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-owned/family-managed firms based on kin altruism (Hamilton, 1964). Family members weigh the payoffs to relatives in proportion to relatedness. The theory shows that family ownership and management entails both costs and benefits. Kin altruism makes relatives soft monitors. This leads to a "policing problem" within family firms. This policing problem results in both increased managerial diversion and increased monitoring costs at fixed compensation levels. Relatedness has conflicting effects on managerial compensation, efficiency, and firm value. On the one hand, owners are more willing to concede rents to family managers to increase collective family payoffs. On the other hand, because family managers internalize the costs to the family from their rejection of owner demands, relatedness also lowers managers' reservation compensation demands. When incentive constraints bind, increasing kinship always increases the efficiency of the family firm under family management but, in some cases, does not increase firm value and may also promote nepotistic hiring. When the participation constraint binds, kinship lowers efficiency but may raise firm value and does not induce nepotism. Regardless of which constraint binds, introducing passive external capital into the family firm lowers the payoff and utility of owners and raises the payoff and utility of managers. When the family firm is created by the bequest of a founder, under very weak restrictions, the calculus of relatedness implies that the founder is more altruistic toward descendant managers than the descendant owner. This higher degree of altruism may create incentives for founders to design complex bequests.

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, and Walmart. Moreover a number of very large firms are controlled, managed, and wholly or almost wholly owned, by members of a single family, e.g., Koch Industries and Cargill in the U.S., Esselunga S.p.A and Parmalat Finanziaria S.p.A. in Italy. In fact, even using the most narrow definition of "family firm," one that restricts the scope of family firms to those firms where multiple family members are involved with management and succession is dynastic, Astrachan and Shanker (2003) estimate that more than 30% of US GNP is contributed by family firms.

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, firms where ownership and management are separated but both are in the hands of members of the same family, 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., their 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]

[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 on 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

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, its empirical predictions have be validated by numerous studies of human behavior.[2]

The key characteristics of kin altruism based on the Hamilton's concept of inclusive fitness, are that altruism is stable over time, symmetric, limited, and restricted by the calculus of genetic relationship. The bonds of relation are stable because the degree of kinship between two agents is constant over their life span. Kin altruism is symmetric because they are derived from a relatedness which is a symmetric relation in diploids such as humans.[3] 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. 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.

The key hypothesis underlying this paper is that kin altruism is a distinguishing feature of family firms. As we discuss in detail in Section 8.3, it is certainly plausible, although not uncontroversial, to posit non-kinship based altruism bonds that mimic most aspects of kin altruism. The presence or absence of other forms of altruism is not crucial to the validity of our predictions because the contrasts we draw between family and non-family firms depend only on the assumption that, because of kin altruism, on average, relationships between kin exhibit significantly higher overall levels of altruism than relationships between non kin. The consensus in the psychology and evolutionary psychology literature supports this assumption. The analysis in this paper should also not be taken as arguing that altruism should only be incorporated into models of agents who are biologically related.[4] Our aim is simply to study the effect of kin control and management on firm behavior by considering an obvious difference between kin and non-kin firms, genetic relatedness, and using the most well-established and researched consequence of relatedness for behavior, kin altruism. The question of whether the bonds between agents in social networks are best modeled by altruism or some other paradigm (e.g., reciprocal exchange, repeated game) is an interesting question but outside the scope of this paper.

We introduce kin altruism into a principal/agent model of effort, monitoring, and diversion. The effort model is quite standard, i.e., managerial effort affects the distribution of project cash flows and is only observed by the manager. Cash flows are also only observed by the manager unless the owner incurs a non-pecuniary monitoring cost. Thus, the monitoring model closely resembles a standard costly

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inclusive fitness, e.g., neighbor-modulated fitness (West and Gardner, 2013).

[2]For example, Madsen, Tunney, Fieldman, Plotkin, Dunbar, Richardson, and McFarland (2007) provides experimental evidence that agents' willingness to bear costs to benefit other agents is monotonically increasing in kinship. 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).

[3]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.

[4]For examples of interesting models that develop altruism based on internalization of other (non-necessarily related) agents welfare, see Lee and Persson (2010) and Lee and Persson (2012)

state verification model, for example Townsend (1979). However, in contrast to most state-verification models, the owner cannot commit to monitoring.

We analyze the model by first considering monitoring and reporting policy at fixed compensation and effort levels. Next, we endogenize compensation and effort. We ask two sorts of questions. First, how does kinship altruism affect the internal workings of the family firm, i.e., how does kinship altruism affect monitoring, effort compensation, value generation, and the division of value between owners and managers? Second, we ask how kinship altruism affects the interaction between the family firm and external environment, i.e., the willingness of the firm to hire external managers and raise external capital. Finally, because we aim to model firms where ownership and management are divided between different agents in the same family, and because the stereotypical origin of such firms is a bequest by a firm founder to descendant relatives, we consider how kin altruism affects bequest decisions.

A basic insight of this analysis is that, at fixed compensation and effort levels, increasing kinship always increases both the likelihood of monitoring and monitoring expense. Because kinship reduces the incentive of the family owner to monitor the family manager, kinship generates a "policing problem" This effect increases the threshold level of managerial underreporting required to make the owner's monitoring threat credible. Reduced credibility of monitoring leads to more underreporting and thus, a higher equilibrium probability of monitoring as well as greater monitoring expense. Moreover, The policing problem is highly convex in the degree of kinship, i.e., the effect of kinship on monitoring expense is fairly small at low levels of kinship but the adverse effect of increasing kinship is very large at high levels of kinship. Thus, increasing the kinship between the owner and manager from second to first cousin will have only a negligible effect on monitoring expense while increasing kinship from a half-sibling to full siblings will have a substantial effect. The model's prediction of a positive association between monitoring expense and kinship is consistent with the observations of Bertrand and Schoar (2006) that cooperation between family members is frequently difficult to achieve. These results are also consistent with experimental evidence provided in Barr, Dekker, and Fafchamps (2008) which shows that, although genetic relatedness lowers the cost of group formation, kin altruism does not support enforcement of risk-sharing agreements.[5]

Next, we turn to endogenizing the terms of employment and examine the effects of kinship on compensation and firm performance. The key insight from our analysis is that the welfare effects of family ownership depend on the "frontier" on which managerial compensation is negotiated: the *agency frontier*, along which compensation is fixed by effort incentive compatibility, or the *labor market frontier*, along which compensation is set by the manager's participation constraint. Along the agency frontier, increasing kinship always increases total (manager plus owner) value generated by the family firm when kin-managed but also distorts the hiring decision by increasing nepotism, the owner's willingness to hire less competent kin managers over more competent external candidates. Along the labor market frontier, increasing kinship always reduces total value but does not induce nepotism. In contrast to the production of value, the division of value between owners and managers depends largely on the cost of employing

[5]The effect of kinship on policing opportunism modeled in this paper is, in a more generic and reduced-form framework, also analyzed by evolutionary biologists studying the problem of how "policing strategies," can be favored by natural selection. Ratnieks (1988) finds evidence to support a negative association between relatedness and policing in a comparative study of Bumble bee and Honey bee behavior. Gardner and West (2004) and El Mouden, West, and Gardner (2010) develop theoretical models which show that high levels of relatedness disfavor the selection of policing strategies.

the monitoring technology. When the costs of monitoring are low, kinship gains are captured by owners. In fact, in the labor market setting, owners may gain from increased kinship even though increasing kinship lowers total value. In contrast, when the cost of monitoring are high, kinship gains are captured by managers.[6]

The logic behind the agency results is that the increased policing costs induced by family ownership are always dominated by the higher levels of managerial effort induced by kinship altruism. When the costs of monitoring are low, family ownership may, even at endogenous compensation levels, still lead to increased policing costs. However, in this case, policing costs are second order relative to the effort stimulation engendered by the manager's partial internalization of the gains to firm value produced by effort. When the cost of monitoring is high, family owners adjust managerial compensation upward to reduce the underreporting incentives of related managers and this compensation adjustment reduces both the incentive of the manager to divert and the incentive of the owner to monitor. Increased compensation also improves managerial effort incentives and thus increases total value. However increased compensation per se lowers firm value and, hence, when the cost of monitoring is very high, although the total gain from increased kinship is positive, the value of the firm is reduced. Increasing kinship increases nepotism for the same reasons that it increases value under kin management: When incentive constraints bind, managers earn agency rents, owners prefer kin-rent capture to outsider-rent capture. Thus, family owners will opt for internal managers even when the value gain from external hiring is fairly large. This result is consistent with Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon (2007), which documents a negative effect of intra-family managerial succession.

The logic behind the labor market results is based on two simple consequence of the kinship altruism paradigm: first, kinship altruism is limited and therefore never sufficient to induce a family owner to increase the compensation of the family manager above the manager's reservation demands unless such increases lead to better firm performance. In the labor market setting, the family manager will earn his reservation utility regardless of whether he works inside or outside the family firm. Second, the manager's reservation compensation demands for accepting employment with the family firm depend on the effect on firm value of the manager rejecting the owner's employment offer. The family owner can thus use any firm value loss resulting from the manager's spurning of the owner's employment offer to "hold up" the family manager, i.e., induce the family manager to accept lower compensation from the family firm than the manager would accept from an external employer. The force of this *loyalty holdup* is proportional to the degree to which the family manager is indispensable to the family firm and the degree of kinship between owner and manager. When the loyalty holdup is effective, it drives down the family manager's compensation. Reduced compensation exacerbates the policing problem within the family firm but if monitoring costs are small, the reduced compensation effect dominates and increasing kinship increases firm value even as it lowers total value. The incentive for nepotism is absent in the labor market setting because managerial agency rents are absent. At the same time, the

[6]Interestingly, the importance of the frontier in our model is analogous to results on kin selection in evolutionary biology. If related animals compete only with relatives for a fixed pool of resources, then aiding one relative only harms other relatives: in this case, the force of selection will not favor an altruistic allele. The introduction of an agency problem into the analysis, permits the pool of resources (in our model total value generated by firm) to vary with altruism and thus "opens up a frontier" over which kin altruism can operate. Evolutionary biologists open the fronter using other modeling assumptions (Taylor and Irwin, 2000).

higher the quality of the rival outside manager, the weaker the force of the loyalty holdup. Thus, as the labor market thickens, and close replacements for the family manager become available, the gains from the loyalty holdup converge to 0. Because family ownership lowers total value by exacerbating the monitoring problem, and because, in the labor market setting. there is no counterbalancing effect of kinship on effort, in the limit, the preferences of the family owner become anti-nepotistic. That is, when perfect substitutes for external manager are present, the family owner always prefers to hire external candidates.

Relating these predictions to the existing empirical literature on performance and managerial compensation is difficult for a number of reasons. First, our analysis is focused on wholly family-owned firms, while the empirical literature focuses on publicly-owned family firms. Second, the literature itself reaches conflicting conclusions: 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.[7] Third, the value effects in our analysis include the non-pecuniary costs of managerial effort which, in the agency setting, are higher for family firms because the equilibrium level of managerial effort is higher. We show that because of this non-pecuniary effort cost, it may well be the case that increasing kinship both increases observed compensation and reduces the manager's value. Fourth, our model shows that the effect of kinship on performance is highly conditional while the extant empirical literature seeks to document unconditional effects of kinship on performance and managerial compensation. Our results do, however, suggest a number of testable hypotheses based on the conditional effect we derive. For example, the marginal effect of kinship and both firm performance and managerial compensation should be positively related to the specificity of the human capital required to manage the firm. A second prediction is that the marginal effect of kinship on compensation should be positively related to the costs of the monitoring technology. These costs depend both on the institutional environment (e.g., legal and accounting system) and the cash flow generation technology.

