Blood and Money: Kin altruism, governance, and inheritance in the family firm

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Abstract

This paper develops a theory of governance and inheritance within family firms based on kin altruism (Hamilton, 1964). Family members weigh the payoffs to relatives in proportion to relatedness. The theory shows that family management entails both costs and benefits. The attenuated monitoring incentives associated with kin altruism produce a "policing problem" within family firms. This policing problem results in both increased managerial diversion and increased monitoring costs. Relatedness has conflicting effects on manager–owner compensation negotiations. On the one hand, owners are more willing to concede rents to family managers to increase total value. On the other hand, because family managers internalize the costs to the family from their rejection of owner demands, relatedness lowers managers' reservation compensation level. Lower compensation leads to more diversion and costly monitoring. Firm founders anticipate the costs and benefits family control when designing their bequests. For typical family trees, kin altruism ensures that founders' preferences are much more closely aligned with value maximization than those of any of their descendants'. Thus, founder bequests are designed to weaken closer relatives' bargaining power in posthumous negotiations with more competent distant relatives.

Keywords: Corporate governance, entrepreneurship, kin altruism, contract theory

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1 Introduction

The organization of economic activity around family units is globally pervasive. The vast majority of businesses are controlled by families. As pointed out by Fukuyama (1995), outside the Anglo-sphere, Northern Europe and Japan, the preponderance of non-state firms are family controlled. As documented by Porta, Lopez-de Silanes, and Shleifer (1999), 45% of publicly listed international firms are family controlled. Even in the U.S., the majority of firms with revenues less than $500 million are family controlled, and many very large firms are tied to families, e.g., Ford, Koch Industries, and Walmart. While biological kinship is not a defining characteristic of a family (given the possibility of adoption) biological kinship nevertheless is fundamental to defining the concept of family and is descriptive of the vast majority of family units. The aim of this paper is to develop a theory of family firms based on this fundamental property.

This theory is founded on the concept of inclusive fitness developed by Hamilton (1964). The inclusive fitness of a given agent is that agent's own fitness summed with the weighted fitness sum of all other agents, the weights being determined by the other agents' coefficient of relatedness, i.e., kinship, to the given agent. The logic behind kin altruism is that gene expression affects the number of copies of a gene in the gene pool both through its direct effect on the fitness of the agent expressing the gene and through its effect on the fitness of other agents sharing the gene. Because of relatedness, kin have a far higher than average probability of sharing any gene, including genes for altruistic behavior, than unrelated agents. Thus, a gene for kin altruism can increase in a population even if it is harmful to the fitness of the agent having the gene, provided that the costs to the agent are low relative to the benefits to kin. Selection of a kin altruistic gene requires that

$$rB > C, \tag{1}$$

where r represents the coefficient of relatedness, B the benefit to the relative, and C is the cost to the altruistic agent. Our theory of the family firm identifies fitness with terminal wealth less any non-pecuniary effort costs and assumes that family members maximize their inclusive fitness. Identifying wealth and with fitness is admittedly a strong assumption. However, strong positive associations between wealth and fitness have been documented both in historical (Clark and Hamilton, 2006) and contemporary (Nettle and Pollet, 2008) societies, at least for males. Thus, the assumption is not implausible as a first-order approximation.[1]

Kin altruism in family firms is clearly a hypothesis worthy of consideration. The theoretical foundation of kin altruism is simple, its driving exogenous variable–kinship–is observable, and, as is detailed below, in many scientific disciplines, its predictions are strongly supported. Moreover, basing the degree of altruism between agents on their genetic relationship forces the degree of altruism to satisfy the restrictions imposed by the calculus of heredity. We will show that these restrictions generate many of

[1] Note that the altruism selection equation, (1) requires a number of ancillary assumptions. In general, selection for kin altruism requires only genetic correlation between the benefactor and recipient of altruism. This correlation need not be based of descent. See, Chapter 3 of McElreath and Boyd (2007) for a complete discussion. Also, per se, the kin selection equation, (1), does not depend on Hamilton's inclusive fitness model. It can be derived from other models of selection not based on inclusive fitness, e.g., neighbor-modulated fitness (West and Gardner, 2013).

the predictions of the model. Thus, the kin-altruism hypothesis is testable.

The key characteristics of family altruism, motivated by the Hamiltonian concept of inclusive fitness, are that altruism is symmetric, limited, "harsh," and governed by the calculus of relationship. The bonds of relation are symmetric because they are derived from a relatedness which is a symmetric relation in diploids such as humans.[2] Altruism is limited because, except for identical twins and highly inbred families, even the tightest kinship bonds, parent/offspring or sibling/sibling, produce relatedness sufficient to internalize roughly half of the effect of an agents' actions on a relative. Moreover, this sort of altruism is harsh in that it aims only at maximizing total inclusive fitness and is thus not concerned with fair distribution of fitness across relations. For this reason, a family agent in my analysis is willing to sacrifice the welfare of a single relative to further his own genetic interests and/or the family's as a whole.[3] Because altruism is governed by the calculus of relationship, it is roughly based on the length of the path in the family tree that connects relatives. Thus, inclusive fitness predicts that ancestors will be more altruistic to descendants than the descendants linked through the ancestor will be toward each other.[4]

Family altruism is introduced into a standard principal/agent model of effort, monitoring, and diversion. First we consider the effect of kinship on monitoring and the diversion of output. Two family members have claims on the firm's output. One family member, called the "manager," actually observes the firm's output. The other family member, called the "owner," does not observe output. The claim of the manager on output might be fixed by negotiations between the owner and manager or might arise from an endowed equity stake in the firm. However, at the monitoring stage, these arrangements have been fixed and the process by which they were reached has no affect on the agents' incentives going forward. Only the manager observes the cash flow. After observing the cash flow, the manager reports cash flows to the owner. The owner can either accept the manager's report or verify the report. Verification is costly but perfect. As in, for example, Townsend (1979), the compensation received by the manager is a contracted function of the manager's report and the results of verification (if verification occurs) and satisfies limited liability. The owner cannot, however, commit contractually to verify the cash flow. Rather, the verification decision is the owner's best response to the manager's report.

Our basic result is that kinship (the level of the coefficient of relation between the owner and manager) always exacerbates monitoring problems by lowering likelihood of owner monitoring and increasing likelihood that the manager will falsely report low cash flows. The net effect of a lower likelihood of monitoring low reports and more low reports being made is that the unconditional probability of monitoring increases with kinship as does the probability of successful diversion by the manager. This occurs because monitoring is costly and reduces total family welfare while the owner's loss from diversion is partially offset by internalized gains to the related manager. Internalization makes the related owner a soft monitor. The owner's softness is exploited by the related manager who increases his attempts

[2]Diploids have two homologous copies of each chromosome, one from the mother and one from the father. Some social insects (e.g., bees, ants, and wasps) are haplodiploids—males carry one homologous copy and females two. For such haplodiploids, the brother–sister coefficient of relation is asymmetric. The author would like to thank Andy Gardner for pointing out this asymmetry.

[3]For example, Mayer Amschel Rothschild's decision to disinherit his daughters in order to keep family wealth in what he believed to be the more able hands of his sons is quite consistent with the specification used in this analysis,see Mayer (2012).

[4]The "rough" qualification is required because of the possibility of inbreeding and multiple paths connecting family members. See Section 8.1 for more discussion.

to divert so much that the overall probability of monitoring and the attendant dissipation costs always increase.

Next, we consider the effect of kinship on the production of cash flows. We assume that, in order for the project to produce output, effort on the part of the manager is required. Effort produces a stochastic cash flow. Effort is neither observable nor verifiable. The manager will work for the firm only if the expected utility from employment at least equals the utility from rejecting employment. If the manager accepts employment, the manager chooses the effort level that maximizes his utility. In this setting, we consider compensation negotiations between the owner and manager assuming that the owner acts as the principal in a standard principal-agent employment model. When the model is closed by fixing compensation, two new effects of kinship emerge: one favoring efficiency, which we term the "bright-side" scenario, and the other retarding efficiency, which we term the "dark-side" scenario. The bright-side scenario occurs when the incentive constraint for ex ante effort is binding. In this case, the owner selects from incentive compatible effort–compensation pairs to maximize his welfare. The owner's tradeoff—at higher levels of compensation, total family value is larger but the manager's effort rents are also larger. Kin altruism has two effects on the owner's choice. First, at any given level of compensation, because of the kin altruism of the manager, effort is higher, thus the rent concession required to induce a given level of effort is less. Second, the kin altruism of the owner means that the owner partially internalizes the manager's effort rent. Thus, the owner is more willing to concede compensation to increase effort. The two effects are reinforcing and lead to higher effort and thus total output. Hence, in the bright-side scenario, kinship's adverse effect on the monitoring problem is mitigated and perhaps even outweighed by its favorable effect on the ex ante effort problem.

In contrast, in the "dark-side" scenario, the reservation constraint is binding. In this case, the endogenous determination of compensation increases the dissipative cost of kinship. When the manager is related to the owner, the manager's walk-away value from rejecting an employment offer made by the owner will partially internalize the loss to the owner from the manager's rejection. This makes the related manager's minimum acceptable compensation less than the minimal acceptable compensation of an unrelated manager. Thus, the owner can offer the related manager less compensation than an equivalent unrelated manager would accept. We call this effect the *loyalty holdup* effect. Lower compensation encourages more diversion by the manager which in turn stimulates more monitoring by the owner but not enough increased monitoring to prevent diversion from increasing. In some parameterizations of the dark-side scenario, the manager's value, which includes both compensation and expected diversion gains, is greatest for unrelated and closely related managers. Unrelated managers receive large compensation packages and divert little; closely related managers receive small compensation packages but divert a significant fraction of firm value. Firm value is greatest and the manager's value is smallest for intermediate degrees of kinship: kinship that is close enough to extract significant compensation concessions but not so close that it leads to a significant reduction of owner monitoring incentives.

Finally, we consider the effect of kinship on inheritance. We model a single agent, called the "founder," who has created the firm and has two relatives, one close and one distant, or perhaps even adopted, to whom she can bequeath the ownership rights in the firm. The founder's preferences, like those of her descendants, are governed by kin altruism. Thus, the founder's bequest will trade off the

payoffs to her close relative against the overall value of the family firm. We show that the calculus of relatedness implies that for normal family pedigrees, the founder's preferences are more aligned with total family-value maximization than any of the descendants' preferences. When the ability differences between the relations are sufficiently large, the founder will use her bequest to shield the more competent distant relative from hold ups by the less competent closer relative. Thus, laws that restrict founder bequests, which as Ellul, Pagano, and Panunzi (2010) point out are pervasive in non-Anglo-Saxon legal systems, have adverse productivity consequences for family firms.

1.1 Related literature

A paper centered on relatedness should fully reveal its own pedigree. This paper's relatives come from two distinct families of research— economics/financial economics and evolutionary biology/psychology. The motivating idea for the theory—inclusive fitness—has been the subject of a great deal of research in both evolutionary biology and psychology. For example, Madsen, Tunney, Fieldman, Plotkin, Dunbar, Richardson, and McFarland (2007) provide experimental evidence that agents' willingness to stand in an uncomfortable position for the sake of other agents is monotonically increasing in the agents' degree of relatedness. Field experiments also seem to support the role of genetic relatedness in behavior. For example, Daly and Wilson (1988) find that the intra-family child homicide probability is 11 times higher for step-parents than natural parents. Field evidence from other researchers shows that kinship relations increase political alliance ability (Dunbar, Clark, and Hurst, 1995), facilitate the assumption of group leadership (Hughes, 1988), and increase cooperation in catastrophic circumstances (Grayson, 1993).[5] Evolutionary biology has produced overwhelming evidence for kin altruism in many species. For example, Dudley and File (2007) show that a common plant, sea rocket, will grow its roots more aggressively when potted with unrelated plants than when potted with relatives. Even the policing problems associated with family altruism have close analogues in evolutionary biology. For example, Ratnieks (1988) finds evidence to support a negative association between relatedness and policing in a comparative study of Bumble bee and Honey bee behavior.[6]

However, kin altruism is the only concept used in this work that is drawn from evolutionary theory. The rest of the paper's pedigree can be found in the economics and financial economics literature. As pointed out by Bertrand and Schoar (2006), many family-firm theories are based on characteristics shared by many family firms—firm-specific human capital, capital constraints, private benefit extraction—which are not defining properties of family firms.[7] These theories are not family-firm theories per se. If they offered a complete explanation of family firm behavior there would be no need for a

[5] For a survey of a large body of related work see Cartwright (2000).

[6] The effect of kinship on policing opportunism modeled in this paper is, in a more generic and reduced-form framework, also modeled by evolutionary biologists studying the problem of how "policing strategies," can be favored by natural selection. Policing strategies involve imposing punishments on agents who engage in non-cooperative behavior even though imposing the punishment has adverse fitness consequences for the punisher. Gardner and West (2004) and El Mouden, West, and Gardner (2010) show that high levels of relatedness disfavor the selection of punishment strategies. From a different, more general perspective, this paper is also connected to the emergent literature on the effects of genetics on economic and financial behavior. See, for example, Wallace, Cesarini, Lichtenstein, and Johannesson (2007), Galor and Moav (2002), and Cesarini, Johannesson, Lichtenstein, Sandewall, and Wallace (2010).

[7] See, for example, Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon (2007), Almeida and Wolfenzon (2006), and Burkart, Panunzi, and Shleifer (2003)

special theory of the family firm and that explanations of family firm behavior ought to be subsumed in general contract theory. The theory of family firms that is most closely linked to defining family characteristics is probably Fukuyama (1995). Fukuyama argues informally that, in the absence of general social capital, important business relations must be based on intrafamily trust. Family trust is based, in turn, on cultural norms related to family loyalty. From Fukuyama's perspective, family loyalty lowers agency costs in intrafamily business transactions while, at the same time, forming closed networks and thus retarding the development of external capital and managerial labor markets. This model's perspective is rather different. In this paper, families control does not resolve the problem of trust and in fact can lead to conflict because family altruism suppresses the policing of opportunistic behavior. Moreover, rather than being substitutes for family firms, institutional and market development strongly complement the relative performance of family firms, although such institutional development might also reduce their incidence.

The empirical literature on family firms is more extensive than the theoretical literature. Most of this research has focused on identifying the unconditional relation between family ownership and firm performance. The results have been mixed and the definitions of family firms used by different researchers have been inconsistent. For example, Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon (2007) document a negative effect of intra-family succession using Danish data. In contrast, Anderson and Reeb (2003) report a positive effect of family ownership on firm performance for U.S. firms and Sraer and Thesmar (2007) report similar results for French firms. However, Miller, Breton-Miller, Lester, and Cannella (2007) and Villalonga and Amit (2006) find, for U.S. firms, that, after controlling for the effect of a founder/owner, family firms do not outperform non-family firms.[8] Since this model does not predict any uniform relation between family ownership and performance and the empirical literature produces conflicting conclusions, it is not easy to use these papers to assess the kin altruism model.

Evidence that is perhaps more relevant to making a preliminary assessment of the plausibility of kin altruism as a driver of family firm behavior can be found in a smaller body of research that studies specific decisions and behaviors of family firms rather than their overall performance. Ellul, Pagano, and Panunzi (2010) show that restrictions on the rights of heirs to bequeath firms to distant relatives has a significant averse impact on the value of family firms. This is consistent with the conclusions of kin altruism in that founder bequests, although not unbiased, tilt toward total value maximization and thus frustrating founders' ability to use bequests to protect the interests of competent distant relatives destroys value. The model's result that kinship increases monitoring costs and diversion is consistent with the observations of Bertrand and Schoar (2006) that cooperation between family members is frequently difficult to achieve. Conflicts between family members have been even more extensively documented in the management literature (Davis and Harveston, 2001). Clinical research by Karra, Tracey, and Phillips (2006) also seems consistent with the basic predictions of this paper. Karra, Tracy and Phillips find that family control increases cooperation in early stage firms but leads to conflicts as firms age and grow. Under the postulate that, in early stage firms, joint effort is key and liquid assets capable of being diverted are scarce while more mature firms generate large pools of liquid assets that can be diverted, their result is exactly what this paper's analysis predicts.

