the fraction of supervisors, the fraction of skilled employees/clerks, the fraction of unskilled employees/clerks.	There may be intra-industry variations in the skill structure of firms. Family firms run by outside CEOs pay lower wages mostly because they have less-skilled employees (Sraer & Thesmar, 2007).
Gender	- Bassanini et al. (2013) - Sraer and Thesmar (2007)	Percentage of male employees (gender composition).	
Age	- Bassanini et al. (2013) - Sraer and Thesmar (2007)		Family firms run by outside CEOs pay lower wages mostly because they have younger employees (Sraer & Thesmar, 2007).
Job tenure/ seniority	- Bassanini et al. (2013) - Sraer and Thesmar (2007)		
Part-time/ full-time status	- Bassanini et al. (2013)	Dummy (=1 if the employee works full time and 0 otherwise).	

Table E2: Overview of possible wage discount indicators: firm characteristics

Indicator	References	Definition/measurement	Rationale
Size	- Bassanini et al. (2013) - Carrasco-Hernandez and Sánchez-Marín (2007)	– Number of employees in the firm. – Logarithm of the sales.	Compensation is significantly related to firm size. Family firms and non-family firms have significantly different sizes (Bayo-Moriones & Merino-Díaz de Cerio, 2001; Carrasco-Hernandez & Sánchez-Marín, 2007).
Age	- Bassanini et al. (2013) - Carrasco-Hernandez and Sánchez-Marín (2007) - Sraer and Thesmar (2007)	Difference between the current year and the year of incorporation.	Older firms pay on average higher wages. Observing higher wages in more mature firms. For example, older firms employ more skilled employees (Carrasco-Hernandez & Sánchez-Marín, 2007; Heyman, 2007).
Industry	- Bassanini et al. (2013) - Carrasco-Hernandez and Sánchez-Marín (2007) - Sraer and Thesmar (2007)	2-digit NACE.	Compensation systems and the family/non-family firm distribution are significantly different between industries. So, part of the wage discount is likely to be captured by industry effects (Carrasco-Hernandez & Sánchez-Marín, 2007; Sraer & Thesmar, 2007).
Use of ICT	- Bassanini et al. (2013)	Managers are asked what proportion of the employees use (i) computers, (ii) the Internet, (iii) the Intranet. This is measured on a Likert scale.	
Use of innovative managerial practices	- Bassanini et al. (2013)	The index is the weighted sum of the following 9 composite variables: performance dialogue, employees' participation, employees' autonomy, existence of targets, managing human capital, rewarding high performance for managers, rewarding high performance for non-managers, performance review, consequence management.	Given that non-family firms tend to be more innovative than family firms, they may attract more dynamic employees (Bassanini et al., 2013).

CEO education	- Carrasco-Hernandez and Sánchez-Marín (2007)	Dummy (=1 if the CEO has university studies and 0 otherwise).	CEO university education level is significantly different in family firms and non-family firms. It is considered to be a factor that explains managers' capacity to run the firm (Carrasco-Hernandez & Sánchez-Marín, 2007).
Being listed on the stock market	- Bassanini et al. (2013)	Dummy (=1 if firm is part of a firm listed on the stock market or belonging to a listed group and 0 otherwise).	

Table E3: Labor relations data

	Labor/employer relations are generally cooperative			Strikes are rare and always quickly resolved with minimum economic losses	The collective bargaining power of workers is high	Labor relations are generally … (hostile, productive)	
Data Source	*GCR 1993*	*GCR 1999*	*GCR 2003*	*GCR 1999*	*GCR 1999*	*WCY 1999*	*WCY 2003*
Australia	4.4	4.3	4.5	4.1	4.9	5.8	7.0
Austria	6.0	6.1	5.7	7.0	5.5	7.6	7.7
Belgium	4.5	4.4	4.2	4.1	5.2	5.2	5.5
Canada	4.4	4.8	4.9	4.5	4.6	6.1	6.6
Denmark	6.1	6.0	6.0	5.6	5.0	7.7	7.4
Finland	5.5	5.4	5.5	5.0	6.0	7.1	7.6
France	3.3	3.3	3.5	3.2	4.4	4.4	4.3
Germany	5.3	5.3	4.7	5.6	5.3	7.0	5.6
Greece	4.4	3.9	4.1	3.1	4.3	4.8	5.6
Ireland	5.2	5.2	5.0	5.3	4.8	7.1	7.6
Israel	5.0	4.7	4.3	3.7	5.0	6.5	6.1
Italy	4.3	4.2	3.8	3.6	4.6	5.0	4.8
Japan	6.0	6.1	5.4	6.2	4.2	7.7	7.6
Korea	3.9	3.9	3.6	3.3	4.6	3.6	3.6
Netherlands	**5.9**	**5.9**	**5.8**	**5.9**	**5.2**	**7.7**	**7.4**
New Zealand	5.4	5.6	4.7	5.8	3.6	7.7	6.9
Norway	5.7	5.7	4.9	4.7	5.7	7.4	7.4
Portugal	4.8	5.0	4.4	4.9	3.8	6.3	5.3
Spain	4.5	4.5	4.3	4.8	4.6	5.7	5.5
Sweden	5.8	5.9	5.8	5.2	5.8	7.4	7.1
Switzerland	6.1	6.4	6.1	6.7	3.4	8.0	8.2
U.K.	5.5	5.1	5.0	5.6	3.5	6.9	6.7
U.S.	5.1	5.0	5.2	5.1	4.1	6.2	6.4

Note: GCR is Global Competitiveness Report and WCY is World Competitiveness Yearbook composed by the International Institute for Management Development. The scale for GCR is from 1 (strongly disagree) to 7 (strongly agree). The scale for WCY is from 1 (hostile) to 10 (productive). This table is extracted from the study of H. M. Mueller and Philippon (2011).

Table E4: Trade union density

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Australia	23.0	22.3	22.3	20.2	18.5	18.6	19.3	18.4	18.5	18.2	17.0
Austria	34.7	34.9	33.9	31.6	30.5	29.7	29.4	29.0	28.4	28.0	27.8
Belgium	54.1	54.0	53.7	54.8	54.7	54.4	54.9	53.8	55.1	55.0	55.1
Canada	28.2	27.8	27.7	27.4	27.3	27.0	27.3	27.2	26.9	27.2	27.1
Denmark	71.6	70.4	70.7	68.4	67.9	66.3	67.7	67.0	66.4	67.2	66.8
Finland	72.9	71.5	70.6	70.4	70.5	69.8	69.2	68.6	69.6	69.8	69.0
France	7.9	7.7	7.7	7.6	7.5	7.6	7.7	7.7	7.7	7.7	7.7
Germany	23.0	22.2	21.7	20.7	19.9	19.1	18.9	18.6	18.5	18.3	18.1
Greece	24.6	24.0	24.1	24.1	24.0	23.5	22.6	22.1	22.7	22.8	21.5
Ireland	37.4	35.5	34.0	32.4	31.5	31.9	33.1	32.7	32.6	31.2	29.6
Israel	35.8	34.4	33.1	32.0	30.5	28.6	27.3	25.7	24.2	22.8	
Italy	33.7	34.1	33.8	33.6	34.0	33.9	35.2	36.0	36.3	36.9	37.3
Japan	19.7	19.3	18.8	18.3	18.3	18.2	18.5	18.4	19.0	18.0	17.8
Korea	10.8	10.3	9.9	10.0	10.6	10.3	10.0	9.7	9.9	10.1	
Netherlands	**20.5**	**20.8**	**20.6**	**20.0**	**19.3**	**18.8**	**19.1**	**18.6**	**18.4**	**17.9**	**17.8**
New Zealand	21.2	20.8	20.9	21.3	21.4	20.8	21.6	21.0	21.1	20.9	19.8
Norway	55.1	55.0	54.9	54.2	53.0	52.6	53.6	53.7	53.5	53.3	52.1
Portugal	21.3	21.7	21.6	21.2	21.2	20.9	20.6	19.8	18.8	18.9	
Spain	15.9	15.4	14.6	14.3	15.5	17.2	17.6	17.3	16.9	17.1	16.9
Sweden	78.0	78.1	76.5	75.1	70.8	68.3	68.4	68.2	67.5	67.5	67.7
Switzerland	19.9	19.5	19.3	18.9	18.5	17.5	17.3	17.1	16.7	16.2	16.2
United Kingdom	29.6	29.0	28.6	28.2	28.1	27.3	27.3	26.6	25.8	26.0	25.8
United States	12.4	12.0	12.0	11.5	11.6	11.9	11.8	11.4	11.3	10.8	10.8
OECD countries	19.6	19.2	18.9	18.3	18.1	18.0	18.1	17.7	17.6	17.2	17.0

Note: Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners. Density is calculated using survey data, wherever possible, and administrative data adjusted for non-active and self-employed members otherwise.

Source: OECD Labour Force Statistics - https://stats.oecd.org/Index.aspx?DataSetCode=UN_DEN.