Interestingly, in both the agency and labor market settings, kinship increases marginal cost of passive external capital to the owners of a family firm. This result follows because, in both settings, outside capital improves the bargaining position of managers relative to owners. Family members do not internalize the gains and losses to outside investors. Thus, the manager's incentive to exert increased effort or accept reduced compensation when working for the family firm is reduced by outside ownership. At the same time, the owner's incentive to restrict managerial compensation to protect firm profits is also diminished. Both these effects increase managerial compensation at the expense of owner profits. Rational outside investors anticipate these effects when they price securities issued by the family firm and this makes external finance costly. This result implies that family firm owners will impose higher hurdle rates on new investments requiring external finance than non-family firms and that investment in family firms will be more sensitive to financial slack (which can be measured using financing deficit variable developed by Frank and Goyal (2003)) than investment by non-family firms. To our knowledge, these predictions have not been tested. However Anderson and Reeb (2003) show that family ownership is

[7] 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.

associated with less corporate diversification. If diversifying investments are typically marginal NPV projects, this result is consistent with the model's predictions.

Given that separation of ownership and management is costly and, in some cases, more costly when ownership and management are divided between kin, the question arises as to why the sort of family firm we model would ever be created. One possible origin is a bequest to descendants by a firm founder. We show that bequests generating division between ownership and management are rational in the presence of kin altruism. At the same time, founders sometimes prefer to pass over close relatives and bequest their firm to more distant but more competent descendants. Such bequest decisions are value increasing. This prediction is consistent with the evidence provided by Ellul, Pagano, and Panunzi (2010) which shows that laws that restrict or tax more heavily founder bequests to distant relatives (which are pervasive in non-Anglo-Saxon legal systems) adversely affect firm value. More generally, we show that the calculus of kin relationship implies, under very weak conditions, that founder preferences attach more weigh to total family value than any of the descendant's preferences. Thus, in the presence of agency rents, founders have a preference for granting competent distant relatives higher compensation and more job-security than incompetent direct-descendants will offer. Thus, founders have an incentive to design bequests that permit them to control compensation and hiring policy from "beyond the grave."

2 Model

2.1 Overview

The world lasts for one period, bracketed by dates 0 and 1. All agents are risk neutral and patient. There are two agents in the baseline model: a "family owner" and a "family manager." Sometimes, when there is no risk of ambiguity, will refer to the family owner/manager pair simply as the "owner" and the " manager." The family owner and family manager are kin. 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. Collectively, the family owner and family manager are called "family agents" and the total value received by the family owner and family manager is called "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 baseline model, the family owner hires the family manager by making a first-and-final compensation offer that the family 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. In order to induce the manager to exert effort and accept employment the owner offers the manager an employment contract that satisfies limited liability. Both effort and realized cash flow are observed only by the manager. Thus, neither effort nor the realized cash flow are verifiable or contractible. However, After observing the cash flow, the manager makes a verifiable report of cash flows to the owner. The manager and owner then divide reported cash flow based on the employment contract. After receiving the manager's report, the owner has the option of monitoring. Monitoring imposes a non-pecuniary cost on the owner. Monitoring is perfectly effective in that it always detects and returns to the owner all cash flows in excess of reported cash flow.

3 Specifics

3.1 Preferences

The kin altruism preferences of family agents are reflected in their utility function, u:

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

$$0 \le h \le 1/2. \tag{3}$$

where v^{Self} represents the agent's own value and v^{Relative} represents the relative's value. Value includes both the monetary payoffs and the non-pecuniary costs of effort, in the case of the manager, and monitoring, in the case of the owner. The scalar h represents kinship, the strength of the relation, or family tie, between the family agents. Condition 3 is motivated by the fact that the ½ is the highest degree of relatedness produced by typical mating patterns.[8] An exemplar of the scenario we have in mind is a founder who has bequeathed her firm to her son. The son, who, lacks managerial ability, hires another family member to manage the firm, say a nephew who has worked with the founder and is steeped in the firm's culture and tacit knowledge base. Later, we will discuss how founder kin altruism can rationalize such bequests and hiring decisions. For now, we take the manager–owner dyad as given. 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 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 family value. Using v^{Family}, we can express the utility function of a family agent in the following three forms:

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

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

$$u^{\text{Self}} = h\, v^{\text{Family}} + (1-h)\, v^{\text{Self}}. \tag{6}$$

These reformulations are trivial from a technical perspective but provide crucial insights for the subsequent analysis. Equation 4 shows that when choosing between two outcomes that produce the same family value, the family agent always prefers the outcome that produces a smaller value for the relative. Equation 5 expresses the principle that when choosing between decisions that leave the utility of the

[8] The condition that the degree of kinship between the owner and manager, h, does not exceed ½ is motivated by inclusive fitness, which limits for non-inbreed, non-monozygotic (i.e., non-identical twins) haploids (e.g., humans) kinship to at most ½. This specific boundary for h is not required to establish our results; however, some boundary is frequently required. As kin altruism becomes unlimited, i.e., $h \to 1$, the monitoring problem generated by relatedness vanishes because either (a) the owner concedes all firm value to the manager or (b) managerial effort converges to the first-best level even in the absence of any compensation. Whether (a) or (b) occurs first depends on complex polynomial expressions. Because these cases are not very interesting when altruism is motivated by inclusive fitness, we eschew working out these boundary conditions.

relative fixed, family agents always prefer the choice that is family-value efficient. This principle is analogous to the principle in contract theory that, when all possible decisions of the principle hold the agent to his reservation payoff, the principle makes the efficient value maximizing choice. We will see that the principle embodied by equation 5 imposes profound limitations on the ability of kinship to affect firm behavior. Equation 6, shows that the utility of family members is a weighted average of selfish and family value, with the weight on family value given by h and the weight on self value given by $1-h$.

3.2 Effort

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

$$\tilde{x} = \text{dist.} \begin{cases} \bar{x}, & \text{w.p. } p \\ 0 & \text{w.p. } 1-p \end{cases}. \tag{7}$$

The manager selects $p \in [0, \bar{p}]$, $\bar{p} \in (0,1]$. p represents the probability that the cash flow from the project equals $\bar{x} > 0$. 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 $K(\cdot)$ 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.

3.3 Kinship and monitoring

After the cash flow is generated, the manager observes the cash flow. The cash flow is the manager's private information. After observing the cash flow, the manager sends a message to the owner. This message is observable and verifiable by third parties. We call this message "reported cash flow." We assume that reported cash flow cannot exceed the cash flow. Thus, we can view the report of cash flow as being equivalent to the deposit of the cash flows in an escrow account as in, for example, Harris and Raviv (1995). As in Harris and Raviv, by the revelation principle, we can also assume that report equals either 0 or $\bar{x}$. Cash flows in excess of reported cash flows are termed "unreported cash flows." The owner has access to a monitoring technology. If the owner uses the technology and monitors, the owner incurs a non-pecuniary cost of $c > 0$. We call this cost the "cost of monitoring." The monitoring technology is perfectly effective, it completely returns all unreported cash flows to the owner. If the owner does not monitor, the manager receives all unreported cash flows. In this case, we say that the manager "diverts" cash flows. The owner decides whether to monitor after observing the manager's report. Monitoring cannot be verified by third parties but is observed by both the manager and the owner. Because only reported cash flows are verifiable, contracts must be contingent only on reported cash flows. Contracts are assumed to satisfy limited liability. Thus, when the reported cash flow equals 0, the only feasible limited liability contract stipulates a payment of 0 to both the owner and manager. When the reported cash flow equals $\bar{x}$, feasible contracts stipulate that the manager receives w and the owner receives $\bar{x} - w$, where $0 \le w \le \bar{x}$. We term w "management compensation" or simply "compensation." If the manager reports $\bar{x}$, reported cash flow equals the highest possible cash flow and the owner knows that the report is truthful. In this case, the owner has no incentive to monitor. If the reported cash flow is 0, then it is either the case that (a) the cash flow is, in fact, 0 and the manager reported truthfully or (b) the manager "underreported," i.e., the cash flow equaled $\bar{x}$ and the manager reported 0. If the manager reported 0 when the true cash flow is 0, the unreported cash flow equals 0 and thus monitoring does not benefit the owner. If the manager underreported cash flows, monitoring permits the owner to capture the unreported cash flow of $\bar{x}$. Our model of reporting and monitoring is quite standard and closely tracks the Townsend (1979) model of costly state verification. The major difference is that, in contrast to Townsend, the owner cannot precommit to monitoring. Thus, the question of the renegotiation-proofness of the monitoring decision, which is important in Townsend, is not relevant to our analysis.

3.4 Parameter restrictions

Throughout the analysis, we impose the following parameter restrictions:

$$\max_{p\in[0,\bar{p}]} p\bar{x} - (v_R + K(p) + c) > 0, \tag{8}$$

$$(1-h)\bar{x} - c > 0. \tag{9}$$

(8) 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, (9), implies that the owner's utility benefit from monitoring when the owner knows that the manager has underreported cash flow, 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 when compensation and output are fixed

In this section we treat compensation, w, and effort, and thus the uptick probability, p, as fixed parameters. Thus, there are only two interesting choices we must analyze: the manager's reporting decision when $x = \bar{x}$, and the owner's monitoring decision when the manager reports 0. In later sections, we will endogenize w using the manager's participation or incentive compatibility conditions. 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.

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

$$u_M^{\text{Underreport}} = (1-m)\,\bar{x} + h\,m\,(\bar{x}-c), \tag{10}$$

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

$$u_M^{\text{NotUnderreport}} = w + h(\bar{x}-w). \tag{11}$$

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 (10) and (11), which produces

$$m^* = \frac{(1-h)(\bar{x}-w)}{c\,h + (1-h)\bar{x}}. \tag{12}$$

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 expected 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 portion of manager's payoff that is internalized as specified in (2), is given by

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

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

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

Let σ represent the probability of the manager reporting 0 conditioned on the cash flow being $\bar{x}$. The cash flow distribution (which is given by (7)) and Bayes rule imply that ρ, the probability that the cash flow equals $\bar{x}$ conditioned on a report of 0, is given by

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

4.3 Monitoring/reporting equilibrium

In this section, the uptick probability, p is exogenous. For some choices of p, the solution to the monitoring reporting problem is "trivial," i.e., the solution will call for the owner not to monitor and for the manager to divert the entire cash flow. In subsequent sections we show that the owner will never select compensation policies that produce these trivial solutions. Thus, to focus on solutions to the monitoring reporting game which can be supported by optimal compensation policies, we impose the following parametric restriction:

$$(1-h)\bar{x}\,p > c. \tag{13}$$

Assumption (13) ensures that the uptick probability, p, is sufficiently high to ensure that monitoring is a best reply to a managerial strategy of always 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 (13) ensures that for a sufficiently high probability of underreporting, the owner would monitor. If assumption (13) were not satisfied, then the owner will never monitor and the equilibrium solution would be for the manager to underreport with probability 1. Thus, there is a unique mixed strategy equilibrium in which (4.2), (12) and (4.2) are satisfied. The equilibrium probabilities of underreporting, σ^*, and monitoring reports of 0, m^*, in this mixed strategy equilibrium are given by

$$\begin{aligned}\sigma^* &= \frac{c\,(1-p)}{p\,(\bar{x}(1-h)-c)},\\ m^* &= \frac{(1-h)(\bar{x}-w)}{c\,h+(1-h)\,\bar{x}}.\end{aligned} \tag{14}$$