[8] See Miller and Le Breton-Miller (2006) for a comprehensive summary of these results and the various definitions of family firm used in the empirical literature.

Perhaps the closest relatives of this paper are two papers that do not model family firm behavior but do model general altruism motivated by friendship. Lee and Persson (2010) model the effect on an unrelated principal of delegated monitoring when a worker and the worker's supervisor have altruistic preferences toward each other. In addition, both workers feel shame if they act opportunistically toward the principal. Their model has an important technical similarity to ours: in both models altruism is symmetric and limited. However, in our analysis, agents are shameless, considering the payoff effects of their decisions only on themselves and their fellow family members. This lack of shame leads to a much darker perspective on the effect of altruism on monitoring efficiency. Lee and Persson (2012) develop a model of early-stage angel finance that incorporates paternalistic altruism. This paper, unlike ours, is not focused on monitoring or governance. [9]

2 Model

2.1 Overview

In the basic model, the world lasts for one period, bracketed by dates 0 and 1. There are two agents in the basic model: an owner and a manager. The owner has monopoly access to a project which we will call a firm. The owner can only operate the project if he secures the efforts of the manager and the owner and manager are related by kinship. We will refer an owner/manager pair who are kin simply as the "owner" and " manager." Collectively, the family owner and family manager are called "family agents" and the total value received by these agents is called the "family" value. We assume that consanguinity between agents leads them to partially internalize the effects of their actions on the payoffs to other family members. The specific mechanism governing this internalization, borrowed from the theory of kin selection, is presented later.

In the basic model, the owner hires the manager by making a first-and-final compensation offer that the manager can either accept or reject. If the offer is accepted, the manager makes an unobservable effort decision that produces a cash flow also only observed by the manager. The manager then decides on the cash flow to report to the owner. After observing the manager's report, the owner decides whether to monitor the cash flow. Monitoring is costly but perfectly reveals the actual cash flow. Based on the realized cash flow, the report, and possibly information produced by monitoring, the cash flows of the firm are divided between the family agents. In Section 8 we extend the basic model analysis to consider a bequest of ownership rights by a founder to one of two potential heirs, at least one of which is related to the founder. The bequest, made at date -1, will determine the owner of the firm at date 0. The heir-owner will then have the option of hiring the other potential heir to manage the firm. In that case, the

[9] Another stream of related literature is Becker (1974) and its descendants such as Bergstrom (1989). Like this paper, the subject of these models is family economic activity. However, unlike this paper, these papers model asymmetric altruism—the parent is completely altruistic, maximizing family utility, and the children are completely selfish. Allocations of family resources by the parent to the child are not contracted through an owner/manager relationship but rather the resources are gifted by the parent. At a more general level, the basic economic and financial market model used in this paper is related to a very large body of research in contract theory. The effort provision problem is modeled as an ex ante choice problem with ex ante incentive compatibility and reservation constraints as in, for example, Laffont (2002). The model of diversion follows, for example, Bolton and Scharfstein (1990) in assuming that managers can divert unverified cash flows. It resembles Townsend (1979) because in this analysis, as in Townsend's, principals can pay a cost to verify cash flows. In contrast to Townsend, this model does not permit the principal to precommit to a verification strategy.

heir assumes the role of owner and the non-heir assumes the role of manager within the basic model setup.

The timing of events is summarized in Figure 1.

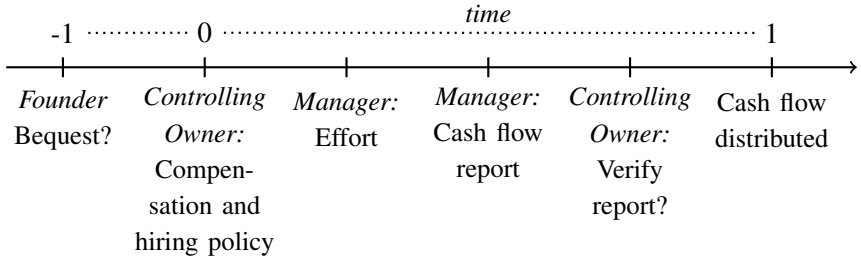


Figure 1: Timing of decisions in the model.

3 Specifics

3.1 Preferences

All agents are risk neutral and patient. The kin altruism preferences of family agents is reflected in their utility function, u:

$$u^{\text{Self}} = v^{\text{Self}} + h\, v^{\text{Relative}}, \quad 0 \leq h \leq 1/2. \tag{2}$$

where v^{Self} represents the agent's own value and v^{Relative} represents the relative's value. The scalar h represents kinship, the strength of the relation, or family ties, between the family agents.[10] Note that agents are not altruistic in the sense of preferring relatives' gains to their own. If asked how they would split a fixed amount of money with a relative, each relative's preferred choice is to take everything for herself. However, relatives might abstain from such transfers when the transfers are highly dissipative, i.e., the transfer from one to another significantly reduces total family value. This observation is most apparent if we rewrite the utility function using some equivalent formulations. Let $v^{\text{Family}} = v^{\text{Self}} + v^{\text{Relative}}$ represent total family value. Then, using total family value, we can also express the utility function of a family agent in the following three forms:

$$u^{\text{Self}} = v^{\text{Family}} - (1-h)\, v^{\text{Relative}}, \tag{3}$$

$$u^{\text{Self}} = (1+h)\, v^{\text{Family}} - u^{\text{Relative}}, \tag{4}$$

$$u^{\text{Self}} = h\, v^{\text{Family}} + (1-h)\, v^{\text{Self}}. \tag{5}$$

These reformulations of the utility function show that across choices that leave the either the utility or the payoff of kin fixed, agents prefer the decision that maximizes family value. This is not a very surprising

[10] The condition that the degree of kinship between the owner and manager, h, does not exceed 1/2 is motivated by inclusive fitness, which limits for non-inbreed, non-monozygotic (i.e. non-identical twins) haploids (e.g., humans) to at most 1/2. This specific boundary for h is not required to establish our results; however, some boundary is required. As kin altruism becomes unlimited, i.e., $h \to 1$, the monitoring problem generated by relatedness vanishes because (a) the owner simply concedes all firm value to the manager and (b) managerial effort converges to the first-best level even in the absence of any compensation. Because these cases are not very interesting when altruism is motivated by inclusive fitness as it is in this paper, we eschew working out these boundary conditions.

observation, but it will prove useful in the subsequent analysis.

3.2 Reporting and monitoring

After the cash flow is generated, the manager sends a message to the owner. This message is only observed by the owner. By the revelation principle, we can assume that the message is a report of a cash flow of 0 or of a cash flow of $\bar{x}$. We call this report "reported income." If the owner does not monitor, reported income equals income. If the owner monitors, income equals the actual cash flow. Monitoring cannot be verified and the report is observed only by the owner. Income is transferred by the manager to the owners, and then distributed to the owners and the manager. Because reported income must be transferred, reported income can never exceed cash flows. Thus, when the firm's cash flow is 0, the manager always reports 0. If the cash flow is $\bar{x}$ the manager can report either 0 or $\bar{x}$. The manager's compensation is based on reported income. Because payments to the manager satisfy limited liability in reported income, the payment received after a report of 0 always equals 0. If the manager reports 0 and the actual cash equals $\bar{x}$ and the owner does not monitor, the manager diverts $\bar{x}$ to personal consumption. If the manager reports 0 and the actual cash equals $\bar{x}$, and the owner monitors, the manager cannot divert $\bar{x}$ to personal consumption and, since the payment received by the manager given a report of 0 is 0, the owner receives the entire cash flow. If the owner verifies a report of 0, regardless of whether the report is truthful or not, the owner pays a monitoring cost of c. If the manager reports $\bar{x}$, the owner knows that the report is truthful. In this case, cash flows are divided between the manager and the owner based on reported cash flows with the manager receiving w and the owner receiving $\bar{x} - w$. From the perspective of the reporting and monitoring model, it does not matter how w is fixed. However, when we analyze manager-owner compensation negotiations later, we will fix w using the managers' reservation and incentive compatibility conditions.

The payoffs, to the manager and firm, excluding managerial effort costs, for a fixed contracted payment , w, to the manager are depicted in Figure 2.

3.3 Effort

The random cash flow from the project, $\tilde{x}$, has the following distribution

$$\tilde{x} = \text{dist.} \begin{cases} \bar{x}, & \text{w.p. } p \\ 0 & \text{w.p. } 1-p \end{cases}. \tag{6}$$

The manager selects $p \in [0, \bar{p}]$, where p represents the probability that the cash flow from the project equals $\bar{x}$. We call p the *uptick probability*. The manager's choice of p imposes a non-pecuniary effort cost of $K(p)$ on the manager, where K is a weakly increasing function of p. Effort is not observable by any agent except the manager. If the firm fails to operate, the project produces a payoff of 0, and the manager receives a payoff of v_R, the manager's reservation payoff.

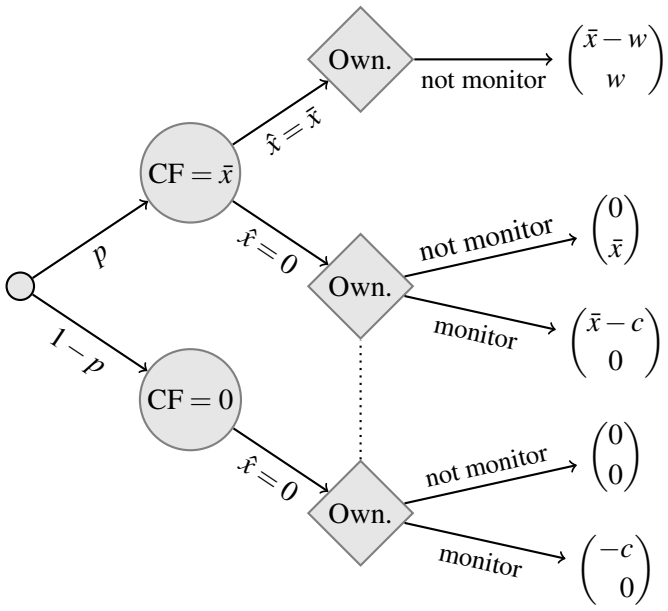


Figure 2: The payoffs to the manager and owner, excluding the manager's non-pecuniary effort costs, are represented by the end points of the tree. The top number in each array represents the owner's payoff and bottom number represents the manager's payoff. The dotted line represents the owner's information set at the time the monitoring decision is made.

3.4 Parameter restrictions

Throughout the analysis, we impose the following parameter restrictions:

$$\max_{p\in[0,\bar{p}]} p\bar{x} - (v_R + K(p) + c) > 0, \tag{7}$$

$$(1-h)\bar{x} - c > 0. \tag{8}$$

(7) implies that the expected cash flow to the project exceeds the cost of effort, monitoring, and the manager's reservation payoff. Thus, absent any kinship between the agents, undertaking the project is optimal even if undertaking the project requires that the owner incur the monitoring expenditure, c. The second restriction, (8), implies that the owner's utility benefit from monitoring, which equals the gain from transferring a concealed cash flow of $\bar{x}$ from the manager to the owner, $(1-h)\bar{x}$, exceeds the cost of monitoring, c. If this assumption were violated, the owner would never monitor and the manager would divert the entire cash flow.

4 Kinship and monitoring

In this section, we analyze the monitoring/reporting problem in the case where the game is not trivial, i.e., when the cost of monitoring c is positive. In this case, monitoring is costly and will only be undertaken when the gains from monitoring exceed its cost. The gain from monitoring depends on the likelihood that managers attempt diversion by underreporting. Managerial underreporting will depend, in turn, on the likelihood of monitoring. In equilibrium, monitoring and underreporting will be simultaneously

determined. Our aim is to investigate the effect of kinship on diversion and monitoring.

The manager's reporting policy decision is whether to report $\bar{x}$ or 0 when the cash flow is equal to $\bar{x}$. The manager cannot commit to a reporting policy but rather makes the reporting decision after observing the cash flow. The owner's policy decision is whether to monitor the manager's report of a zero cash flow. The owner cannot commit to a monitoring decision ex ante but rather must choose a monitoring policy which is a best reply to the manager's reporting policy.

4.1 Incentives to underreport

When the cash flow equals $\bar{x}$ and the manager reports $\bar{x}$, he receives w and the owner receives $\bar{x}-w$. If the manager reports 0, and the owner does not monitor, the manager receives $\bar{x}$ and the owner receives 0. If the owner monitors, the manager receives 0 and the owner receives $\bar{x}-c$. Thus, conditioned on underreporting, the manager's utility is

$$u_M^{\text{Underreport}} = (1-m)\,\bar{x} + h\,m\,(\bar{x}-c), \tag{9}$$

and conditioned on truthfully reporting $\bar{x}$, the manager's utility is

$$u_M^{\text{NotUnderreport}} = w + h(\bar{x}-w). \tag{10}$$

Thus, the manager's best reply is to divert if $m < m^*$, not divert if $m > m^*$, and, both diversion and non-diversion are best responses if $m = m^*$, where m^* is determined by equating (9) and (10), which produces

$$m^* = \frac{(1-h)(\bar{x}-w)}{c\,h + (1-h)\bar{x}}. \tag{11}$$

4.2 Incentives to monitor

Let ρ represent the owner's posterior assessment of the probability that the cash flow is $\bar{x}$ conditioned on the manager reporting 0. Later we will determine this posterior using Bayes rule. If the owner monitors, the owner will receive $-c$ if the cash flow is 0 and $\bar{x}-c$ if the cash flow is $\bar{x}$. Thus, the owner's payoff from monitoring is

$$\rho\,\bar{x} - c.$$

If the owner decides not to monitor, his payoff is 0. Now consider the manager's payoff conditioned on a report of 0. If the cash flow is actually 0, the manager's payoff is 0 regardless of the owner's monitoring decision; if the cash flow is $\bar{x}$, the manager receives $\bar{x}$ if the owner does not monitor, and 0 if the owner monitors. Thus, the utility to the owner from monitoring, reflecting both his payoff and the manager's payoff as specified in (2), it is given by

$$u_O^{\text{Mon.}} = \rho\bar{x} - c. \tag{12}$$

If the owner does not monitor, the owner's utility is given by

$$u_O^{\text{NotMon.}} = h\,\rho\,\bar{x}.$$

Thus, the owner's best reply is to monitor if $\rho > \rho^*$ not monitor if $\rho < \rho^*$; both monitoring and not monitoring are best replies if $\rho = \rho^*$, where

$$\rho^* = \frac{c}{(1-h)\bar{x}}. \tag{13}$$

Let σ represent the probability of the manager reporting 0 conditioned on the cash flow being $\bar{x}$. The cash flow distribution under effort (which is given by (6)) and Bayes rule imply that ρ, the probability that the cash flow equals $\bar{x}$ conditioned on a report of 0, is given by

$$\rho = \frac{\sigma p}{\sigma p + (1-p)}. \tag{14}$$

4.3 Monitoring/reporting equilibrium

To determine the equilibrium, we first impose the following parametric restriction:

$$(1-h)\bar{x}p > c. \tag{15}$$

Assumption (15) is simply imposed to ensure that the uptick probability, p, is sufficiently high to ensure that monitoring is a best reply to a managerial strategy of always attempting diversion by underreporting cash flows. To determine the equilibrium level of monitoring and reporting, first note that no equilibrium exists in which monitoring occurs with probability 1: if monitoring were to occur with probability 1, then the manager would never underreport. In that case, monitoring would not be a best response for the owner. Next, note that the highest possible value of ρ, produced by the conjecture that the manager always underreports, is p. Thus, assumption (15) ensures that for a sufficiently high probability of underreporting, the owner would monitor. If assumption (15) were not satisfied, then the owner will never monitor and the equilibrium solution would be for the manager to divert with probability 1. Thus, there is a unique mixed strategy equilibrium in which (14), (11) and (13) are all satisfied. The equilibrium probabilities of underreporting, σ^*, and monitoring reports of 0, m^*, in this mixed strategy equilibrium are given by

$$\begin{aligned} \sigma^* &= \frac{c(1-p)}{p(\bar{x}(1-h)-c)}, \\ m^* &= \frac{(1-h)(\bar{x}-w)}{ch+(1-h)\bar{x}}. \end{aligned} \tag{16}$$

