Conflicts in Private Family Firms*

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Abstract

We use Norwegian household-level data and full structures of family relationships to understand how succession decisions are made when the family has multiple potential heirs. We argue that the decision on ownership distribution in family firms is related to the potential of future family conflicts, and that such within-family dynamics have implications for firm investment and growth. We identify the causal effect by looking at whether the founder has experienced a divorce or a separation in the distant past. We instrument the founder's divorce with the frequency of divorces in the extended family relationships outside of the nuclear family, which makes the founder's divorce more socially acceptable. Since some family conflicts are inevitable and family heirs might not be able to trade their shares, founders should consider adjusting their inheritance to minimize the possibility of heir feuds and adverse effects on firm growth.

Keywords: Family Firms, Corporate Governance, Ownership Structures, Divorce

JEL Classification: G32, G34

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1 Introduction

Krister Ahlström, a fourth-generation CEO of Ahlstrom Corporation, noted to Harvard Business Review in 1998, "In the first generation, the ownership and the management of the company are wrapped up in one person: the founder. In the second and third generations, a gap forms and gradually widens. [...] So what happens if I am a family member, and I do not trust management or the board, and I cannot sell my shares? I am likely to make trouble." A year later Krister Ahlström resigned in favor of a cousin preferred by the family's dissidents.

Family in-fighting that reduces the performance of the firm has been documented both in the academic literature (Bertrand and Schoar, 2006) and the business literature on family firms (Davis and Harveston, 2001). Family feuds following the deaths of the controlling owners in family firms have also been widely covered in the media around the world. For instance, a legal battle between the heirs of Koch Industries kept public attention for over ten years while brothers of the Ambani family had fierce disputes over Reliance Industries in India. An international survey of family firms by PricewaterhouseCoopers (2015) indicates that discussion about the future strategy of the business is the most likely reason to cause tension in the families and over a third of surveyed firms experience it.

At the same time, even with the expected family infighting in the horizon, second-generation family firms more often than not have siblings sharing the ownership in the firm.[1] Given demographic statistics in the US and around the world,[2] it is expected that family firms will be facing significant leadership and wealth transfer challenges. This paper aims to show how the anticipation of the potential conflicts adjusts the bequeathed ownership stakes and minimizes the negative effects on firm investment and growth.

We motivate our empirical study with a stylized model where we argue that the potential

[1] Based on 2007 Survey of Business Owners, out of 13,667 US family firms with the inherited ownership, 12,433 have more than one owner (see Appendix 3 and the associated discussion in Section 2.2).

[2] For instance, Financial Times (2018) wrote that a whole generation of postwar German entrepreneurs were preparing for retirement and by 2022 more than one in five (840,000) owners of small and medium size enterprises in Germany were expected to experience the change in ownership.

for family conflicts over the business strategy of a family firm affects the distribution of the voting power. Before making the bequest decision the founder evaluates the expected agreement among his heirs. Although the founder is interested in maximizing heirs' private valuations of the firm, they also want to reduce the chance that because of disagreement no voting majority is formed. When the potential for family members to disagree about the corporate policy is higher, the control is bequeathed to a smaller number of heirs.

We test these claims using granular data on Norway's privately-held firms. In particular, we match the population-wide family relationship data to the individual ownership data for the period of 2001-2017. This lets us not only understand which family members own stakes in family firms but also capture which family members do not hold any ownership in these firms. By knowing the family member characteristics at the time of firm transitions, we can shed light on the topic on the counterfactual of family firm transitions.[3]

We focus on the ownership transitions when the founder gives up a major portion of their initial ownership. Based on the literature in social sciences, we suggest that potential conflicts are related to such family characteristics as the age spacing between children, similarity among their educational attainments, and whether they are born to the same parents. Conditional on the shares being transferred within the family, we find that the family transitions with more dispersed bequest are more likely with fewer potential conflicts. In addition, we find that potential conflicts are also linked to higher probability that the shares will be sold outside the nuclear family, and that this will happen faster, suggesting that dispersion of opinion might be related to how long the firm stays in the family's hands.

Based on our correlations that the bequest is more concentrated if the potential heirs come from different parents and are of more spaced in age, we suggest that such dispersion can be related to founder having had a divorce or a separation in the past. We use this observation to derive the causal relationship between the potential family disagreements,

[3]Indeed, from the past literature we know a lot about who owns the firms in general given that most financial regulators require such reporting but less so on who could have owned but do not own stakes in those firms.

the ownership allocation and the firm performance.

In particular, we rely on deep family relationship data to suggest that while founder's divorce might be related to the firm's performance, social acceptability of divorce might vary across families. We argue that past divorces in the family make the founder's divorce more likely. We thus instrument the founder's divorce by past divorces or separations of the members of the extended family who do not work or are not otherwise related to the firm in question. Our findings show that extended family divorces have a significant explanatory effect on founder's divorce. In our most precise tests, we focus on first-degree cousin divorces as they are likely to be of similar age as the founder, and also find a significant positive relationship.

The instrumental variables estimation shows that extended-family-instrumented divorces are related to less dispersed within-family bequest and lower likelihood of firm staying within the family at the transition time, suggesting that the potential family conflicts shape ownership structures and affect firm survival rates.

We further focus on the effects on firm investment. We find that divided bequest is related to lower firm investment over the next three years following the transition within the family. This effect is not absorbed by the personal characteristics of the family heirs, and suggests that within-family dynamics might be an important component on how family firms expand and grow.

The paper primarily relates to the literature on the succession in family firms. Prior empirical literature has looked at the impact of family succession on firm performance (e.g., Pérez-González (2006); Bertrand et al. (2008); Bennedsen et al. (2007); Mehrotra et al. (2013); Tsoutsoura (2015)) and has compared family firm performance to that of non-family firms (e.g., Faccio and Lang (2002); Claessens et al. (2002); Anderson and Reeb (2003); Villalonga and Amit (2006); Sraer and Thesmar (2007)). We contribute to this literature by studying how within-family dynamics relate to ownership allocation during family transition and future firm performance, conditional on the firm staying in the family control. In

a related paper, Lee et al. (2016) study how the number of male descendants in Korean chaebol families induces succession tournaments and hampers firm performance.

Prior literature has also offered theories on the existence of family firms (Bhattacharya and Ravikumar, 2001; Chami, 2001; Caselli and Gennaioli, 2013; Burkart et al., 2003) as well as their corporate governance structures (Ellul et al., 2010).[4] In contrast to Ellul et al. (2010), we argue that even without the constraints of inheritance laws, both shared or concentrated control can nevertheless arise in the family firms, depending on the potential of family conflict. Noe (2015) looks at how kinship – the case when the owner hires a related family member as the manager of the firm – affects the principal-agent problem, from which we abstract in this paper.

Moreover, this paper is connected to the literature on the ownership concentration and allocation of control (Aghion and Bolton, 1992; Zwiebel, 1995; Bennedsen and Wolfenzon, 2000; Aghion and Bolton, 2003; Dhillon and Rosetto, 2015). In both Bennedsen and Wolfenzon (2000) and Aghion and Bolton (2003) agents prefer to participate in a winning coalition as otherwise they incur a monetary expense (in the forms of, respectively, tunneled firm resources or taxes to finance the public good) that is transferred to the winning coalition. The benefit of the joint control thus comes from the potential misalignment of interests as each agent values the possibility of being in a winning coalition and extracting rents from other members. Similarly, in Dhillon and Rosetto (2015), a common risk aversion parameter would reduce the benefits of joint control. In our case, the value of joint control decreases with the potential exogenous misalignment of interests among agents.

The findings in this paper also add to the studies on how bequest is divided among heirs. Most of the literature concentrates on the consumption of heirs (e.g., altruism models such as Becker and Tomes (1979)) rather than on how division affects productive assets.[5]

[4]Family firms indeed often have unique corporate governance mechanisms. See Villalonga and Amit (2009) on the control enhancing mechanisms in the US family firms or Villalonga et al. (2015) on the corporate governance mechanisms specific to family firms.

[5]Among the studies that look into productive assets, Bertocchi (2007) considers that some assets such as land are indivisible while Chu (1991) assumes increasing returns to scale in how bequeathed wealth can be invested. See Kopczuk (2009) for the full summary of the theoretical and empirical literature on bequest

Empirically, while the division of bequeathed wealth is often equal or favors heirs who need more assistance, Menchik (1980) shows that if the inherited property is a family business, bequest is 15-29% more unequal than in the full sample of family transfers.

Finally, we relate to the corporate finance literature on the benefits and costs of diversity in organizations, e.g., corporate boards (see Ferreira (2010) for a review on this topic). In Donaldson et al. (2020)'s study on the implications of the board deadlock on the choice of board parameters, the authors cite survey evidence that 67% of directors report the inability to decide about some issues in the boardroom and 30% say they have encountered a boardroom dispute threatening the very survival of the corporation. Landier et al. (2009) talk about the optimal dissent in organizations from the principal-agent perspective. Our study focuses on the ownership allocation based on the arguably inherent family characteristics that are likely more exogenous to the firm performance than the director choices, thus circumventing some of the challenges of the empirical literature in identifying the effects of diversity on the corporate performance.

2 Hypothesis development

2.1 Baseline structure

Consider a firm initially fully owned by its founder. At $t = 0$, the founder retires after dividing his ownership among N heirs. At $t = 1$, the firm must pick one of many mutually exclusive projects. At $t = 2$, each project yields a cash flow as well as non-pecuniary private benefits to the heirs. We first discuss the assumptions behind the investment problem at $t = 1$ and further outline the founder's decision at $t = 0$.

Investment problem Assume that a fixed investment (of size 1) has to be made to take any of the projects. Although all projects bring equal cash flows $C > 1$, the N family

motives.

members disagree about the value of private benefits of each project. As suggested by Hart and Holmstrom (2010), private benefits can be viewed as a way of capturing different beliefs held by agents about the consequences of strategic choices, i.e., this could reflect the disagreement about the cash flow benefits that each project brings and thus they are non-pecuniary and private only ex ante. Another interpretation could be that heirs disagree about the types of projects that best preserve family legacy ("family name"), i.e., they are non-pecuniary and private even ex post. As a simplification, let each heir get private benefits $B > 1$ from one of the available projects and 0 from all others.