We see from equation (14) 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 only source of value dissipation in the monitoring/reporting game is *monitoring expense*, the expected cost of monitoring the reporting/monitoring equilibrium. Monitoring expense is simply the probability of monitoring multiplied by the cost of monitoring, c. Thus, the effect of kinship on family value depends on the probability of monitoring. The effect of kinship on the probability of monitoring is more subtle that the other comparative statics: the owner's monitoring decision is made ex post, after a 0 report is observed.[9] 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 underreporting. Because underreporting triggers monitoring, it increases monitoring costs to the owner. Part of this cost increase is internalized by the related manager. Because kinship increases 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 probabil-

[9]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.

ity of diversion required to trigger monitoring increases with kinship. Thus, 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 probability of monitoring. Monitoring occurs if and only if a report of 0 occurs and that report is monitored. Thus, the probability of monitoring is given by $\mathrm{PM}^* = m^*\,(1-p(1-\sigma^*))$. 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

$$\mathrm{PM}^* = m^*(1-p(1-\sigma^*)) = \frac{(1-h)^2(1-p)\bar{x}(\bar{x}-w)}{((1-h)\bar{x}-c)(ch+(1-h)\bar{x})}. \tag{15}$$

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 compensation, w and the uptick probability, p. In this equilibrium, the probability of monitoring zero reports, m^*, and underreporting, σ^* are given by equation* (14). *In the equilibrium,*

a. The probability of underreporting, σ^*, is increasing and convex in kinship, h,

b. The probability of monitoring of zero reports, m^*, is decreasing and concave in kinship, h.

c. The probability of monitoring and hence monitoring expense are both increasing and log convex (a fortiori convex) in kinship, h.

d. The probability of 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 monitoring expense, 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 zero 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. Hence, increasing kinship lowers family value.

Intuition for the somewhat surprising result that kinship increases the probability of monitoring and lowers family value can be gleaned from inspecting the elasticity of the total probability of monitoring with respect to kinship:

$$\frac{\mathrm{PM}'(h)}{\mathrm{PM}} = \underbrace{\frac{c}{(1-h)\,((1-h)\,\bar{x}-c)}}_{\frac{\mathrm{PZeroReport}^{*\prime}(h)}{\mathrm{PZeroReport}^*(h)}} + \underbrace{\left(-\frac{c}{(1-h)\,((1-h)\,\bar{x}+c\,h)}\right)}_{\frac{m^{*\prime}(h)}{m^*(h)}}. \tag{16}$$

The elasticity of zero reports with respect to kinship, $\mathrm{PZeroReport}^{*\prime}/\mathrm{PZeroReport}^*$ 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 $(1-h)\bar{x}+c\,h$, 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 only part of the monitoring cost, $h\,c$, reflecting altruistic internalization of monitoring costs. This effect reduces the absolute elasticity of monitoring. Thus, the probability of zero reports exhibits more absolute elasticity than the probability of 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 (16) as

$$\frac{\mathrm{PM}'(h)}{\mathrm{PM}} = \left(\frac{c}{1-h}\right)\left(\frac{1}{(1-h)\bar{x}-c} - \frac{1}{(1-h)\bar{x}+c\,h}\right). \tag{17}$$

The first term of (17) 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 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. Log convexity implies that the monitoring expense associated with family management will disproportionately increase with kinship, with small increases in the degree of kinship having much larger effects at already high levels of kinship.

4.4 Kinship and the value of commitment

Our analysis has assumed that the family owner cannot commit to a monitoring policy. Commitment to a monitoring policy is admittedly problematic in our setting. A well-established result in the costly state verification literature is that commitments to monitoring policies are not renegotiation proof (see, for example, Hart (1995)). Moreover, the standard rationale for positing commitment in costly state verification models is that the principal, typically a financial intermediary, is contracting with a large number parties and thus, the gains from renegotiating with an individual borrower are small compared with the cost of lost reputation with other borrowers. This rationale seems strained in our family-firm context in which the owner contracts with a small number of family members.[10] Despite these legitimate concerns, we think that analyzing the role of commitment is useful in the context of our model. Analysis of commitment will provide a great deal of insight into how the model works and why altruism between principals and agents can actually increase the probability of dissipative monitoring. Moreover, addressing the role of commitment is straightforward.

To examine commitment, first note that the family owner's optimal commitment is to the smallest monitoring probability that makes truthful reporting a best response for the manager. This strategy is exactly m^* defined by equation (12).[11] Because, under m^*, truthful reporting is a best response, the equilibrium in the monitoring/reporting game will call for the manager (acting like a Stackelberg follower) to divert with probability 0. Thus, monitoring will only occur when the cash flow is in fact low. Therefore, under commitment, the probability of monitoring equals

$$\mathrm{PM}_{\mathrm{Commit}} = (1-p)\, m^*$$

From inspection of equation (15) it is clear that the probability of monitoring, and thus also monitoring expense, is lower in the case of commitment even when the manager and owner are not kin, i.e., $h = 0$. Also, note that, as shown in Proposition 1, the probability of monitoring zero reports, m^*, is decreasing in kinship. In the commitment case, the probability of monitoring is a fixed multiple of the probability of monitoring zero reports. Thus, under commitment, the probability of monitoring is *decreasing* in kinship. The value of commitment is the difference between the probabilities of monitoring with and without commitment multiplied by the cost of monitoring, c. Thus, the value of commitment is given by $c\,(\mathrm{PM}^* - \mathrm{PM}_{\mathrm{Commit}})$. As we have shown, the equilibrium probability of monitoring absent commitment, PM^*, is increasing in kinship, h, while the probability of monitoring under commitment, $\mathrm{PM}_{\mathrm{Commit}}$, is decreasing in kinship. Thus, the value of commitment is increasing in kinship. These results are summarized in the following Lemma.

Lemma 1. *For any fixed uptick probability, p and compensation level, w,*

i. Under commitment to monitoring policies, monitoring expense is decreasing in kinship.

ii. The value of committing to monitoring policy is increasing in kinship.

The basic insight from Lemma 1 is that the problem of family governance, at fixed compensation, w and output, p, levels, is a problem of commitment. Increasing kin altruism reduces owners' incentive to monitor, to maintain the credibility of monitoring, an increase in kinship must be countered by an

[10] Another general problem with commitment by a principal to a monitoring policy is that commitment is not robust to any positive probability that the agent (in our case, the manager) observes the strategy to which the principal commits with error (see Bagwell (1995)).

[11] Of course, this involves commitment to a mixed strategy, which is even more problematic than commitment to a pure strategy. Both contractual enforcement and enforcement through reputation sanctions are more difficult for a mixed strategy commitment because it is impossible to verify with certainty from the realized policies followed by the principal, whether, in fact, the principal, is following the random strategy distribution to which he has supposedly committed.

increase in underreporting, which increases the frequency of monitoring and thus increases monitoring expense. When the credibility constraint is ignored, increasing kinship simply increases the proportion of owner monitoring costs internalized by the manager and thus kinship reduces the manager's incentive to underreport. This argument suggests that family firms might have a stronger incentive than non-family firms to invest in "external enforcement" mechanisms to substitute for owner monitoring. The prevalence of charters (Daniell and Hamilton, 2010) and external CFOs (Daily and Dollinger, 1992) can be interpreted as evidence for investment in such mechanisms.

5 Kinship with endogenous compensation: The agency model

The agency model is meant to reflect the case where the agency frontier is always open. That is, the incentive constraint determines managerial compensation and family value can always be increased by increasing the manager's share of total output. With this objective in mind, we formulate the following simple parameterization of the model. Initially, we assume that neither the firm nor the manager have outside options. We implement this assumption by setting the manager's reservation compensation to zero, i.e., we assume that $v_R = 0$ and assume that the family manager is the only candidate for managing the firm. The agency problem is introduced by assuming that the uptick probability, p, equals the level of (unobservable) managerial effort. Effort imposes a non-pecuniary additive cost on the manager of K, where

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

We assume that the upper bound on p, $\bar{p}$, and the first-best probability both equal 1. Because the first-best effort solves the problem:

$$\max_{p \in [0,1]} \bar{x}\, p - K(p).$$

Thus, the condition that the first-best effort equals 1 is equivalent to the condition that $k \geq \bar{x}$. To simplify the exposition of the results and reduce the number of free parameters, we further assume that the marginal return to effort at the first-best effort level is equal to 0, which implies that $k = \bar{x}$. In summary, we impose the following functional form on effort cost:

$$K(p) = {}^1\!/\!{}_2\, \bar{x}\, p^2, \quad p \in [0, 1]. \tag{18}$$

Extending the analysis to $k > \bar{x}$ would simply complicate the algebra. The effective upper bound on p in this case would be $x/k < 1$. Since, even at first best effort, the uptick probability would be less than 1, the monitoring problem would persist even at first-best effort, reducing to some extent the effect of increased p on the value of the firm. Since, as we will see, kinship increases p, this would reduce the positive effect of kinship on value. Permitting $k < \bar{x}$ would change the results in a rather trivial fashion. In this case, the owner could eliminate the agency problem without granting the manager complete ownership of the firm. Thus, for some parameterizations of the model, kinship would eliminate both the agency and monitoring problem. Algebraically defining this region is quite tedious and provides no new insights.

For a fixed compensation level, w, and uptick probability, p, monitoring and reporting probabilities will be the same as those derived in Section 4.3 where we analyzed the monitoring and reporting subgame. These probabilities are provided by (14). 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. Because truthful reporting (like underreporting) is always a best response in the mixed strategy solution of the monitoring-reporting subgame, the manager's utility given truthful reporting, provided by (11), represents the manager's utility when the cash flow equals $\bar{x}$. The cash flow equals $\bar{x}$ with probability p. When the cash flow equals 0, which occurs with probability $1-p$, the manager's utility is simply the internalized cost of owner monitoring, $h\,c\,m^*(w)$. Thus, we see that the manager's utility in the agency model conditioned on uptick probability p and compensation w can be expressed as

$$u_M^A(p,w) = p\,(w + h\,(\bar{x} - w)) - (1-p)\,h\,c\,m^*(w) - \frac{\bar{x}\,p^2}{2}.$$

The manager's choice of the uptick probability is defined by

$$p \in \operatorname{Argmax}\{p \in [0,1] : u_M^A(p,w)\}. \tag{19}$$

Solving problem (19) for p yields the equilibrium compensation associated with uptick probability p. Define this level of compensation as $w_M^A(p)$. $w_M^A(p)$ is given by

$$w_M^A(p) = \frac{\bar{x}p - h\,(c + (1-h)\bar{x} + p\,(\bar{x} - c))}{(1-h)^2}. \tag{20}$$

$w_M^A(p)$ represents the compensation level that is required to induce the manager to produce uptick probability p given that the manager accepts the owner's employment offer.