We see from equation (16) that monitoring intensity is decreasing in kinship, h, while managerial underreporting is increasing in h. This implies that diversion is larger when kinship is higher. The effect of kinship on the total probability of monitoring is more subtle: the owner's monitoring decision is made ex post, after a 0 report is observed.[11] Zero reports occur when the actual cash flow is 0 or the manager underreports. Thus, holding monitoring intensity constant, the probability of monitoring is increasing in the probability of diversion. Because diversion triggers monitoring, it increases monitoring costs to the owner. Part of this cost increase is internalized by the related manager. Because of kinship increases

[11] Were the owner to choose the monitoring probability ex ante, before observing the manager's report, the owner's monitoring costs would be sunk and thus would not affect the related manager's diversion incentives. The author is indebted to Simon Gervais for clarifying this point.

internalization, the level of monitoring required to deter diversion falls with kinship. At the same time, because the related owner internalizes the manager's gain from diversion in proportion to kinship, the probability of diversion required to trigger monitoring also increases with kinship. Since kinship both (a) increases underreporting and (b) reduces the probability that zero reports will be monitored, the combined effect of (a) and (b) determines kinship's effect on the unconditional probability of monitoring and thus monitoring costs. Monitoring occurs if and only if a report of 0 occurs and that report is monitored. Thus, the total probability of monitoring, given by $\text{PM}^* = m^*(1-p(1-\sigma^*))$. The fall in m^* induced by an increase in kinship decreases the probability of monitoring. At the same time, the increase in σ^*, also induced by an increase in kinship, increases the probability of monitoring. The effect of kinship on the probability of monitoring is thus not obvious at first glance. However, explicit calculation of the equilibrium probability of monitoring, PM^*, shows that

$$\text{PM}^* = m^*(1-p(1-\sigma^*)) = \frac{(1-h)^2(1-p)\bar{x}(\bar{x}-w)}{((1-h)\bar{x}-c)(ch+(1-h)\bar{x})}$$

is an increasing function of h. These observations motivate the following proposition.

Proposition 1. *There is a unique equilibrium level of monitoring and underreporting conditioned on a given contractual payment to the manager, w. In this equilibrium, the probability of monitoring zero reports, m^*, and underreporting, σ^* are given by equation* (16)*. In the equilibrium, the probability of*

a. Underreporting is increasing and convex in kinship, h,

b. Monitoring of zero reports is decreasing and concave in kinship, h.

c. The total probability of monitoring occurring is increasing and log convex (a fortiori convex) in kinship, h.

d. The probability of successful diversion is increasing in kinship, h.

Proof. These results follow from differentiating the expression for underreporting, zero report monitoring, diversion, and the total probability of monitoring. □

Thus, at any fixed compensation level, kinship increases both diversion and costs of monitoring, which are proportional to the probability of monitoring. This result follows because increasing kinship reduces the welfare loss to the owner from diversion of firm resources by his kin—the manager. This weakens monitoring incentives. Weaker monitoring incentives lead to more underreporting and thus more reports of low cash flows. Since monitoring only occurs after low reports, this leads to a higher total probability of monitoring even though, conditional on a low report being made, the probability of monitoring is lower. Since the only dissipative cost faced by the family as a whole is monitoring costs, increasing kinship lowers total family payoffs. These observations are illustrated in Figure 3 below.

Some intuition for the somewhat surprising result that kinship always increases the probability of monitoring at a rate which itself is increasing in the degree of kinship can be gleaned from inspecting the elasticity of the total probability of monitoring with respect to kinship:

$$\frac{\text{PM}'(h)}{\text{PM}} = \underbrace{\frac{c}{(1-h)\left((1-h)\bar{x}-c\right)}}_{\frac{\text{PZeroReport}^{*\prime}(h)}{\text{PZeroReport}^*(h)}} + \underbrace{\left(-\frac{c}{(1-h)\left((1-h)\bar{x}+ch\right)}\right)}_{\frac{m^{*\prime}(h)}{m^*(h)}}. \tag{17}$$

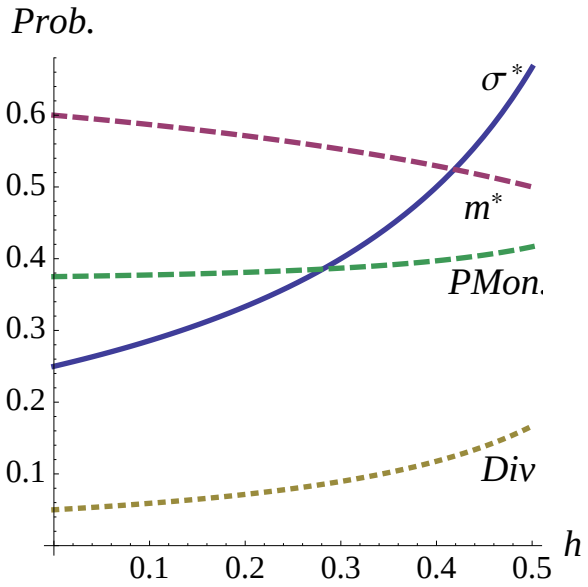


Figure 3: The probability of underreporting, σ^* (represented by the solid line), monitoring reports of 0, m^* (represented by the thick dashed line), managerial diversion, *Div.*, (represented by the dotted line), and monitoring occurring, *PMon.* (represented by the thin-dashed line), as a function of kinship, h. In the graph, $c = 0.2$, $p = 0.5$, $\bar{x} = 1.0$, and $w = 0.4$.

The elasticity of zero reports with respect to kinship, $\text{PZeroReport}^{*\prime}/\text{PZeroReport}^{*}$ is inversely proportional to the term $(1-h)\bar{x}-c$, which represents the owner's diversion monitoring gain, i.e., the gain to the owner from monitoring when the owner knows diversion is being attempted by the manager. The absolute value of the elasticity of zero-report monitoring with respect to kinship, $-m^{*\prime}/m^{*}$ is inversely proportional to $(1-h)\bar{x}+ch$, the manager's cost of apprehension, i.e., the loss to the manager of diversion when diversion is monitored. An increase in the total probability of monitoring requires that the absolute elasticity of zero reports exceeds the absolute elasticity of zero-report monitoring. Both elasticities contain a $(1-h)\bar{x}$ term, which reflects the transfer of monitored cash flow back to the owner. They differ with regard to how they factor in the monitoring cost term, c. The owner's diversion-monitoring gain is reduced by the entire cost of monitoring, c, because the owner directly incurs this cost. This effect increases the absolute value of the elasticity of the zero-report probability. In contrast, the manager's cost of diversion is increased by part of the monitoring cost, hc, reflecting altruistic internalization of monitoring costs. This effect reduces the absolute elasticity of monitoring. Thus, zero reports exhibit more absolute elasticity than the monitoring of zero reports, i.e., kinship reduces the rate of monitoring zero reports more slowly than it reduces the rate of zero reports and thus increases the total probability of monitoring.

Next, consider log convexity. Note that we can express (17) as

$$\frac{\text{PM}'(h)}{\text{PM}} = \left(\frac{c}{1-h}\right)\left(\frac{1}{(1-h)\bar{x}-c} - \frac{1}{(1-h)\bar{x}+ch}\right) \tag{18}$$

The first term of (18) is increasing in h as is the second term and both terms are positive. Thus, the elasticity of the total probability of monitoring with respect to kinship is increasing, which accounts for

the log convex relation between kinship and expected monitoring costs. The key to the increasing elasticity of monitoring with respect to kinship is that the owner's diversion monitoring gain is decreasing in kinship while the manager's cost of apprehension is also *decreasing* in kinship. The first result is expected. The second is at first glance surprising. Why would kinship actually lower the cost to the manager of being caught in the act of diversion? The intuition is best grasped by considering extreme cases. A non-altruistic manager will count as a cost of apprehension the transfer of the diverted cash back to the owner while a completely altruistic manager will be indifferent to this transfer but will count only the smaller dissipative cost incurred by the owner from monitoring. Thus, increasing kinship not only, as expected, lowers both the gain from monitoring to the manager, but also lowers the cost of being monitored to the manager. Thus, in addition to lowering the incentive to monitor, kinship lowers the marginal effectiveness of monitoring. The lowered incentive to monitor increases the manager's level of diversion. The lowered effectiveness of monitoring implies that the level of monitoring required to deter any given level of diversion increases. Hence, the rate at which kinship engenders monitoring costs is increasing in the level of kinship.

5 Intrafamily compensation negotiations: The bright-side scenario

As will become more apparent as we develop the model fully, kinship has a number of distinct effects on firm efficiency, as well as manager and owner welfare. In the most general formulation of the model, these effects are difficult to disentangle. Thus, we will begin our analysis by imposing parametric assumptions that isolate the positive and negative effects of family control. We first consider the case in which the reservation wage constraint is not binding and monitoring is costless. This is the "bright side" scenario for family control. Next, we consider the opposite case, where the monitoring problem is predominant and limited liability and the managerial reservation constraint fix compensation. This is, as we shall see, the "dark-side scenario" for family control. Finally, primarily through numerical simulations, we explore the general case where monitoring is a significant problem and the effort incentive compatibility conditions fix managerial compensation. We will see that the results in the general case will depend on whether the positive or negative effects dominate.

To implement the bright-side scenario model, we assume that $c = 0$ and $v_R = 0$. Under these assumptions, monitoring is costless and thus the monitoring/reporting problem has a trivial solution—the owner monitors with probability 1 and the manager does not underreport; incentive computability and limited liability are the binding constraints. We also assume, in this section, that the output/effort relation takes the following simple form:[12]

$$K(p) = {}^1\!/_2 k\, p^2, \quad p \in [0, \bar{p}], \bar{p} \leq \bar{x}/k. \tag{19}$$

If the manager works for the firm, the wage level is w, and uptick probability is p, the value to the

[12]The upper bound imposed $\bar{p}$ is not required to obtain any of the results. The bound simply rules out effort levels that are so high that they lower total family welfare. Such effort levels are never optimal. By ruling out these effort levels we shorten some of the proofs.

manager v_M and owner v_O are given as follows:

$$\begin{aligned} v_M &= pw - 1/2\, k\, p^2, \\ v_O &= p(\bar{x} - w), \end{aligned} \qquad p \in [0, \bar{p}] \text{ and } w \geq 0.$$

The utilities of the manager and owner are given by

$$\begin{aligned} u_M &= pw - 1/2\, k\, p^2 + h\,(p(\bar{x} - w)), \\ u_O &= p(\bar{x} - w) + h\,(pw - 1/2\, k\, p^2) \end{aligned} \qquad p \in [0, \bar{p}] \text{ and } w \geq 0. \tag{20}$$

If the manager refuses to accept employment, the firm cannot operate and thus the payoffs to the manager and owner both equal 0 and, therefore, their utilities equal 0.

The manager's effort problem is given by

$$\max_{p \in [0, \bar{p}]} u_M.$$

The solution to this problem is

$$p_M^*(w) = \min \left[\frac{w(1-h) + \bar{x}h}{k}, \bar{p} \right].$$

Define p_0 by

$$p_0 = p_M^*(0) = \frac{\bar{x}h}{k}. \tag{21}$$

Note that p_0 is the uptick probability given the lowest possible level of managerial compensation, 0. The function p_M^* is strictly increasing, so we can define the inverse map

$$w_M^*(p) = \frac{k\,p - h\bar{x}}{1-h}, \quad p \in [p_0, \bar{p}]. \tag{22}$$

Provided $[p_0, \bar{p}]$ is not empty, we can thus formulate the owner's problem as choosing, $(p, w_M^*(p))$ combinations to maximize the owner's utility subject to the manager's reservation constraint. However, given our assumption that the reservation compensation is 0, the reservation constraint is not binding. Thus, using expressions (22) and (20), we can write the owner's problem as

$$\max_{p \in [p_0, \bar{p}]} p(\bar{x} - w^*(p)) + h\,(p\, w^*(p) - 1/2\, k\, p^2). \tag{23}$$

Note that if we evaluate the derivative of the objective function, given in (23) we obtain:

$$(h+1)\,\bar{x} - (h+2)\,k\,p. \tag{24}$$

If we evaluate this expression at p_0 we see that it is positive for $h \leq 1/2$ thus the optimal choice of p will either be in the interior of $[p_0, \bar{p}]$ or will equal the upper endpoint, $\bar{p}$. The fact that the first-order condition is positive at p_0 and the definition of p_0 given by expression (21) combined with the fact that

$\bar{p} \leq \bar{x}/k$ implies that the optimal solution to the owner's problem, p_O^*, satisfies the following inequalities:

$$p_O^* k - \bar{x} \leq 0 \quad \text{and} \quad p_O^* k - h\bar{x} \geq 0.$$

Solving the first-order condition shows that the owner's optimal choice, p_O^*, if the interval $[p_0, \bar{p}]$ is not empty, is given by

$$\min\left[\frac{(h+1)\bar{x}}{(h+2)k}, \bar{p}\right] \quad h \in [0, 1/2]. \tag{25}$$

The interval is empty if and only if $\bar{p} < p_0$. If the interval is empty, the highest feasible p is attained at a 0 compensation level. Thus, the optimal solution is to set $p = p_0$. Combining this observation with expression (25) shows that the optimal choice for the owner is defined by

$$p_O^* = \max\left[p_0, \min\left[\frac{(h+1)\bar{x}}{(h+2)k}, \bar{p}\right]\right], \quad h \in [0, 1/2]. \tag{26}$$

If the owner managed the firm himself, and thus internalized all of the benefits and costs of undertaking the project, the owner would set $p = \min[\bar{x}/k, \bar{p}]$. This first-best level of effort is never attained under management by the manager as can be seen through inspecting (25). However, it is equally apparent that kinship leads to a higher level of output than would be attained if the manager was not kin and that the level of output is increasing in kinship.[13] There are two drivers of the welfare gains from kinship. The first, which has a standard analog in the principal-agent literature, is that the manager internalizes firm gains through kinship; in a sense the manager has an implicit ownership stake in the owner's profits, engendered by kinship. Thus, the manager, even without explicit performance based compensation, acts as if he is a partial owner of the firm. The other effect, which is somewhat different than that found in standard agency models, is that the owner acts as if he partially "owns" the manager's pay check. Increasing p increases total output at the cost of raising compensation and thus increasing the fraction of output captured by the manager. Thus, the partial internalization of the manager's compensation gain induces the owner to be more willing to sacrifice firm profits for the sake of increasing overall output. Given the intuition developed above the following results are not too surprising.

Proposition 2. *In the bright-side scenario, total output and the value of the firm are weakly increasing in kinship and are strictly increasing whenever the uptick probability p_O^* is in the interior of the feasible range. The manager's value is weakly decreasing in kinship and is strictly decreasing whenever p_O^* is in the interior of the feasible region.*

Proof. See the Appendix. □

[13] In fact, inspecting the equation seems to indicate that even if $h = 1$, the uptick probability might fall below the first-best level. However, this conjecture is not correct as it fails to take into account the parameter restriction, $h < 1/2$. If we evaluate equation (24) at p_0 as defined in (21), we see that for all $h > 1/2(\sqrt{5}-1) \approx 0.618$ (24) is negative at p_0, implying that the optimal solution to the owner's problem calls for $p = p_0 = h(\bar{x}/k)$ which indeed converges to the first-best solution as $h \to 1$.