Importantly, heirs realize the private benefits irrespective of their ownership, i.e., they care about the direction that the firm takes even if they are not getting direct cash flow benefits out of it. For instance, even if their main sources of income are not related to the original family firm, children might still benefit in their own ventures and careers from a good standing of their family's reputation. These private benefits can also be seen as differences in non-monetary preferences (e.g., avoid non-environmentally-friendly strategies). Alternatively, they can be see as the disagreement in the beliefs about C (e.g., heir is convinced about the potential of the strategy but cannot persuade others).[6]

The choice of the project involves one of the owners suggesting a project and all of the owners voting whether to take it. Unless the voting majority agrees to take the project, the project is not taken. If none of the projects is chosen, the firm goes into a deadlock[7] and neither the owners realize cash flows from the new project, nor family members get respective private benefits[8] but the initial investment is also not wasted.

[6]Such assumption is more likely to hold in entrepreneurial or family family than large publicly listed firms. For instance, in Aghion and Bolton (1992), the entrepreneur receives the non-pecuniary private benefits even if the investor holds control. However, one might think of other cases. One example could be the citizens of the country who feel national sentiment towards an ailing local firm. Although they might not realize the cash flow benefits, they agree on the private benefits and are willing to fund the bailout via their taxes, thus saving a likeable national firm from distress.

[7]Deadlock can be seen as the continuation of usual activities as in Donaldson et al. (2020), i.e., the firm does not take the new investment project and continues along its current path. Zero cash flow benefits at the time of the deadlock can just be considered as scaling.

[8]If several projects provide different private values for the heirs and each heir has a ranking over their preferences for each project, a deadlock can be interpreted as the probability of Condorcet cycles.

When the heirs need to choose the project, they observe the realization of everyone's preferences for the projects, however, ex ante, before allocating the control the founder only observes the distributional properties of how preferences are assigned. That is, the mapping from projects to B is not necessarily independent among heirs. High correlation can be interpreted as having similar value system or agreement about the mission of the firm. Denote the conditional probability that two heirs get B from the same project by $\alpha \in [0, 1]$, which is exogenously given.[9]

Finally, no one in the family has external wealth, nor receives income outside of the family firm.

Inheritance problem The founder observes the probability that heirs agree on the project α and divides the ownership of the firm among them, given a one share-one vote structure. Assume that the founder cares equally about them. Everyone has linear utility. The founder thus maximizes the combined value of the firm as valued by all his descendants – the sum of private benefits and cash flow benefits of all his heirs:

$$\max_{w=w^1,\ldots,w^N} \sum_{i=1}^{N} \left[E\left(B^i\right) + w^i \lambda C\right] \tag{1}$$

where $(1-\lambda)$ is the probability of a deadlock, w^i is the heir i's ownership share (s.t. $\sum_{i=1}^{N} w^i = 1$), C are cash flows while B^i is the size of the heir i's private benefits. In other words, the objective function of the founder is independent of how cash flow benefits are allocated, and only depends on how many children end up getting the private benefits.

We first discuss the intuition of the main result, when the founder has three heirs. The general results for N heirs is provided in Appendix 2.

[9] This is related to the congruence parameter between agents in Aghion and Tirole (1997) and Burkart et al. (1997). In family business literature, such agreement within family is also referred to as family cohesiveness (Salvato and Melin, 2008), cumulative emotional capital (Sharma, 2004) or family culture (Poza et al., 1997).

Three heirs Denote heirs by $i \in \{1;2;3\}$, equally likely J different projects by j, s.t. $J \geq 3$, and a draw that i receives B from j by $i = j$. These draws are not independent among heirs and are related via the parameter α. When $\alpha = 1$ and their preferences are perfectly aligned, the probability that all heirs prefer the same project $P(\cap i = j) = 1$, while when $\alpha = 0$ and it is impossible that any two heirs prefer the same project, $P(\cap i = j) = 0$. When preferences are independent $P(\cap i = j) = \frac{1}{J}$.

While that is not key to deriving our result, we assume that the congruence parameter might differ across heir pairs. In particular, the heirs are indexed in such a fashion that an heir's index number corresponds to his rank in terms of agreement with each other, i.e. the heir 1 has higher average agreement with 2 and 3 than the heir 2's average agreement with 1 and 3. In particular, while $P(2 = j\&1 = j) = P(3 = j\&2 = j\&1 = j) \equiv \alpha$, $P(3 = j\&2 = j\&1 \neq j) \equiv \alpha\,(1-\alpha)^2$. That means that the probability that all heirs prefer the same project is α^2 while the probability that all of the heirs prefer different projects is $(1-\alpha)^3$.

A heir realizes B if (a) all heirs prefer the same project; (b) other heirs prefer the same project and they together hold a majority of votes; (c) he holds the majority of votes by himself and can impose his preferred project. So, the expected private benefits for the heir 1 is:

$$E(B^1) = [\alpha^2 + \alpha(1-\alpha)1_{(w^1+w^2>\frac{1}{2})} + \alpha(1-\alpha)1_{(w^1+w^3>\frac{1}{2})} + (1-\alpha)^3 1_{(w^1>\frac{1}{2})}]B$$

In other words, heir 1's expected value of private benefits is the probability that B is realized if all heirs prefer the same project (with probability α^2) in which case who holds voting power is irrelevant; if both heir 1 and heir 2 prefer the same project and they hold the majority of votes (with probability $\alpha(1-\alpha)$); if both heir 1 and heir 3 prefer the same project and they hold the majority of votes (with probability $\alpha(1-\alpha)$); or if heir 1 disagrees with other heirs on the preferred project but heir 1 holds the majority of votes and can

impose his preferences (with probability $(1-\alpha)^3$).

Based on the similar logic, the expected private benefits for $i \in \{2;3\}$ are:

$$E(B^i) = [\alpha^2 + \alpha(1-\alpha)1_{(w^i+w^{-i1}>\frac{1}{2})} + \alpha(1-\alpha)^2 1_{(w^i+w^{-i2}>\frac{1}{2})} + (1-\alpha)^3 1_{(w^i>\frac{1}{2})}]B$$

Adding all the cases together, we can see that the ex ante probability λ that some project will be chosen and the firm will not end up in the deadlock is: $\lambda \equiv 1-(1-\alpha)^3$.

Analysis The founder faces a trade-off. If he passed ownership to a single heir, the other heirs would still face the private benefits but would not be able to influence the choice of projects, so their ex ante valuations would be lower than in the cases when they might be in the winning coalition which imposes its course of projects. In other words, with or without ownership the heir might believe that the corporate decisions made by his brother are a disgrace to a family name or would not improve the valuation of the firm, so (in addition to all cash flow benefits) he would value the chance to influence decision making. On the other hand, shared ownership among three increases the possibility of the deadlock which is costly to the firm.[10] There is some threshold ex ante agreement α^* below which the unilateral control is optimal and above which the joint control is optimal.

In our analysis we also assume that the deadlock cannot be avoided with the side transfers that could sway the decision of one the heirs and that discontent members of the family cannot be bought out with the deferred payments.[11] We also assume that the firm cannot

[10] Also, we do not distinguish the case when one heir owns the majority of shares from the case when a trust where he is a trustee owns it. All our discussion and results can be interpreted as the direct ownership of heirs in the firm with the voting rights versus the ownership via the trust where only one of them has the actual voting power in the firm.

[11] While we normalize that private benefits are equal to 0 for the non-preferred project, in the family firm setting one could imagine that the private benefits for the non-preferred projects might in fact be negative, i.e., the heirs strongly dislike the strategy that they do not vote for. Given that we assume no outside wealth, by dismissing side transfers that come from the final cash flow we assume that they are not sufficient to compensate for such negative private benefits. In addition, one might also consider that players are infinitely patient. They are able to make such binding counterbid offers to some of the players that discriminate other players but also cannot precommit ex ante to a non-discriminatory agreement by mutual consent with all other players. Harsanyi (1977, p. 235) argues that "in an n-person cooperative game with free communication, if the players can make firm offers to each other, then *every* possible sectional coalition

be split up into multiple divisions, i.e., the costs of splitting up are prohibitively expensive or firm's production function is such that the output can only be produced with the full set of current inputs.

Proposition 1. When $N = 3$, there exists such $\alpha^* = \frac{B+C}{2B+C}$ that for $1 > \alpha > \alpha^*$ all children hold votes with equal voting power and for $\alpha < \alpha^*$ one child holds the majority of votes. The founder is indifferent between these two options if $\alpha = \alpha^*$ or $\alpha = 1$.

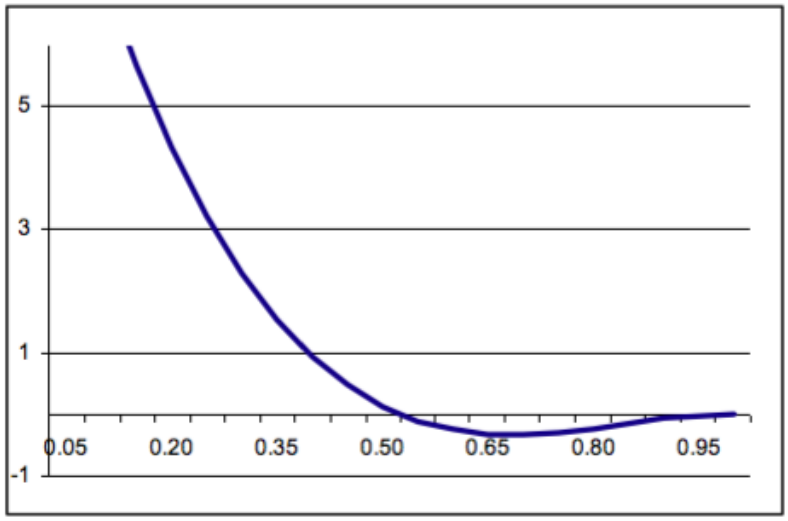
Proof. See Appendix 1.

Figure 1 depicts the benefits of unilateral control over the joint control as a function of α when $\frac{B}{C} = 5$. The vertical axis shows the value to founder from unilateral control minus the value to founder if from joint control. The horizontal axis plots α. The benefit of unilateral control is higher for low agreements as there is a high probability that no project will be chosen if all heirs jointly owned the firm. With very high agreements the benefit of joint control over single control recedes as the likelihood that family members would even agree to the dictatorial choice increases.