Table E5: Detailed industry repartition

Industry *j*	Name	NACE Rev. 2	#obs.	%	# firms	%	# family firms	%
1	Food	10-12	329	7.91	130	7.17	45	8.14
2	Textile, apparel & leather	13-15	31	0.75	8	0.77	4	0.72
3	Wood, paper, printing (products)	16-18	79	1.90	23	2.22	11	1.99
4	Chemicals, pharmaceutical (products)	19-21	171	4.11	65	3.59	5	0.99
5	Rubber and plastics	22-23	160	3.85	66	3.64	21	3.80
6	Basic and fabricated metal products	24-25	233	5.60	93	5.13	42	7.59
9	Computer, electronic and optical products	26	66	1.59	27	1.49	3	0.54
10	Electrical equipment	27	38	0.91	14	0.77	2	0.36
11	Machinery and equipment, n.e.c.	28	160	3.85	61	3.37	28	5.06
12	Motor vehicles and other transport equipment	29-30	115	2.76	50	2.76	35	6.33
13	Furniture, other manufacturing n.e.c.	31-33	110	2.64	45	2.48	11	1.99
14	Retail and wholesale	45-47	1245	29.93	551	30.41	173	31.39
15	Transportation and storage	49-53	234	5.63	99	5.46	22	3.98
16	Accommodation and food service	55-56	34	0.82	13	0.75	4	0.72
17	Publishing, audiovisual and broadcasting activities	58-60	77	1.85	40	2.21	1	0.18
18	Telecommunications	61	54	1.30	28	1.55	0	0
19	IT and other information services	62-63	125	3.00	56	3.09	4	0.72
20	Consultancy, architectural and engineering activities	69-71	572	13.75	289	15.95	94	17.00
21	R&D activities	72	36	0.87	17	0.94	0	0
22	Other professional, scientific and technical activities	73-75	38	0.91	18	0.99	3	0.54
23	Administrative and support service, other services	77-82; 96	253	6.08	109	6.02	43	7.78
Total			4160	100	1802	100	551	100

Table E6: List of variables used in step 1 – wage equation

Variable	Definition	Source
Log_wages	natural logarithm of standardized annual real wages expressed in FTE	Stelsel van Sociaal-statistische Bestanden
Family ownership	= 1 if (i) the majority of ownership rests in the hands of a natural person and/or relatives of the founding family, (ii) at least one representative of the family or kin is formally involved in the management of the firm, and (iii) at least the second generation has to be involved in the firm = 0 otherwise	Elsevier
Male	= 1 if male employee = 0 otherwise	Enquête Beroepsbevolking
Age	age of the employee at the time of the Labor Survey	Enquête Beroepsbevolking
Tenure	number of months the employee has worked since his 15th	Enquête Beroepsbevolking
Education	= 1 if employee has a lower education (= basisonderwijs, vmbo, avo onderbouw, mbo1) = 2 if employee has a high school education (= Havo, vwo, mbo) = 3 if employee has a college education (= HBO, WO-bachelor, WO-master, doctor)	Enquête Beroepsbevolking
Manager	= 1 if employee has a management function = 0 otherwise	Enquête Beroepsbevolking ISCO2008
Ethnicity	= 0 if employee is of European origin = 1 otherwise	CBS register
Firm size	natural logarithm of number of employees	Stelsel van Sociaal-statistische Bestanden
Foreign ownership	= 1 if firm is foreign owned = 0 if firm is in the hands of a Dutch company	Algemeen Bedrijven Register
Exporting firm	= 1 if the firm had trade activities in either goods and/or services = 0 otherwise	Internationale handel goederen en diensten
Innovative firm	= 1 if firm engaged in product[100] and/or process innovation[101] = 0 if firm did not engage in product or process innovation	Community Innovation Survey

[100] A product innovation is the market introduction of a new good or service or a significantly improved good or service with respect to its capabilities, such as improved software, user friendliness, components or sub-systems (CIS).
[101] A process innovation is the implementation of a new or significantly improved production process, distribution method, or support activity for your goods or services (CIS).

Table E7: Estimates of $\hat{\mu}_{it}^{W}$ and $\hat{\varphi}_{it}$ for some sectors, 2010-2013

	All firms		All firms		Family firms		Family firms		Non-family firms		Non-family firms	
	WITHIN-FE	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*	*WITHIN-FE*	*W-LP*
Industry j	$\hat{\mu}^{W}$		$\hat{\varphi}$		$\hat{\mu}^{W}$		$\hat{\varphi}$		$\hat{\mu}^{W}$		$\hat{\varphi}$	
Food	0.189** (0.088)	0.202** (0.088)	0.084*** (0.027)	0.072** (0.033)	0.097*** (0.031)	0.091*** (0.032)	0.047*** (0.013)	0.043*** (0.013)	0.458 (0.646)	0.438 (0.609)	0.222*** (0.051)	0.267*** (0.102)
Chemicals, pharmaceutical	0.094*** (0.028)	0.100*** (0.031)	0.043** (0.018)	0.049*** (0.017)	0.123*** (0.030)	0.370*** (0.066)	0.049*** (0.014)	0.128*** (0.013)	0.106*** (0.024)	0.108*** (0.034)	0.164*** (0.011)	0.130*** (0.008)
Rubber and plastics	0.499*** (0.185)	0.493*** (0.162)	0.257*** (0.026)	0.258*** (0.026)	0.185*** (0.053)	0.175*** (0.056)	0.181*** (0.067)	0.257*** (0.026)	0.947 (0.995)	0.937 (1.122)	0.482*** (0.054)	0.483*** (0.057)
Basic and fabricated metal	0.163*** (0.040)	0.136*** (0.032)	0.108*** (0.009)	0.111*** (0.010)	0.187*** (0.068)	0.206*** (0.076)	0.101*** (0.021)	0.206*** (0.018)	0.122*** (0.037)	0.109*** (0.020)	0.141*** (0.003)	0.154*** (0.005)
Machinery and equipment, n.e.c.	0.091*** (0.026)	0.067*** (0.018)	0.085*** (0.007)	0.063*** (0.006)	0.092*** (0.031)	0.100*** (0.034)	0.041*** (0.009)	0.054*** (0.011)	0.087*** (0.031)	0.054*** (0.011)	0.052*** (0.005)	0.077*** (0.007)
Retail and wholesale	0.231*** (0.064)	0.225*** (0.061)	0.114*** (0.003)	0.113*** (0.003)	0.397 (0.302)	0.412 (0.286)	0.201*** (0.011)	0.204*** (0.011)	0.194*** (0.062)	0.187*** (0.036)	0.106*** (0.006)	0.104*** (0.006)
Consultancy, architectural, engineering	0.773* (0.421)	0.643 (0.400)	0.445*** (0.004)	0.301*** (0.001)	0.133*** (0.041)	0.130*** (0.040)	0.601*** (0.017)	0.618*** (0.012)	0.921 (1.168)	0.910 (1.031)	0.587*** (0.021)	0.580*** (0.021)
Administrative and support service	0.711 (0.450)	0.620 (0.555)	0.450*** (0.115)	0.516*** (0.129)	0.228** (0.094)	0.223*** (0.021)	0.212*** (0.021)	0.210*** (0.022)	0.820 (0.594)	0.976 (0.840)	0.383*** (0.031)	0.307*** (0.079)

Note: Standard errors in parentheses are computed using the delta method (Wooldridge, 2002).

Stars ***, ** and * give the significance at the 1%, 5% and 10%.

Estimating equation: $y_{it} = \gamma_{i0t} + \gamma_{iKt}k_{it} + \gamma_{iMt}m_{it} + (1 - \mu_{it}^{W})s_{iLt}l_{it} - \frac{1}{\eta_j}q_t^j + \tilde{a}_{it} + \tilde{u}_{it}$