The equilibrium monitoring and reporting strategies derived in Section 3.3 require assumption (13). This assumption is equivalent to $p \ge c/((1-h)\,\bar{x})$. Thus, assumption (13) restricts the domain of $w_M^A(\cdot)$ to $p \ge c/((1-h)\,\bar{x})$. The range of $w_M^A(\cdot)$ is also restricted by the limited liability constraints. The owner limited liability constraint requires that $w \le \bar{x}$ and the manager limited liability constraint requires that $w \ge 0$. However because w_M^A is strictly increasing in p we can express these constraints on the range of w_M^A as constraints on the domain of w_M^A. Because w_M^A is strictly increasing and $w_M^A(1) = \bar{x}$. Thus, for all $p \in [0,1]$, the owner limited liability constraint $w \le \bar{x}$ is satisfied. In contrast, the manager limited liability constraint $w \ge 0$ does restrict the feasible choices of p. Solving equation (20) for $w_M^A(p) = 0$ yields,

$$p^{w=0} = h\left(1 + \frac{(1-h)\,c}{c\,h + (1-h)\,\bar{x}}\right). \tag{21}$$

Thus, the constraint that $w \ge 0$ can be implemented by constraining the owner to choosing $p \ge p^{w=0}$. Thus, condition (13), and the manager limited liability conditions will be satisfied provided that $p_{\min} \le p \le 1$, where $p_{\min}$ is defined as

$$p_{\min} = \max\left[p^{w=0}, \frac{c}{(1-h)\bar{x}}\right]. \tag{22}$$

The owner's utility, given uptick probability p, and compensation $w_M^A(p)$ is given by

$$u_O^A(p) = p\Big((1-\sigma^*(p))\big(\bar{x}-(1-h)\,w_M^A(p)\big)+\sigma^*(p)\,h\,\bar{x}\Big) - h\,{}^1\!/_2\,\bar{x}\,p^2. \tag{23}$$

The only constraint that remains to be considered is the manager's participation constraint. If the manager rejects the owner's offer of employment, the value to both manager and owner will equal 0. This implies that the manager's utility from rejecting the owner's offer is 0. Thus, the manager's participation constraint is

$$u_M^A(p, w_M^A(p)) \geq 0. \tag{24}$$

The owner's problem is to maximize u_O^A over feasible choices of p, subject to the participation constraint, (24), i.e., the owner's problem is given by

$$\begin{gathered}\max_{p\in[p_{\min},1]} u_O^A(p),\\ s.t.\ u_M^A(p, w_M^A(p)) \geq 0\end{gathered} \tag{25}$$

We will first solve a relaxed problem which ignores the participation constraint and then show, in Proposition 2, that, in fact, the ignored participation constraint is always satisfied. The relaxed problem is defined as follows:

$$\max_{p\in[p_{\min},1]} u_O^A(p). \tag{26}$$

The solution to this problem is characterized by Lemma 2,

Lemma 2. *The solution to the relaxed problem* (26) *has the following characteristics:*

i. u_O^A *is strictly concave.*

ii. The value of p *that solves* (26) *is always interior.*

iii. The optimal choice of p^A *is uniquely defined by the first-order condition:*

$$u_O^{A\,\prime}(p^A) = 0. \tag{27}$$

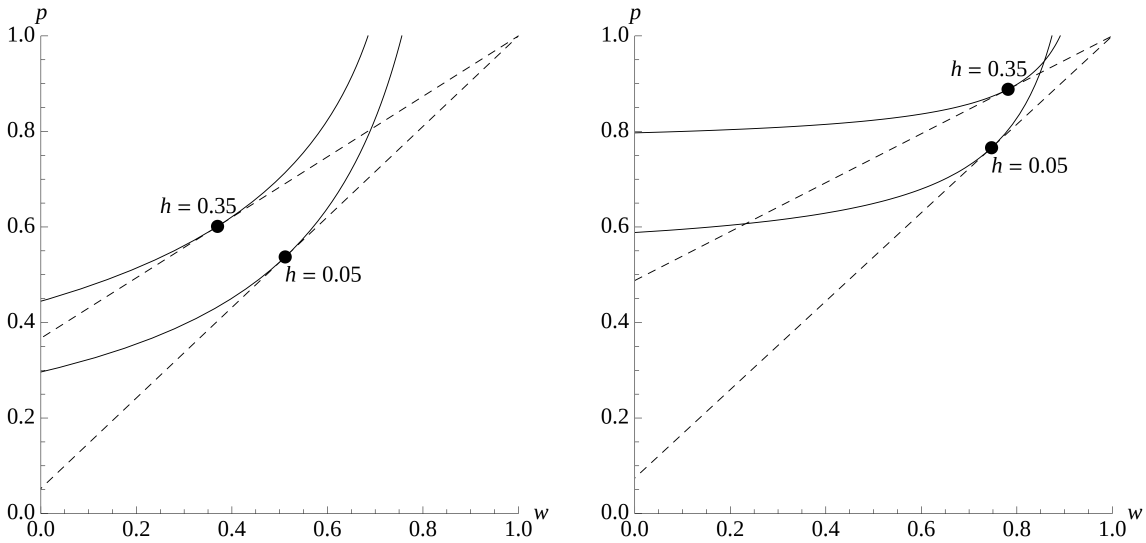
Proof. See the Appendix.

The important implication of Lemma 2 is neither the owner nor manager limited liability constraints ever bind, i.e., the family owner will always offer positive compensation to the family manager but never offer compensation equal to the entire cash flow $\bar{x}$. The owner limited liability constraint not being binding follows from our earlier assumption that $(1-h)\bar{x} > c$. The manager limited liability constraint not being binding relies to some extent on assumption (3), that $h \leq {}^1\!/_2$. In fact, there exists a region of the parameter space where h is less than 1 but greater than ${}^1\!/_2$ over which the owner's optimal policy is to set $p = p^{w=0}$, i.e., to pay zero compensation. In essence, in this region, it is optimal for the owner to compensate the family manager purely through internalized firm value. When this occurs, the limited liability constraint prevents further increases in kinship from changing the terms of compensation. However, as argued earlier, because kinship coefficients in excess of ${}^1\!/_2$ are unlikely and because characterizing the region in which the limited liability constraint is binding is tedious, we have chosen to avoid these complications through assumption (3).

5.1 Effect of kinship on output, compensation, and monitoring

Lemma 2 shows that the optimal compensation decision made by the owner is quite well behaved as an optimization problem. However, we will see that the comparative statics of this problem with respect to kinship, h, are quite subtle. Their subtlety results from the symmetric effect of kinship on owner and the manager. When kinship increases, the amount that the owner needs to pay to ensure a given level of effort changes and the owner's willingness to increase compensation also changes. The interaction of these effects make the relation between kinship and variables such as compensation rather complex. To simplify some of the expression used to sign these relations, we introduce a new variable $\chi = c/\bar{x}$. χ represents the cost of monitoring normalized by the uptick cash flow. Introducing χ simplifies the analysis because the value functions, for the owner and manager, and thus the corresponding utility functions are all homogeneous of degree 1 in $\bar{x}$ for a fixed level of affiliation, i.e., $v_j(\bar{x}, c, h) = \bar{x}\, v(1, \chi, h)$, $j = O, M$. Thus, if we let $\hat{v}_j(\chi, h) = v_j(1, \chi, h)$, we can express these value and utility functions as, $v_j(\bar{x}, c, h) = \bar{x}\, \hat{v}_j(\chi, h)$ and $u_j(\bar{x}, c, h) = \bar{x}\, \hat{u}_j(\chi, h)$. Because, when the problem is parametrized using the normalized cost of monitoring variable χ, $\bar{x}$ enters the objective function only as a positive multiplier, it does not affect the optimized value of p. Thus, we can express the optimized value of p, p^A, purely in terms of h and χ. This simplifies our expressions greatly. An additional advantage of the normalization is that $\hat{v}_j$ represents the value received by j when $\bar{x} = 1$. Thus, in the subsequent section, where we consider the hiring decision when a candidate external manager exists, we fix $\bar{x} = 1$ for the family manager and model the external candidate manager as a manager identical to the family manager with respect to effort preferences and normalized cost of monitoring who differs from the family manager only in two respects— his competence, proxied by $\bar{x} = e$ is greater than 1 and his kinship with the firm owner, h, equals 0. Using this approach, we do not need to derive a new value function for the external candidate manager.

To determine the effect of kinship on value, we need to determine its effect on the uptick probability, p and on compensation, w. A great deal of insight into these effects is provided by the following illustration, Figure 1. We see from Figure 1–Panel A that increasing kinship has two effects on equilibrium compensation. The first effect, *effort stimulation*, translates upward the uptick probability associated with any given level of compensation. The manager is willing to work harder at a given compensation level because the manager internalizes some of the owner's gains from the manager's effort. This effect is not too surprising. The second effect, which is perhaps a bit less obvious, is *incentive blunting*: increasing kinship blunts the responsiveness of performance to increased compensation. In the figures, this effect is captured by the smaller slope of the output-to-compensation schedule associated with closer kinship. Increased compensation transfers value from the owner to the manager, as kinship increases, the manager internalizes more of the cost to the owner of these transfers. Thus, the incentive provided by increasing compensation is attenuated. Hence, at any fixed level of compensation, increasing kinship both increases managerial effort and reduces the marginal effect of compensation on effort. As illustrated in Panel A, when the cost of monitoring is very low, the effort stimulation and incentive blunting



Panel A. Compensation, w, and output, p, when the normalized cost of monitoring, χ, is small, $\chi = 0.05$.

Panel B. Compensation, w and output, p, when the normalized cost of monitoring, χ, is large, $\chi = 0.50$.

Figure 1: In the figures, the vertical axis represents management compensation, w, and the horizontal axis represents the uptick probability, p. The dashed lines represent the output-to-compensation schedule, and the solid lines represent family owner indifference curves.

effects dominate. In this case, incentive blunting induces the owner to reduce compensation. The effect of this reduction on output is however more than compensated by the effort stimulation effect. Thus, as kinship increases, effort, measured by the uptick probability, increases and compensation falls.

However, when the cost of monitoring is high, as illustrated in Panel B, another effect of increasing kinship becomes salient, *monitoring-expense mitigation*: Increasing kinship, at a fixed compensation policy both increases monitoring expenses and the owner's distaste for monitoring expense relative to compensation. When the cost of monitoring is small, this effect is second order and has little effect on equilibrium compensation or output. However, as the cost of monitoring increases, the monitoring-expense mitigation effect becomes dominant. Thus, when the cost of monitoring is sufficiently high, increasing kinship leads the owner to mitigate the increase in monitoring expense by increasing compensation and, because effort is itself increasing in both kinship and compensation, this increase in compensation increases effort. These intuitions are formalized in the propositions developed below. Our first characterization of the effect of kinship in the agency context, Proposition 2, shows increasing kinship always increases effort and thus the uptick probability, p.

Proposition 2. *The uptick probability, p which solves the relaxed agency problem represented by expression* (26)*, p^A, is*

$$p^A(h,\chi) = \frac{1+\chi}{2} + \frac{h}{2}\left(\frac{(1-h)^2+(1-h)\,h\,\chi+(1+h)\,\chi^2}{(1-h)\,((1-h)(2+h)+h\,\chi)}\right), \quad \chi = c/\bar{x}. \tag{28}$$

i. p^A, is increasing in kinship h.

ii. *The utility of the manager given that $p = p^A(h,\chi)$ is always strictly positive. Thus, p^A, the solution to the relaxed agency problem* (26) *solves the agency problem defined by expression* (25).

Proof. See the Appendix.