As $\frac{d\alpha^*}{d(B/C)} < 0$, the larger are the private benefits compared to cash flow benefits, the more appealing is the divided bequest. Thus, if intangible wealth of the firm is more important to heirs, the founder puts more emphasis on how to generate higher expected private benefits for all heirs rather than ensure the flows of cash flows in the firm. A firm becomes a vehicle to build the reputation for the family and dividing voting rights raises the valuation of this reputation. As $\frac{B}{C} \to \infty$, $\alpha^* \to \frac{1}{2}$ while as $\frac{B}{C} \to 0$, $\alpha^* \to 1$. When private benefits are large, even for a slight chance that preferences are not same, the bequest has to be divided. On the contrary, when $B = 0$, the family members are indifferent between any of the projects (they do not have incentives to vote against a randomly chosen project) and the ownership

S is vulnerable to disruption by outsiders who can bribe one or more members of S into withholding their cooperation from the other members of S. Since every coalition is vulnerable in this way, no stable agreement can arise, unless the players agree not to use such disruptive tactics against any possible coalition in the game". Agreement not use such disruptive tactics might not be renegotiation-proof.

Figure 1: Benefits of unilateral control over joint control



structure is irrelevant. In fact, even with $C = 0$, unilateral bequest is optimal for $\alpha < \frac{1}{2}$ as in the deadlock none of the heirs gets private benefits.

Appendix 2 provides the general result for any N. The optimal ownership structure depends on the number of heirs. Also, the division of control crucially depends on the tie-breaking rule, i.e. whether it is sufficient for the largest coalition to control half of the votes to implement the preferred project. If a control of half of the votes is not enough to implement the preferred project, it is never optimal to give control to odd number of heirs. The (even) number of heirs to which it is optimal to give control depends on α. A range of α exist for any even number of heirs to have an optimal control and the larger is α, the larger is the number of heirs that share control. If a control of half of the votes is enough to implement the preferred project, the optimal solution reverses and it is never optimal to give control to an even number of heirs. The control split between any even number of heirs is optimal for some α. Ex ante the founder prefers the former tie-breaking rule.

2.2 Empirical implications

These theoretical predictions build our empirical hypotheses:

Hypothesis 1. In the cases where future conflicts are less likely, family businesses are more

often inherited by multiple family members.

Hypothesis 2. Conditional on more than one child inheriting the shares, higher disagreement leads to more unequal bequests.

Hypothesis 3. In the cases where future conflicts are less likely, the ownership remains longer in the family's hands.

Hypothesis 4. In the cases where private benefits are higher compared to cash flow benefits, family businesses are more often inherited by multiple family members.

Hypothesis 5. The firms with divided bequest have lower investment after the transfer, compared to the firms with the unilateral bequest.

Because of the data quality, we will rely on Norwegian sample in our empirical analysis, but we first provide evidence that the ownership distribution is also unequal in other, larger, economies and in particular in the US. That family firms vary in terms of the ownership stakes can be seen from 2007 Survey of Business Owners Public Use Microdata Sample which reports the ownership distribution for four largest owners of $2,165,680$ US firms. We look at those firms that indicate themselves as family firms and where all of the largest four owners have inherited their stakes. Out of $13,667$ such firms, $12,433$ have between two and four owners. As we show in Appendix 3, $6,936$ or 55.8% of these have an equal division of ownership (either 50% each in case of two owners, 34% or 33% each in the case of three owners, or 25% each in the case of four owners).

While these figures are thought-provoking, the US data, even at the detailed Census level, does not allow us study the inheritance choice as we are unable to observe the potential set of heirs, i.e., those who could have received ownership but did not. In addition, even for the heirs that have received the ownership, we do not have available information on their demographic characteristics and identify their relationships (e.g., they might have inherited the ownership stakes from different, unrelated, founders). In fact, even the self-declared definition of "family firms" might not be consistent across firms. We thus turn to Norwegian data.

3 Data

3.1 Sample construction

In our main empirical analysis, we use the ownership data of the complete population of Norwegian economically active non-financial limited liability firms over 2001-2017. This data comes from Experian. We match it to the panel of the full family relationship data, which comes from the Norwegian Tax Authority. The dataset from the Norwegian Tax Authority provides core relationships between those persons who are active in a firm in any role and their extended family members (spouses, parents, grandparents, great grandparents, great-great grandparents). This allows us to build the deep family relationship map for all core individuals, i.e., to understand the sibling and cousin relationships, even if these siblings and cousins do not have ownership in the firm. Appendix 4 describes the raw family relationship data, lists the key steps in the procedure how we create the deep family relationship map, and tells how we merge it with the ownership data.

We aggregate corporate subsidiary structures at the ultimate owner level, i.e., we only consider one firm per business group. Moreover, in our sample of family firms, we only consider firms that (a) have a family as the largest owner and at least 20% of ownership in the firm. We also require (b) the largest owner ("founder") to have at least 50% of the family's stake and (c) be at least 40 years old in the first year in our sample. Further, we require that (d) this person has at least one descendant child or step-child, and (e) the firm survives at least three years during our sample period and has positive records for sales and assets. After imposing these conditions on the whole population of Norwegian firms that are active between 2001 and 2017 our final sample includes 95,879 firms.

With the first condition (a) we focus on firms where family transitions are important to the firm. The condition (b) allows us to focus on one nuclear family that is the most important in the transition rather than the dynamics than involve interfamily interactions.[12]

[12]For instance, we exclude firms where multiple second-generation heirs share ownership but neither of them has a majority. We discuss some implications of multiple generations in Section 8.

Conditions (c) and (d) limit the sample to the cases where ownership transitions are relevant, i.e., the founder is old enough to consider transition and has at least one heir. Finally, condition (e) removes the short-lived and economically inactive ventures.

3.2 Sample description: All sample firms

We first describe our sample of 95,879 firms and their characteristics.

We first reconfirm that the firms we study are important for family. The median firm has 1.341m NOK of assets and that constitutes 25.5% of the majority family's wealth. The median ownership fraction by the family is 100% and the median founder's share is 94.4%. That is our sample primarily consists of firms owned by a single owner/family. The median founder age is 51 years at the time we observe the firm first. In 13.8% cases the founders are women.

We are able to observe most of the firms almost since their inception. The median age of the firm at the start of their appearance in the sample is 2 years. Only 4.7% of firms (4,512 firms) are over 25 years old in 2001 and 1.2% of firms (1,119 firms) are over 50 years with the oldest firm being 147 years of age in 2001.

We condition the sample on having at least one descendant child, including step-children. The median number of children that the founder has at the start of when we start observing the firm was two. Out of 95,879 firms, 11,313 firms have one descendant child, 41,772 have two descendant children, 30,293 have three descendant children, 9,346 have four descendant children, and the rest have more than four. The sample is quite balanced between male and female descendants.

If we focus on children that are over 18 years old and are more likely to be considered for ownership transfer, 24,322 firms have none, 17,443 firms have one descendant adult child, 31,542 have two descendant adult children, 16,706 have three descendant adult children, 4,445 have four descendant adult children, and the rest have more than four.

We further describe some characteristics that could be related to the disagreement be-

tween heirs. One potential disagreement between the heirs could come from them being of different age. The median age of descendant adult children is 26.3 years, ranging between 18 and 66. The median of the maximum age difference of heirs within the family is five years, ranging between 0 and 48 (where 99% percentile is 24). The median standard deviation of heir age within the family is 3.16 years. We observe 2,955 firms with at least one set of twins.

The other potential source of heterogeneity might come from different education backgrounds of children. Here we only look at the adult children heirs that are 24 years or older. We have 37,307 firms with at least two children heirs over 24, and out of these, in 16,819 firms at least two children heirs differ in whether they have university education, suggesting considerable heterogeneity. We can also look into the fields of study.[13] In the cases with at least two children heirs over 24 and where we have education field available, the field differs in 44.48% of the cases.

There might be disagreement coming from the fact that children have different parents or the family experienced other major events. We have 11.1% of firms where not all children have the same parents. In 39.7% of firms founder has experienced divorce or separation. In our empirical tests, we will exploit the prevalence of divorces as a way to identify the potential of family conflicts.

Also, the children might differ because of their abilities that might be correlated with their salaries. We do not have salary information for all children in our sample but for the cases that we have we see that the median salary is 190,674 NOK and the largest salary is 4,512,927 NOK. On average, within the family the average salary difference between grown-up children is 75,950 NOK.

Some children are already involved in the firm even before their parents transfer the larger stakes. At the start of firm being observed in the sample, 12.1% of firms have heirs with some ownership stakes in the firm. The average age of descendant adult children who

[13]Our data provides nine fields of study: General subjects; Humanities and arts; Teacher training and pedagogy; Social sciences and law; Business and administration; Natural sciences, vocational and technical subjects; Health, welfare and sport; Primary industries; Transport and communications, safety and security and other services.

have ownership stakes in the firm initially is 31. In 3.32% of cases initially, the child is the CEO of the firm in question, In 19.3% of cases, at least on child sits on its board of directors. In 14.8% cases, at least one child works for the firm.

3.3 Sample description: Transfer firms

We record the firms in the year of the transition where the transition is defined as the year when the decrease in the founder's share passes the threshold of 10% (as measured from the start when the firm is observed in our sample).[14] We choose a rather low gradual threshold as we expect that succession planning induces allocation of shares even before a major inheritance event. Across all firms in our sample, it is unlikely that earlier allocations will systematically differ from the later allocations, so the few earlier allocations that we capture in our sample is unlikely to bias our estimates.

Out of 95,879 firms, in 28.8% cases (27,627 firms) we observe at least one founder transfer of ownership of at least 10% between 2001 and 2017. The number of family transitions averages at 1,625 per year and varies from around 1,000 per year in 2009-2011 to over 2,500 per year in 2001-2003, possibly reflecting economic fundamentals or a general trend of increased entrepreneurship over time.

Table 1 provides summary statistics for our sample firms that have experienced transition. The average age of the founder in the transition year is stable at early to mid 50s to early 60s throughout the sample with the median being at 59 years over the whole period. In 7% of firms we observe founder deaths during our sample period. The average age of the firm at the time of transition is 9 years.