6 Intrafamily compensation negotiations: The dark side

In the bright-side scenario we abstracted from the monitoring problem by assuming that monitoring was costless but effort was costly. This produced the most favorable case for family ownership from an overall welfare perspective—the bright-side scenario. In this section, we abstract from the ex ante effort problem by assuming that effort is costless but monitoring is costly. We call this case the "dark-side scenario." The specific parametric assumptions we impose are as follows:

$$K(p) = 0, \tag{27}$$

$$v_R > 0, \tag{28}$$

$$(1-h)\,\bar{x}\,\bar{p} > c, \tag{29}$$

$$\bar{x}\bar{p} - v_R > c. \tag{30}$$

Equation (27) sets effort costs to 0 and inequality (28) ensures the reservation value of the manager is positive. Under these assumptions, the manager will choose the highest feasible uptick probability, $\bar{p}$. Inequality (29) insures that the general condition (15) is satisfied and thus the owner's monitoring costs are not so high that no monitoring will occur. Inequality (30) ensures that the general condition (7) is satisfied and thus the project has positive value.

6.1 Compensation

In this section we determine the equilibrium level of compensation. As specified in Section 3.3, no output can be produced without managerial effort. Thus, the owner will always offer sufficient compensation to ensure effort and retain the manager. Since effort is costless in the dark-side scenario being analyzed here, the manager will always exert effort if he accepts employment.

If the manager accepts employment, the cash flow to the manager either equals $\bar{x}$ or 0. If the cash flow equals $\bar{x}$, the manager's utility is as given in monitoring/reporting subgame defined in Section 4.3. If the realized cash flow is 0, the manager's payoff is 0 and the owner's payoff equals the losses from monitoring the manager's 0 cash flow report, given by $-m^* c$. Thus, the manager's utility is

$$u_M^* = \bar{p}\,(w + h\,(\bar{x} - w)) - (1-\bar{p})h\,m^*\,c. \tag{31}$$

The owner's utility is determined in like fashion. The owner's utility is given by the expectation over the two possible reports 0 and $\bar{x}$. If 0 is reported, the owner's utility is given by the mixed strategy equilibrium in the monitoring/reporting subgame. Since the utility to the owner is the same whether he monitors or does not monitor in the subgame, the utility of the owner after a report of 0 equals the owner's utility after a report of 0 given that the owner does not monitor. This is given by $h\rho^*\bar{x}$. The probability of a zero report is $1-(1-\sigma^*)\,\bar{p}$. If the manager reports $\bar{x}$, which occurs with probability $(1-\sigma^*)\,\bar{p}$, the owner's utility is $\bar{x}-(1-h)\,w$. Thus, the utility of the owner is given by

$$(1-(1-\sigma^*)\,\bar{p})(h\rho^*\bar{x}) + ((1-\sigma^*)\,\bar{p})(\bar{x}-(1-h)\,w).$$

Using equation (14) we can simplify this expression to

$$u_O^* = \bar{p}\left((1-\sigma^*)(\bar{x}-(1-h)w)+\sigma^* h\bar{x}\right). \tag{32}$$

From (16) and (32), and (29) it is clear that, despite kinship, the owner's utility is decreasing in the level of managerial compensation. For this reason the owner will never set compensation higher than the level required to satisfy the problem's constraints. If the manager does not work for the firm he earns v_R and the owner's payoff is 0. Thus, minimum managerial compensation that satisfies the reservation constraint satisfies

$$\bar{p}\left(w+h(\bar{x}-w)\right)-(1-\bar{p})hm^* c = v_R.$$

Solving this equation for w yields the minimal compensation to the manager required to ensure that the reservation constraint is satisfied:

$$\frac{v_R}{\bar{p}} - \frac{h((\bar{p}\bar{x}-v_R)((1-h)(\bar{p}\bar{x}-c)+c\bar{p}))}{(1-h)\bar{p}(ch+(1-h)\bar{p}\bar{x})}. \tag{33}$$

There is an additional constraint on compensation, limited liability, which requires a positive payment to the manager. Thus, in order to obtain the equilibrium level of compensation we need only impose the limited liability condition:

$$w_M^* = \max\left[\frac{v_R}{\bar{p}} - \frac{h((\bar{p}\bar{x}-v_R)((1-h)(\bar{p}\bar{x}-c)+c\bar{p}))}{(1-h)\bar{p}(ch+(1-h)\bar{p}\bar{x})}, 0\right]. \tag{34}$$

As long as the limited liability constraint is not binding, increasing kinship reduces the equilibrium compensation level, w_M^*. This result is recorded and demonstrated below.

Proposition 3. *Compensation, w_M^*, is weakly decreasing in kinship, h and, whenever $w_M^* > 0$, w_M^* is a smooth strictly decreasing convex function of h.*

Proof. See the Appendix. □

The negative effect of kinship on compensation results from a "loyalty hold-up." Because the management skills for the project are firm specific, if the manager refuses to work for the family firm then project cash flows are lost, which harms the family as a whole. The manager internalizes the family's losses and thus will be reticent to reject even low salary offers from the owner. Thus, the firm-specific nature of the skills required to run the firm actually weaken the bargaining position of the family member possessing these unique skills.

6.2 Efficiency

In Section 4.3 we show that total monitoring increases with kinship at a fixed wage. In Section 6.1 we show that increased kinship leads to lower compensation. Reductions in compensation, absent diversion attempts by the manager, increase the size of the owner's residual claim, $\bar{x}-w$. The gain from diversion relative to non-diversion is exactly this residual share. Thus, lowered compensation makes underreporting more attractive at any fixed monitoring policy, so reductions in compensation require increases in

monitoring to deter diversion. Combining these two observations makes the logic behind the following proposition apparent.

Proposition 4. *(a) Whenever $w_M^* > 0$, the probability that the owner will monitor the manager's report of a zero cash flow is strictly increasing in kinship.*
(b) The total probability of monitoring is increasing in kinship
(c) Total family value is decreasing in kinship

Proof. See the Appendix. □

Proof. See the Appendix. □

Note that both when the payment to the manager is fixed, the case considered in section 4.3, and in the analysis of this section where the payment is negotiated, kinship increases the unconditional probability of monitoring. However, in the fixed payment case, the probability of monitoring conditioned on a report of zero falls as kinship increases. The increase in the total probability of monitoring occurs in the fixed payment case because the reduced conditional probability of monitoring zero reports is swamped by the increase in the likelihood of zero reports. However, when the payment to the manager is negotiated and the manager's reservation constraint binds, compensation varies with kinship and the loyalty hold up effect ensures that even the conditional probability of monitoring increases with kinship. Thus, while kinship increases the probability of inefficient monitoring even when the manager's payment is fixed, the probability of monitoring will be much more responsive to increases in kinship when compensation is negotiated and the reservation constraint binds, i.e., the loyalty hold up is effected.

6.3 Value

Next, we consider the value effects of kinship. The manager does not aim to maximize the value of his employment relation with the firm nor does the owner aim to maximize the firm's value: rather, both of these family agents aim to maximize their utility, which partially internalizes the gains to fellow family members. However, the actions of the owner and manager, which vary with kinship, have valuation effects. The effect of kinship on valuation depends both on kinship's effect on efficiency was well as its effect on the distribution of value between the manager and the owner. Because of these distributional effects, in the dark-side scenario, kinship may increase firm value even though it lowers total family value.

6.3.1 Firm value

Equations (34), (16), and (32), determine the owner's equilibrium value, v_O^*, which is given by

$$v_O^* = \bar{p}\,(m^*\,\bar{x}\,\sigma^* + (1-\sigma)\,(\bar{x} - w_M^*)) - c\,m^*(1 - \bar{p}\,(1-\sigma^*)). \tag{35}$$

where σ^* is defined by (16) and w_M^* by (34).

From Propositions 3 and 4, we see that increasing kinship will (i) lower compensation, (ii) increase underreporting, and (iii) increase monitoring. Effect (i) increases firm value while effects (ii) and (iii)

lower firm value. For this reason, the relation between firm value and kinship is, in general, neither monotone nor concave. However, the relation between kinship and value is strictly quasiconcave. Hence, the relation is always unimodal. Whether the value-maximizing level of kinship is interior depends on the degree of uncertainty regarding firm cash flows and the costs of monitoring relative to the total expected operating cash flows. These observations are formalized in Proposition 5.

Proposition 5. *a. The value of the firm is a quasiconcave function of kinship, h.*
b. Let $\gamma = c/(\bar{p}\,\bar{x})$*, then*

i. if

$$(1-\gamma)^2 - \gamma^3\left(((1-\bar{p})-\gamma)(\bar{p}-\gamma)+(1-\gamma)\gamma\right) > 0, \tag{36}$$

There exists a unique positive level of kin relatedness, which maximizes the value of the firm.

ii. If

$$(1-\gamma)^2 - \gamma^3\left(((1-\bar{p})-\gamma)(\bar{p}-\gamma)+(1-\gamma)\gamma\right) \leq 0, \tag{37}$$

then the value of the firm is greatest when the manager is not related to the owner, i.e., $h = 0$

Proof. See the Appendix. □

The region of the parameter space over which kinship increases value is presented in Figure 4.

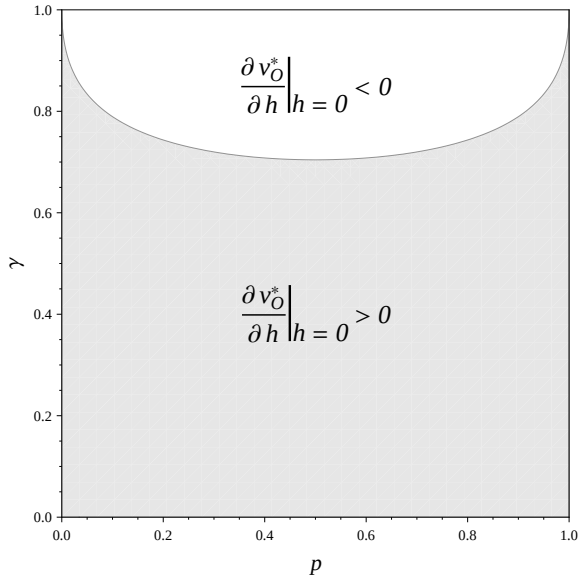
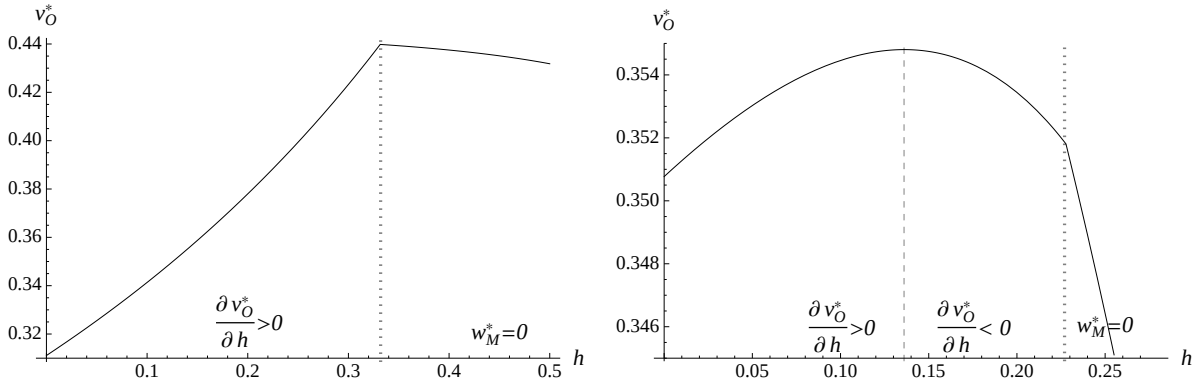


Figure 4: The horizontal axis represents γ, monitoring cost as a fraction of total firm value. The vertical axis represents $\bar{p}$, the probability of a high cash flow given effort.

Proposition 5 shows that the answer to the question of whether kinship can increase value depends only on the cost of monitoring as a proportion of the total expected operating cash flows, γ, and the uptick probability, $\bar{p}$. The fact that some level of kinship increases value does not preclude higher levels of kinship from destroying value. If fact, a sufficiently high level of kinship may make credible monitoring impossible and thus prevent owners from extracting any value from the project. However, despite these limitations, the proposition does reveal that family firms may have higher values than otherwise identical

non-family firms even when family firms are inefficient. In these cases, the firm's gain in value from the loyalty holdup exceeds its loss from inefficient monitoring. Figure 5 presents fairly representative illustrations of the possible relations between firm value and kinship under the dark-side scenario.



Panel A Panel B

Figure 5: Effect of kinship on firm value at a sample of admissible model parameters. In each of the figures, kinship is plotted on the horizontal axis, h, and firm value is plotted on the vertical axis. The region labeled $\partial v_O^*/\partial h > 0$ represents the region where firm value is increasing in kinship. The region labeled $\partial v_O^*/\partial h < 0$ represents the region where firm value is decreasing in kinship and the managerial compensation exceeds 0. The region labeled $w^* = 0$ represents the region where managerial compensation equals 0. As the graphs suggest, the relation between kinship and firm value is quasiconcave. The parameters for Panel A are $v_R = 0.15$, $\bar{x} = 1$, $\bar{p} = 0.50$, and $c = 0.10$. The parameters for Panel B are $v_R = 0.11$, $\bar{x} = 10$, $\bar{p} = 0.125$, and $c = 0.90$.

6.3.2 The manager's value

Because, in the dark-side scenario, there are no effort costs, the manager's value is just the expected cash flow received by the manager. It is given by

$$v_M^* = \bar{p}\left((1-m^*)\,\sigma^*\,\bar{x} + (1-\sigma^*)\,w_M^*\right). \tag{38}$$

The effect of kinship on the manager's value function is somewhat subtle. Recall, that the reservation constraint is always binding at the equilibrium compensation contract if the limited liability constraint can be satisfied at a compensation level that makes this constraint bind. However, this condition only ensures that the manager's utility from accepting employment is constant. Since utility incorporates internalized family gains, it is not identical to value. The manager's value is produced by two components: compensation and diversion. Increasing kinship always weakly lowers compensation, but at the same time it increases diversion. Thus, the effect of kinship on the manager's value is determined by the balance of these two effects. When kinship is low, the compensation reduction effect always dominates, and increasing kinship lowers the manager's value. However, increasing kinship from a sufficiently high starting point can actually increase the manager's value. This reversal can occur for two reasons, one fairly obvious and the other subtle. The obvious reason is that compensation has been lowered so much by kinship that it has hit the limited liability boundary. In that case, the manager clearly earns

positive rents as kinship increases because his compensation cannot fall and equilibrium diversion increases. But this is not the only mechanism through which increasing kinship increases the manager's value. Increases in value can also occur when the reservation constraint is binding. The condition for such increases is that the value of the project, measured by $\bar{p}\bar{x} - v_R - c$ is sufficiently low. The logic behind the reversal is that although an increased degree of kinship increases the fraction of the family's gain the manager internalizes and thus uses to satisfy his reservation constraint, the increase in kinship also increases monitoring and thus lowers the total family gain. Thus, at a higher degree of kinship, the manager has less family gain to internalize into his utility function. Hence, to keep his utility constant, his direct gains from diversion must increase. These results are recorded in the following proposition:

Proposition 6.

(a) The manager's value is strictly quasiconvex in kinship, h and thus there is a unique degree of kinship that minimizes the manager's value.

(b) For all h sufficiently close to 0, increases in kinship lower the manager's value.

(c) The manager's value is maximized either at the lowest or highest admissible degree of kinship.

(d) If the manager's value is maximized at the highest degree of kinship, the limited liability constraint must be binding.