Appendix F: Distributions

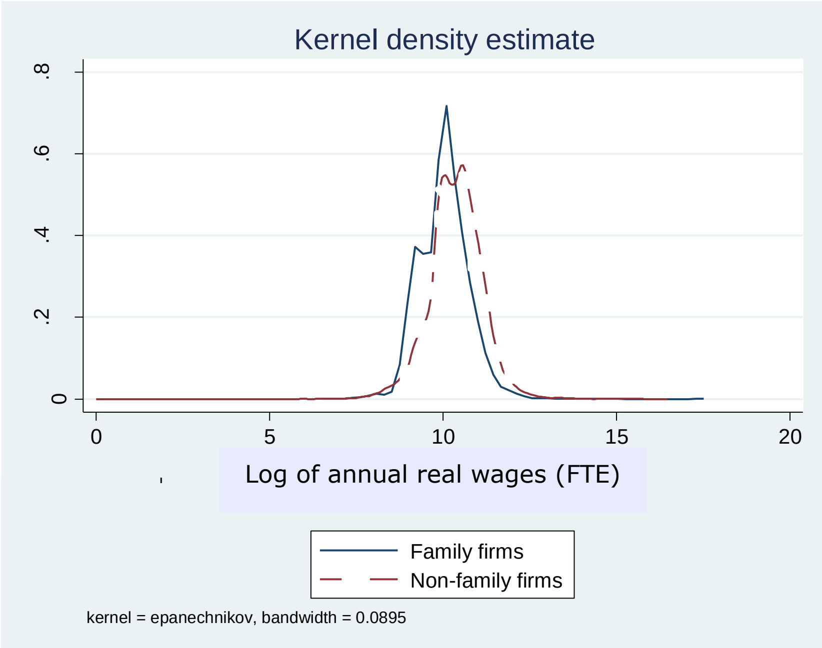


Figure F1: Log wages distribution by firm ownership type

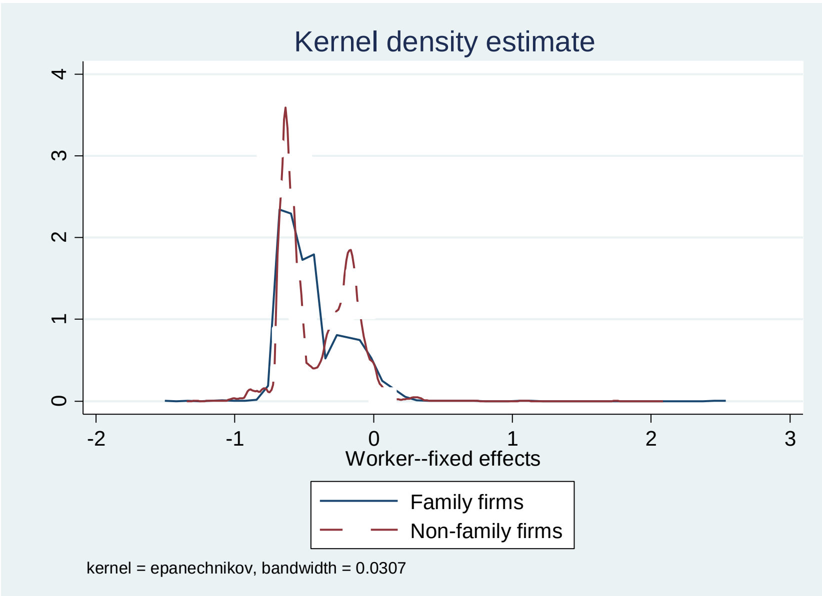


Figure F2: Worker FE distribution by firm ownership type

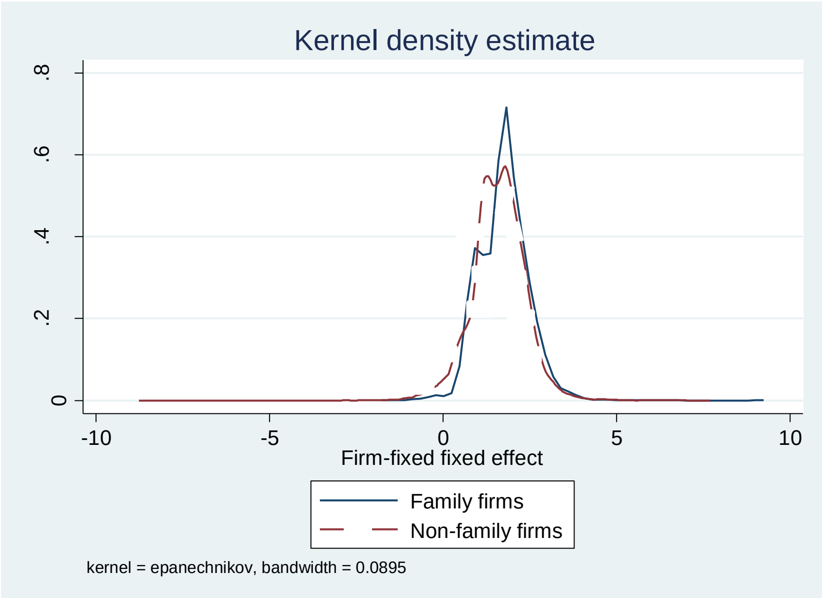


Figure F3: Firm FE distribution by firm ownership type

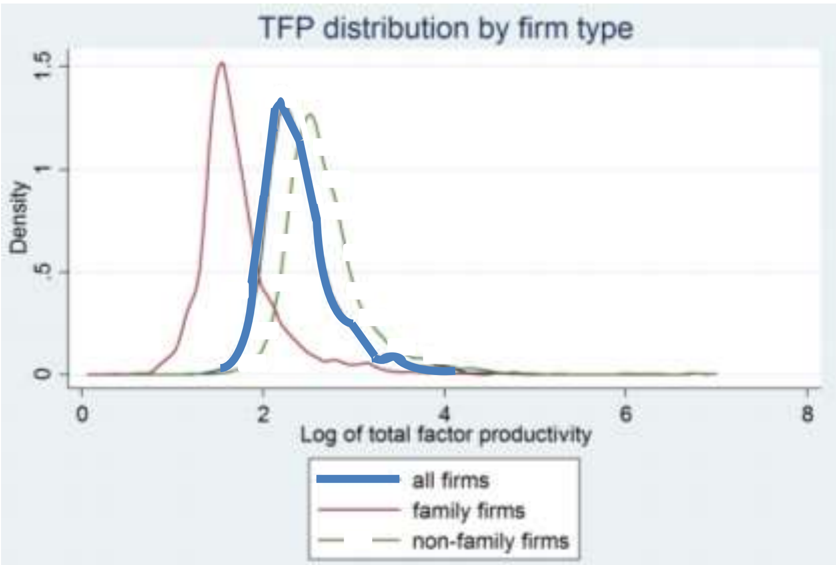


Figure F4: TFP distribution by firm ownership type

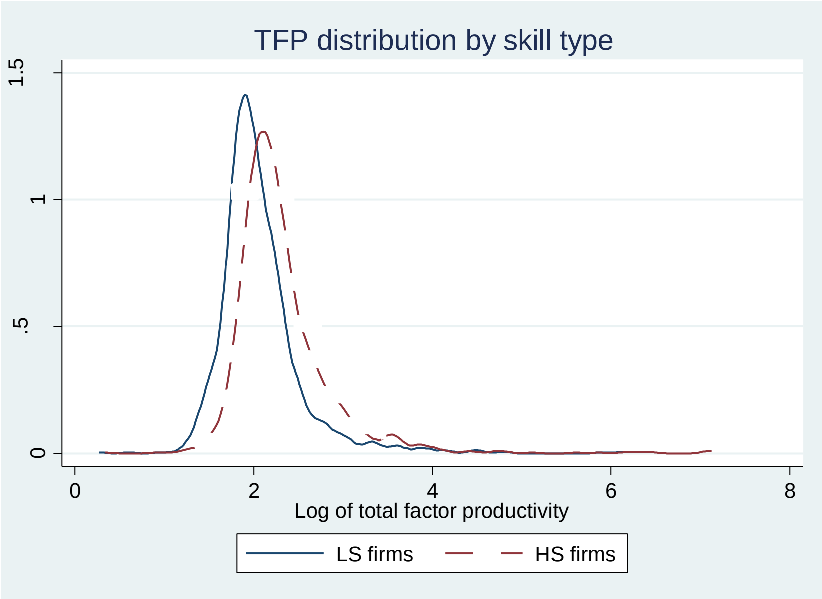


Figure F5: TFP distribution by firm skill type

Appendix G: The two way high dimensional fixed effects regression model

In this appendix we describe the procedure that allows estimation of a wage equation that incorporates two high dimensional fixed effects in order to be able to identify worker and firm fixed effects. For this exercise we build upon the methodology initially developed by Abowd et al. (1999) and Abowd et al. (2002) and extended by Guimarães and Portugal (2010) and Raposo et al. (2015) to allow for estimation of wages explained by observed and unobserved characteristics of workers and firms.

The baseline specification is Eq. (1):

$$\ln w_{ijt} = \gamma_1 X_{1,ijt} + \gamma_k X_{k,ijt} + \theta_i + w_j + \tau_t + \varepsilon_{ijt} \tag{1}$$

where θ_i is the worker fixed effect and w_j is the firm fixed effect that employs worker *i.* $\ln w_{ijt}$ represents the natural logarithm of the real annual wage of worker *i* $(i = 1, \dots, N)$ working at firm *j* $(j = 1, \dots, J)$ at year *t* $(t = 1, \dots, T)$. The variable X_1 is a dummy variable, which equals to one if the worker *i* is employed in year *t* in a firm that is defined as a family firm. $X_{k,ijt}$ is a vector of *k* observed exogenous variables that explain worker *i* wages. τ_t are year fixed effects and the error term ε_{ijt} is assumed to follow standard assumptions.

In order to state the basic statistical relations more clearly we restate Eq. (1) in matrix format:

$$W = \beta Z + \theta F_1 + w F_2 + \varepsilon \tag{2}$$

where Z is $N\,x\,k$, F_1 is $N\,x\,G_1$ and F_2 is $N\,x\,G_2$, and both G_1 and G_2 have high dimensionality. In this equation F_1 and F_2 are high dimensional matrices for the worker and firm fixed effects, respectively. Z is the stacked matrix of time-varying explanatory variables and year fixed effects from Eq. (1).

Now, the full least squares solution to the estimation problem for Eq. (2) solves the following normal equations for all estimable effects:

$$\begin{bmatrix} Z'Z & Z'F_1 & Z'F_2 \\ F_1'Z & F_1'F_1 & F_1'F_2 \\ F_2'Z & F_2'F_1 & F_2'F_2 \end{bmatrix} \begin{bmatrix} \beta \\ \theta \\ w \end{bmatrix} = \begin{bmatrix} Z'W \\ F_1'W \\ F_2'W \end{bmatrix} \tag{3}$$

which can be arranged to show:

$$\begin{bmatrix} Z'Z\beta + Z'F_1\theta + Z'F_2w = Z'W) \\ F_1'Z\beta + F_1'F_1\theta + F_1'F_2w = F_1'W \\ F_2'Z\beta + F_2'F_1\theta + F_2'F_2w = F_2'W \end{bmatrix} \tag{4}$$

Solving each set of equations independently yields:

$$\begin{bmatrix} \beta = (Z'Z)^{-1}Z'(W - \theta F_1 - wF_2) \\ \theta = (F_1'F_1)^{-1}F_1'(W - wF_2 - \beta Z) \\ w = (F_2'F_2)^{-1}F_2'(W - \theta F_1 - \beta Z) \end{bmatrix} \tag{5}$$

The above partition of the normal equations suggests a convenient iteration strategy. It is computationally difficult to invert the left matrix due to the large number of workers and firms. Therefore, iterating between these sets of equations provides us with the exact least squares solution. All we need to do is compute several linear regressions with *k* explanatory variables and compute group means of residuals. It is clear from the previous equations that at each iteration the fixed effects are simply computed as averages of the residuals. For an example, $(F_1'F_1)^{-1}F_1'$ is simply a demeaning operator for the worker fixed effect (Guimarães & Portugal, 2010; Raposo et al., 2015).