The median transfer is 50% of ownership stake. In about one-third of the cases (9,411 cases) at least one of the children receive some shares, while in two-thirds all transferred shares are sold outside the family. If we condition the sample to the firms that had within-family transition and initially had at least two descendants, our sample is 8,057 cases (7,748

[14] We inspect if the founder has had any other transitions before to make sure that we are not capturing serial entrepreneurs who frequently exit their stakes in firms.

if we restrict to at least two descendants being at least 18 years old). Within this sample, we find that in 56% of cases only one descendant receives the shares while in 44% more than one descendant receives the shares. The median fraction of children who receive the shares in case of multiple children is 50% and the mean is 60%.

4 Descriptive empirical analysis

4.1 Within-family ownership dispersion

We start our empirical analysis from this last observation that 50% of children experience the increase in their ownership share in the year of transition in case of within family transitions. Our first step is to test Hypothesis 1 on whether in the cases where future conflicts are less likely, family businesses are more often inherited by multiple family members.

We start with providing the correlations of the the resulting ownership distribution with the family member characteristics at the time of ownership transition. We perform a set of tests, where we directly approach Hypothesis 1 and conditional on the firm being preserved within the family during the transition and the family having at least two children, we examine how many children get stakes as well as the dispersion in the stakes they get. We cluster standard errors at a broad industry level.

Table 3, Panel A, reports the tests where we estimate regressions with the dependent variable being the percentage of children with ownership share increases in the transition year if the family has multiple children. We pick several proxies of the potential conflict – dispersion in education levels, age dispersion, being born to different parents – and estimate regressions for each of the proxies separately. We control for the number of children.

First, we look at the dummy variable of children differing in their levels of education. We define the variable to be one if some children have university education but others do not, thus they likely to have more dispersion of opinion.[15] We find that the dummy of children

[15]Similarity in academic achievement has been shown to be an important and consistent predictor of

being of different educational attainment is associated with fewer of them getting the shares in transition.

Second, we look at whether the dispersion in the age of children is related to how many children experience increases in ownership stakes. Presumably, dispersion in age is related to higher possible dispersion in opinion and ex ante disagreements as children are likely to have spent less time bonding during the childhood years and more likely to experience different world views and positions in lifecycles. We see that the standard deviation in children age is negatively associated with the number of children receiving shares.

Third, we look at whether children heirs are born to different parents, given that full siblings tend to be emotionally closer and have more contact than half-siblings (Pollet, 2007; Pollet and Hoben, 2011). We find that the presence of different parents is negatively associated with the fraction of children inheriting the ownership.

We next test Hypothesis 2 by repeating the same exercise but instead of the percentage of children who receive shares in the transition, we use the concentration in the ownership shares that are transferred. Here we also condition for at least two children to receive the shares. If for any reason the founder preferred to bequeath the shares to multiple children even after he observes high potential conflict, the bequeathed shares should be made dissimilar, so that one of the children would have higher voting power and avoid the conflict. That is, the ownership concentration should be lower with higher potential for the conflicts.

We estimate the Herfindahl-Hirschman (HHI) index of the share concentration based on the shares fractions inherited by children, where shares are estimated as a fraction owned by the family. We report results in Table 3, Panel B. and find that age similarity and children coming from different parents are negatively related with the concentration in the share transfers. On the other hand, we find that different levels of educations are positively correlated with higher concentration.[16]

friendship ties (Flashman, 2012).

[16]We are collecting data to look at whether there any other changes in wealth of descendants around the transition years, i.e. whether some heirs in the family firms are compensated in other ways.

4.2 Internal and external transitions

We further investigate Hypothesis 3 that in the cases where future conflicts are less likely, the ownership remains longer in the family's hands. With severe potential conflicts, the possibility that the business will be sold off outside of the family is less unappealing. Also, if potential conflicts are evident in the future, the transfer outside of the family will occur faster as the founder might internalize that the possibility of transition within the family might turn out to be too costly. In other words, the valuation of the firm by the founder increases with α while the valuation of the controlling stake by non-family investors is unvarying with α as the latter only value cash flow benefits. Thus, higher α should lead to more reasons for the family ownership.[17]

Here we look at how proxies for conflicts based on family characteristics correlate with whether at least one family member received ownership shares, i.e, the transition was within-family. In addition, we look at how family characteristics correlate with the age of the firm at the time of transition in case the transition is outside of the family. We perform the same set of analysis as in Section 4.1 but with the dependent variables being a dummy of within-family transitions (Table 4, Panel A) and the age of the firm at the time of transfer to outsiders (Table 4, Panel B).

In the case of the dummy whether the transition is within-family, we find that differing education, age dispersion, and different parents are all negatively associated with the firm staying in the family, which is consistent with our hypothesis

Looking at the age of the firm in case it is transferred externally, we find that differing gender, age dispersion, and different parents are all negatively associated with how long the firm stays in the family, which is again consistent with our hypothesis.

[17]Similarly, Bertrand and Schoar (2006) find that family businesses are more prevalent in the cultures with stronger family ties. In light of our framework, one could interpret that countries with stronger family ties are more likely either to have less frequent conflicts in the family firms, or to have established norms how to resolve such conflicts, i.e. they should be associated with a higher α.

5 Divorces

We now turn to our main analysis where we focus on whether the relationship between the potential of family conflicts and the ownership concentration can be deemed to be causal.[18]

We rely on the extensive family relationship data. Based on our correlations that the bequest is more concentrated if the potential heirs come from different parents and are of more dispersed age, we look at whether founder's divorces lead to more concentrated bequest.

Divorces are associated with children having different parents. Since adult full siblings tend to be emotionally closer and have more contact than half-siblings (Pollet, 2007; Pollet and Hoben, 2011), divorce is likely to lower affinity between the potential heirs. In addition, divorce is likely to have an effect on children from the same parents (Amato, 2000; Amato and Cheadle, 2005). In particular, psychology literature has shown that parental divorce has strong effects on sibling conflict and the effect persists to later in life (Riggio, 2001; Sheehan et al., 2004; Poortman and Voorpostel, 2009).

Norway has had liberal divorce policy stretching back to 1909 (Johansen, 2018) and so parties in our sample period were unlikely to face constraints in dissolving their marriages. However, we face an empirical challenge that founder's marital relationships, including the possibility of divorce, might be affected by the firm performance and thus might not be independent of firm outcomes as well as ownership distribution. Also, unobserved external factors such as expected economic conditions could affect both firm performance and the founder's relationship status.

We thus continue with the instrumental variables specification. We instrument the founder's divorce by whether anyone in the extended family of the founder has experienced

[18] Although in the theoretical model, α is treated as an exogenous parameter, in reality it might not be the case. First, α is (to some extent) a choice variable of the founder. In fact, the founder faces a trade-off in allocating his limited (time) resources between increasing the value of the firm and spending the time with the family. Time spent with the family strengthens the family ties and thus minimizes the chance of the conflicts or establishes an efficient low-cost process to resolve them.

Moreover, α could be endogenous to the choice of ownership structure. One could imagine that, if the control is concentrated with one child, the other children can raise their disagreement with the decisions of the firm. Such and the corresponding situation with higher agreement if the control is shared, would increase the region where shared control is optimal but would not qualitatively change the results.

a divorce or a separation in the past. We define the extended family as the members of blood and non-blood relationships outside of the nuclear family but limited to four levels of horizontal relationships and eight levels of vertical relationships. We argue that history of divorce in the family makes it more acceptable socially and increases its cultural familiarity.[19]

We exclude the direct nuclear family divorces and separations as these might be affected by the focal firm performance. Also, direct lineage divorces and separations might change heirs' personalities, which could affect firm performance. For instance, founders' parents' divorce might be associated with a more likely divorce of the founder but also change their risk-taking behavior. We also make sure that extended family members on which we rely on to create our instruments are not directly involved in the firm neither as the board members, owners, or salaried employees. After omitting these direct lineage family members and those extended family members who are involved with the firm, we believe that the remaining family members who we study affect founder only through the family relationships and thus exclusion restriction can be supported.

We report the instrumental variable results in Table 7, Panel A. In column (1) we report the first stage (of the regression reported in column (2)) where the instrumented variable is a dummy variable of whether the founder has divorces or separated before the firm transfer and the instrument is a dummy variable of the presence of divorces in the extended family. We see that the instrument is strong with the F statistic of excluded instrument being 958.1.

In column (2) we report the estimation where we explain the percentage of heirs receiving the bequest with the instrumented founder divorce. We find the coefficient to be significantly negative. In column (3) we instead look at the HHI of the heirs' bequest and find significantly negative coefficient. In column (4) we see that within family transfers are also less likely after founder's divorce and in column (5) we see that when the firms are transferred to outsiders, they are likelier to be younger if the founder has experienced divorce or separation. In Panel B, we repeat the same analysis but instead of using a dummy of extended family divorces

[19]In a similar vein, social science research has shown that parental divorces are associated with more frequent divorces of children (e.g., Wilfinger (2003); Amato and DeBoer (2001)).

as an instrument, we use the number of divorces in extended family, and except for column (2) find consistent results.

We further zoom in on the instrument and only look at the divorces of the founders' first cousins who are likely to have been in a similar age group. First cousins are thus among the extended family members who might have had most influence in changing founder's perspective on social norms of divorce. As before, we make sure that these first cousins are not affiliated with the firm neither through being an employer, nor owner. We repeat the same specification as in the earlier panels and as reported in Panel C we find consistent results, except for column (3).

6 Inheritance tax reform

We further look at the importance of private benefits. We have posited, as part of Hypothesis 4, that when private benefits are higher, compared to cash flow benefits, family business are more often inherited by multiple family members. It is challenging, however, to measure non-pecuniary private benefits.

As in our model, we claim that if the value of the firm to the family consists of cash flow benefits and non-pecuniary private benefits (e.g., Aghion and Bolton (1992)), the relative value of non-pecuniary benefits rises if the cash flow benefits drop (a similar interpretation made in Hart (2001)). We look for the exogenous variations that would affect the cash flow benefits without affecting firm operations. Inheritance taxes fit this requirement for family firms. By reducing the expected cash flow benefits to family shareholders, inheritance raise the relative importance of non-pecuniary private benefits.

Starting with 2014, Norway has abolished inheritance tax. Before 2014, the inheritance and gift tax had a zero rate for taxable amounts up to NOK 470,000. From this level, in the case of children (or parent) inheritance, the rate was 6% up until NOK 800,000 and 10% thereafter. For all other beneficiaries the corresponding rates were 8% and 15%. The

inheritance tax stopped applying for deaths after January 1, 2014, and still applied for deaths before that irrespective of when the transfer of property actually occurred.