The expression for the equilibrium uptick probability provided in Proposition 2 does exhibit a complex dependence on kinship. However, the character of the equilibrium uptick probability is transparent in some special cases. When the cost of monitoring equals 0 (and thus, $\chi = 0$), $p^A = (1+h)/(2+h)$ and is clearly increasing in kinship, h. When the manager and owner are unrelated, i.e., $h = 0$, the expression reduces for p^A in Proposition 2 reduces to $p^A = (1+\chi)/2$. Thus, increasing the cost of monitoring, increases the equilibrium level of effort when the manager and owner are unrelated. The reason is straightforward. As the cost of monitoring increases, the owner's ability to capture the cash flows of the firm through monitoring falls. Increased capture of firm rents by the manager improves the manager's effort incentives. It is also clear from inspecting the expression for p^A in the Proposition that the uptick probability at positive levels of kinship is always higher than the uptick probability when the manager and owner are unrelated (i.e., $h = 0$). Proposition 2 in fact shows that the uptick probability is strictly increasing in h. The derivation requires some tedious algebra and is thus deferred to the appendix. Proposition 2 also shows that the manager's participation constraint is always satisfied by the solution to the relaxed problem. In a model incorporating agent altruism, demonstrating that the manager's participation constraint is satisfied even under the assumption that the manager has no outside options is not entirely trivial. The difficulty is that the manager will internalize part of the owner's value. Because the probability of monitoring and thus the owner incurring monitoring expenses, is higher when output is low, the manager, if he accepts the owner's compensation offer, has an incentive to exert effort simply to lower the owner's monitoring expense. Thus, it is conceivable that the manager might be willing to exert effort at a low compensation level that leaves his utility negative but not as negative as it would have been had the manager accepted employment but exerted no effort. In fact, Proposition 2 shows that this is not possible in our model. The reason that the manager participation constraint is always satisfied is that violations of the participation constraint require a high degree of kinship. However, the owner's optimal choice of p, ignoring the participation constraint, always increases with kinship. This increase in p increases the manager's utility from employment at a rate sufficient to keep the manager's utility positive.

The question remains as to whether this positive effect of kinship on the uptick probability, p, is countered by increased monitoring expense induced by increased kinship. The next proposition shows that the probability of underreporting is always increasing in the degree of kinship. Thus, our earlier result—that kinship increases the likelihood of underreporting at a fixed compensation level—also holds when compensation is endogenously determined by the incentive compatibility constraint of the agency model.

Proposition 3. *In the agency setting, the probability that the manager will underreport a high cash flow, σ^{A*}, is given by*

$$\sigma^{A*} = \frac{(1-p^A(h,\chi))\chi}{p^A(h,\chi)(1-h-\chi)}.$$

σ^{A*} is increasing the degree of kinship, h, between the manager and owner.

Proof. See the Appendix.

Proposition 3 shows that increased kinship never induces the owner to adjust compensation upward sufficiently to nullify the underreporting incentives generated by increased kinship. However, underreporting per se does not generate monitoring expenses. It only generates costs if zero reports are monitored. The likelihood that zero reports are monitored depends not only on the normalized cost of monitoring, χ, but also the level of compensation, w. Increasing w reduces the probability of monitoring required to deter diversion. Thus, the effect of kinship on monitoring depends on kinship's effect on compensation. The next result characterizes the compensation–kinship relation.

Proposition 4. *Compensation, w, in the agency setting is given by*

$$w^{A*} = w^A_M(p^A(h,\chi)).$$

Increasing kinship, h, can either increase or reduce w^{A*}. The conditions for each of these cases are provided below: Let $\alpha = \chi/(1-h)$. If

i. If $\alpha < \underline{\alpha}_W \equiv 1/\sqrt{3} \approx 0.58$, increasing kinship reduces compensation, w^{A*}

ii. If $\alpha > \bar{\alpha}_W \equiv \sqrt{13}-3 \approx 0.61$, increasing kinship increase compensation, w^{A*}

iii. If $\alpha \in [\underline{\alpha}_W, \bar{\alpha}_W]$ increasing kinship reduces (increases) w^{A*} whenever $h < (>) h_W$, where

$$h_W = \frac{(1-\alpha)\sqrt{(1+\alpha)\,(4-11\,\alpha^2+\alpha^3)} - \left(2+\alpha-6\,\alpha^2-\alpha^3\right)}{4\,\alpha\,(1-\alpha-\alpha^2)}.$$

Proof. See the Appendix.

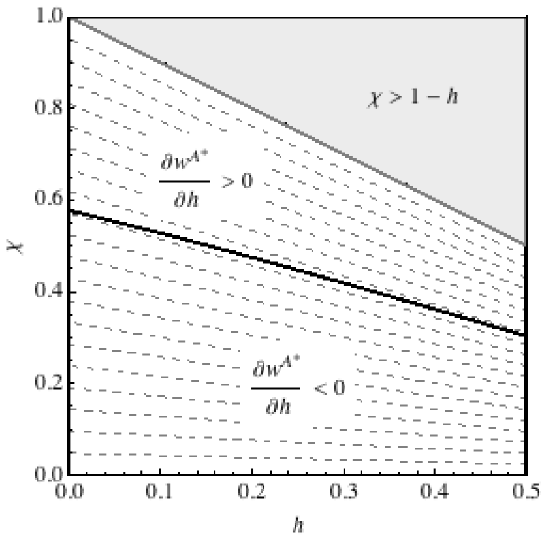


Figure 2: The effect of kinship, h, on compensation, w^{A*}. In the figure, the horizontal axis represents the level of kinship, h. The vertical axis represents the normalized cost of monitoring, $\chi = c/\bar{x}$. The thin dashed lines represent points (h,χ) on the graph which generate the same altruism inflated cost of monitoring, $\alpha = \chi/(1-h)$.

Note that the our surd parameterization of the boundary between positive and negative kinship effects is expressed in terms of h and $\alpha = \chi/(1-h)$ rather than h and χ. The map $((h,\chi) \to (h, \chi/(1-h))$

is however one-to-one and thus the parametrization provides a complete, albeit not very intuitive, characterization of the (h,χ) regions where increased kinship reduces and increases compensation. Expressed in terms of h and χ these regions are defined by quintic polynomials and thus do not yield tractable parameterizations. In contrast, in the transformed variables h and α, the regions are defined by a jointly quadratic polynomial and thus permit a surd parameterization. In fact, the proposition shows that the effect of kinship on compensation is almost, but not quite, determined simply by $\alpha = \chi/(1-h)$. Note that α can be expressed as $\alpha = \chi/(1-h) = \chi(1+h+h^2\ldots)$. Thus, α can be thought of as the altruism inflated cost of monitoring per unit of firm scale. When altruism inflated costs of monitoring are high, i.e., $\alpha > \bar{\alpha}_W \approx 0.61$, monitoring costs are salient to owners. The owner sacrifices personal gains to reduce expected monitoring expense and adopts a high compensation policy. Increased compensation lowers monitoring intensity because, at higher levels of compensation, the intensity of monitoring required to deter diversion is lower. In this region, increasing kinship leads to even larger owner concessions to the manager. When $\alpha < \underline{\alpha}_W \approx 0.58$, the cost of monitoring is not salient to the owner. The owner thus exploits the increased non-pecuniary effort incentives provided by increased kinship to lower managerial compensation. In this case, the uptick probability increases with kinship but not as much as it would have had the owner not reduced compensation. The dependence of kinship's effect on compensation on the altruism inflated cost of monitoring is illustrated in Figure 2. In the figure, we present the regions of (h,χ)-space were increasing kinship increases and decreases compensation. Dashed curves in the figure represent"iso-α" curves, i.e., points in (h,χ)-space which produce the same altruism inflated cost of monitoring. The fact that these curves are nearly parallel to the boundary between the regions where increasing kinship increases and reduces compensation indicates the close but not quite perfect dependence of the compensation–kinship relation on α.

At a fixed compensation level, as shown in Section 4.3, kinship reduces the owner's incentive to monitor zero reports, albeit not sufficiently to counter the increased level of underreporting. When compensation is endogenously determined by the incentive problem, Proposition 4 shows that increases in kinship reduces compensation when α, the altruism inflated cost of monitoring, is sufficiently small. Reduced compensation increases the level of monitoring required to deter diversion and in some cases this increase is sufficient to counter the reduction in monitoring incentives induced by increased kinship. This observation is formalized in the following proposition.

Proposition 5. *The probability that the owner will monitor reports of a low cash flow in the agency setting, m^{A*}, is given by*

$$m^{A*} = \frac{1-p^A(h,\chi)}{1-h}.$$

Increasing kinship, h, can either increase or reduce m^{A*}. The conditions for each of these cases are provided below: Let $\alpha = \chi/(1-h)$; define $\underline{\alpha}_m = \sqrt{2}-1 \approx 0.41$; define $\bar{\alpha}_m \in (0,1)$ as be the unique positive root of the cubic equation, $\alpha^3+9\alpha^2+3\alpha-4$, $\alpha_m \approx 0.51$.[12] Then

i. if $\alpha < \underline{\alpha}_m \approx 0.41$, increasing h increases monitoring, m.

ii. if $\alpha > \bar{\alpha}_m = 0.51$, increasing h reduces monitoring

[12] In fact, it is possible, using Cardan's formula for cubic, to solve for this cubic equation for $\bar{\alpha}_m$. The exact solution is $\bar{\alpha}_m = -3+2\sqrt{6}\sin\left(\frac{1}{3}\tan^{-1}\left(\frac{\sqrt{367}}{41}\right)\right)+2\sqrt{2}\cos\left(\frac{1}{3}\tan^{-1}\left(\frac{\sqrt{367}}{41}\right)\right)$.

iii. If $\alpha \in (\underline{\alpha}_m, \bar{\alpha}_m)$, then increasing h increases (decreases) monitoring whenever

$$h > (<) \frac{\sqrt{1-2\alpha+3\alpha^4-2\alpha^5}-\left(1-3\alpha^2\right)}{2\alpha(1-\alpha-\alpha^2)}.$$

Proof. See the Appendix.

Proposition 5 shows that, once again, the effect of kinship is fixed to a large extent simply by the altruism inflated cost of monitoring, α. When this cost is low, $\alpha < \underline{\alpha}_m \approx 0.41$, the cost of monitoring is of second-order importance to the owner and the owner uses increases in the manager's kin altruism to reduce the manager's compensation so much that, even after accounting for the reduced underreporting incentive engendered by kinship, the owner must increase monitoring to deter diversion. Thus, m increases with kinship. When $\alpha > \underline{\alpha}_m \approx 0.51$, the adverse effect on family value of monitoring expenses becomes sufficiently salient to deter the owner from making such substantial reductions in compensation.

In contrast to the owner's compensation and monitoring strategy, w and m, expected monitoring expense is not tightly related to the altruism inflated cost of monitoring. Monitoring expense is directly dependent on another factor—the uptick probability, p. Because a low cash flow must be reported when in cash flow is truly low, and, when the cash flow is high, the probability that it will be reported as low is less than one, increasing p reduces monitoring expense. When this effect is sufficiently strong, monitoring expense can fall as kinship increases even when the altruism inflated cost of monitoring is low. When this occurs, compensation falls with kinship, and thus underreporting increases, and the probability of monitoring zero reports also increases. However, the positive effect on the uptick probability induced by increasing kinship is sufficient to outweigh both of these effects. This result is formalized in Proposition 6.