The iterative solution alternates between estimation of θ, w, and β and proceeds as follows. The algorithm makes use of the Frisch-Waugh-Lovell theorem, which fits the model in two steps. In the first step, the influence of two high dimensional fixed effects is removed from all the variables in the model. This can be done by running a linear regression of each individual variable on only the high dimensional fixed effects and storing the residuals (Guimarães & Portugal, 2010; Raposo et al., 2015). Through the recursive algorithm the current value of β can be used to estimate the current value of θ. In estimating w the previous values of β and θ are used. Then, the algorithm restarts and will converge because the parameter updates are chosen according to the equations in (16) (Raposo et al., 2015). In the second step, we estimate the regression using the stored residuals (obtained in step 1) instead of the original variables with a correction to the degrees of freedom. This approach yields the exact least squares solution for the coefficients and standard errors (Guimarães & Portugal, 2010; Raposo et al., 2015).

Appendix H: Selection criteria population

Table H1: Selection criteria population survey

Product name	Bel-first
Update nummer	210
Software versie	70.00
Data update	21/09/2015 (n° 2104)
Gebruikersnaam	lucp7764
Exportdatum	23/09/2015
Cut-off date	31/03

1.	Private ondernemingen	836 612
2.	NACE-BEL 2008, Alle codes: 10 - Vervaardiging van voedingsmiddelen, 11 - Vervaardiging van dranken, 12 - Vervaardiging van tabaksproducten, 13 - Vervaardiging van textiel, 14 - Vervaardiging van kleding, 15 - Vervaardiging van leer en van producten van leer, 16 - Houtindustrie en vervaardiging van artikelen van hout en van kurk, exclusief meubelen; vervaardiging van artikelen van riet en van vlechtwerk, 17 - Vervaardiging van papier en papierwaren, 18 - Drukkerijen, reproductie van opgenomen media, 19 - Vervaardiging van cokes en van geraffineerde aardolieproducten, 20 - vervaardiging van chemische producten, 21 -Vervaardiging van farmaceutische grondstoffen en producten, 22 - Vervaardiging van producten van rubber of kunststof, 23 - Vervaardiging van andere niet-metaalhoudende minerale producten, 24 - Vervaardiging van metalen in primaire vorm, 25 - Vervaardiging van producten van metaal, exclusief machines en apparaten, 26 - Vervaardiging van informaticaproducten en van elektronische en optische producten, 27 - Vervaardiging van elektrische apparatuur, 28 - Vervaardiging van machines, apparaten en werktuigen, n.e.g., 29 – Vervaardiging en assemblage van motorvoertuigen, aanhangwagens en opleggers, 30 - Vervaardiging van andere transportmiddelen, 31 - Vervaardiging van meubelen, 32 - Overige industrie, 33 - Reparatie en installatie van machines en apparaten, 35 - Productie en distributie van elektriciteit, gas, stoom en gekoelde lucht, 36 - Winning, behandeling en distributie van water, 37 - Afvalwaterafvoer, 38 - Inzameling, verwerking en verwijdering van afval; terugwinning, 39 - Sanering en ander afvalbeheer, 41 - Bouw van gebouwen; ontwikkeling van bouwprojecten, 42 - Weg- en waterbouw, 43 – Gespecialiseerde bouwwerkzaamheden, 45 - Groot- en detailhandel in en onderhoud en reparatie van motorvoertuigen en motorfietsen, 46 - Groothandel en handelsbemiddeling, met uitzondering van de handel in motorvoertuigen en motorfietsen, 47 - Detailhandel, met uitzondering van de handel in auto's en motorfietsen, 49 - Vervoer te land en vervoer via pijpleidingen, 50 - Vervoer over water, 51 - Luchtvaart, 52 - Opslag en vervoerondersteunende activiteiten, 53 - Posterijen en koeriers, 55 - Verschaffen van accommodatie, 56 - Eet- en drinkgelegenheden, 58 - Uitgeverijen, 59 – Productie van films en video- en televisieprogramma's, maken van geluidsopnamen en uitgeverijen van muziekopnamen, 60 - Programmeren en uitzenden van radio- en televisieprogramma's, 61 - Telecommunicatie, 62 - Ontwerpen en programmeren van computerprogramma's, computerconsultancy- activiteiten en aanverwante activiteiten, 63 -Dienstverlenende activiteiten op het gebied van informatie, 68 - Exploitatie van en handel in onroerend goed, 69 - Rechtskundige en boekhoudkundige dienstverlening, 70 – Activiteiten van hoofdkantoren; adviesbureaus op het gebied van	726 691

	bedrijfsbeheer, 71 - Architecten en ingenieurs; technische testen en toetsen, 72 - Speur- en ontwikkelingswerk op wetenschappelijk gebied, 73 - Reclamewezen en marktonderzoek, 74 – Overige gespecialiseerde wetenschappelijke en technische activiteiten, 75 - Veterinaire diensten, 77 - Verhuur en lease, 78 - Terbeschikkingstelling van personeel, 79 - Reisbureaus, reisorganisatoren, reserveringsbureaus en aanverwante activiteiten, 80 - Beveiligings- en opsporingsdiensten, 81 - Diensten in verband met gebouwen; landschapsverzorging, 82 - Administratieve en ondersteunende activiteiten ten behoeve van kantoren en overige zakelijke activiteiten	
3.	Aantal werknemers: Laatst beschikbare jaar, min=10 (unconso. accounts preferred, NRF are excluded)	35 553
4.	Ond./Verenig. met jaarrekeningen	654 958
5.	Rechtstoestand: Normale toestand	497 742
6.	Statuut: Actieve ondernemingen	497 663
7.	Rechtsvorm: NV, BVBA, Coöperatieve vennootschappen	741 944
8.	NACE-BEL 2008, Alle codes: 32121 - Bewerken van diamant, 32122 - Bewerken van edelstenen (m.u.v. diamant) en van halfedelstenen, 46761 - Groothandel in diamant en andere edelstenen	2 970
9.	Uit te keren winst: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	455 158
10.	Winst (Verlies) van het boekjaar (+/-): Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	462 885
11.	Totaal der activa: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	470 630
12.	Vaste activa: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	427 237
13.	Cash flow: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	401 825
14.	Omzet: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	78 698
15.	Geldbeleggingen en liquide middelen: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	472 215
16.	Netto bedrijfskapitaal: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	471 953
17.	Schulden op ten hoogste één jaar: Alle bedrijven met een bekende waarde, Laatst beschikbare jaar (unconso. accounts preferred, NRF are excluded)	465 151
18.	Taal: Nederlands, Frans, Tweetalig	640 794
19.	Laaste jaar met rekeningen: 2014	344 103
20.	Oprichtingsdatum: tot en met 2012	779 856
21.	Consolidatie code: U1 (Niet-geconsolideerde jaarrekeningen, zonder geconsolideerde tegenhanger)	652 961

22.	NACE-BEL 2008, Alle codes: 01 - Teelt van gewassen, veeteelt, jacht en diensten in verband met deze activiteiten, 02 - Bosbouw en de exploitatie van bossen, 03 - Visserij en aquacultuur, 05 - Winning van steenkool en bruinkool, 06 - Winning van aardolie en aardgas, 07 - Winning van metaalertsen, 08 – Overige winning van delfstoffen, 09 – Ondersteunende activiteiten in verband met de mijnbouw, 64 - Financiële dienstverlening, exclusief verzekeringen en pensioenfondsen, 65 - Verzekeringen, herverzekeringen en pensioenfondsen, exclusief verplichte sociale verzekeringen, 66 – Ondersteunende activiteiten voor verzekeringen en pensioenfondsen, 84 - Openbaar bestuur en defensie; verplichte sociale verzekeringen, 85 - Onderwijs, 86 – Menselijke gezondheidszorg, 87 – Maatschappelijke dienstverlening met huisvesting, 88 - Maatschappelijke dienstverlening zonder huisvesting, 90 - Creatieve activiteiten, kunst en amusement, 91 - Bibliotheken, archieven, musea en overige culturele activiteiten, 92 - Loterijen en kansspelen, 93 - Sport, ontspanning en recreatie, 94 - Verenigingen, 95 - Reparatie van computers en consumentenartikelen, 96 - Overige persoonlijke diensten, 97 - Huishoudens als werkgever van huishoudelijk personeel, 98 - Niet-gedifferentieerde productie van goederen en diensten door particuliere huishoudens voor eigen gebruik, 99 - Extraterritoriale organisaties en lichamen	184 651

TOTAAL **8 810**

Booleaanse selectie: 1 En 2 En 3 En 4 En 5 En 6 En 7 En Niet 8 En 9 En 10 En 11 En 12 En 13 En 14 En 15 En 16 En 17 En 18 En 19 En 20 En 21 En Niet 22

Appendix I: Histograms innovation scale of Zahra et al. (2000)