(e) If $\bar{p} > \frac{1}{3-\gamma}$, where $\gamma = c/(\bar{p}\bar{x})$ and $\bar{p}\bar{x} - v_R - c$ and $(1-h)\bar{p}\bar{x} - c$ are sufficiently close to 0, then increasing kinship increases the manager's value.

Proof. See the Appendix. □

The quasiconvexity of the manager's value in kinship, developed in Proposition 6, is easiest to understand if we consider extreme cases. First, eliminate the kinship effect by supposing that $h = 0$. In this case, monitoring is strict and compensation large, reflecting the manager's reservation value, and thus the manager's value is large. Next, consider the case in which h is large. In this case, the incentive to monitor is weak, but, at the same time, compensation is low because of the loyalty holdup. Because of low compensation, the manager has a strong propensity to divert. Thus, the level of monitoring is high despite the owner's kinship-attenuated propensity to monitor. Excessive diversion and monitoring reduce total family gains, so such gains can make only a limited contribution to meeting the manager's reservation utility. To compensate, the manager's value must be large, just as in the $h = 0$ case.

7 Shades of gray: Combining dark-side and bright-side effects of kinship

In this section we consider the family firm when both monitoring and effort effects are present. The analysis in these cases is much less straightforward. We will assume that monitoring costs, c, are positive, the reservation constraint is not binding, i.e., $v_R = 0$, and that output/effort relation is as specified in equation (19) in the bright-side scenario. We can solve the model in an analogous fashion to the development in sections 5 and 6. Monitoring and reporting probabilities will be the same as those derived

in Section 4.3, i.e.,

$$\sigma^* = \frac{c\,(1-p)}{p\,(\bar{x}\,(1-h)-c)}, \tag{39}$$

$$m^* = \frac{(1-h)(\bar{x}-w)}{c\,h+(1-h)\,\bar{x}}. \tag{40}$$

In order to induce the manager to expend sufficient effort to produce uptick probability, p, it must be the case that, given compensation w, p is an optimal choice for the manager. From equation (31) we see that this condition can be expressed as

$$p \in \text{Argmax}\{p \in [0,\bar{p}] : p\,(w+h\,(\bar{x}-w)) - \frac{1}{2}(1-p)h\,m^*(w)\,c\,p^2\}. \tag{41}$$

The owner will always prefer to induce effort at the smallest level of compensation consistent with the incentive compatibility condition given by (41) and the limited liability constraint. Define this level of compensation as $w_M^*(p)$. Following the same approach as was followed in Section 5, we can solve for $w_M^*(p)$ which yields

$$w_M^*(p) = \frac{k\,p}{(1-h)^2} - \frac{h}{\bar{x}}\left(\frac{(kp\,(\bar{x}-c)+\bar{x}\,(c+(1-h)\,\bar{x}))}{(1-h)^2}\right). \tag{42}$$

The owner maximizes utility over feasible choices of $p \in [0,\bar{p}]$, were, as in (32), the owner's utility is given by

$$\bar{p}\,((1-\sigma^*(p))(\bar{x}-(1-h)\,w_M^*(p)) + \sigma^*(p)\,h\,\bar{x}).$$

Using the approach developed in Section 5, this expression yields an optimal choice of p, denoted by p_O^* and given by

$$p_0^* = \min[\max[p_O^{\text{Int.}}, p_O^{\text{Zero}}], \bar{p}], \tag{43}$$

where $p_O^{\text{Int.}}$ is the value of p that solves the first-order condition for the manager's optimization problem given compensation of $w_M^*(p)$ and p_O^{Zero} is p the manager will select when compensation is set to the limited liability boundary, 0. A bit of algebra yields explicit forms for $p_O^{\text{Int.}}$ and p_O^{Zero}. These are provided below:

$$p_O^{\text{Int.}} = \frac{c^2\,hk + c\,(1-h)\,k\,\bar{x} + (1-h)^2\,(1+h)\,\bar{x}^3}{(1-h)\,k\bar{x}(((1-h)(2+h))\bar{x}+ch)}$$

$$p_O^{\text{Zero}} = h\left(\frac{\bar{x}}{k}\right)\left(1+\frac{(1-h)\,c}{c\,h+(1-h)\,\bar{x}}\right).$$

Substituting p_0^* from (43) into the equilibrium, wage, w_M^*, monitoring, m^*, and underreporting, σ^*, given by (42), (40), and (39), respectively can be used to determine the effects of kinship in the gray scenario developed in this section.

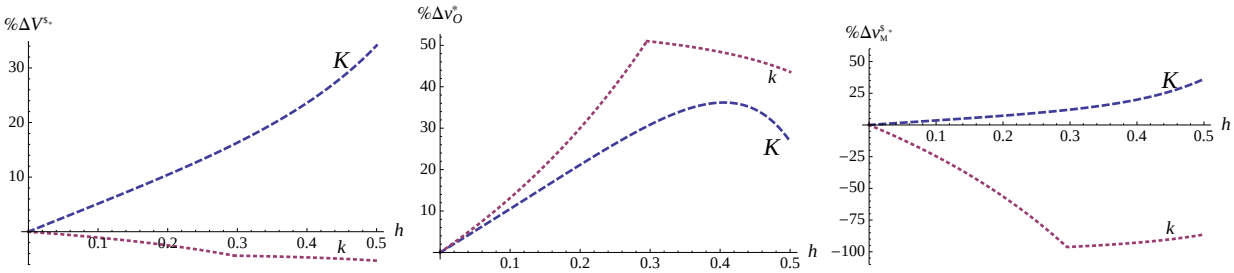
Unfortunately, as can be seen by inspecting the equations just developed, the gray scenario is somewhat opaque. This is not surprising as there are a number of effects in play. Now the owner's tradeoffs are significantly more complex than the ones the he faced in either the bright-side or dark-side scenarios.

An increase in kinship will (i) increase the owner's own willingness to raise compensation, at the cost of owner's own payoff, if it will increase total family payoff, (ii) make the manager willing to exert more effort at any given level of compensation, and (iii) make the owner less willing to monitor low reported cash flows. Effect (ii) will tend to increase compensation when increased compensation increases firm output at the cost of increasing the rents captured by the manager. However, increased compensation will itself lower the owner's incentive to monitor. The incentive to monitor will also be directly lowered by closer kinship. Because of effect (iii), the manager's gains from diversion will be higher. Since diversion gains can only be reaped if cash flows to divert are produced, these diversion gains will themselves improve the manager's effort incentives. So, even at a fixed or reduced compensation level the manager's value might increase as kinship is increased. Such an outcome becomes more likely when monitoring costs are high. Thus, when output is highly responsive to effort, as in the bright-side case, and monitoring costs are significant, as in the dark-side case, an increase in the degree of kinship may be associated with greater manager payoffs but lower compensation, with closely related managers extracting a significant portion of their value from diversion. In contrast, if managerial value-creation is not very pay sensitive at the equilibrium level of compensation, then the increase in the manager's willingness to exert effort for the good of the family caused by an increase in kinship will lead the owner to simply reduce compensation. This reduction in compensation will itself increase managerial diversion incentives. In addition, the increased level of family altruism, by discouraging monitoring, will also increase diversion incentives. Thus, compensation will fall steeply in kinship, while diversion and monitoring will rise—essentially the same result as observed in the dark-side scenario. Which scenario will emerge depends on the specifics of the parameter choices in a highly nonlinear fashion. Thus, we will address this issue through numeric rather than algebraic analysis.

Having settled on a numerical approach, the next question is which variables should be the focus of analysis. Since neither non-pecuniary costs nor agent utility are observable, we will not simulate changes in these variables. Rather, we will focus on the observable effects of kinship on monitoring, the owner's (i.e., firm) value, and the manager's monetary value. The manager's monetary value is the manager's value gross of non-pecuniary effort costs. Notationally, we represent the manager's monetary value by superscripting "\$" to v_M. The family's monetary value is the sum of the owner's value and the manager's monetary value, also represented by superscripting family value V with \$.

These effects are illustrated in Figures 6. In this figure, the variable of interest is plotted against kinship, h, for two cases, high effort costs, represented by K, and low effort costs, represented by k. Because the absolute payoffs in the two cases are very different, and thus difficult to present on the same graph, we graph the percentage difference of the variable's value from its $h = 0$ value. In Panel A of Figure 6, we see that increasing kinship lowers total family value when effort costs are low and increases total family value when effort costs are high. Firm value, plotted in Panel B, has an interior maximum in kinship in both the high effort and low effort cases. The manager's monetary value, plotted in Panel C, is composed both of gains from compensation and gains from diversion. In the low effort-cost case, the manager's monetary value falls until the limited liability constraint is reached. At that point compensation is fixed and the reduced monitoring associated with further increases in kinship cause monetary value to increase. In the high effort-cost case, the increase in compensation caused by

increasing kinship amplifies the increased gains from diversion caused by more relaxed monitoring and the manager's monetary value increases dramatically with kinship.



A. Total Family Value B. Firm Value C. Manager monetary value

Figure 6: The % effect of kinship, h, on total family monetary value, $V^{\$*}$, firm value, v_O^*, and manager monetary value, $v_M^{\$\,*}$, for high, K, and low, k, levels of effort cost. In the figures the parameters are $c = 0.50$, $K = 1.75$, $k = 0.50$, $\bar{x} = 1.0$, and $\bar{p} = 0.70$

8 Inheritance from the founder and the birth of family firms

In the previous sections we examine the behavior of family firms—firms in which ownership rights, control and managerial human capital are concentrated within a family. In this section, we examine the birth of family firms from the bequest of a founder. We assume that the founder has developed a positive NPV project which we will call the "firm," and has also developed, among her relatives, the human capital required to manage this project after her death. The firm is the founder's only asset and, as her life draws toward its end, she needs draw up a bequest transferring ownership rights to surviving family members. These family members have differing degrees of relatedness to the founder and also have differing endowments of human capital. The founder has nepotistic preferences favoring enriching closer relations at the expense of some reduction in overall family-firm value. However, as we will show, kin altruism based on genetic relatedness implies that, for typical family pedigrees, the founder's nepotistic preference for closer relations will not be as strong as those relations' own selfish preferences for their own payoffs relative to rival family members. The founder's bequest problem arises because she cannot directly control the policies her relatively "selfish" descendants adopt after she dies. However, the founder can use her bequest to shape the descendants' intra-family negotiations and thus influence the posthumous governance and management of the family firm.

8.1 Inheritance model

Consider the problem of a founder at date -1 making a bequest of the firm. The founder knows she will die between date -1 and date 0. Thus, the founder derives no direct payoff the bequest decision. The founder's decision will maximize her inclusive fitness based on kin altruism as measured by the coefficient of relationship, i.e., kinship, between the founder and her potential heirs. There are two potential heirs: S and N. We represent the kinship between the founder and S with h_S, the kinship

between the founder and N by h_N, and the kinship between N and S by h_{NS}. We assume that

$$0 \leq h_N < h_S \leq 1/2 \text{ and } 0 \leq h_{NS} \leq 1/2.$$

For the most part, these assumptions simply extend the parametric assumptions imposed in the earlier section to the case of three related agents. The key assumption is that $h_N < h_S$, i.e., the kinship between the founder and S is greater than the kinship between the founder and N. An important special case of the model is when the two potential heirs are collaterally related, with only S being a direct descendant of the founder. For example, assuming no inbreeding, and that S is the son of the founder and N is the founder's nephew, then $h_S = 1/2$, $h_N = 1/4$, and $h_{NS} = 1/8$. Another special case is when S is the founder's daughter and N has been adopted into the family or is the founder's son-in-law (or perhaps both as would be the case under Japanese Mukoyoshi adoption).[14] In this case, $h_S = 1/2$, $h_N = 0$, and $h_{NS} = 0$. The potential heirs have (perhaps) different reservation payoffs, v_R^S for S and v_R^N for N. The upside payoff ($\bar{x}$ in the earlier sections of the paper) the potential heirs can attain from managing the firm also varies and equals x_S under S's management and equals x_N under N's management.

Although the cash flows to income can be divided between the heirs through contracts, control of the firm is not divisible. Only one of the potential heirs can assume control. We call the potential heir to whom the control of the firm is bequeathed the *heir* and call the potential heir to whom it is not bequeathed the *non-heir*. If some cash flows rights are bequeathed to the non-heir, through, for example, a minority equity stake or a debt claim, we call the non-heir's stake a *noncontrolling stake*. When the founder's bequest does not specify a noncontrolling stake, we call the bequest *simple*. Thus, a bequest is an assignment of control rights to one of the potential heirs and (possibly) the assignment of a noncontrolling ownership stake to the other potential heir. After receiving the bequest, the heir decides on the firm's employment and compensation policies. The founder's bequest cannot bind the heir with respect to these choices. We will say that a bequest implements a given payoff profile (v_N, v_S) if, under the bequest, posthumous negotiations between the potential heirs produces payoffs (v_N, v_S) to N and S respectively.

The negotiations between the potential heirs evolves as specified in the family-firm model developed earlier. The heir, being the owner of the firm and thus having control over the firm's policies, chooses the firm's employment and compensation polices. If the heir does manage the firm himself he becomes the "heir-manager." If the bequest is simple and the heir manages the firm, the non-heir obtains his reservation payoff regardless of the management decisions made by the heir. Thus, kin altruism does not affect the heir-manager's effort decision and the heir-manager, as sole owner, internalizes the entire effect of his effort decision. Thus, an heir-manager's effort level is first-best, i.e., it maximizes total firm value net of effort costs. If the heir delegates management to the non-heir, we model the division of ownership and management between them *mutatis mutandis* using the family owner-manager model developed in the earlier sections of the paper. Thus, in general, in this case, the firm's effort and monitoring policies

[14] See Mehrotra, Morck, Shim, and Wiwattanakantang (2013) for further discussion of the use of adoption by family owners in Japan. Adoption of a non-relative heir could serve as a substitute for the noncontrolling ownership stakes considered in this paper. Like granting noncontrolling stake to a less competent blood relation, a bequest to a more competent adopted heir who is married to a less competent blood relation hands control to a competent heir yet, through family law, provides the blood relation with a claim on firm value.

will not be first-best.

The tension in the founder's bequest decision arises because expected net output at any given level of effort is highest when the firm is managed by the founder's more distant relative, N, i.e.,

$$x_N - v_R^N > x_S - v_R^S. \tag{44}$$

Inequality (44) implies that total payoffs to the family are highest if the founder makes a simple bequest to N. In addition to putting the firm in the strongest hands, allocating all control and ownership to N eliminates the agency costs associated with the division of ownership and control. However, the founder values payoffs to N less than payoffs to S. Even if S inherits and hires the more efficient N to manage the firm, the agency costs associated with the separation of ownership and control will still lower total output relative to management, control, and ownership by N. In fact, a simple bequest to S may or may not lead to higher total payoffs than management by N and ownership by S depending on whether the higher productivity of N can compensate for the increased agency costs associated with the separation of ownership and management.

The founder, when making her bequest, anticipates these effects and chooses the bequest that maximizes her utility. The founder's utility is the relationship-weighted sum of N's and S's anticipated payoffs. Thus, the founder chooses her bequest to maximize

$$u_F = h_S v_S^e + h_N v_N^e,$$

where v_S^e, and v_N^e represent the anticipated payoffs to N and S resulting from the bequest. Next note that the founder's utility function is only unique up to increasing affine transformations. Thus, we can and will express the founder's utility in the following equivalent form:

$$u_F = v_S^e + \frac{h_N}{h_S} v_N^e.$$

As in the family firm model developed earlier, the potential heirs, S and N, will each maximize their own inclusive utility. Thus, S chooses the policies that maximize

$$u_S = v_S^e + h_{NS} v_N^e,$$

and N chooses policies that maximize

$$u_N = v_N^e + h_{NS} v_S^e.$$

8.2 Founder benevolence

For all family members, family governance decisions trade off total family welfare against selfish gain. This is a bit more obvious if we rewrite the utility functions of the family members using expression (5).