Proposition 6. *Expected monitoring expense in the agency setting, ME^{A*}, is given by*

$$ME^{A*} = \bar{x}\chi \frac{(1-p^A(h,\chi))^2}{1-h-\chi}.$$

Increasing kinship, h, can either increase or reduce ME^{A*}. The conditions for each of these cases are provided below. Let $\alpha = \chi/(1-h)$. If

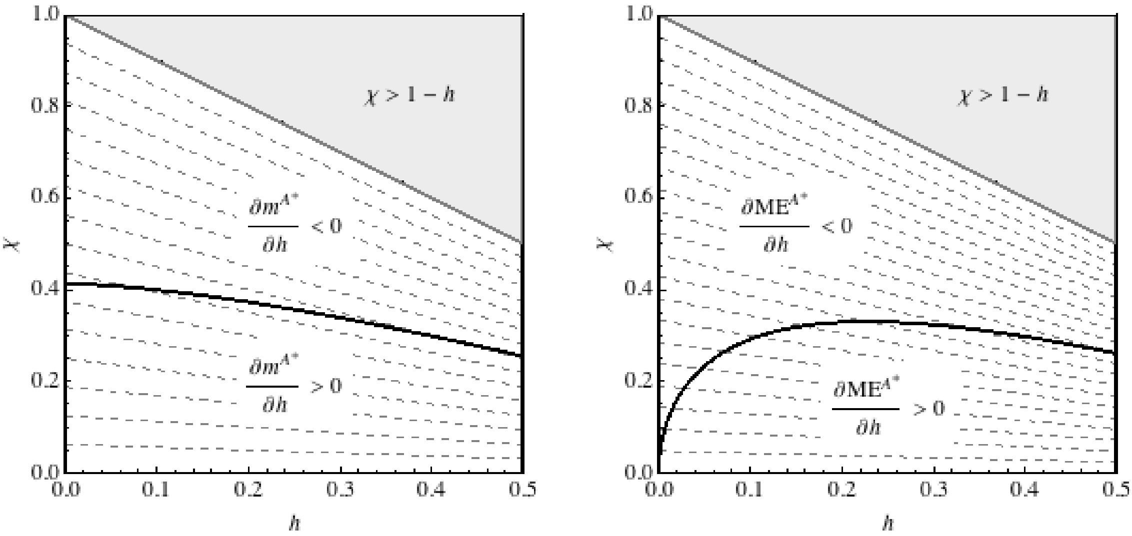
i. If $\alpha < \alpha_{ME} \equiv 1/2\left(\sqrt{145}-11\right) \approx 0.52$ then kinship always increases ME^{A*}.

ii. If $\alpha \geq \alpha_{ME}$, then increasing kinship reduces (increases) ME^{A*} whenever $h < (>) h_{ME}$, where

$$h_{ME} = \frac{-6\alpha^2-\alpha-\sqrt{(1-\alpha)^2(2\alpha+1)(2\alpha+3)(3-4\alpha)}+3}{2\alpha(\alpha(2\alpha+3)-3)}.$$

Proof. See the Appendix.

Propositions 5 and 6 are illustrated in Figure 3. Panel A presents the range of parameters under which increasing h increases the probability of monitoring zero reports, m, and Panel B presents the range of parameters under which increasing kinship increases monitoring expense. Consistent with the propositions developed above, the dependence of the probability of monitoring zero reports on the altruism inflated cost of monitoring, α, is much greater than the dependence of monitoring expense on α. In the graphs, this is reflected by the greater conformity between the iso-α lines and the region boundaries exhibited by the probability monitoring zero reports relative to the conformity exhibited by monitoring expense.



Panel A. The effect of kinship, h, on the probability of monitoring zero reports, m^{A*}.

Panel B. The effect of kinship, h, on expected monitoring expense, ME^{A*}.

Figure 3: In the figures, the horizontal axis represents the level of kinship, h. The vertical axis represents the normalized cost of monitoring, $\chi = c/\bar{x}$. The thin dashed lines represent points (h, χ) on the graph which generate the same altruism inflated cost of monitoring, $\alpha = \chi/(1-h)$.

6 Kinship's and value

Thus, for a significant range of the parameter space, increasing kinship increases output by increasing p and also reduces monitoring expense. In fact, as the next proposition demonstrates, even over the region where kinship increases monitoring expense, the net effect of increasing kinship on family value under equilibrium compensation policies is always positive.

Proposition 7. *Family value in the agency setting, $v^{A*} = v^{A*}_M + v^{A*}_O$, is given by*

$$v^{A*} = \bar{x}\left(\frac{p^A(h,\chi) + (1 - p^A(h,\chi))p^A(h,\chi)}{2} - \frac{\chi(1 - p^A(h,\chi))^2}{1 - h - \chi}\right).$$

v^{A*} is increasing in kinship, h.

Proof. See the Appendix.

The intuition behind Proposition 6 is that the only region of the parameter space where increased monitoring expense might overwhelm the positive effects of increased kinship on output is a region where the altruism inflated cost of monitoring is low. However, over this region, although monitoring expense is increasing in kinship, it is small in absolute terms and thus the increased monitoring expense is always more than compensated by the increased output induced by increasing kinship.

6.1 Firm and owner value

The value to the owner and manager are given by substituting in the in the equilibrium reporting and monitoring probabilities, given by equation (14), the equilibrium compensation schedule, given by equation (20), and the equilibrium uptick probability, given by (28), into the manager's value function and then noting that the owner's value is the difference between family value, given in Proposition 6, and the manager's value. This yields, after some algebraic simplification, the following result:

$$v_M^{A*} = \bar{x}\frac{1}{2}\left(1+(1-p^A(h,\chi))\left((1-p^A(h,\chi))\left(\frac{2(1-\chi)}{1-h-\chi}-1\right)-\frac{2(1-h(1-\chi))}{(1-h)^2}\right)\right) \tag{29}$$

$$v_O^{A*} = v^{A*} - v_M^{A*}, \tag{30}$$

where v^{A*} is given in Proposition 6 and p^A is defined by equation (28).

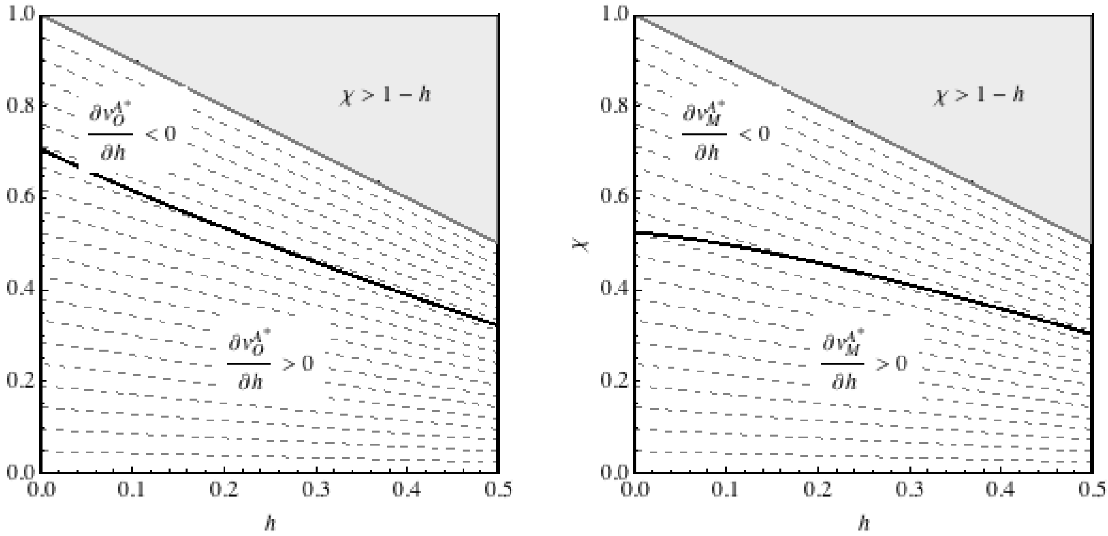
Proposition 6 shows that when incentive constraints bind, kinship increases family value. This increase in family value is divided between the manager and the owner. This raises the question of who captures the value gain? Although it is not possible to obtain a surd parameterization of the regions where increasing kinship increases firm and manager value, once again the division of the gains from kinship depends largely on the altruism inflated cost of monitoring, $\alpha = \chi/(1-h)$. This result is recored below.

Proposition 8. *Let $\alpha = \chi/(1-h)$ represent the altruism inflated cost of monitoring and let v_O^{A*} represent the owner value in the agency model. Similarly let v_O^{A*} represent the manager value.*

i. When the altruism inflated cost of monitoring, α, is less than the unique root (between 0 and 1) of the polynomial, $-6-10\,\alpha+19\,\alpha^2+18\,\alpha^3+3\,\alpha^4$, which is approximately equal to 0.624, owner value increases as kinship increases. When α is greater than $1/\sqrt{2}\approx 0.707$ owner value decreases as kinship increases.

ii. When α is less than the unique root of $-1-\alpha+5\,\alpha^2+\alpha^3$ between 0 and 1, which is approximately equal to 0.525 manager value decreases as kinship increases. When α is greater than the unique root of $-26-31\,\alpha+88\,\alpha^2+54\,\alpha^3+5\,\alpha^4$ (between 0 and 1), which is approximately equal to 0.604, manager value increases as kinship increases.

Proposition 8 shows that division of kinship gains depends primarily on the altruism inflated cost of monitoring. When this cost is low, the direct effect of kinship in reducing compensation and the indirect effect from reduced compensation increasing monitoring, both reduce manager value and increase owner value. When the altruism inflated cost of monitoring is high, the owner, anticipating the large increased monitoring expense that kinship generates at a fixed compensation policy is willing to increase compensation significantly. This leads to higher value for the manager and lower value for the owner. In intermediate cases, the owner and manager split the gain from the increase in family value and both owner value and manager value increase. This result is illustrated in Figure 4 which plots the effect of increased kinship on owner and manager value for different levels of kinship and the normalized monitoring costs. The dashed lines in the figure, which represent, iso-α curves are nearly parallel to the boundary between the regions where increasing kinship increases and decreases value. This illustrates the close but imperfect relation between the altruism inflated cost of monitoring, α, and the effect of increasing kinship on owner and manager value.



Panel A. Effect of kinship, h, on the owner's value, v_O^{A*}.

Panel B. Effect of kinship, h, on the manager's value, v_M^{A*}.

Figure 4: In the figures, the horizontal axis represents the level of kinship, h. The vertical axis represents the cost of monitoring normalized for firm size, $\chi = c/\bar{x}$. The thin dashed lines represent points (h, χ) on the graph which generate the same altruism inflated cost of monitoring, $\alpha = \chi/(1-h)$.