1. Product innovation

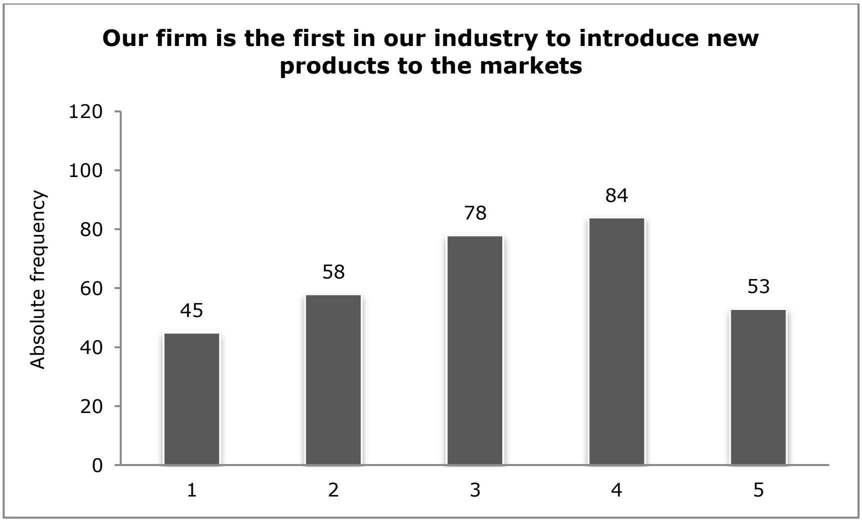


Figure I1: Product innovation – item 1

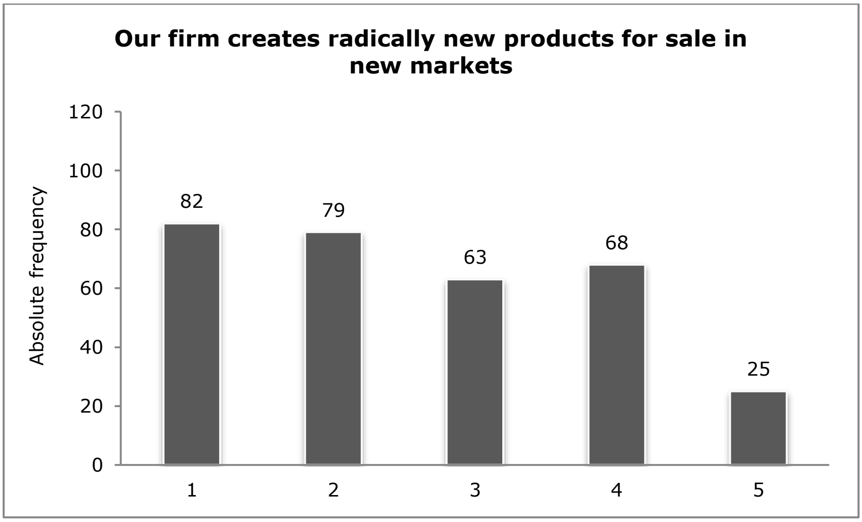


Figure I2: Product innovation – item 2

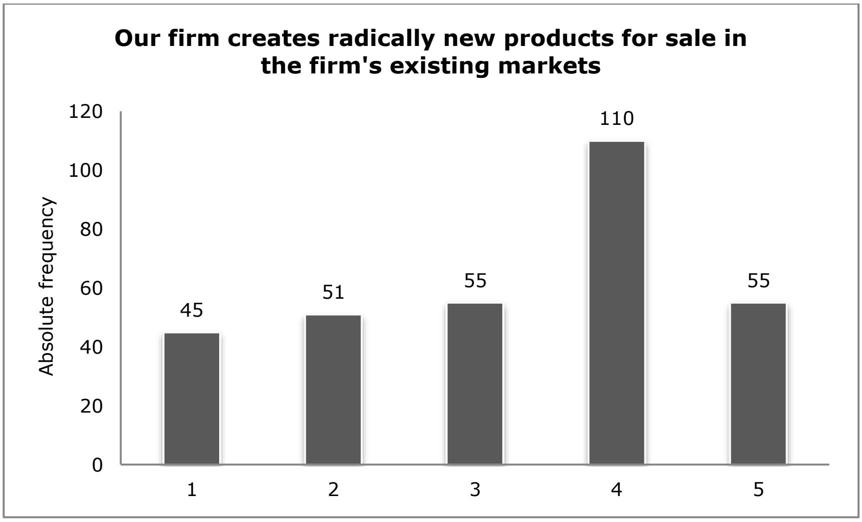


Figure I3: Product innovation – item 3

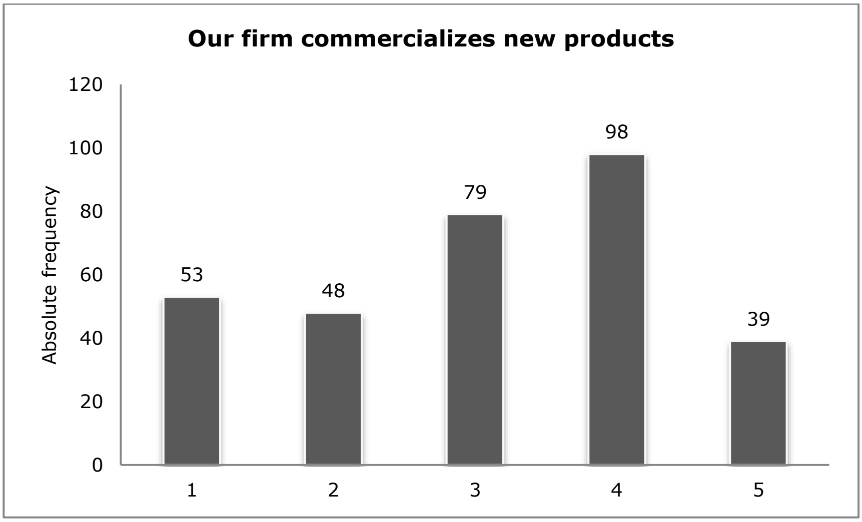


Figure I4: Product innovation – item 4

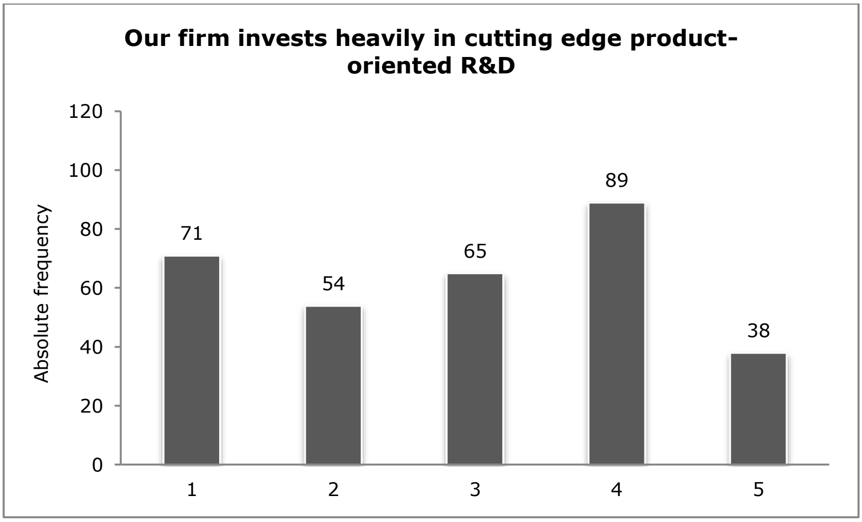


Figure I5: Product innovation – item 5

2. <u>Process innovation</u>

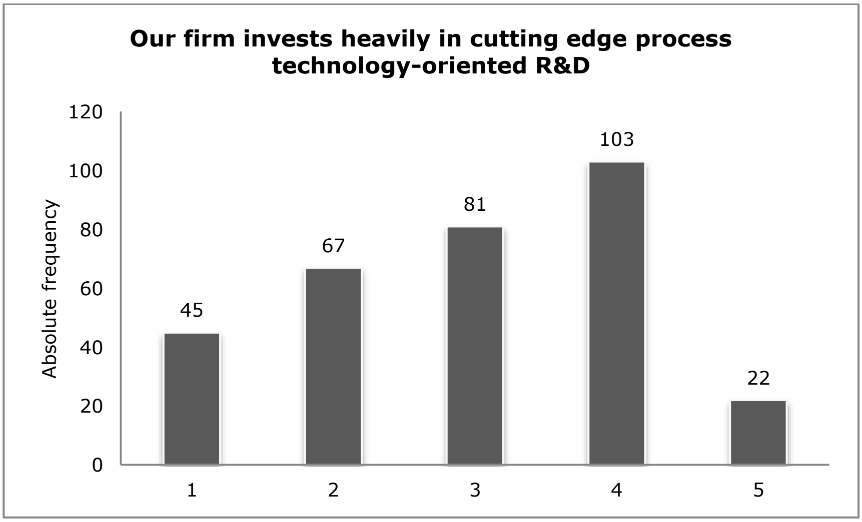


Figure I6: Process innovation – item 1

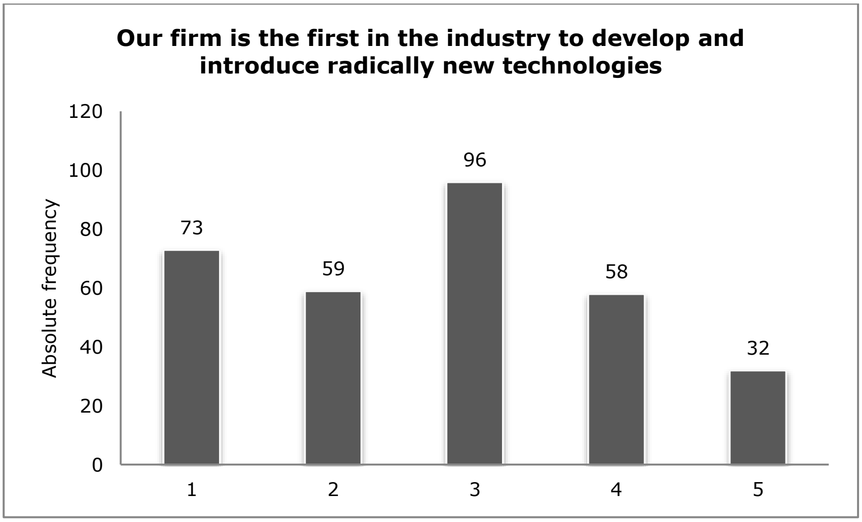


Figure I7: Process innovation – item 2