This yields

$$u_S = h_{NS}\, v^e + (1 - h_{NS})\, v_S^e, \tag{45}$$

$$u_N = h_{NS}\, v^e + (1 - h_{NS})\, v_N^e. \tag{46}$$

$$u_F = \frac{h_N}{h_S}\, v^e + \left(1 - \frac{h_N}{h_S}\right) v_S^e, \tag{47}$$

where $v^e = v_S^e + v_N^e$ represents the total anticipated payoff to both potential heirs. Thus, for the founder, the ratio h_N/h_S represents the degree to which her preferences are aligned with total value maximization while h_{NS} represents the potential heirs' degree of alignment. This observation motivates the following definition.

Definition 1.

- *If $h_N/h_S > h_{NS}$ then we will term the founder's preferences* relatively benevolent*;*
- *if $h_N/h_S = h_{NS}$ then we will term the founder's preferences* aligned*;*
- *if $h_N/h_S < h_{NS}$ then we will term the founder's preferences* relatively discriminatory.

If the founder preferences are relatively benevolent, they tilt more toward total family value maximization as opposed to the maximization of the payoffs to any particular family member. Since all value in our model is captured by some family member, a founder's tilt toward total family value maximization implies a tilt towards total value maximization. Thus, if the founder is relatively benevolent, the founder's preferences are also more pro-social. Relative benevolence does not imply that the founder's bequest is aligned with value maximization. When total value differences are sufficiently small, the founder will prefer bequeathing the firm to S even if total value is higher under N. The value increment created by transferring control and or cash flow rights to N must be sufficiently large to overcome the founder's bias toward S. Transfers to the more distant relative indicate that the more distant relative can create substantially greater value. Thus, our analysis is consistent with the empirical results in Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon (2007) that document superior firm performance when family owners transfer control to outside managers. Moreover, as we discuss in more detail in Section 8.3, when sufficiently incompetent, even the closely related potential heir may prefer transferring control to outsiders or more distant relatives and taking a non-controlling stake in the firm. However, when the founder is relatively benevolent, her preference for such pro-social control transfers is stronger than her potential heirs.'

In some cases, founder and heir preferences are automatically aligned. For example, when N is not related to either S or the founder, $h_N/h_S = h_{NS} = 0$. Thus, if S is the heir, the founder's preferences are aligned with S. This implies that if S inherits, S will make the same policy choices as the founder would have made had she been alive. Another case of alignment, although one of less practical significance, is where the founder is not inbreed, S's spouse is not related to S and N is S's child, i.e., N is S's grandchild and S is her child. In this case, the alignment condition is satisfied because $h_S = 1/2$, $h_S = 1/4$, and $h_{NS} = 1/2$. However, because of age differences, children and grandchildren of the founder will rarely be competing for inheritance. Even if preferences are not aligned, over many specific policy choices

the founder's preferences and S's do not clash, for example, for any two polices that produce the same expected payoff to N. Over such policies both the founder and S will prefer the policy that maximizes total value. Finally, using expression (4) we also see that whenever the two polices produce the same *utility* to N, the founder's and S's preferences are also the same, and, again, both will prefer the policy that maximizes total value. However, when S hires N it is often the case that total payoffs can be increased by increasing the rents earned by N. In that case, unless the alignment condition is satisfied, the policy chosen by S will generally not coincide with the policy the founder would have chosen were she to have made the choice. In which direction will the founder's bias fall? The logic of kinship-based altruism provides us with a fairly definitive answer to this question—typical family structures imply relative founder benevolence.

Proposition 7. *The following conditions are sufficient for the founder-relative benevolence condition (given by Definition 1) to be satisfied:*

i. *The founder is not inbred, S is the son of the founder, N is not a descendant of S, and the coefficient of relation between the founder's spouse and N, represented by h'_N, is less than three times the coefficient or relation between the founder and N, h_N.*

ii. *The founder is not inbred, N is not a direct descendant of either the founder or founder's spouse but is related to the founder, and the family tree is unilateral, i.e., all indirect lines of descent between collateral relatives pass through only one of the relatives' parents.*

In case ii, the founder's benevolence exceeds S's by a considerable margin because

$$\frac{h_N}{h_S} \geq 4\, h_{NS}.$$

Proof. First consider condition i. Note that by Malécot's formula (see Malécot (1948) or Chapter 5 of Lange (2002)),

$$h_{NS} = \frac{1}{2}\left(h_N + h'_N\right). \tag{48}$$

Because the founder is not inbred and S is her son, $h_S = 1/2$. Using this fact and equation (48) we have that

$$\frac{h_{NS}}{h_N/h_S} = \frac{1}{4}\left(1 + \frac{h'_N}{h_N}\right), \tag{49}$$

and the result follows.

To prove condition ii, first note that by assumption N is not a direct descendant of the founder or the founder's spouse. Thus, all lines of descent connecting N and S are indirect. By the assumption that the family tree is unilateral and that the founder and N are related, all indirect lines of descent connecting S and N pass through the founder. Thus, each of these lines of descent also connects the founder to N. Thus, for each path from S to N, there exists a path from the founder to N, which is shorter by at least one arc. By Wright's formula for the coefficient of relationship (Wright, 1922), we see that the contribution of a path from S to N to relatedness is at most half of the corresponding path from the founder to N. Therefore, the coefficient of relationship between N and S, h_{NS}, which is the sum of all the path contributions by the Wright formula, is at most one half of the coefficient of relationship

between the founder and N, h_N, i.e., $h_{NS} \leq h_N/2$. Because the founder is not inbred, $h_S \leq 1/2$. Thus, $h_N/h_S \geq 2h_N$. The result follows. □

As Proposition 7 demonstrates, the conditions for founder benevolence will be satisfied by "typical" family pedigrees. In such pedigrees, collateral relatives of the founder are only indirectly connected to each other through a common ancestor of the founder. In this case, the paths connecting the founder to N are shorter than the paths connecting N and S to each other. The geometric decline of the level of kin altruism implied by the inclusive fitness model leads to the founder being relatively more benevolent toward N than S. Hence, the founder, although biased toward her closer relative S, is more willing to sacrifice S's welfare for the sake of overall value creation than S himself. As shown by the more general condition i, kinship relationships on the founder spouse's side between N and S must be very strong to reverse founder benevolence. For example, assuming no inbreeding and that S is the son of the founder, even if N and S are double cousins, and thus the unilaterality constraint of condition ii of Proposition 7 is violated, we have $h_S = 1/2$, $h_N = h_{NS} = 1/4$. In that case, the founder benevolence condition is still satisfied as $h_N/h_S = 2h_{NS} > h_{NS}$. However, it is possible for kinship links between the founder's spouse and N to reverse the relative benevolence condition. An example is provided below in Figure 7.

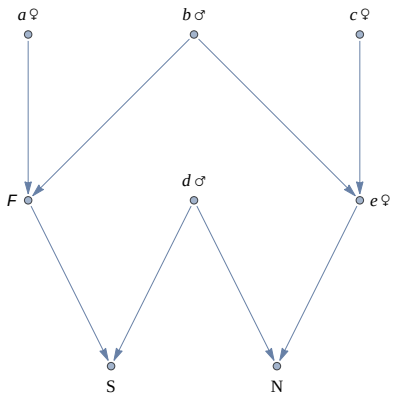


Figure 7: *Counterexample: Founder's preferences are more discriminatory than S's.* In the figure, directed arcs connecting nodes indicate that the source node is a parent of the sink node. Root nodes are assumed to be unrelated to each other and not inbred. In the graph, S and N are half brothers with common father, d. F, the founder, is the half-aunt of N. N and S share two common ancestors, their father, d, and F's father, b. The founder and N have only one common ancestor, b. Thus, the relationship coefficient, h, between the two collateral potential heirs, S and N, is $h_{NS} = 5/16$, while the relationship coefficient between the founder and N is only $h_N = 1/8$. Hence, $h_N/h_S = 1/4 < h_{NS} = 5/16$. Therefore, the founder's preferences are relatively discriminatory.

Because founder relative benevolence seems to be the far more typical state of affairs, we will focus on this case in the subsequent analysis. Even if the founder is relatively benevolent, and thus has policy preferences that conflict with those of the potential heirs, a simple bequest may still be sufficient to ensure that the founder's preferred policy is followed posthumously. For example, if the relationship between N's rents and firm value is linear under delegated management, then the founder will either prefer to choose the compensation policy that minimizes N's rents or the policy that maximizes total firm value. However, total firm value is maximized by eliminating the agency problem entirely by

setting N's compensation so that N captures the full value of the project. However, this policy produces payoffs to founder and the potential heirs identical to the policy of handing ownership and control to N. If the founder prefers the policy that minimizes N's rents at the expense of lowering total value then, by the assumption of relative benevolence, so will S. Thus, as long as S prefers delegated management, bequeathing the firm to S will lead to the implementation of the founder's preferred policy.

Thus, when there is a linear relation between N's rents and total firm value, the only case in which a simple bequest will not implement the founder's preferred policy is the case where the founder prefers delegated management but S, if bequeathed the firm, does not hire N and instead manages the firm himself. However, as long as compensation under delegated management provides no rents to N then S's and the founder's preferences regarding delegation relative to sole management by S will be the same. In the dark-side scenario of section 6, total firm value is, in fact, linear in the manager's reservation payoff. Moreover, increasing the manager's reservation payoff is equivalent to leaving the reservation payoff fixed and increasing the manager's rent. Also in the dark side scenario, equilibrium compensation always leaves the manager on his reservation constraint provided that compensation meeting the reservation constraint satisfies limited liability. Thus, we have established the following sufficient conditions for the optimality of simple bequests.

Lemma 1. *As long as N reservation payoff is sufficiently large so that N-reservation constraint cannot be satisfied at 0 compensation, in the dark-side scenario, where relatedness does not increase firm value, founder-preferred policies can always be attained through simple bequests of the entire firm to one of the two potential heirs.*

8.3 Implementation: an extended example

8.3.1 Unrestricted bequests

When family altruism generates value, the conclusion of Lemma 1 no longer holds. As we will show, divided bequests can increase total value at the expense of lowering S's payoff. Because the founder's preferences are relatively benevolent, the founder will often prefer such divided bequests. To develop these results, a monitoring problem is not required. Thus, to minimize the algebraic burden, we develop the analysis in the simplest possible setting—the bright-side scenario: $c = 0$, the reservation payoff of the potential heirs is 0, and the relation between managerial effort and output is as specified in equation (19). We also assume that $x_N < k$. This assumption ensures that the optimal effort levels is interior and limits the number of cases we have to consider. Otherwise, it has no material effect on the result. It is clear from simple continuity arguments that all of our qualitative results can be obtained with positive reservation payoffs and positive monitoring costs so long as the effort-incentive, rather than the reservation constraint, is binding. In order to distinguish between payoffs and utilities under the different potential control and management configurations for the firm, we represent the payoffs and utilities as follows: when S controls the firm and hires N to manage, we superscript with n; when S controls and manages the firm, we superscript with S; when N controls and manages, we superscript with N.

First, consider the founder's ability to implement preferred allocations through a control bequest to N combined with a minority ownership stake bequeathed to S. Because N manages the firm, firm cash

flows equal either 0 or x_N. Any limited liability claim on the firm will pay 0 when the cash flow is 0 and some amount less than or equal to x_N when the cash flow equals x_N. Thus, we can specify the noncontrolling stake simply by stating the cash flow to that stake in the event that the firm's cash flow equals x_N. We represent this cash flow with o. The stake could take different legal forms: e.g., preferred stock, dual class stock, debt, or, if the promised cash flow was sufficiently small, a minority equity stake. Perhaps a noncontrolling stake could also be implemented by contracts requiring the firm to purchase inputs from a company controlled by S.

Next, consider the relation between N's effort, parameterized by the uptick probability p, and the size of the minority stake o. Specializing equation (46) to the parametric assumptions in this section, we see that the utility of N given a noncontrolling stake of o held by S and an uptick probability of p is given by

$$p\left((x_N - o) + h_{NS}o - \frac{kp^2}{2}\right) - (1-p)\frac{kp^2}{2}. \tag{50}$$

The first-order condition for effort ensures that all effort incentive-compatible combinations of p and o are related by

$$o = \frac{x_N - kp}{1 - h_{NS}}. \tag{51}$$

If we substitute (51) into equation (50) we obtain the utility of S as a function of the uptick probability p:

$$u_S^N(p) = \frac{1}{2}p\left(2\left(1+h_{NS}\right)x_N - \left(2+h_{NS}\right)kp\right).$$

Thus, this concave function of p attains its maximum at

$$p_S^N = \frac{\left(1+h_{NS}\right)x_N}{\left(2+h_{NS}\right)k},$$

which, using expression (51), implies a noncontrolling stake of

$$o_S^N = \frac{x_N}{2 - h_{NS}\left(1+h_{NS}\right)}.$$

Next, consider the founder's preferred choice of p. This is determined using in exactly the same way as S's. Thus, the founder's utility under N's control and management and the founder's choice of optimal uptick probability and noncontrolling stake, p_F^N and o_F^N are given as follows:

$$\begin{aligned}
v^N(p) &= \left(px_N - \frac{1}{2}kp^2\right), \\
u_F^N(p) &= \left(h_N - h_S h_{NS}\right)v^N(p) + \left(h_S - h_N\right)u_S^N, \\
p_F^N &= p_S^N\left(1 + \frac{h_N - h_{NS}h_S}{\left(1+h_{NS}\right)\left(\left(h_S - h_N\right) + \left(h_S - h_N h_{NS}\right)\right)}\right), \\
o_F^N &= \frac{x_N - kp_F^N}{1 - h_{NS}}.
\end{aligned}$$

Relative benevolence implies that the founder's preferred incentive-compatible uptick probability is higher than S's, and thus the noncontrolling stake that the founder bequeathes to S is less than S's

preferred stake, i.e., $p_F^N > p_S^N$ and $o_F^N < o_S^N$. Because $o_F^N < o_S^N$, a bequest of control to N combined with a noncontrolling stake of o_F^N to S, will not be renegotiated by N and S. To see this, note that any reduction in the stake would lower the utility of S and any increase in the stake would lower the utility of N. Since the total payoff is lower under S's management, N and S will not negotiate a transfer of management to S. Thus, by bequeathing control to N and providing S with a minority stake, the founder can implement any policy involving N's management. Among all policies involving S's management, the founder always prefers a simple bequest to S. This follows because, conditioned on S managing the firm, increasing S's ownership share always increases both total value and the payoff to S. Thus, increasing S's ownership always increases the founder's welfare. Since the firm will choose the first-best level of effort when S is the sole owner and manager, and thus set $p = x_S/k$, the total value of the firm when S is the sole manager and owner, v^S, and the payoffs to S and N are given by

$$v^S = \frac{x_S^2}{2k}, \quad v_S^S = \frac{x_S^2}{2k}, \quad v_N^S = 0.$$

We claim that whenever the founder's preferred policy is S's ownership and management, S will in fact not choose to hire N to manage the firm. For S to prefer hiring N to managing the firm himself subsequent to a simple bequest, it must be the case that $u_F^S \geq u_F^N(p_S^N)$; using the utility functions provided by equation (3), we see that this inequality is equivalent to

$$v_S^S > v^N(p_S^N) - (1 - \frac{h_N}{h_S})\, v_N^N(p_S^N).$$

By relative founder benevolence, this implies that

$$v_S^S > v^N(p_S^N) - (1 - h_{NS})\, v_N^N(p_S^N),$$

which implies that $u_S^S \geq u_F^S(p_S^N)$. Hence, whenever the founder's optimal policy is for is a simple bequest to S, S will manage the firm himself. Combining all the cases considered thus far, we note that using a combination of control bequests and noncontrolling ownership bequests to N the founder can always implement any allocation of value between S and N that satisfies effort incentive compatibility.