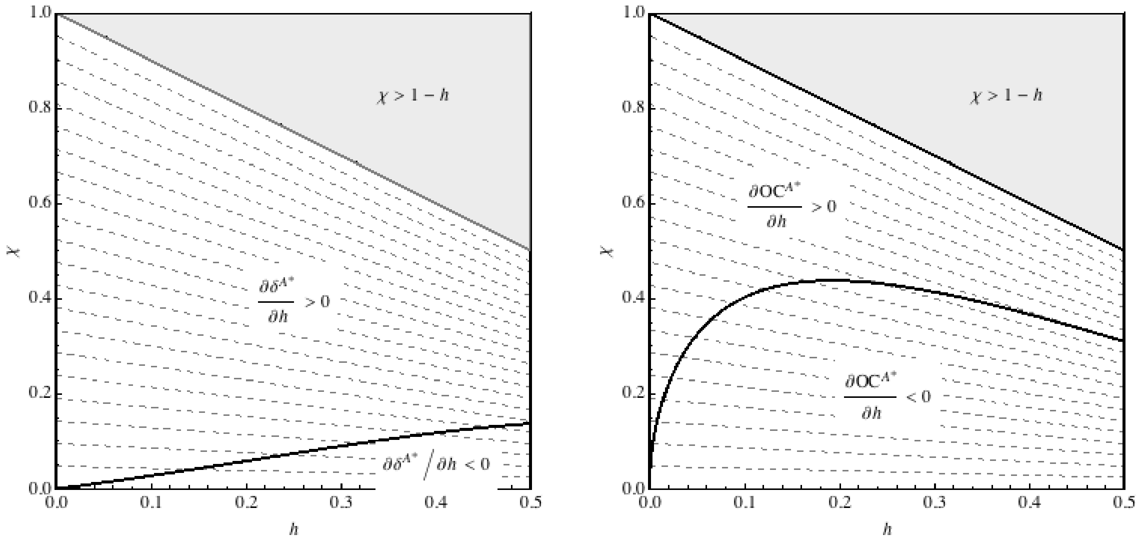
Note that neither the manager's value, v_M^{A*}, nor compensation, w, correspond to the observed level of official managerial compensation: manager value incorporates the manager's non-pecuniary disutility of effort as well as the manager's gains from successful diversion. Also, the compensation payment to the manager w is only made when the cash flow is high and truthfully reported by the manager; thus it reflects promised rather than realized compensation. In order to make comparison of these results with empirical research on compensation more transparent, we illustrate, in Figure 5, the effect of kinship on both diversion and official compensation. The probability of diversion is the probability that the manager will underreport and the manager's underreport will not be monitored. Thus, if we let δ^{A*} represent the equilibrium probability of diversion, then

$$\delta^{A*} = p^{A*}(1 - m^{A*})\,\sigma^{A*}.$$

Similarly, the equilibrium level of official compensation, OC^{A*} is given by the expected official compensation payments to the manager. Expected compensation payments are given by compensation, w, times the probability that the cash flow is high and the manager does not attempt diversion. Thus,

$$\mathrm{OC}^{A^*} = w^{A*}\,p^{A*}\,(1 - \sigma^{A*}).$$

The effect of increasing kinship on diversion and official compensation is graphed in Figure 5. From



Panel A. The effect of kinship, h, on diversion, δ^{A*}.

Panel B. The effect of kinship, h, on official compensation, FC^{A*}.

Figure 5: In the figures, the horizontal axis represents the level of kinship, h. The vertical axis represents the cost of monitoring normalized for firm size, $\chi = c/\bar{x}$. The thin dashed lines represent points (h, χ) on the graph which generate the same altruism inflated cost of monitoring, $\alpha = \chi/(1-h)$.

Panel A of Figure 5 we see, first, that increasing kinship almost always increases diversion. This is not surprising given that Proposition 3 shows that increasing kinship always increases underreporting and Proposition 2 shows that increasing kinship increases p, the uptick probability. The only case where increasing kinship lowers diversion occurs when the cost of monitoring is very low. In this case, the reduction in compensation triggered by an increase in kinship leads to a substantial increase in the probability of monitoring zero reports, m, an increase sufficiently large to offset both the increase in p and the increase in the probability of underreporting, σ. The results for official compensation are somewhat more surprising. Note that for h sufficiently small, increasing kinship *always* increases official compensation. In fact, one can show by explicit evaluation that

$$\left.\frac{\partial \mathrm{OC}^{A*}}{\partial h}\right|_{h=0} = \frac{\chi^2}{4} > 0.$$

Thus, weakly related managers will always receive higher official compensation than unrelated managers. Such managers, because of higher effort levels and thus higher non-pecuniary effort costs may have lower values than unrelated managers but their observed compensation will be higher. The higher level of official compensation results because kinship's first-order effect around 0 kinship on the uptick probability, p is larger than its effect on the level of promised compensation associated with an uptick, w.

6.2 Nepotistic hiring

Thus far, we have assumed that the family manager is the only potential manager of the firm. We now consider how kinship affects the hiring decision when there are two candidate managers of the firm. One candidate manager, the family manager, is related to the owner through kinship given by $h, > 0$ the other candidate manager, the "external manager," is not related to the owner, i.e., for the external manager, $h = 0$. The normalized cost of monitoring χ is the same for both candidate managers. Except for relatedness the only difference between the two managers is the payoff they generate conditioned on an uptick, $\bar{x}$. We assume that for the family manager, $\bar{x} = 1$ and for the unrelated manager, $\bar{x} = e > 1$. Keeping with the agency setting, we assume that the reservation payoffs of both the external and family candidate managers are 0. This assumption is not required to establish our result but we require that the participation constraint not be binding and the assumption of a zero reservation value is a convenient way to ensure that this is the case.

Thus, for any fixed level of effort, the external manager produces higher expected output. However, this does not imply that the external manager is "better" than the family manager. Kinship can increase managerial effort and sometimes, at endogenous compensation levels, also reduce monitoring expenses. How we define "better" is also not entirely clear as it depends on which value function is used to make the comparison of the external and family management. We consider two possibilities–shareholder value and social value. Shareholder value compares the value of the firm under the external and family managers while social value considers the sum of the payoffs to the three agents, the family owner, the family manager, and the external manager. To formalize these ideas, first note that, because the reservation value of the manager who is not hired equals 0. if the family manager is hired, the total payoff will equal the sum of the family (kin) manager's value and the family owner's value, which we represent by v^K. Similarly if the external manager is hired, the total payoff will equal the sum of the family owner's value and the external manager's value, which we represent by v^E. We represent the family owner's value if the owner hires the family (kin) manager by v^K_O and, if the owner hires the external manager, by v^E_O. We represent the value of the family and external manager if they are hired by the owner by v^K_M and v^E_M respectively. The payoff of any shareholder is proportional to the owner's value. Thus, hiring the external manager is shareholder preferred if $v^E_O > v^K_O$. Because shareholder value equals total value less the value received by the hired manager, the share value gain from hiring the external manager is proportional to

$$\Delta^E_{\text{Sh}} = (v^E - v^K) - (v^E_M - v^K_M) > 0. \tag{31}$$

Hiring the external manager is socially preferred if total value is higher under the external manager. Thus, the gain from hiring the external manager under the social objective function is

$$\Delta^E_{\text{SW}} = v^E - v^K > 0. \tag{32}$$

The owner's hiring decision is governed neither by the social welfare function nor share value maximization but rather by the kin altruism as specified in (2) . Using the form of the altruism function given in equation (4) we can express the owner's gain from hiring the external manager as

$$\Delta_O^E = (v^E - v^K) - (v_M^E - (1-h)\, v_M^K). \tag{33}$$

Proposition 9. *In the agency setting,*

i the gain to the family owner from hiring the family manager is always greater than the social gain and the shareholder gain.

ii If $e < 2$ (i.e., the external manager's competence is less than twice the family manager's) and the altruism inflated cost of monitor, α, is sufficiently close to one, hiring is always shareholder value nepotistic.

iii Parameters of the model exist under which the shareholder gain from hiring the external candidate is positive while both the family owner's gain and the social gain from hiring the external candidate are negative, i.e., nepotistic hiring can increase social welfare.

Proof. See the Appendix.

Proposition 9 shows, first, that the family manager's hiring decision is never "anti-nepotistic" in the agency setting. Shareholder preferences are based on the difference between the change in total value and the change in managerial rents induced by the hiring choice. Family owner preferences are also based on the difference between the change in total value and the change in managerial rents. However, for the family owner, the rents extracted by the family manager are discounted at a rate proportional to kinship. Thus, the gain to the family owner from the change in managerial rents induced by selecting the external candidate is smaller than the share value gain. In fact, the kinship-based cost of external management, $v_M^E - (1-h)\, v_M^K$, is always positive. Thus, although the payoffs to family managers may well be higher than the payoffs to external managers as shown in Figure 4, the growth in family manager rents caused by increased kinship is never sufficient to offset the increased discounting of these rents also induced by increased kinship.

When α converges to 1, anticipated monitoring expense, relative to the family owner's willingness to monitor the family manager, becomes so large that the owner's optimal policy under family management converges to conceding firm value to the family manager. Because this concession eliminates the agency problem by making the manager the effective owner of the firm, effort converges to first-best under the family manager. The family owner's gain converges to the gain from internalizing the manager's value. If the owner hires the external manager, the cost of monitoring are still high but the owner, because he does not internalize the manager's gains will not set compensation policy in a way that concedes firm value to the manager. Under this lower compensation the external manager will exert less effort and monitoring expense will be greater. However firm value will not converge to 0. Thus, the external manager will be preferred by shareholders. However, unless the difference in competence is huge, the family owner will prefer hiring the family manager. When kinship is high relative to the difference in competence, and α is close to one, social welfare will also be higher under the family manager than it would have been had the manager been picked on the basis of share value maximization. In the case where α is close to one, the manager's preferences are aligned with social welfare but shareholders' are not.

When α is close to zero and thus the costs of monitoring are small, neither shareholder nor manager interests are aligned with social welfare. In this case, compensation to the family manager is low. Share value is maximized by hiring the family manager because the lower managerial rents under the family manager more than offset the total value gain from hiring the more competent external candidate. *A fortiori*, the family owner also prefers the family manager because the family owner discounts even the small rents extracted by the family candidate. Thus, in this case, hiring is nepotistic relative to the social welfare criterion but not relative to shareholder value maximization. These observations are illustrated in Figure 6.

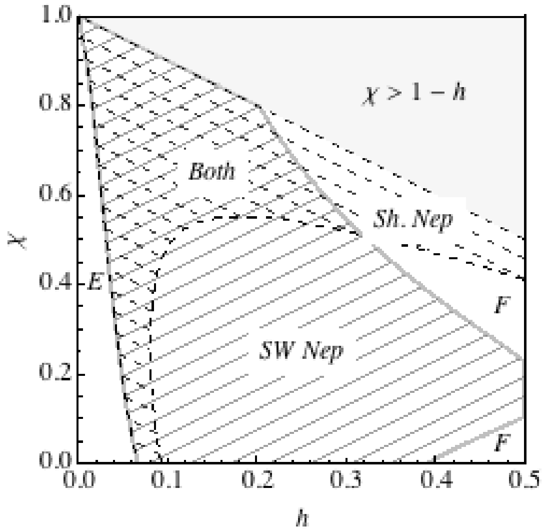


Figure 6: *Nepotism in the agency setting.* In the figure, the degree of kinship, h, is plotted on the horizontal axis and the normalized level of kinship, $\chi = c/\bar{x}$ on the vertical axis. Output conditioned on an uptick, $\bar{x}$ equals 1 under the family manager, F and 1.1 under the external manager, E. In the regions labeled F (E) social welfare, the family owner's utility, and shareholder value are all maximized by selecting the family (external) manager. In the region labeled "SW Nep." share value and owner utility are maximized if the family manager is selected but social welfare would be higher if the external manager were selected. In the region labeled "Sh. Nep." social welfare and owner utility are maximized if the family manager is selected but share value would be higher if the external manager were selected. In the region labeled "Both", family owner utility is maximized by selecting the family manager but both share value and social welfare would be higher if the external manager were selected.