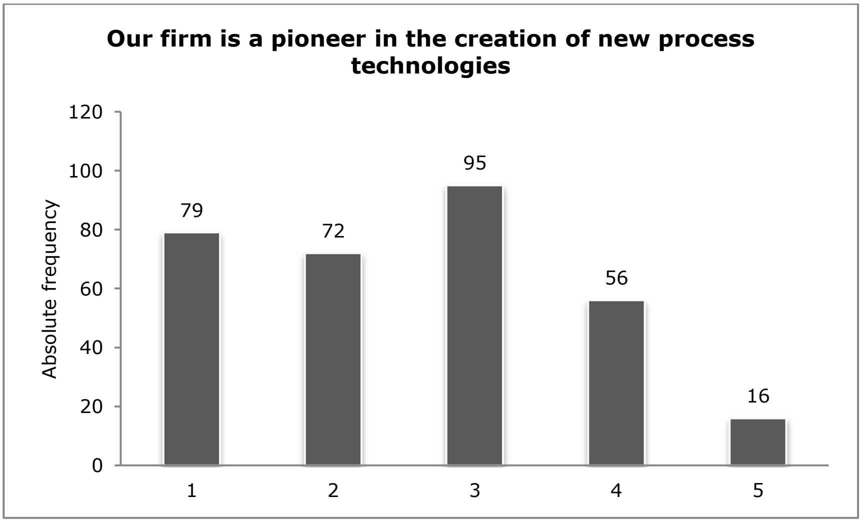


Figure I8: Process innovation – item 3

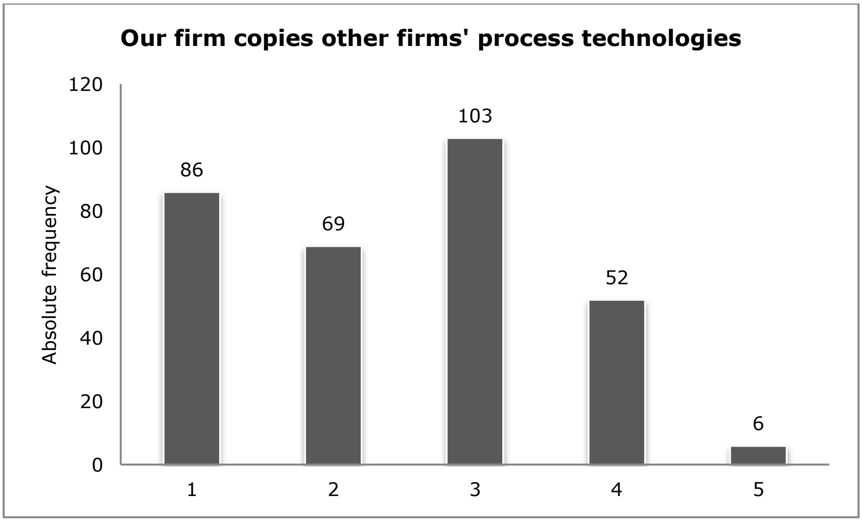


Figure I9: Process innovation – item 4

3. <u>Organizational innovation</u>

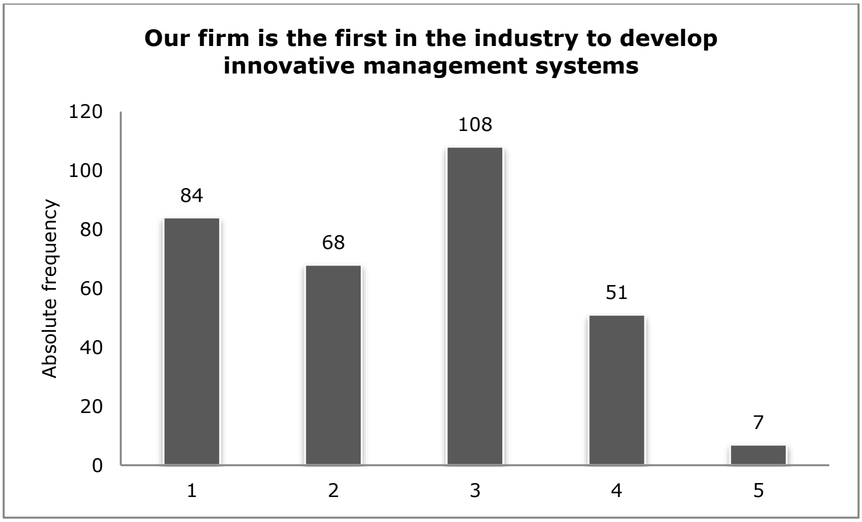


Figure I10: Organizational innovation – item 1

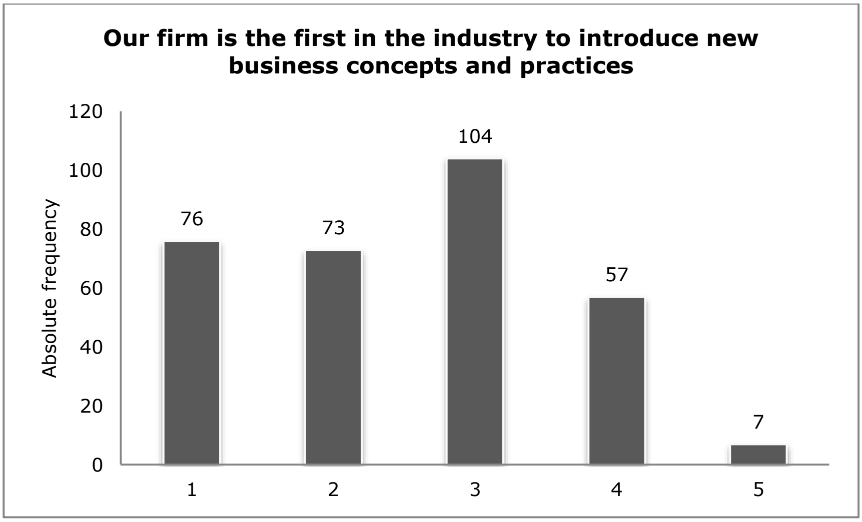


Figure I11: Organizational innovation – item 2

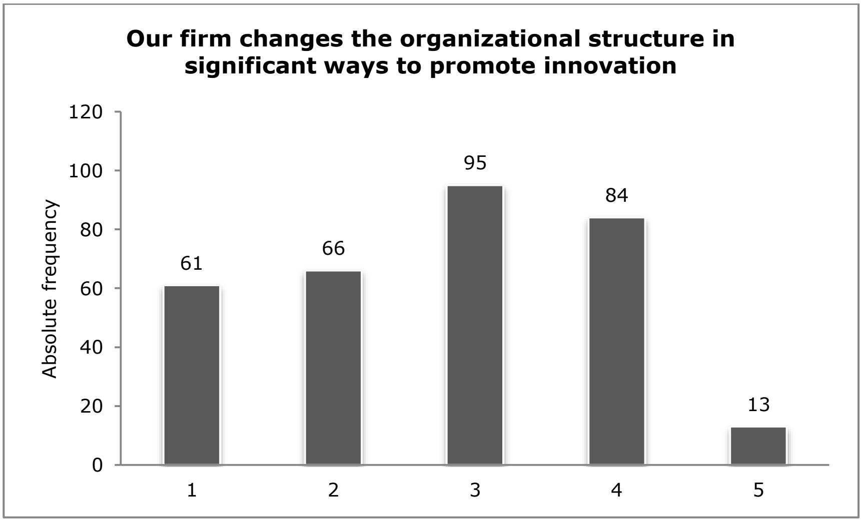


Figure I12: Organizational innovation – item 3

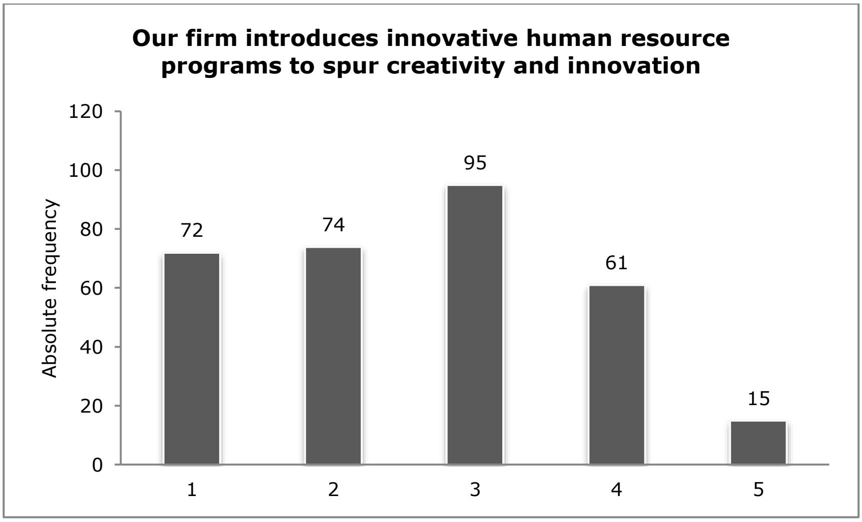


Figure I13: Organizational innovation – item 4

Appendix J: Questionnaire

Enquête "Innovatiegedrag van Belgische bedrijven"