We estimate the saved inheritance taxes for firms that had founders pass away after year 2014 by assuming that the taxable amount would have been equal to the NOK value of firm's assets.[20] We then compare the transfers that were an outcome of founder's death in 2010-2013 to those that were an outcome of founder's death in 2014-2017. For each founder's death and transfer in 2014-2017 we find the firm in terms of the closest value of assets that had founder's death and transfer in 2010-2013. We find 147 such pairs.

Based on our arguments, lower inheritance taxes should make private benefits B less important compared to the cash flow benefits C. This should lead to lower disagreement and thus more equal ownership shares. Indeed, we find that the concentration of the bequeathed ownership shares (HHI) is 0.46 after 2014 and 0.40 before 2014, the statistic of the difference being 1.55, which weakly supports our prediction.

7 Investment and growth

In our final set of analysis, we look at whether the succession decisions that we study are related to the firm growth and in particular on the investment. As per our assumption about the deadlock if there is disagreement and divided bequest, we expect that the firms with divided bequest between heirs should have lower investment.

We define investment as the change in the book value of fixed assets after accounting for depreciation, accumulated over the three years after the share transfer and scaled by the fixed assets at the time of the transfer. We limit this ratio to be between 0 and 1. We condition the sample on the firms having multiple children. As before, we cluster standard errors by industry.

We report results in Table 5. In Panel A, we provide baseline specifications where we link

[20] Throughout our all sample period, median firm's assets constitute 25% of family's wealth; the corresponding figure is 21.3% for transfers in 2010-2017.

investment to how divided the bequest is between the children during the ownership transfer. In column (1), we provide the specification where we link investment to the number of children who inherit the shares. In column (2), we look at the fraction of children who inherit the firm's shares, out of all children in the family. In column (3), we look at the concentration of inherited shares by children, measured by the HHI index. In this case we limit the sample to at least two children inheriting the shares. We can draw an overall conclusion that the number of children who inherit the shares (and how concentrated their ownership is) is negatively associated with the investment in the three years after the ownership transfer.

In Panel B, we investigate children characteristics that might be linked to the investment. The first three columns of Panel B correspond to the columns in Panel A with additional controls added to the regression. In particular, we control for the number of adult children, the average age of inheritor children, fraction of male inheritors and fraction of inheritors with university education. Adding these controls does not affect the relationship between ownership dispersion and the investment. Among these controls, we see that the percentage of male heirs, non-university based education background, and the younger inheritors are associated with larger investment, which can be possibly explained by greater risk taking.

Firms might also differ in their overall investment policies. In column (4), we also control for pre-transition investment, estimated in the same way as the dependent variable but estimated (as an annual value) in the year before the transition.

Finally, we look at the robustness of defining the investment variable. Panel C corresponds to the specification in Panel B, column (3). In column (1), instead of capping the investment variable between 0 to 1, we take a natural log. In column (2), we winsorize investment variable at 1% level. In column (3), we exclude the cases where the impairment constitutes more than 50% of the assets. In column (4), instead of accumulating the continuous investment variable over 3 years, we count the number of years (from 0 to 3) in which the investment is positive.

In Table 6 we report the corresponding estimations where the dependent variable is the

cumulative sales growth over the three years after the transition. We report the associations between sales growth and two ownership dispersion variables: the number of children who inherit the shares and the fraction of children who inherit the firm's shares, out of all children in the family. In both cases, with and without controls, we see that the more dispersed within-family ownership is associated with lower sales growth after the ownership transition.

All in all, divided bequest seems to be related to lower firm investment and sales increase, which suggests that within-family dynamics might be an important component on how family firms expand and grow.

8 Conclusions and discussion

We use the population of Norwegian limited liability firms and complete owner family relationships to examine the transition of ownership from one to the next generation. We document that the patterns of divided bequest are more likely when the potential disagreement is lower in private Norwegian family firms. Occurrence of multiple heirs correlate negatively with children being of different gender, different educational attainment, having larger dispersion in age, and founder having had divorce and separation and thus children coming from different parents. We find that divided bequest is associated with lower firm investment in the future, likely hampering firm growth.

We motivate empirical work by providing a model of ownership distribution in the family firms. We argue that family members realize non-pecuniary private benefits from the firm's activities but they disagree which actions of the firm provide these private benefits. The founder faces a dilemma how to divide the ownership between his heirs. Bequeathing the voting shares to all heirs maximizes their valuation of private benefits as such structure increases their chances of being a part of the winning coalition that chooses the course of the firm. However, if no winning coalition is formed, no course of action is taken and the firm experiences the cost of deadlock. At the other extreme, concentrating the voting shares in

the hands of one heir eliminates the chance of deadlock but reduces the valuation of expected private benefits by the other heirs. Thus, when there is a large potential disagreement about the private benefits, the control of the firm is concentrated with one heir. If the probability of disagreement is low, a divided bequest is optimal.

Our identification strategy relies on the observation that the intensity of within-family heir conflicts is exacerbated by the founder divorces. Since founder divorces might be related to the firm performance, we instrument them by past divorces of extended family members not affiliated with the firm such as the divorces of first cousins. We find that founder divorces shape heir ownership distribution and contribute to the firm survival.

Further work will extend the analysis to take into account multiple generations and "pruning the family tree" as the potential solution to the conflicts. In the multiple generation setting every generation would make the same choice of bequest as in our current setting. However, the decisions in the later generations differ from the founder's decision in the first generation. Decision makers in the later generations only care about how their own heirs value the firm and not how the heirs of other branches of the family value it (i.e., they care about their own children but not their nephews). Also, it is likely that the agreement within the branch of the family is higher compared to cross-branch agreements, i.e., there is higher agreement between siblings than between cousins (Becker (1981)).

We expect that the probability of concentrated bequest is higher in the second generation as concentrated bequest creates the highest bargaining power with respect to other branches of the family. On the other hand, the set of correlations at which a concentrated bequest is made in the first generation is reduced. The founder has to take into account the unobservable correlations between his grandchildren and the fact that a single inheritor would not care for his nephews and nieces. With more generations taken into account, single bequest becomes less common in the first generation, although it is more common with every subsequent generation compared to the first generation. Thus, the number of family owners does not necessarily expand infinitely, i.e., the family tree gets effectively pruned.

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Main Tables

Table 1: Descriptive Statistics

This table shows descriptive statistics for firms in our sample. We start with the population of 95,879 economically active limited liability firms between 2001 and 2017. We only consider firms that have a family as the largest owner. We require the largest owner ("founder") to have at least 50% of the family stake in the first year in our sample. We only consider firms where age difference between the founder and the firm is more than 35 years, the founder is the CEO and/or chairman of the firm, and the firm is older than 5 years. We record the firms in the year after the transition where the transition is defined as the year when the change in the founder share passes the threshold of 5%. Panel A records the number of observations, the average founder's age, and the average firm's age in our sample. Panel B provides a number of summary statistics for sample's firms in the year of transition.

Panel A: Observations		
Year	Number of transfer firms	Average founder's age at transfer
2001	2,925	55.44
2002	2,509	56.60
2003	2,734	57.44
2004	1,897	58.70
2005	2,025	60.24
2006	1,095	59.65
2007	2,235	60.23
2008	1,676	60.35
2009	1,264	59.61
2010	1,322	60.27
2011	1,267	60.09
2012	1,445	60.67
2013	1,099	59.81
2014	1,153	61.37
2015	982	62.13
2016	1,020	62.47
2017	979	64.44

Panel B: Summary statistics at the start of the sample	
	Mean
Family characteristics	
Number of children	2.56
Number of children over 18	1.87
Number of female children	1.20
Number of male children	1.36
Age of adult children	29.29
Maximum age difference between children	6.21
Twins	0.03
Percentage of children with university education	0.44
Founder characteristics	
Founder age	54.64
Founder is CEO	0.50
Founder is Chairman	0.62
Founder is salaried	0.37
Firm and ownership characteristics	
Firm age	8.17
Family's starting share	76.89
Family's ending share	70.60
Founder's starting share	67.03
Founder's ending share	16.93
Number of children with share at start (%)	27.11
Number of children with share after transition (%)	54.58
Within family transitions	
Founder's ownership transfer to family members (%)	64.40
Children with share increase if family has multiple children (%)	43.78

Table 2: Dispersion of ownership shares

This table provides the correlation between the ownership concentration and a number of proxies of the potential for family conflict. The data is based on the Norwegian private family firms matched to the family relationships and focuses on the within-family bequests over 2001-2017. In Panel A, we correlate the the percentage of heirs who receive the bequest (the left-hand-side variable) with the characteristics of the family of the founder. We limit the sample to the same family transitions. In Panel B, we correlate the dispersion of the bequeathed ownership shares (Herfindahl-Hirschman Index, HHI) (the left-hand-side variable) with the characteristics of the family of the founder. We limit the sample to same family transitions with at least two children bequeathing the shares. In Column (1), we relate it to any of the children of being of different levels of education. In Column (2), we relate it to the age dispersion, including the presence of the twins. In Column (3), we relate it to the heirs being born to different parents. We report the coefficients and the robust standard errors, clustered at the industry level, in the brackets. ***, **, and * refer to the statistical significance at 1%, 5%, 10% respectively.

Panel A: Multiple heirs			
	(1)	(2)	(3)
Different education	-0.027***		
	(0.004)		
Age dispersion		-0.019***	
		(0.001)	
Different parents			-0.148***
			(0.008)
Number of children	-0.092***	-0.082***	-0.091***
	(0.006)	(0.005)	(0.006)
Constant	0.860***	0.894***	0.856***
	(0.015)	(0.016)	(0.014)
R^2	0.109	0.127	0.124
N	8055	8055	8055

Panel B: Dispersion of ownership shares			
	(1)	(2)	(3)
Different education	0.019**		
	(0.007)		
Age dispersion		-0.002**	
		(0.001)	
Different parents			-0.015*
			(0.009)
Number of heirs	-0.040***	-0.037***	-0.039***
	(0.005)	(0.005)	(0.005)
Constant	0.267***	0.276***	0.272***
	(0.020)	(0.019)	(0.019)
R^2	0.024	0.021	0.021
N	3392	3392	3392

Table 3: Within-family transition

This table provides the correlations between a number of proxies of the potential for family conflict and external vs internal transitions.. The data is based on the Norwegian private family firms matched to the family relationships and focuses on the within-family bequests over 2001-2017. In Panel A, we correlate the dummy, equal to one if the ownership is transferred within family and zero if the ownership is transferred outside of family (the left-hand-side variable) with the characteristics of the family of the founder. In Panel B, we the firm age at the time of its transition to outside ownership (the left-hand-side variable) with the same characteristics of the family of the founder. In Column (1), we relate it to any of the children of being of different levels of education. In Column (2), we relate it to the age dispersion, including the presence of the twins. In Column (3), we relate it to the heirs being born to different parents. We report the coefficients and the robust standard errors, clustered at the industry level, in the brackets. ***, **, and * refer to the statistical significance at 1%, 5%, 10% respectively.