Proposition 8. *When the founder is free to divide control and cash flow rights in any way the founder sees fit, and the benevolence condition is satisfied, then the founder, perhaps by combining the allocation of control with an allocation of a noncontrolling interest to the closer relative, S, can implement posthumously her preferred incentive compatible allocation.*

8.3.2 Primogeniture restrictions

As we have seen, when founder bequests are unrestricted, founders can implement their preferred outcomes through either a simple bequest to S or by bequeathing control to N and a noncontrolling share to S. However, in practice, bequests are restricted in most legal jurisdictions. These restrictions limit the ability of founders to prefer distant over close relatives.[15] Moreover, even when bequests are unre-

[15] For a complete discussion of the restrictions on inheritance see Ellul, Pagano, and Panunzi (2010)

stricted, rules regulating security design, e.g., laws that prevent the separation of cash flow and control rights, might block some bequests. It is not possible to model all possible bequest restrictions. So, we will consider a simple, and rather classic restriction—primogeniture. Under primogeniture, control of the family business must pass to the closest relative, S, but a noncontrolling stake can be passed to N. S will then exercise his control rights either by hiring N to manage the firm or by managing the firm himself. Our formulation of inheritance restrictions as primogeniture restrictions imposes a fairly weak restriction on bequests. It simply requires that control of family business be handed down to the closer relative without restricting the ability of the founder to pass cash flow rights to more distant relatives. Thus, if we can identify welfare costs from our primogeniture restriction, stronger inheritance restrictions, which might, for example, also restrict cash flow transfers to distant relatives, will also entail welfare costs.

In this framework, the founder's flexibility is limited to choosing the noncontrolling stake to assign to N. The key effect of bequeathing noncontrolling ownership to N has is its effect on N's compensation as determined by the negotiations between S and N. N's compensation is affected by N's noncontrolling stake because this stake affects the payoff to N if N rejects an employment offer made by S. After N's rejection, S will manage the firm with N receiving a payment proportional to his noncontrolling ownership stake. As in the previous section, we can specify this stake simply as the payment, o, received by the noncontrolling owner when the firm's cash flow equals x_S.

Noncontrolling bequests to N are aimed only at increasing the bargaining power of N in negotiations with S. The founder will only make such bequests when the founder anticipates that S will hire N to manage the firm. This follows because a noncontrolling state held by N when S manages the firm lowers firm value through agency conflicts caused by divided ownership. Because both total firm value and S's payoff will be lower when S manages and N holds a noncontrolling stake than they would be if S were the sole owner, the founder's bias toward S ensures that the founder prefers a simple bequest to S over S's management and divided ownership.

Because of the founder's relative benevolence and because greater managerial bargaining power leads to greater total firm value, granting N a noncontrolling stake to use as a bargaining chip in employment negotiations may increase the founder's utility. However, as we will show, bequests of noncontrolling stakes to N are a much less effective mechanism for implementing founder-preferred allocations than direct control allocations to N. The problem with noncontrolling stakes is that they affect payoffs only through their ability to increase N's' reservation demands. However, N's reservation demands depend on the payoff that N would have attained as a noncontrolling owner under S's control. When S is sufficiently incompetent, N's reservation value from a noncontrolling stake is too low to affect employment negotiations. In this case, a noncontrolling stake cannot implement founder preferences and thus, primogeniture restrictions, by frustrating the founder's benevolent dispositional preferences, cause significant welfare losses.

To initiate the analysis, first consider the reservation payoffs to S and N. These payoffs are realized if N rejects a compensation proposal of S and thus S manages the firm. Given a noncontrolling stake of o for N, if S manages the firm himself, he will receive $x_S - o$ with probability p and 0 with probability $1-p$. Following the development in Section 8.1, S will pick p to maximize the kinship weighted average

of his payoff and N's payoff. This yields an optimal effort level for S conditioned on the noncontrolling stake o defined as follows.

$$p_S^S(o) = \frac{x_S - (1 - h_{NS})\, o}{k}. \tag{52}$$

The payoffs to the firm under S's management determine the utility to N of rejecting S's employment offer. The definition of N's utility given by equation (45) and S's optimal effort choice, given by (52), yields the utility to N from rejecting an employment offer from S, $u_N^{\text{Rej.}}$, which is defined below:

$$u_N^{\text{Rej.}}(o) = o\, p_S^S(o) + h_{NS}\left(p_S^S(o)(x_S - o) - \frac{1}{2}k{p_S^S(o)}^2\right) = \frac{(x_S - (1 - h_{NS})\, o)\left(\left(2 - h_{NS} - h_{NS}^2\right) o + h_{NS} x_S\right)}{2k}. \tag{53}$$

The utility of S, given that S picks effort level $p_S^S(o)$, is given by

$$u_S^{\text{Rej.}}(o) = \frac{(x_S - (1 - h_{NS})\, o)^2}{2k}.$$

$u_N^{\text{Rej.}}$ is maximized at

$$o^+ = \frac{x_S}{(1 - h_{NS})\,(2 + h_{NS})}. \tag{54}$$

Raising o above o^+ lowers the reservation demands of N and thus cannot strengthen N's bargaining position. Thus, when searching for an optimal level of noncontrolling ownership, we can restrict attention to $o \in [0, o^+]$.

Now consider the effort decision of N, if N agrees to accept a payment of w in exchange for surrendering his noncontrolling ownership stake in the firm to S, then N's utility will be given as follows:[16]

$$p\left((w + h_N S(x_N - w)) - \frac{1}{2}kp^2\right) + (1 - p)\left(-\frac{1}{2}kp^2\right). \tag{55}$$

Differentiating expression (55) with respect to p shows that the first-order condition for an optimal choice of p can only be satisfied if

$$w = \frac{kp - h_{NS} x_N}{1 - h_{NS}}. \tag{56}$$

The utility of the owner, S is given by

$$p\,(x_N - w) + h_N S\left(pw - \frac{1}{2}kp^2\right). \tag{57}$$

Substituting the effort incentive compatibility function (56) into expressions (57) and (55) yields the utility and payoffs of the owner and manager, conditional on S hiring N to manage the firm. We represent the utility and payoffs of S under N's management with $u_S^n(p)$, and $v_S^n(p)$ respectively and represent the

[16] Of course, it would, in practice, be more usual for N to receive a payment, say a, in addition to his ownership stake for managing the firm. However, a dollar from compensation has exactly the same incentive effect as a dollar from noncontrolling ownership. Thus, to simplify exposition and make as obvious as possible the parallel between our analysis in this section and the analysis in the earlier sections of the paper, we represent the total payment to N as w rather than $a + o$.

utility and payoffs of N under N management with $u_N^n(p)$ and $v_N^n(p)$ respectively.

$$u_S^n(p) = (2+h_{NS})\, p \left(\frac{(1+h_{NS})}{(2+h_{NS})} x_N - \frac{1}{2} kp \right), \tag{58}$$

$$v_S^n(p) = \frac{p\,(x_N - p\,k)}{1-h_{NS}}, \tag{59}$$

$$u_N^n(p) = \frac{kp^2}{2}, \tag{60}$$

$$v_N^n(p) = \frac{p\,((1+h_{NS})\,kp - 2h_{NS}x_N)}{2\,(1-h_{NS})}. \tag{61}$$

If S is bequeathed control, and S decides to attempt to hire N, S makes a first-and-final offer to N. Because of the monotone relation between compensation and p, we can think of this offer as being a proposed uptick probability that fixes a compensation level rather than a compensation level that fixes an uptick probability. Thus, we can express S's compensation determination problem as

$$\max_{p\in[0,1]} u_S^n(p) \quad \text{s.t. } u_N^n(p) \geq u_N^{\text{Rej.}}(o). \tag{62}$$

Now consider the unconstrained solution to problem (62). Simple calculus shows that the unconstrained solution chosen by S is given by

$$p_S^n = \frac{(1+h_{NS})\,x_N}{(2+h_{NS})\,k}. \tag{63}$$

The first-best level of effort, which maximizes the total value, is given by

$$p_{\text{fb}}^n = \frac{x_N}{k}.$$

By the assumption that the founder's preferences are relatively benevolent, the founder has no incentive to implement an uptick probability less than p_S^n. This follows because implementing an uptick probability above the first-best would lower total payoffs as well as lower S's payoff relative to first-best. Thus, we restrict attention to $p \in [p_S^n, p_{\text{fb}}^n]$. If the constraint in problem (62) binds, i.e., $u_N^n(p_S^n) < u_N^{\text{Rej.}}(o)$, then because N's utility is strictly increasing in p and S's utility is strictly decreasing in $p > p_S^n$, S, conditioned on hiring N, will increase p to a level where constraint is exactly satisfied. If, at this p, S is weakly better off hiring N rather than managing the firm himself, then, given o, hiring N is incentive compatible. Thus, we will say that $o > 0$ implements uptick probability p_o if (a) $u_N^n(p_o) = u_N^{\text{Rej.}}(o)$ and $u_S^n(p_o) \geq u_S^{\text{Rej.}}(o)$. Next note that equation 3 and equation (4) imply the following conditions for implementation:

$$u_N^n(p_o) = u_N^{\text{Rej.}}(o),$$
$$v^n(p_o) \geq v^{\text{Rej.}}(o).$$

The reservation-demand increase generated by a noncontrolling stake depends on the payoff to N from rejecting S's offer. This payoff depends on the value of the firm under S's control and management. Only if S is sufficiently competent will N's reservation demands be increased by a noncontrolling stake sufficiently to affect N's negotiated compensation.

Proposition 9. *Under primogeniture restrictions it is not possible for the founder to implement, through bequest, an uptick probability in excess of S's optimal choice if the value of the firm under S's management is sufficiently small, i.e.,*

$$\frac{x_S}{x_N} \leq \frac{1}{\sqrt{2+h_{NS}}}. \tag{64}$$

Proof. N's reservation value is maximized when $o = o^+$. Thus, if, even when the founder bequeaths a minority state equal to o^+, it is still the case that the utility to N from rejecting S's employment offer at the S's preferred terms, $p = p_S^N$, is no greater than N's utility from accepting S's preferred terms, a minority stake cannot implement any p in excess of $p = p_S^N$. Thus, implementation of any uptick probability in excess of p_S^N is not possible if

$$u_N^{\text{Rej.}}(o^+) \leq u_N^n(p_S^N) \tag{65}$$

Expression (64) is an algebraic simplification of (65) using (54), (63), (60), and (53). □

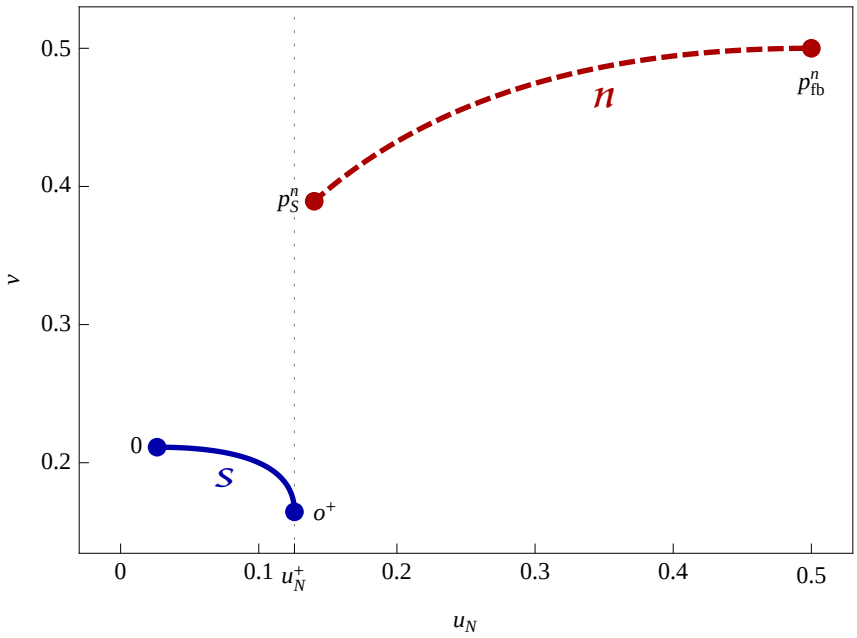


Figure 8: When S's ability is so low that a noncontrolling stake held by N has no effect on firm policies.

The necessity of condition (64) for using bequests under primogeniture to increase the uptick probability is illustrated in Figure 8. In the figure, $\mathcal{S}$ represents the curve in u_N–v space traced out by varying the noncontrolling ownership stake of N from 0 to o^+ under the assumption that the firm is managed by S. We see that increasing N's noncontrolling ownership stake increases N's utility conditioned on rejecting S's employment offer and thus increases his reservation demands. $\mathcal{N}$ represents the curve in u_N–v space traced out by varying p from S's unconstrained choice, p_S^n, to the first-best choice,p^{fb}, under the assumption that S delegates management to N. As p increases, both the utility of S and the total

payoff increase. Implementation requires that the noncontrolling stake affects either the compensation or delegation policy of S when S is bequeathed controlling ownership. However, as Figure 8 shows, even the highest reservation payoff for N that noncontrolling ownership can induce, given by u_N^+, is less than the payoff produced by S's unconstrained compensation choice, p_S^n. In this case, the output of the firm under S's management is so low that the payoff to N from being a noncontrolling owner with S managing the firm is so low that the threat to opt for this payoff does not improve N's bargaining position.

9 Directions for future research

This paper is a first attempt to integrate intra-family altruism into the corporate finance paradigm. Since corporate finance theory is a very rich and well-developed field of intellectual inquiry, the scope of a single research paper cannot hope to extract all, or even all of the important implications of kin altruism. In fact, even listing all of the interesting directions in which this analysis might be extended is not an easy task. However, I will try to map out a few paths for future exploration.

The extension that is closest to the current model development but probably not the most interesting is relaxing the assumption that owners have all bargaining power in compensation negotiations. To understand the effect of reallocating bargaining power, first consider the effect of a complete reversal of the baseline model assumptions, i.e., grant all the bargaining power to the manager. In this case, because the skills required to run the firm are manager-specific, the owner's reservation payoff is 0. Thus, if all bargaining power were to be assigned to the manager, the manager would be able to capture the entire payoff from the project. The family manager would in essence become the family owner/manager and family ownership would be resolved into a sole proprietorship. Thus, just as in the standard principal–agent model with unrelated agents, reversing the bargaining power would eliminate the agency problem and lead to the first-best solution. A non-trivial division of bargaining power that modeled bargaining using a standard efficient bargaining model (e.g., Nash bargaining solution) between the owner and manager would lead to a solution intermediate between the solution in the baseline model and the first-best solution, with the solution approximating the baseline model when the manager's bargaining power was small and approximating first-best solution when the manager's bargaining power was large. Since this is the same result that the standard non-kinship principal–agent models yield, from the perspective of theory, it is not a very exciting extension. However, such an extension would produce a perhaps important, but not very surprising empirical implication—increasing managerial bargaining power reduces the effect of kinship on value. However, as long as the manager has insufficient bargaining power to capture all of the firm's cash flows, a manager–owner monitoring problem would remain and this problem would be affected by kinship.

This paper has deliberately focused on self-contained family firms in which both capital and labor are provided by family members. This seems like a logical first step in the analysis of the effect of kinship on governance and value. Focusing on the self-contained family firm has the advantage of isolating the problems of family firms *qua* family firms from the more general governance questions surrounding small capital-constrained firms administered by managers with firm-specific human capital. However, the analysis of the self-contained family firm is just a first step in addressing the effects of kinship on

economic activity. Most large family firms, especially in more developed economies, use a mix of family and non-family labor and capital. Thus, the next step in this analysis should be to analyze the effect of kinship on the family firm's use of external labor and capital markets.