Functie respondent: ○ CEO/bedrijfsleider ○ Andere: ………………………………………………………………

Ondernemingsnummer (facultatief): ………………………………………………………………

1. <u>Algemene bedrijfsgegevens</u>

1.1. Welke criteria zijn van toepassing op uw bedrijf? (meerdere antwoorden mogelijk)

- ○ Minstens 50% van de aandelen is in handen van één persoon
- ○ Minstens 50% van de aandelen is in handen van één familie
  N.B.: Een familie wordt in dit onderzoek beschouwd als een groep mensen die door bloedverwantschap of het huwelijk met elkaar verbonden zijn.
- ○ Uw bedrijf wordt als een familiebedrijf beschouwd
- ○ Uw bedrijf is geen familiebedrijf
- ○ Uw bedrijf was vroeger een familiebedrijf maar nu niet meer

1.2. Hoeveel procent van de omzet werd <u>*in 2014*</u> gerealiseerd in buitenlandse markten (bij benadering)?

…………………%

1.3. Maakt uw bedrijf deel uit van een groep van ondernemingen?

○ Ja ○ Nee → **ga naar vraag 2.1**

1.4. Gaat het om een nationale of internationale groep van ondernemingen?

- O Nationaal
- O Internationaal

1.5. Is uw bedrijf de finale moederonderneming van de groep?

- O Ja
- O Nee

2. **Management en CEO**

2.1. Is de huidige CEO de oprichter van het bedrijf?

- O Ja
- O Nee

2.2. Wat is het geslacht van de huidige CEO?

- O Man
- O Vrouw

2.3. Wat is de leeftijd van de huidige CEO? ……………….jaar

2.4. Wat is het hoogst behaalde diploma van de huidige CEO?

- O Lager secundair onderwijs
- O Hoger secundair onderwijs
- O Hogeschool / hoger onderwijs korte type
- O Universitair / hoger onderwijs lange type
- O Andere: ………………………………………………..

2.5. Hoeveel jaar is de huidige CEO reeds actief in:

- deze functie? ……………………….jaar
- dit bedrijf? ……………………….jaar
- deze industrie? ……………………….jaar

2.6. Hoeveel procent van de aandelen is momenteel in handen van de huidige CEO (bij benadering)? ……..……%

2.7. Hoeveel leden telt het topmanagementteam momenteel, inclusief de CEO? ....
N.B.: Een topmanagementteam wordt in dit onderzoek beschouwd als zijnde de CEO en alle managers die rechtstreeks rapporteren aan de CEO.

2.8. Hoe was het topmanagementteam, inclusief de CEO, de afgelopen 3 jaren samengesteld?

	2015	2014	2013
Aantal familieleden			
Aantal niet-familieleden			

3. Innovatie

3.1. Hoeveel procent van de *huidige* omzet zal *dit jaar* geïnvesteerd worden in R&D (bij benadering)? ....%

3.2. Hoeveel procent van de omzet werd *in 2014* geïnvesteerd in R&D (bij benadering)? ....%

3.3. Gelieve onderstaande tabel in te vullen door een cijfer van 1 tot 7 te omcirkelen.
N.B.: Indien u getal 1 omcirkelt dan sluit uw bedrijf aan bij de linkse stelling, omcirkelt u getal 7 dan sluit uw bedrijf aan bij de rechtse stelling.

In het algemeen heeft ons bedrijf de intentie om:

Een sterke nadruk te leggen op de marketing van de *huidige* producten of diensten.	1	2	3	4	5	6	7	Een sterke nadruk te leggen op R&D, technologisch leiderschap en innovatie.
Geen nieuwe producten of diensten te introduceren.	1	2	3	4	5	6	7	Veel nieuwe producten te introduceren.
Enkel kleine aanpassingen aan te brengen aan haar bestaande producten of diensten.	1	2	3	4	5	6	7	Radicale veranderingen aan te brengen aan haar producten of diensten.

3.4. Heeft uw bedrijf in de periode 2013-2015 nieuwe of sterk verbeterde *goederen en/of diensten* geïntroduceerd? Dit kunnen goederen of diensten zijn die nieuw voor de markt zijn of alleen nieuw voor uw bedrijf.

○ Ja, hoeveel? ………………… ○ Nee → **ga naar vraag 3.7**

3.5. Hoeveel van deze nieuwe producten en/of diensten werden in de periode 2013-2015 gerealiseerd door actieve samenwerking met externe partners? ………………………….

N.B.: Innovatiesamenwerking is actieve participatie met andere ondernemingen of niet-commerciële instellingen (zoals o.a. universiteiten) op het gebied van innovatieactiviteiten. Beide partners hebben niet noodzakelijk commercieel baat bij de samenwerking. Deze vraag heeft geen betrekking op uitbesteding van werkzaamheden zonder actieve samenwerking.

3.6. Gelieve het type innovatiepartner te beschrijven.

	Ja	Nee
Andere ondernemingen binnen uw ondernemingsgroep	○	○
Leveranciers van apparatuur, materieel, componenten of software	○	○
Klanten of afnemers	○	○
Concurrenten of andere bedrijven in uw bedrijfstak	○	○
Consultants, commerciële laboratoria of particuliere R&D-instellingen	○	○
Universiteiten of andere instellingen voor hoger onderwijs	○	○
Overheids- of openbare onderzoeksinstellingen	○	○

3.7. Heeft uw bedrijf in de periode 2013-2015 nieuwe of sterk verbeterde *processen en/of methodes* geïntroduceerd? Deze nieuwe processen of methodes kunnen betrekking hebben op het productieproces van goederen of diensten, de distributiemethode of de ondersteunende activiteiten voor uw goederen of diensten.

○ Ja ○ Nee

3.8. Heeft uw bedrijf in de periode 2013-2015 één of meerdere van de volgende *organisatorische innovaties* geïntroduceerd: nieuwe kennismanagementsystemen, veranderingen in de werkorganisatie of veranderingen in relaties met andere bedrijven of openbare instellingen?

O Ja O Nee

3.9. Gelieve aan te geven in welke mate de volgende stellingen van belang zijn voor uw bedrijf.

	niet van belang	eerder niet van belang	neutraal	eerder van belang	van belang
Ons bedrijf is de eerste in de sector die nieuwe producten introduceert op de markt.	O	O	O	O	O
Ons bedrijf houdt zich bezig met het creëren van volkomen nieuwe producten voor verkoop op *nieuwe* markten.	O	O	O	O	O
Ons bedrijf houdt zich bezig met het creëren van volkomen nieuwe producten voor verkoop in *bestaande* markten waarin het bedrijf momenteel actief is.	O	O	O	O	O
Ons bedrijf houdt zich bezig met het commercialiseren van nieuwe producten.	O	O	O	O	O
Als bedrijf investeren wij veel in vernieuwende *product-*georiënteerde R&D.	O	O	O	O	O
Als bedrijf investeren wij veel in vernieuwende *procestechnologie*-georiënteerde R&D.	O	O	O	O	O
Ons bedrijf is de eerste in de sector met het ontwikkelen en introduceren van volkomen nieuwe technologieën.	O	O	O	O	O
Ons bedrijf is een pionier in het creëren van nieuwe proces-technologieën.	O	O	O	O	O
Ons bedrijf kopieert procestechnologieën van andere bedrijven.	O	O	O	O	O

Ons bedrijf is de eerste in de sector om innovatieve management-systemen te ontwikkelen.	O	O	O	O	O
Ons bedrijf is de eerste in de sector die nieuwe bedrijfsconcepten en praktijken introduceert.	O	O	O	O	O
Ons bedrijf verandert de organisatiestructuur aanzienlijk om innovatie te promoten.	O	O	O	O	O
Ons bedrijf introduceert innovatieve human resource programma's om creativiteit en innovatie te stimuleren.	O	O	O	O	O

3.10. Gelieve aan te geven in welke mate u akkoord bent met de volgende stellingen.

	oneens	enigszins oneens	neutraal	enigszins eens	eens
Ons bedrijf is één van de eerste die naar de markt gaat met nieuwe producten en diensten.	O	O	O	O	O
Ons bedrijf is beter in het verbeteren van interne processen dan onze concurrenten.	O	O	O	O	O
Ons bedrijf is beter in het ontwikkelen van nieuwe producten en diensten die beantwoorden aan klantenbehoeften dan onze concurrenten.	O	O	O	O	O
Ons bedrijf wordt door de consument gezien als innovatiever dan onze concurrenten.	O	O	O	O	O

3.11. Heeft uw bedrijf in de periode 2013-2015:

	Ja	Nee
een octrooi aangevraagd?	O Hoeveel? ……………..	O
een industrieel ontwerp gedeponeerd?	O	O
een handelsmerk gedeponeerd?	O	O
een auteursrecht vastgelegd?	O	O

3.12. Hoeveel zullen de R&D-uitgaven *dit jaar* bedragen (bij benadering)? ………………..……….EUR

3.13. Hoeveel bedroegen de R&D-uitgaven *in 2014* (bij benadering)? …………..…..……….EUR

3.14. Heeft uw bedrijf in de periode 2013-2015 de volgende innovatieactiviteiten verricht?

	Ja	Nee
De aankoop van kant en klare producten/diensten ontwikkeld door derden.	O	O
De aankoop van processen opgericht door externe partijen.	O	O
Het uitbesteden van R&D-activiteiten aan derden.	O	O
De aankoop van geavanceerde machines, uitrusting en/of computerhardware of –software ten behoeve van nieuwe of sterk verbeterde producten en processen.	O	O
De aankoop van externe kennis door licentieovereenkomsten voor octrooien en niet-geoctrooieerde uitvindingen, knowhow en andere vormen van kennis van andere bedrijven of organisaties.	O	O

4. Schuldfinanciering

4.1. In welke mate ervaart uw bedrijf toegang tot schuldfinanciering als een probleem voor de werking en groei van het bedrijf?

helemaal geen probleem	klein probleem	matig probleem	groot probleem	zeer groot probleem
O	O	O	O	O

4.2. Heeft uw bedrijf de afgelopen 3 jaren geprobeerd om schuldfinanciering te krijgen?

O Ja   O Nee → **ga naar vraag 4.4**

4.3. In hoeverre is uw bedrijf in de afgelopen 3 jaren erin geslaagd om schuldfinanciering te krijgen van de volgende kredietverleners?