Panel A: Within-family transition			
	(1)	(2)	(3)
Different education	-0.081***		
	(0.008)		
Age dispersion		-0.014***	
		(0.001)	
Different parents			-0.153***
			(0.013)
Number of children (18+)	0.113***	0.128***	0.123***
	(0.004)	(0.003)	(0.004)
Constant	0.166***	0.137***	0.116***
	(0.025)	(0.021)	(0.021)
R^2	0.117	0.114	0.120
N	27627	24541	27627

Panel B: Firm age at outside transition			
	(1)	(2)	(3)
Different education	-0.786**		
	(0.322)		
Age dispersion		-0.221***	
		(0.076)	
Different parents			-2.079***
			(0.478)
Number of children (18+)	0.962***	1.180***	1.114***
	(0.116)	(0.118)	(0.104)
Constant	10.232***	10.072***	9.743***
	(0.593)	(0.758)	(0.559)
R^2	0.016	0.018	0.018
N	18502	16117	18502

Table 4: Divorces

This table provides the instrumental variables specification between the founder's divorce and ownership transition outcomes. The data is based on the Norwegian private family firms matched to the family relationships and focuses on the within-family bequests over 2001-2017. In Panel A, we instrument founder's divorce with the dummy if there was any divorce in the founder's extended family. In Panel B, we instrument founder's divorce with the number of divorces in the founder's extended family. In Panel B, we instrument founder's divorce with the dummy if there was any divorce among the founder's first cousins. In all three panels, Column (1) reports the first stage specification. Column (2) reports the second stage where the dependent variable is the dispersion of the bequeathed ownership shares, measured as HHI. Column (3) reports the second stage where the dependent variable is the percentage of heirs who receive the bequest. Column (4) reports the second stage where the dependent variable is the dummy, equal to one if the ownership is transferred within family and zero if the ownership is transferred outside of family. Column (5) reports the second stage where the dependent variable is the firm age at the time of its transition to outside ownership. We report the coefficients and the robust standard errors, clustered at the industry level, in the brackets. ***, **, and * refer to the statistical significance at 1%, 5%, 10% respectively.

Panel A: Instrument: A dummy of divorces in the extended family					
	(1)	(2)	(3)	(4)	(5)
	First stage	% heirs with bequest	HHI of heirs' bequest	Within family transfer	Age at outside transfer
Extended family divorce	0.235***				
	(0.008)				
Founder divorce		-0.052**	-0.101**	-0.096***	-8.132***
		(0.023)	(0.042)	(0.028)	(0.967)
Number of children (18+)	-0.011*	-0.093***		0.120***	0.996***
	(0.006)	(0.006)		(0.004)	(0.076)
Number of heirs			-0.043***		
			(0.006)		
Constant	0.169***	0.867***	0.307***	0.141***	12.882***
	(0.018)	(0.015)	(0.030)	(0.028)	(0.831)
R^2		0.108	-0.067	0.117	-0.045
N	8055	8055	3392	27627	18502

Panel B: Instrument: Number of divorces in the extended family					
	(1)	(2)	(3)	(4)	(5)
	First stage	% heirs with bequest	HHI of heirs' bequest	Within family transfer	Age at outside transfer
Extended family divorce	0.032***				
	(0.001)				
Founder divorce		-0.033	-0.117***	-0.076***	-8.597***
		(0.036)	(0.026)	(0.029)	(1.101)
Number of children (18+)	-0.014***	-0.093***		0.120***	0.991***
	(0.005)	(0.006)		(0.004)	(0.073)
Number of heirs			-0.043***		
			(0.005)		
Constant	0.239***	0.862***	0.313***	0.133***	13.072***
	(0.016)	(0.015)	(0.023)	(0.028)	(0.940)
R^2		0.109	-0.094	0.117	-0.056
N	8055	8055	3392	27627	18502

Panel C: Instrument: Number of divorces by first cousins					
	(1)	(2)	(3)	(4)	(5)
	First stage	% heirs with bequest	HHI of heirs' bequest	Within family transfer	Age at outside transfer
First cousin divorce	0.046***				
	(0.003)				
Founder divorce		-0.128**	-0.013	-0.379***	-12.931***
		(0.061)	(0.053)	(0.062)	(2.074)
Number of children (18+)	0.001	-0.094***		0.114***	0.947***
	(0.005)	(0.006)		(0.004)	(0.068)
Number of heirs			-0.039***		
			(0.004)		
Constant	0.273***	0.889***	0.276***	0.254***	14.848***
	(0.016)	(0.026)	(0.015)	(0.040)	(1.306)
R^2		0.086	0.017	0.027	-0.197
N	8055	8055	3392	27627	18502

Table 5: Investment

This table provides OLS specifications where the dependent variable is the investment, defined as the change in the book value of fixed assets after accounting for depreciation, accumulated over the three years after the share transfer scaled by the fixed assets at the time of the transfer, and capped between 0 and 1. The data is based on the Norwegian private family firms matched to the family relationships and focuses on the within-family bequests over 2001-2017. We condition the sample on the families having multiple children. In Panel A, we provide baseline specifications where our explanatory variables are the number of children who inherit the firm's shares during the ownership transfer (column (1)), the fraction of children who inherit the firm's shares, out of all children in the family (column (2)), and the concentration of inherited shares by children, measured by HHI index (column (3)). In Panel B, we provide the corresponding specifications but we control for family characteristics: number of adult children, the age of inheritors, fraction of male heirs, and fraction of heirs with university education. In column (4), we also control for investment in the year before the transfer. Panel C corresponds to the specification in Panel B, column (2), but here we vary the definition of the dependent variable. In column (1), instead of winsorizing the investment variable, we take a natural log. In column (2), we winsorize investment variable at 1% level. In column (3), we removes cases where impairment constitutes more than 50% of fixed assets. In column (4), instead of accumulating the continuous investment variable over 3 years, we count the number of years (from 0 to 3) in which the investment is positive. We report the coefficients and the robust standard errors, clustered at the industry level, in the brackets. ***, **, and * refer to the statistical significance at 1%, 5%, 10% respectively.

Panel A: Baseline specifications			
	(1)	(2)	(3)
Number of heirs	-0.050***		
	(0.007)		
% Percentage of inheriting children		-0.188***	
		(0.029)	
HHI of inherited shares			-0.139***
			(0.033)
Constant	0.456***	0.491***	0.354***
	(0.049)	(0.043)	(0.058)
R^2	0.009	0.014	0.003
N	5838	5838	2270

Panel B: Robustness: Controls				
	(1)	(2)	(3)	(4)
Number of heirs	-0.053***			-0.005
	(0.009)			(0.013)
% Percentage of inheriting children		-0.159***		-0.137***
		(0.026)		(0.036)
HHI of inherited shares			-0.114***	
			(0.034)	
Number of children (18+)	0.021***	-0.005	0.006	-0.002
	(0.004)	(0.005)	(0.006)	(0.007)
Age of heirs	-0.003***	-0.003***	-0.003***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
% Male children heirs	0.083***	0.081***	0.079**	0.082***
	(0.024)	(0.024)	(0.031)	(0.022)
% University education of heirs	-0.057***	-0.057***	-0.121***	-0.060***
	(0.019)	(0.018)	(0.019)	(0.014)
Pre-transition investment				0.177***
				(0.023)
Constant	0.451***	0.532***	0.439***	0.463***
	(0.049)	(0.040)	(0.061)	(0.053)
R^2	0.027	0.028	0.028	0.049
N	5602	5602	2270	4835

Panel C: Robustness: Investment definition				
	(1)	(2)	(3)	(4)
% Percentage of inheriting children	-0.535***	-0.807***	-0.105***	-0.228***
	(0.109)	(0.255)	(0.025)	(0.078)
Number of children (18+)	-0.029	-0.136***	0.001	0.041***
	(0.019)	(0.042)	(0.005)	(0.012)
Age of heirs	-0.013***	-0.033***	-0.002**	-0.005*
	(0.003)	(0.006)	(0.001)	(0.002)
% Male children heirs	0.249***	0.058	0.087***	0.282***
	(0.083)	(0.208)	(0.020)	(0.070)
% University education of heirs	-0.171**	-0.080	-0.054***	-0.327***
	(0.063)	(0.093)	(0.015)	(0.067)
Constant	-0.064	3.427***	0.407***	1.200***
	(0.102)	(0.409)	(0.040)	(0.129)
R^2	0.023	0.005	0.024	0.042
N	4887	5602	5507	8055

Table 6: Sales growth

This table provides OLS specifications where the dependent variable is the cumulative sales growth over the three years after the share transfer, and capped between -100% and 200%. The data is based on the Norwegian private family firms matched to the family relationships and focuses on the within-family bequests over 2001-2017. We condition the sample on the families having multiple children. Our explanatory variables are the number of children who inherit the firm's shares during the ownership transfer (columns (1) and (3)) and the fraction of children who inherit the firm's shares, out of all children in the family (columns (2) and (4)). In columns (1) and (2) we provide the associations without controls while in columns (3) and (4) we control for family characteristics: number of adult children, the age of inheritors, fraction of male heirs, and fraction of heirs with university education. ***, **, and * refer to the statistical significance at 1%, 5%, 10% respectively.