The most obvious motivation for accessing external capital is capital constraints. In this paper, the family firm's investment in the project is made by the family and thus the project is fully owned by the family. If the family firm were capital constrained, it would have to resort to external capital to finance investment. If this capital was passive and thus the family owner retained the controlling interest, then external capital would both (a) reduce the manager's effort incentives and (b) the owner's monitoring incentives. Effect (a) is specific to family firms while effect (b) is a general agency cost of external finance. Hence, external finance would be even more costly for family firms than other capital-constrained firms. This wedge between the cost of inside and outside capital would lead to even more severe underinvestment incentives for family firms than those faced by non-family capital-constrained firms.

In contrast to passive external capital, active external capital capable of monitoring management, e.g., private equity capital, might be employed by family firms even in the absence of capital constraints. When monitoring is costly kinship can increase expected monitoring costs. Thus, delegating monitoring to an external (to the family) agent may increase value by increasing monitoring credibility. Delegation requires that outsiders be given sufficient ownership stakes to monitor and this increase in external ownership has two effects on managerial incentives. (i) Outside ownership attenuates the family manager's incentive to provide effort and (ii) it reduces the potency of the loyalty holdup because part of the loss caused by the failure to operate is absorbed by extra-family parties. (i) causes an efficiency loss but (ii) simply transfers value to the owner. In the dark-side scenario, effect (i) is turned off. Thus, the potential value gains from injections of active external capital are greatest in this setting. In this case, family owners would have an incentive to sell family firms to active external financiers in order to capitalize the increase in total value accruing from eliminating kinship's adverse effect on monitoring.

Access to external labor markets would also affect the governance of family firms. In this paper, the family firm's project requires firm-specific human capital only possessed by family members. If general human capital provided by professional managers were substituted for firm-specific human capital, family owners would need to decide whether to operate the firm with kin-managers or outside professional managers. Even in cases where family firms did not hire professional managers, the option to higher a professional manager would reduce the loss to the family from the family manager rejecting an employment offer from the family owner. This effect would reduce the power of the loyalty holdup and thus increase the bargaining power of the family manager. As discussed above, increasing the bargaining power of the family manager increases efficiency. Thus, the presence a pool of professional managers would increase the efficiency of family firms.

Appendix

Proof of Proposition 2. The proof is straightforward and follows from explicit computation. By inspection, we see that $p \to w_M^*$ is increasing and thus order preserving. Substitution of expression (26) into the function w_M^*, defined by equation (22), thus yields

$$w_O^* = w_M^*(p_O^*) = w_M^*\left(\max\left[0, \min\left[\frac{(h+1)\bar{x}}{(h+2)k}, \bar{p}\right]\right]\right) =$$
$$\max\left[w_M^*(0), \min\left[w_M^*\left(\frac{(h+1)\bar{x}}{(h+2)k}\right), w_M^*(\bar{p})\right]\right] = \max\left[\min\left[\bar{x}\frac{1-h^2-h}{2-h^2-h}, \frac{k\bar{p}-h\bar{x}}{1-h}\right], 0\right]. \quad \text{(A-1)}$$

Now consider firm value, which equals $p_O^*(\bar{x} - w_O^*)$. Because w_O^* is weakly decreasing in h and strictly decreasing at $p_O^* \in (p_0, \bar{p})$ and (p_O^* is weakly increasing and strictly increasing at $p_O^* \in (p_0, \bar{p})$ we see that the assertion regarding firm value is true. Next, consider the manager's value, given by

$$p_O^* w_M^*(p_O^*) - 1/2 k {p_O^*}^2. \quad \text{(A-2)}$$

Consider the function Γ defined by

$$\Gamma : p \to p w_M^*(p) - 1/2 k p^2. \quad \text{(A-3)}$$

From (A-2) we see that the manager's value is given by $\Gamma[p_O^*]$. Moreover Γ is increasing for $p \geq p_0$ and thus order preserving. Hence, the manager's value is given by

$$\Gamma[p_O^*] = \Gamma\left(\max\left[p_0, \min\left[\frac{(h+1)\bar{x}}{(h+2)k}, \bar{p}\right]\right]\right) = \max\left[\Gamma(p_0), \min\left[\Gamma\left(\frac{(h+1)\bar{x}}{(h+2)k}\right), \Gamma(\bar{p})\right]\right]. \quad \text{(A-4)}$$

Applying the definition of Γ and p_0^* given by equations (A-3) and (26) respectively yields

$$\max\left[-\frac{h^2\bar{x}^2}{2k}, \min\left[\frac{(1+h)\left(1-2h-h^2\right)\bar{x}^2}{2(2+h)^2k(1-h)}, \frac{\bar{p}((1+h)kp-2h\bar{x})}{2(1-h)}\right]\right]. \quad \text{(A-5)}$$

The component functions of (A-5) are all weakly decreasing in h and all components except the 0 term are strictly decreasing. Thus, the manager's value is weakly decreasing in h and strictly decreasing whenever compensation is positive. □

Proof of Proposition 3. Managerial compensation, when the limited liability constraint is not binding, i.e., $w_M^* > 0$, is given by (33). The expression in (33) is a rational function without an zero in the denominator within the acceptable range of parameters. Thus, the function is smooth. Rather straightforward, but very tedious, differentiation and simplification of this function shows that when $w_M^* > 0$

$${w_M^*}'(h) = -\frac{(\bar{p}\bar{x} - v_R)\left(\left((1-h)^2(\bar{x}-c) + 2c(1-h)\right)(\bar{p}\bar{x}-c) + c^2\right)}{(1-h)^2(ch+(1-h)\bar{p}\bar{x})^2}. \quad \text{(A-6)}$$

Because ${w_M^*}'$ is negative and decreasing the result follows for the case of $w_M^* > 0$. Since w_M^* is a continuous non-negative function of h and is decreasing whenever $w_M^* > 0$, w_M^* is weakly decreasing for all

$h \in [0, 1/2]$. □

Proof of Proposition 4. To prove (a), let M_+ represent the equilibrium probability of monitoring conditioned on the equilibrium level of compensation when compensation is positive, i.e.

$$M_+ = m^*(w_M^*), \quad w_M^* > 0 \tag{A-7}$$

Let let M_0 represent the equilibrium probability of monitoring conditioned on the equilibrium level of compensation when compensation is 0, i.e.,

$$M_0 = m^*(w_M^*), \quad w_M^* = 0. \tag{A-8}$$

The equilibrium monitoring probability, m^*, is then given by M, which defined by

$$m^*(w_M^*) = \begin{cases} M_+ & \text{if } w_M^* > 0, \\ M_0 & \text{if } w_M^* = 0. \end{cases} \tag{A-9}$$

To find the explicit form of M_+, substitute the equilibrium compensation when compensation is positive, defined in expression (34), into the probability of monitoring a report of 0 given the equilibrium compensation, defined by (16). This yields

$$M_+(h) = \frac{\bar{p}\,\bar{x} - v_R}{c\,h + (1-h)\,\bar{p}\,\bar{x}}. \tag{A-10}$$

Differentiating this expression with respect to h yields

$$M'_+(h) = \frac{(\bar{p}\,\bar{x} - v_R)(\bar{p}\,\bar{x} - c)}{(c\,h + (1-h)\,\bar{p}\,\bar{x})^2} > 0. \tag{A-11}$$

This establishes (a). To prove (b), first note that the total probability of monitoring equals the probability that the manager reports 0 times the probability that the owner monitors a report of 0. Thus the total probability of monitoring is given by

$$m^*(w_M^*)\,(1 - \bar{p}\,(1 - \sigma^*)).$$

where σ^* is defined by (16). As shown in Proposition (1), σ^* is increasing in kinship. As shown by (b), M is increasing when $w_M^* > 0$. Hence, the result is established for the case of $w_M^* > 0$. Proposition 1 shows that for any fixed compensation level, and thus for $w = 0$, the total probability of monitoring is increasing. Now consider (c). First note that the total family value of the is equal the expected operating cash flow, $\bar{p}\,\bar{x}$ less expected monitoring costs. Thus, total family value is given by

$$\bar{p}\bar{x} - c\,m^*(w_M^*)\,(1 - \bar{p}\,(1 - \sigma^*)). \tag{A-12}$$

Thus, the fact that the probability of monitoring is increasing in kinship implies that the expected cost of monitoring is increasing in kinship. Since kinship does not affect expected operating cash flows, $\bar{p}\bar{x}$,

and increases monitoring costs, it must decrease family value. □

Proof of proposition 5. Let $\bar{h}$ be defined as follows:

$$\bar{h} = \max\{h \in [0, 1 - c/(\bar{p}\bar{x})] : w_M^*(h) \geq 0\}. \tag{A-13}$$

After considerable algebraic simplification, we can express the value of the family firm as a function of h, restricted to the domain $[0, \bar{h}]$ as follows:

$$v_O^*(h) = (\bar{p}\bar{x} - v_R)\frac{\mathbf{N}(h)}{\mathbf{D}(h)}, \tag{A-14}$$

$$\mathbf{N}(h) = \left(\left(c^2 + (1-h)\bar{x}(\bar{p}\bar{x} - c)\right) - \frac{c^2}{1-h}\right), \tag{A-15}$$

$$\mathbf{D}(h) = ((1-h)\bar{x} - c)(hc + (1-h)\bar{p}\bar{x}). \tag{A-16}$$

The functions, $h \hookrightarrow \mathbf{N}(h)$ and $h \hookrightarrow \mathbf{D}(h)$ are both positive under the assumptions given in (29) and (30). The term $\bar{p}\bar{x} - v_R$ is a positive and constant in h and thus can be ignored in the subsequent derivation. Because the functions **N** and **D** are smooth over their domain, and the second derivative of **N** is negative while the second derivative of **D** is positive, $\mathbf{N}(\cdot)$ is strictly concave and $\mathbf{D}(\cdot)$ is strictly convex. To establish quasiconcavity, suppose that

$$\frac{\mathbf{N}(h)}{\mathbf{D}(h)} > \frac{\mathbf{N}(h')}{\mathbf{D}(h')}. \tag{A-17}$$

Rearranging (A-17) produces

$$\mathbf{N}(h) - \mathbf{D}(h)\frac{\mathbf{N}(h')}{\mathbf{D}(h')} > 0. \tag{A-18}$$

The left hand side of (A-18), viewed as a function of h with h' fixed is strictly concave as it is the difference between a strictly concave function and a strictly convex function multiplied by a fixed constant. Thus for any $\lambda \in (0,1)$

$$\begin{aligned}&\mathbf{N}(\lambda h + (1-\lambda)h') - \mathbf{D}(\lambda h + (1-\lambda)h')\frac{\mathbf{N}(h')}{\mathbf{D}(h')} > \\ &\lambda\left(\mathbf{N}(h) - \mathbf{D}(h)\frac{\mathbf{N}(h')}{\mathbf{D}(h')}\right) + (1-\lambda)\left(\mathbf{N}(h') - \mathbf{D}(h')\frac{\mathbf{N}(h')}{\mathbf{D}(h')}\right) = \lambda\left(\mathbf{N}(h) - \mathbf{D}(h)\frac{\mathbf{N}(h')}{\mathbf{D}(h')}\right) > 0.\end{aligned} \tag{A-19}$$

where the last equality follows from the hypothesis, equation (A-17). Thus,

$$\frac{\mathbf{N}(\lambda h + (1-\lambda)h')}{\mathbf{D}(\lambda h + (1-\lambda)h')} > \frac{\mathbf{N}(h')}{\mathbf{D}(h')}, \forall \lambda \in (0,1). \tag{A-20}$$

The fact that (A-17) implies (A-20) implies strict quasiconcavity over $[0, \bar{h}]$. The value function is strictly decreasing over $h \in [\bar{h}, 1/2]$, and is continuous at $\bar{h}$. Thus, the value function is strictly quasiconcave over the entire range of h, $[0, \bar{h}]$.

Because the function is quasiconcave in h, the necessary and sufficient condition for the value function to have a maximum over $(0, \bar{h}]$ is for the derivative of the value function is positive at $h = 0$. The left-hand side of (36) and (37) , has the same sign as the derivative of v_O evaluated at $h = 0$. □

Proof of Proposition 6 . The manager's value is the maximum of the manager's value when the limited liability constraint binds, i.e., $w = 0$ and manager's value when the reservation constraint binds. The maximum of strictly quasiconvex functions is strictly quasiconvex. The manager's value is clearly increasing in h on the limited liability constraint. Thus, we only need to show that the manager's value is quasiconvex when compensation is determined by the reservation constraint. To see this, note that, the manager's value when the manager's value is determined by the reservation constraint, which we represent by v_M^p, can be simplified to obtain

$$v_M^p(h) = \bar{p}\bar{x} - (\bar{p}\bar{x} - v_R)\,\mathbf{F}(h), \tag{A-21}$$

$$\mathbf{F}(h) = \frac{\mathbf{N}(h)}{\mathbf{D}(h)}, \tag{A-22}$$

$$\mathbf{N}(h) = \frac{(1-h)^2\,\bar{p}\bar{x}(\bar{x}-c) - c^2 h}{(1-h)\bar{x} - c}, \tag{A-23}$$

$$\mathbf{D}(h) = (1-h)\,(c\,h + (1-h)\,\bar{p}\bar{x}). \tag{A-24}$$

Next note that $\mathbf{N}$ is strictly concave and positive and $\mathbf{D}$ is strictly convex and positive. Thus using an argument identical to the one used in the proof of Proposition 5 we can verify that $\mathbf{F}$ is quasiconcave. Because $\mathbf{F}$ is quasiconcave and the term multiplying $\mathbf{F}$ in equation (A-21) is negative and constant in h, we see, from inspecting (A-21) that v_M^p is quasiconvex.

Next note that when $h = 0$ the reservation constraint binds so

$$v_M^p(h) - v_M(0) = v_M^p(h) - v_M^p(0) = v_M^p(h) - (k + v_R). \tag{A-25}$$

Using the representation of v_M^p given in (A-21) we obtain,

$$v_M^p(h) - (k + v_R) = (1 - \mathbf{F}(h))\,(\bar{p}\bar{x} - v_R). \tag{A-26}$$

By the parametric restrictions imposed in (7) we see that $\bar{p}\bar{x} - v_R > 0$, because $\mathbf{F}$ is less than 1 over the region of admissible parameters,

$$(1 - \mathbf{F}(h))\,(\bar{p}\bar{x} - v_R) > 0. \tag{A-27}$$

Combining (A-26) and (A-27) shows that

$$v_M^p(h) < v_M(0), \quad h \neq 0. \tag{A-28}$$

Because v_M is quasiconvex in h, it attains is maximal value on the extreme points of its domain. These extreme points are $h = 0$ and $h = \min[1/2, 1 - c/(\bar{p}\bar{x})]$. If the reservation constraint binds at $1 - c/(\bar{p}\bar{x})$ we have shown that this point cannot be a maximizer of v_M. Thus, the maximal value of v_M is attained either at $h = 0$ or the at $h = \min[1/2, 1 - c/(\bar{p}\bar{x})]$ and in this case the reservation constraint is not binding. Next, consider the sufficient conditions for an internal minima. When $\bar{p}\bar{x} - v_R - c$ is sufficiently close to 0, the reservation constraint is always binding at all admissible h If we differentiate v_M and evaluate

the derivative where $(1-h)\,\bar{p}\,\bar{x}-c=0$ we find the derivative is given by

$$(\bar{p}(3-\gamma)-1)\,\frac{(\bar{p}-v_R)\,(1-\gamma)}{(1-\bar{p})\,(2-\gamma)^2\,\gamma^2}. \tag{A-29}$$

This term must be positive for an interior minimum to exist. Since the fraction in (A-29) is always positive the necessary and sufficient condition for (A-29) to be positive is that $\bar{p}\,(3-\gamma)-1)>0$ which is a condition given in the proposition. □

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