	Volledig geslaagd	Deels geslaagd	Niet geslaagd	Niet van toepassing
Banken	O	O	O	O
Andere bedrijven	O	O	O	O
Eigenaars	O	O	O	O
Andere werknemers van het bedrijf	O	O	O	O
Familieleden werkzaam in het bedrijf	O	O	O	O
Familieleden niet werkzaam in het bedrijf	O	O	O	O
Vrienden of andere personen van buiten het bedrijf	O	O	O	O
Andere kredietverleners:……...	O	O	O	O

4.4. Is het de afgelopen 3 jaren voorgevallen dat, hoewel uw bedrijf nood had aan financiering, men geen bankkrediet heeft aangevraagd omdat men dacht dat de aanvraag toch geweigerd zou worden?

	2015	2014	2013
Ja	O	O	O
Nee	O	O	O

Indien ergens ja op vraag 4.4, waarom dacht u dat de aanvraag toch geweigerd zou worden?

…….…

………..………

………..………

5. Familiale invloed

Indien **geen** familiebedrijf → **ga naar vragenreeks 6** (over de raad van bestuur)

5.1. De huidige CEO is:

- O Eerste generatie familiaal ondernemer
- O Familiaal opvolger (2e generatie of later)
- O Manager van buiten de familie

5.2. Welke generatie heeft momenteel het *topmanagement* in handen? (meerdere antwoorden mogelijk)

- O Eerste generatie
- O Tweede generatie
- O Derde of latere generatie

5.3. Welke generatie heeft momenteel de *eigendom* in handen? (meerdere antwoorden mogelijk)

- O Eerste generatie
- O Tweede generatie
- O Derde of latere generatie

5.4. Gelieve aan te geven in welke mate u akkoord bent met de volgende stellingen.
N.B.: Onder de bedrijfsfamilie worden alle familieleden gerekend die actief of passief betrokken zijn bij het bedrijf.

	oneens	enigszins oneens	neutraal	enigszins eens	eens
Alle leden van de bedrijfsfamilie bepalen in belangrijke mate de strategische richting die het bedrijf zal uitgaan.	O	O	O	O	O
Het is essentieel om onafhankelijkheid van het familiebedrijf te bewaren en de controle over het bedrijf in familiale handen te houden.	O	O	O	O	O
Alle leden van de bedrijfsfamilie hebben een sterke verbondenheid met het bedrijf.	O	O	O	O	O
Leden van de bedrijfsfamilie vertellen met trots dat ze deel uitmaken van het familiebedrijf.	O	O	O	O	O
Niet-familieleden, actief in het familiebedrijf, worden behandeld als deel van de familie.	O	O	O	O	O
In het familiebedrijf is wederzijds vertrouwen de basis van het zaken doen met leveranciers, klanten, … .	O	O	O	O	O
Het is essentieel dat het goed gaat met de leden van de bedrijfsfamilie.	O	O	O	O	O
De emotionele banden tussen leden van de bedrijfsfamilie zijn zeer sterk.	O	O	O	O	O
Familiale eigenaars zien hun investering in het familiebedrijf als een langetermijninvestering.	O	O	O	O	O
Succesvolle overdracht naar de volgende generatie is een belangrijk doel voor het familiebedrijf.	O	O	O	O	O

5.5. Heeft de familie een familieforum ingesteld? (ook familieraad of familiale vergadering genoemd)

O Ja O Nee

5.6. Heeft de familie een familiaal charter opgesteld?

O Ja O Nee → **ga naar vraag 5.8**

5.7. Wat wordt er in het familiaal charter geregeld?

- O Waarden van familie en familiebedrijf
- O Doelstellingen van de familie wat het familiebedrijf betreft
- O Eigendom van het familiebedrijf
- O Carrières in het familiebedrijf
- O De rol van niet-familieleden in het familiebedrijf
- O Governance van het familiebedrijf en van de familie
- O Innovatie
- O De leiding van het familiebedrijf
- O Vergoedingen
- O Communicatie
- O Familiale harmonie en conflict
- O Andere: ....

5.8. Gelieve aan te geven in welke mate u akkoord bent met de volgende stellingen.

	helemaal oneens	oneens	enigszins oneens	neutraal	enigszins eens	eens	helemaal eens
Familieleden zijn bereid om elke nieuwe uitdaging aan te gaan waarmee ons familiebedrijf geconfronteerd wordt.	O	O	O	O	O	O	O
Familieleden staan open om nieuwe dingen te proberen voor ons familiebedrijf.	O	O	O	O	O	O	O
Familieleden zijn gefascineerd door nieuwe ideeën.	O	O	O	O	O	O	O
Familieleden hebben het in het algemeen moeilijk met verandering.	O	O	O	O	O	O	O

6. <u>Raad van bestuur</u>

6.1. Hoeveel leden telt de raad van bestuur momenteel? ………………..

6.2. Is de huidige CEO tevens voorzitter van de raad van bestuur?

O Ja O Nee

6.3. Hoe was de raad van bestuur de afgelopen 3 jaren samengesteld?

	2015	2014	2013
Hoeveel leden zijn *interne bestuurders* (=managers van het bedrijf zonder familieband)?			
Hoeveel leden zijn *familiale tewerkgestelde bestuurders* (=leden van de bedrijfsfamilie tewerkgesteld binnen het bedrijf)?			
Hoeveel leden zijn *familiale niet-tewerkgestelde bestuurders* (=leden van de bedrijfsfamilie niet tewerkgesteld binnen het bedrijf)?			
Hoeveel leden zijn *geaffilieerde bestuurders* (=bestuurders die een vertrouwensrelatie hebben met het bedrijf zoals bankiers, advocaten en accountants)?			
Hoeveel leden zijn *externe bestuurders met een aandeel in het kapitaal?*			
Hoeveel leden zijn *externe bestuurders zonder aandeel in het kapitaal?*			

7. Aandeelhoudersstructuur

7.1. Heeft er gedurende de laatste 10 jaar in uw bedrijf een overdracht van aandelen plaatsgevonden?

O Ja, wanneer? ……………………………………………… O Nee → **ga naar vraag 7.3**

7.2. Wat is er precies gebeurd bij de overdracht van aandelen?

- O Familiale overdracht van aandelen
- O Externe investeerder participeert
- O Overname van bedrijf
- O Andere:…………………………………………………………………………………………………….

7.3. Hoe was de aandelenstructuur de afgelopen 3 jaren samengesteld? Hoeveel procent van de aandelen is/was in handen van (bij benadering):

	2015	2014	2013
Niet-familiale managers			
Familiale managers			
Familieleden (niet behorende tot het management)			
Investeringsmaatschappijen			
Werknemers			
Andere: ………………………………………………………………………………...			

Hartelijk dank voor uw medewerking!

De door u verstrekte gegevens worden strikt vertrouwelijk behandeld. We maken in ons onderzoek enkel gebruik van geaggregeerde gegevens en verwijzen op geen enkel moment naar een individueel bedrijf.

Indien u geïnteresseerd bent in de resultaten van dit onderzoek kan u hieronder uw e-mailadres invullen en zullen wij u een samenvattende kopij opsturen.

E-mail: …………………………………………………

Appendix K: List of variables

Table K1: Description of the variables

Variables	Description
Dependent variables	
Product innovation	Likert scale 1=not relevant; 5=relevant: – Our firm is the first in our industry to introduce new products to the market. – Our firm creates radically new products for sale in new markets. – Our firm creates radically new products for sale in the firm's existing markets. – Our firm commercializes new products. – Our firm invests heavily in cutting edge product-oriented R&D.
Process innovation	Likert scale 1=not relevant; 5=relevant: – Our firm invests heavily in cutting edge process technology-oriented R&D. – Our firm is the first in the industry to develop and introduce radically new technologies. – Our firm is a pioneer in the creation of new process technologies.
Organizational innovation	Likert scale 1=not relevant; 5=relevant: – Our firm is the first in the industry to develop innovative management systems. – Our firm is the first in the industry to introduce new business concepts and practices. – Our firm changes the organizational structure in significant ways to promote innovation. – Our firm introduces innovative human resource programs to spur creativity and innovation.
Independent variables	
Ability	Power sub-scale (Klein et al., 2005): - Percentage of family share ownership. - Percentage of family on top management team. - Percentage of board seats held by the family.
Willingness	Likert scale 1=agree; 5=disagree: - **Family control**: Preservation of family control and independence are important goals for our family business. - **Identification**: All family members have a strong sense of belonging to our family business. - **Building social ties**: Non-family employees, which are active in the family business, are treated as part of the family. - **Emotional attachment**: In our family business, the emotional ties among family members are very strong. - **Renewal family bonds**: Successful business transfer to the next generation is an important goal for family members.

Moderator	
Level of external financial constrained	Likert scale 1=no problem; 5=major problem: – The access to finance is a problem for the operation and growth of our business.
Control variables	
ln_size	Logarithmic function of the number of full-time equivalent employees.
ln_age	Logarithmic function of the number of years since founding date.
Export	Dummy, 1 if the firm is active on the international market.

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