	(1)	(2)	(3)	(4)
Number of heirs	-0.030**		-0.029**	
	(0.011)		(0.012)	
% Percentage of inheriting children		-0.109***		-0.092**
		(0.033)		(0.034)
Number of children (18+)			0.022*	0.007
			(0.011)	(0.009)
Age of heirs			-0.003**	-0.003**
			(0.001)	(0.001)
% Male children heirs			0.084**	0.082**
			(0.030)	(0.031)
% University education of heirs			0.050***	0.050***
			(0.016)	(0.016)
Constant	0.275***	0.294***	0.246***	0.293***
	(0.027)	(0.033)	(0.040)	(0.038)
R^2	0.001	0.002	0.005	0.006
N	5571	5571	5354	5354

Appendix 1. Proposition 1 for three heirs

Proposition 1. When $N = 3$, there exists such $\alpha^* = \frac{B+C}{2B+C}$ that for $1 > \alpha > \alpha^*$ one child holds the majority of votes and for $\alpha < \alpha^*$ all children hold votes with equal voting power. The founder is indifferent between these two options if $\alpha = \alpha^*$ or $\alpha = 1$.

Proof. First, assume that no side transfers are allowed. Consider two options how control can be divided: (1) one heir holds the majority of votes and thus has the full control and (2) all heirs hold votes with equal voting power. Denote the value to the founder when one heir holds the majority of votes V^s and the value to the founder when all heirs holds votes V^d. When $N = 3$,

$$V^s = (1 + 2\alpha) B + C$$

and

$$V^d = \left(3\alpha^2 + 2\alpha (1 - \alpha) (3 - \alpha)\right) B + \left(1 - (1 - \alpha)^3\right) C$$

The founder is indifferent between these two options when $V^s = V^d$, i.e. when $\alpha^* = \frac{B+C}{2B+C}$ and $\alpha^* = 1$. For $\alpha < \alpha^*$, $V^s > V^d$ and one heir holds the majority of votes while, for $1 > \alpha > \alpha^*$, $V^s < V^d$ and three heirs hold votes with equal voting power ($w_i \in \left(0, \frac{1}{2}\right)$ s.t. $\sum_{i=1}^{3} w^i = 1$).

Next, in case of the deadlock allow one heir i to promise a side transfer d to some other heir in exchange for the support for his preferred project, subject to $(B + w^i C - d) \geq 0$ and budget constraints $w^i C - d \geq 0$. First, coalitions formed between two out of three heirs are not stable. Say, heir 1 offers θB to heir 2 in exchange for his support for the project that heir 1 prefers. Heir 1's utility is $(1 - \theta) B + w^1 C$ while heir 2's utility is $\theta B + w^2 C$. However, heir 3 has an incentive to offer heir 1 a split where heir 3 gets $(\theta - \epsilon) B$ while heir 1 has utility of $(1 - \theta + \epsilon) B + w^1 C$, in which case both have incentives to deviate. Moreover, side transfers involving all three heirs do not remove the possibility of the deadlock either. The surplus from forming the coalition is constant and any division of B among three heirs can be dominated by a division of B among some two heirs. In summary, the possibility of the side transfers does not change the optimal allocation of control.[21] •

[21] Here we assume that heirs cannot precommit to an ex ante binding agreement (that can only be changed by an unanimous vote) on how the deadlock is resolved. For instance, if $C > 2B$, such agreement could define that in the deadlock "eldest" heir's project is implemented while other two receive the monetary equivalent of B, i.e., everyone guarantees themselves $B + w^i (C - 2B)$. This possibility is assumed away as it might be practically and legally costly to implement.

Appendix 2. Main result for N heirs

Assume that N heirs and J different projects are available, s.t. $J \geq N$. The indices of heirs $i \in \{0; 1; 2; ...; N\}$ are ordered in such a fashion that $P(i^+ = j | i = j \& \forall i^- \neq j) \equiv \alpha (1-\alpha)^i$ for $\forall i^+ > i > i^-$. Further, without loss of generality, we assume that the unconditional probability $P(i = j) = \frac{1}{J}$.

The probability that all heirs prefer the same project is then $P(\cap i = j) = \alpha^{N-1}$. At the other extreme, the probability that all of the heirs prefer different projects is $(1-\alpha)^{\frac{N(N-1)}{2}}$. Denote $k^* = \frac{N+1}{2}$ for odd N and $k^* = \frac{N}{2} + 1$. For $k \geq k^*$ the probability that exactly k out of N heirs agree on the same project is:

$$P_N^{(k)} = f(k-1; N-1, \alpha) + \sum_{i=0}^{\min(k-2, N-1-k)} f(i; N-1, \alpha) P_{N-1-i}^{(k)}$$

where $f(k; N, \alpha)$ is a probability mass function of a binomial distribution.

Moreover, assume that if ownership is held among even number of heirs and one coalition is formed that holds 50% of votes, it can implement its preferred project. If two coalitions hold 50% of votes, the one that has a heir with an index $i = 0$, wins.

The optimal ownership structure then depends on the number of heirs. It is never optimal to give control to the odd number of heirs and the (even) number of heirs to which it is optimal to give control depends on α. A range of αs exist for any even number of heirs to have an optimal control and the larger is α, the larger is the number of heirs that hold control.

Proposition A1. For all even k s.t. $3 < k < N$ there exists such $\alpha^{(k)}$ that it is optimal for founder that k out of N heirs hold votes (with equal voting power) if $\alpha^{(k-2)} < \alpha < \alpha^{(k)}$. If $\alpha < \alpha^*$, it is optimal that one heir holds the majority of votes, while if $\alpha^{(N-1)} < \alpha < 1$, all N heirs hold votes (with equal voting power). When $\alpha = 1$, ownership structure is irrelevant.

Proof (incomplete). Assume first that only two options of bequest are available: splitting the ownership of the firm with equal voting power among all N heirs or leaving it to only one of them. If all N heirs hold equal voting power, the probability of not having a deadlock is $\sum_{k^*}^{N} P_N^{(k)}$ and the expected value of private benefits is $\sum_{k^*}^{N} k P_N^{(k)} B$. On the other hand, the expected value of private benefits if only one heir holds voting power is equal to $1+(N-1)\alpha$. Denote the value to the founder from single bequest $V^s = (1 + (N-1)\alpha) B + C$ and the value to the founder from divided bequest $V^{d(N)} = \sum_{k=k^*}^{N} \left(P_N^{(k)} (kB + C) \right)$. Denote with α^* the level agreement at which the founder is indifferent between these two options, estimated from the solution to $V^s = V^{d(N)}$. Further, we show that such unique solution exists for all

$N > 3$.

If $\alpha = 0$, $V^s > V^{d(N)}$ and the single bequest is optimal. Moreover, if α is close to 1, $V^s < V^{d(N)}$ and the multiple bequest is optimal. Both the value of single bequest and the value of divided bequest are increasing in α, i.e. $\frac{dV^s}{d\alpha} > 0$, and $\frac{dV^{d(N)}}{d\alpha} > 0$. As $\frac{d^2V^s}{d\alpha^2} = 0$ while $\frac{d^2V^{d(N)}}{d\alpha^2} < 0$, for any N there exists a unique $\alpha^* \in (0,1)$ at which $V^s = V^{d(N)}$.

Next, in addition to unilateral control or control split among N heirs, allow the control to be split among $N-1$ heirs. The threshold $\alpha^{(N-1)}$ that defines the indifference of the founder towards the bequest between N and $N-1$ heirs is derived from $V^{d(N)} = V^{d(N-1)} + B\sum_{k=k^*}^{N} R_N^{(k)}$, where $R_N^{(k)}$ is the probability that the heir who does not have ownership stake agrees with the majority's choice of project (if such majority exists), expressed as:

$$R_N^{(k)} = \alpha f\left(k-1; N-1, \alpha\right) + (1-\alpha) \sum_{i=0}^{\min(k-2, N-1-k)} f\left(i; N-1, \alpha\right) R_{N-1-i}^{(k)}$$

If N is even and thus k^* is same for N and $N-1$, $V^{d(N)} \geq V^{d(N-1)} + B\sum_{k=k^*}^{N} R_N^{(k)}$. It comes from the fact that (a) $P_N^{(k)} > P_{N-1}^{(k)}$, i.e. it is more likely that a certain number of heirs agree when there are more of them; (b) since $P_N^{(k)} > R_N^{(k)}$, for the same probability of deadlock, a heir prefers to have voting rights rather than not have voting rights. Thus, there is no advantage of leaving the bequest to $N-1$ instead of N if k^* does not change.

However, if N is odd and thus k^* is different for N and $N-1$, dividing the bequest among less people reduces the probability of the deadlock. Since $P_N^{(k)} > R_N^{(k)}$ and each heir still prefers to have voting rights rather than not have voting rights for the same probability of deadlock, there is a trade-off between a lower valuation of private benefits and a higher valuation of expected cash flows. $\alpha^{(N-1)}$ at which founder is indifferent between these two options can be again derived from $V^{d(N)} = V^{d(N-1)} + B\sum_{k=k^*}^{N} R_N^{(k)}$ which can be restated as:

$$V_{k^*}^{d(N)} - V_{k^*}^{d(N-1)} - B\sum_{k=k^*}^{N} R_N^{(k)} = P_{N-1}^{(\frac{N-1}{2})}\left(\frac{N-1}{2}B + C\right) + R_N^{(\frac{N-1}{2})}B$$

where $k^* = \frac{N+1}{2}$.

Both sides of the equation are non-negative (left hand side is non-negative by the same argument as it is for even N) and for $\alpha > \alpha^{(N-1)}$ (?) monotonically decreasing in α. At $\alpha = \alpha^{(N-1)}$, the right hand side is larger (?). At $\alpha = 1-\epsilon$, left hand side is larger. That implies that there exists a unique $\alpha^{(N-1)}$ such that if $\alpha > \alpha^{(N-1)}$, a division among N is preferable while if $\alpha < \alpha^{(N-1)}$, a division among $N-1$ is preferable.

This argument can be iterated for all k s.t. $3 \leq k < N-1$. Thus, for all even k there

exists such $\alpha^{(k)}$ that k out of N heirs hold decisive votes if $\alpha^{(k-2)} < \alpha < \alpha^{(k)}$. If $\alpha < \alpha^*$, one heir holds the majority of votes, while if $\alpha^{(N-1)} < \alpha < 1$, all N heirs hold decisive votes.•

In fact, if 50% of votes is not sufficient to implement the preferred project for none of the coalitions, it is never optimal to give control to the even number of heirs and the (odd) number of heirs to which it is optimal to give control depends on α. A range of αs exist for any odd number of heirs to have an optimal control and the larger is α, the larger is the number of heirs that hold control. The argument is same as in the case when 50% of votes is sufficient. As reducing the number of owners from an odd N to an even $N-1$ does not change k^*, there is no advantage of leaving to divind the control among $N-1$ heirs.•

Moreover, it is optimal for the founder to give controlling heirs equal voting power.

Proposition A2. The controlling heirs have equal voting power.

Proof. Suppose not. The agreement among some heirs is then less important than the agreement among others. The probabilities of agreement can thus be reassigned to be $P(i^+ = j \& i = j \& i^- \neq j) \equiv \gamma^i \alpha (1-\alpha)^i$ for $\forall i^+ > i > i^-$, where $1 \geq \gamma > 0$ is the choice variable that measures dispersion among voting power of heirs. The benefit of dispersed voting rights is that the probability of the deadlock is lower. For instance, the probability that all of the heirs prefer different projects is $(\gamma(1-\alpha))^{\frac{N(N-1)}{2}}$.

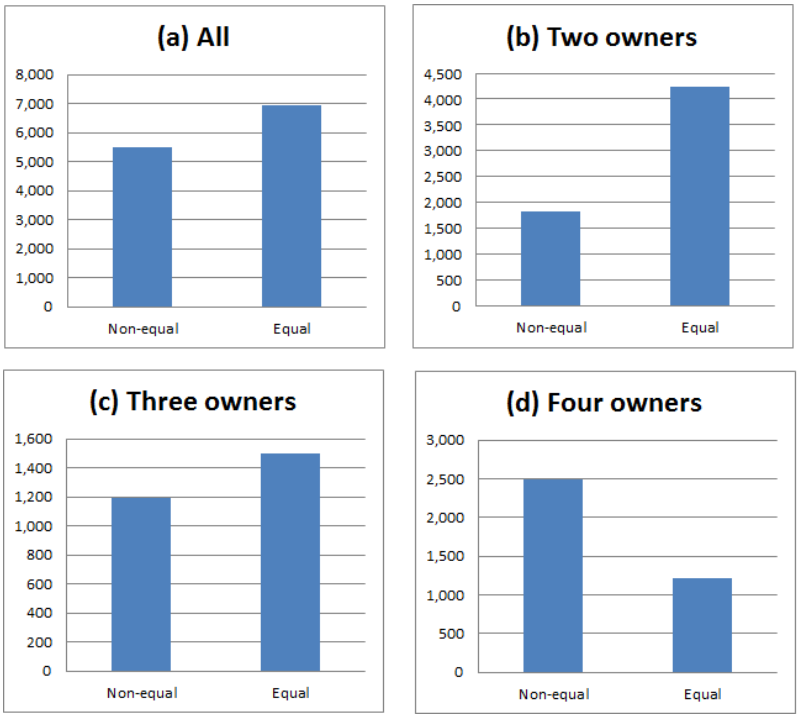
For any N and α, $V^{d(N)}$ is maximized with $\gamma = 1$, which means that everyone's voting power is equal and neither of the possible coalitions is associated with a discount in valuing their expected private benefits.•.

Appendix 3. Ownership distribution in the US

Because of the data quality, we rely on Norwegian sample for our empirical analysis, but here we also provide evidence that these findings extend to other, larger, economies and in particular the US. That family firms vary in terms of the ownership stakes can be seen from 2007 Survey of Business Owners Public Use Microdata Sample which reports the ownership distribution for four largest owners of $2,165,680$ US firms. We look at those firms that indicate themselves as family firms and where all of the largest four owners have inherited their stakes. Out of $13,667$ such firms, $12,433$ have between two and four owners. $6,936$ or 55.8% of these have an equal division of ownership (either 50% each in case of two owners, 34% or 33% each in the case of three owners, or 25% each in the case of four owners).

The figure below reports the distribution of equal and unequal ownership based on the number of owners for firms between two and four owners. Figure (a) reports the distribution of all firms across the two groups of equal and non-equal ownership between the family members. Figure (b) reports the distribution of firms with two owners. Figure (c) reports the distribution of firms with three owners. Figure (d) reports the distribution of firms with four owners.

Distribution of equal and unequal ownership in the US family firms



Appendix 4. Data procedure

We start with the raw relationships, provided by the Norwegian Registry, and then describe how we create deep family relationship map, and how we merge it with the ownership data.

Raw relationships

The raw relationships provided by the data provider are as follows:

1. Spousal relationships

The data allows us to have a complete set of dates of marriages, separations, divorces for spouses or domestic partners, and the date of death or becoming a widow(er). We process these dates to end up with a clean panel data where a person 1 (p1) is linked to a person 2 (p2) via marriage from time 1 to time 2. One person can have multiple non-concurrent relationships. We check that the personal number is legible and conforms to the mathematical test formula for personal numbers. We perform this test for all individuals and consider the ones that pass this test as fully identified individuals. We only keep the relationships between the fully identified individuals.

2. Parental relationships

The raw data provides information about parents for all core individuals (source 1) and for all of their relatives (source 2). Some of the parent entries also specify the custody status and date. We also have information about children for the core persons (source 3). We combine the sources 1, 2, 3 to create the person-parent relationship. In a few cases there are more than 2 parents. We cap this at 4 to avoid very few cases with 5 identified parents. We also test that a parent is not a spouse. In other words, p1-p2 can only have one concurrent relationship in our data. This is imposed to have high data integrity and to avoid data errors propagating one-to-many relationships at a small cost of dropping legitimate concurrent multiple relationships.

3. Grandparents

This field is available for the core individuals.

4. Great grandparents

This field is available for the core individuals.

5. Great-great grandparents

This field is available for the core individuals. The data provider warned us that the data quality for this very remote relationship is not as good as for the other relationships.

6. Children

We invert the parent relationship data to create the children data.

7. Siblings

We use sibling relationships as identified by the data provider for core persons.

8. Cousins

We use the first degree cousin relationships as identified by the data provider.

Deep family relationship data

We permute these relationships 1-8 in the following way to form the *Deep Relationship Map*:

- We consider a relationship set p1-p2-role and join it with p2-p1-role on p2. In addition, we permute this set by a year array covering our panel data time period. We check that the marriage/partnership is active in the year and that the persons are already born in the year.[22] This gives us p1-p2-role-role-p2-p1. From the 8x8 role-role matrix we keep the core deep relationships and record those.

- After redundant relationships, the resulting output dataset contains 37 family roles. These roles are up to 8 level apart vertically (e.g., person-parent is level 1) and 4 levels apart horizontally (e.g., person-parent is level 0, siblings are level 1, cousins are level 2).

- The deep relationship *Deep Relationship Map* might identify several relationships for a p1-p2 couple. We avoid this by assigning each p1-p2-newrole outcome a four digit code (rolecode), where the first two digits are used to rank relationships path (the smaller the number the more important the path) and the last two digits assign a number to the newrole (the smaller the number the more important the relationship is). Note that there can be several paths to identify one p1-p2-newrole set.

[22] We keep the year dimension for the rest of steps and do not mention for brevity.

- We drop the p1-p2-rolecode sets where either of the persons have passed away a year before or a year earlier.

- For each p1-p2 we calculate the minimum rolecode and keep the relationship numerical code. The output is a set p1–newrole–p2, which we rename p1-p2-newrole. This forms *Deep Relationship Map* with 37 relationships (see Appendix Table IA1).

Matching deep family relationships and ownership data

The following procedure describes how we match the deep relationship data to ownership data:

- We permute the basic relationships 1-5 and apply the family-ownership data matching algorithm as this is the part of the CCGR center data code and the way we can extract the data. The algorithm starts with the relationship group of a person, who has some role in a company (owner, board member, CEO). We split this group in clusters of persons, which are linked though the the basic relationships 1-5, and call these clusters *raw families*. We aggregate ultimate ownership share (though direct and indirect ownership channels) for each *raw family* and rank the shares to identify the largest *raw family*.[23]

- We then take the largest owner *raw family* for each firm-year. The previous step only considers *raw family* members who have some role in the firm. We extend this set by adding family members who are not direct owners using the *Deep Relationship Map* and augment *raw family* to create *extended family*. In particular, we permute the *extended family* on itself and look up relationships from the *Deep Relationship Map*.

- Some of the *extended family* relationships will end up having roles in the firm even if they were not linked by *raw family* relationships but the key goal is to capture the *extended family* relationships that do not have roles in the firm. In particular, we count the unique set of individuals, who have siblings; the unique set of individuals, who have a sibling born on the same day (twins); the unique set of individuals, who have cousins (also, second-degree cousins, third-degree cousins).

[23] Note that in some cases the largest owner may not be an individual or family.

Appendix Table A1. Deep Relationship Map

Role Number	Vertical Distance	Lateral Distance	Role	Alternative Path
1	0	0	HOV	
2	0	0	EKT	
3	1	0	BARN	
5	-1	0	FRL	
6	-1	0	STEFRL	
7	-2	0	BES	
8	-3	0	OLD	
9	-4	0	TIP	
11	1	0	STEBARN	
12	-1	1	ONKLTANTE	FRL
13	2	0	BARNEBARN	
14	3	0	OLDBARN	
15	4	0	TIPBARN	
16	1	1	NEVONIESE	BARN
21	0	1	SOSKEN	
22	0	2	SOSKENBARN	SOSKEN
23	0	3	TREMENING	SOSKEN SBN
24	0	4	FIRMENING	SOSKEN SBN TRE
35	-1	0	SVIGERFRL	FRL
31	0	1	LOVSOS	
32	0	2	LOVSBN	
37	-2	0	LOVBES	BES
38	-3	0	LOVOLD	OLD
39	-4	0	LOVTIP	TIP
40	1	0	BARN-EKT	
43	2	0	STE-BARNEBARN	BARNEBARN
44	3	0	STE-OLDBARN	OLDBARN
45	4	0	STE-TIPBARN	TIPBARN
46	2	1	NEVONIESEBARN	BARNBARN
47	3	1	NEVONIESEBARNBARN	OLDBARN
53	1	2	SOSKENBARN-BARN	BARN
54	2	2	SOSKENBARN-BARNBARN	BARNBARN
55	1	3	TREMENINGBARN	BARN
56	-1	2	FRL-SOSKENBARN	FRL ONKLTANTE
57	-2	1	BES-SOSKEN	BES
58	-1	3	FRLTREMENING	FRL ONKLTANTE FRLSOSKENBARN
59	-2	2	BES-SOSKENBARN	
60	-3	1	OLD-SOSKEN	