7 Kinship with endogenous compensation: The labor market model

The labor market model is meant to reflect the case where the agency frontier is closed. That is, the participation constraint determines managerial compensation and the uptick probability selected by the firm does not vary with kinship. In order to maximize the transparency of the logic underlying the results, we choose the simplest possible parameterization of the model that satisfies these conditions: the upper bound on the uptick probability, $\bar{p}$, is less than 1, effort is costless, and the manager's reservation value is positive. As in the agency setting, we initially assume that the family manager is the only candidate for managing the firm. Later, we consider the effect of external candidate managers. The specific parametric assumptions we impose are as follows:

$$K(p) = 0, \tag{34}$$

$$v_R > 0, \tag{35}$$

$$\bar{p} < 1 \tag{36}$$

$$(1-h)\bar{x}\bar{p} > c, \tag{37}$$

$$\bar{x}\bar{p} - v_R > c. \tag{38}$$

Equation (34) sets effort costs to 0. Under this assumption, the manager will choose the highest feasible uptick probability, $p = \bar{p} < 1$. When $p = 1$, the firm's cash flows are nonstochastic, and thus the monitoring problem vanishes. Equation (36) is required to avoid this uninteresting case. Inequality (35) ensures the reservation value of the manager is positive. Otherwise, the limited liability constraint would fix managerial compensation at 0 and thus the problem would collapse to the fixed compensation problem analyzed in Section 4.3. Inequality (37) insures that, at $\bar{p}$, the general condition for owner monitoring, (13), is satisfied. Inequality (38) ensures that the condition (8) is satisfied and thus the project has positive value.

This rather stark specification of the labor market setting is not the only scenario that will produce our results. For example, it is easy to augment the specification with a fixed cost for effort for all positive levels of the uptick probability. In this scenario, again, the uptick probability selected by the firm will equal $\bar{p}$ regardless of kinship. It is also possible to add a quadratic cost of effort, of the sort used in Section 5, provided that the effort cost parameter k is sufficiently small to ensure that the upper bound, $\bar{p}$, is the optimal uptick probability for the firm regardless of kinship. In both of these cases, effort costs to the manager for producing $p = \bar{p}$ would factor into the manager's participation constraint in the same way as increasing the manager's reservation value by a like amount. However, these elaborations do not add new insight and force us to tract two variables—reservation value and fixed effort cost—which end up being perfect substitutes. Thus, our parameterization is simpler and more economical than these alternatives. The key to the results in this section is that the model parameterization satisfies the condition that, in response to an increase in kinship, the owner will not alter the terms of compensation in a way that increases family value.

In the labor market setting, the uptick probability is fixed. Thus, kinship affects value only through its effect on compensation. This makes the analysis considerably more tractable. In the agency setting, we were only able to analytically characterize the directional effect of marginal increases in kinship on the endogenous variables, (e.g., family value, owner value). In the labor market analysis, we will be able to also characterize the overall "shape" of the functional relation between kinship and these variables.

7.1 Compensation

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 this specification, the manager, if he accepts employment, will always exert sufficient effort to produce $p = \bar{p}$. If the manager accepts employment, the cash flow to the manager equals either $\bar{x}$ 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. Since both underreporting and not underreporting are best replies in the subgame, we can use the manager's utility when the manager does not underreport to compute manager utility in this case. 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

$$u_M^L(w) = \bar{p}\,(w + h\,(\bar{x} - w)) - (1 - \bar{p})h\,m^*(w)\,c. \tag{39}$$

The owner's utility is determined in like fashion. If the manager reports $\bar{x}$, which occurs with probability $(1-\sigma^*)\,\bar{p}$, the owner's utility is $\bar{x} - (1-h)\,w$. If the manager report's 0, the owner's utility is given by the mixed strategy equilibrium in the monitoring/reporting subgame. Since both monitoring and not monitoring are best replies in the subgame, we can use the owner's utility when the owner does not monitor to compute owner utility in this case. The utility of the owner after a report of 0 given that the owner does not monitor is given by $h\rho^*\bar{x}$. The probability of a zero report is $1 - (1-\sigma^*)\,\bar{p}$. Thus, the owner's utility is given by

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

Using equation (4.2) we can simplify this expression to

$$u_O^L(w) = \bar{p}\,((1-\sigma^*)(\bar{x} - (1-h)\,w) + \sigma^*\,h\bar{x}). \tag{40}$$

From (14), (40), and (37) 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. One constraint is the participation constraint: if the manager does not work for the firm, he earns v_R and the owner's payoff is 0. Thus, the minimum managerial compensation that satisfies the participation constraint is determined by the equation

$$u_M^L(w) = v_R.$$

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

$$\frac{v_R}{\bar{p}} - \frac{h((\bar{p}\bar{x} - v_R)((1-h)(\bar{p}\bar{x} - c) + c\,\bar{p}))}{(1-h)\bar{p}\,(c\,h + (1-h)\,\bar{p}\bar{x})}. \tag{41}$$

There is one other constraint on compensation, limited liability, which requires a non-negative payment to the manager. Thus, in order to obtain the equilibrium level of compensation we need only impose the limited liability condition. Hence, when the participation constraint can be satisfied at a positive level of compensation, the participation constraint binds; otherwise the manager's compensation is 0. Hence, compensation in the labor market setting is given by

$$w_M^{L*} = \max\left[\frac{v_R}{\bar{p}} - \frac{h\,((\bar{p}\bar{x} - v_R)((1-h)(\bar{p}\bar{x} - c) + c\,\bar{p}))}{(1-h)\,\bar{p}\,(c\,h + (1-h)\bar{p}\bar{x})}, 0\right]. \tag{42}$$

Our first result is that, as long as the participation constraint binds, i.e., compensation is positive, increasing kinship reduces the equilibrium compensation level, w_M^{L*}. This result is recorded below.

Proposition 10. *Compensation, w_M^{L*}, is weakly decreasing in kinship, h and, whenever $w_M^{L*} > 0$, w_M^{L*} 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 required by the project are manager specific, if the manager refuses to work for the family firm, 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 low salary offers from the owner. In the presence of kin altruism, the indispensability of the manager weakens rather than strengthens the managers ability to extract value from the firm.

7.2 Efficiency

In Section 4.3 we showed that the probability of monitoring increases with kinship at fixed compensation. In Section 7.1 we showed that increased kinship leads to lower compensation. Reductions in compensation, absent diversion 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. Hence, reductions in compensation require increases in monitoring to deter underreporting. Combining these two observations makes the logic behind the following proposition apparent.

Proposition 11. *(a) Whenever $w_M^{L*} > 0$, the probability that the owner will monitor the manager's report of a zero cash flow, m^*,is strictly increasing in kinship.*
(b) The probability of monitoring and monitoring expense are increasing in kinship.
(c) Family value is decreasing in kinship.

Proof. See the Appendix.

Note that both when the payment to the manager is fixed, the case considered in section 4.3, and in 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. However, when compensation is fixed by the participation constraint, the loyalty hold up ensures that even the conditional probability of monitoring increases with kinship. Thus, although kinship increases the probability of monitoring even when compensation is fixed, the probability of monitoring will be much more responsive to increases in kinship when compensation is negotiated and the participation constraint binds. This implies that, in the labor market setting, the adverse effect of kinship on family value is much more pronounced than in the fixed compensation case.

7.3 Value of the owner and manager

The effect of kinship on owner and manager value depends not only on kinship's effect on efficiency but also on its effect on the distribution of value between the manager and the owner. Because of these distributional effects, increasing kinship may increase owner value even when it lowers family value.

7.3.1 Owner value

Equations (42), (14), and (40), determine the owner's value, v_O^{L*}, which is given by

$$v_O^{L*} = \bar{p}\,(m^*\,\bar{x}\,\sigma^* + (1-\sigma)\,(\bar{x} - w_M^{L*})) - c\,m^*(1 - \bar{p}\,(1-\sigma^*)). \tag{43}$$

where σ^* is defined by (14) and w_M^{L*} by (42).

From Propositions 10 and 11, we see that increasing kinship will (i) lower compensation, (ii) increase underreporting, and (iii) increase monitoring expense. 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 12.

Proposition 12. *a. The value of the firm is a quasiconcave function of kinship, h.*
b. Let $\gamma = c/(\bar{p}\,\bar{x})$, then
i. if

$$(1-\gamma)^2 - \gamma^3\,(((1-\bar{p}) - \gamma)\,(\bar{p} - \gamma) + (1-\gamma)\,\gamma) > 0, \tag{44}$$

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

$$(1-\gamma)^2 - \gamma^3\,(((1-\bar{p}) - \gamma)\,(\bar{p} - \gamma) + (1-\gamma)\,\gamma) \le 0, \tag{45}$$

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 7.

Proposition 12 shows that unless the cost of monitoring c is very high relative to the expected cash flow, $\bar{p}\,\bar{x}$, owner value is increased by some some degree of kinship with the manager. This result is not surprising the the light of Proposition 1 which shows that the adverse monitoring effect of kinship is relatively small at low kinship levels. Thus, in this case, the loyalty hold-up effect dominates. The fact that some degree of kinship increases owner value does not preclude higher levels of kinship from reducing owner value. In fact, as quasiconcavity suggests, owner value is typically maximized at an interior kinship level.

7.3.2 The manager's value

Because, in the labor market setting, there are no effort costs, the manager's value is just the expected cash flow received by the manager. It is given by

$$v_M^{L*} = \bar{p}\,((1-m^*)\,\sigma^*\,\bar{x} + (1-\sigma^*)\,w_M^{L*}). \tag{46}$$

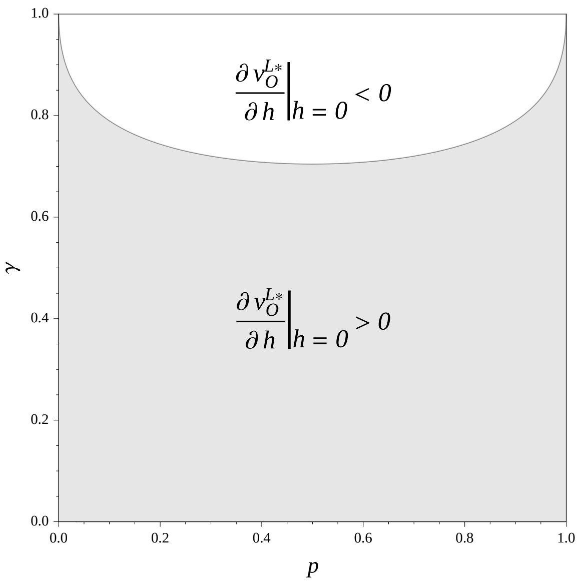


Figure 7: The horizontal axis represents $\gamma = c/(\bar{p}\bar{x})$, monitoring cost as a fraction of total firm value. The vertical axis represents $\bar{p}$, the probability of a high cash flow given effort.

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 is satisfied. However, this condition only ensures that the manager's utility from accepting employment is constant not that the value of accepting employment is constant. Utility incorporates indirect internalized family gains and direct value gains. Introducing kinship altruism generates internalization gains for the manager and thus, keeping utility fixed requires a reduction in the value of compensation. However, increasing kinship from a sufficiently high starting point can actually increase the manager's value. This reversal occurs in two cases, one fairly obvious and the other subtle. The obvious case is that compensation has been lowered so much by kinship that it has hit the limited liability boundary. In this 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 manager value can also occur when the reservation constraint is binding. The logic behind the reversal in this case is that although an increased degree of kinship increases the fraction of the family's gain that the manager internalizes, the increase in kinship also increases monitoring expense and thus lowers family value. For this reason, the manager has less family gain to internalize. Hence, to keep the manager's utility constant, the manager's direct gains might have to be increased. These results are recorded in the following proposition:

Proposition 13.

(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.

7.4 External candidate managers in the labor market setting.

In the labor market setting, the agency frontier is closed: The family firm cannot use internalized gains to improve effort incentives and increase output. The only frontier on which kin altruism can operate is the manager's participation frontier, which is fixed by the value of the manager's outside options. In this setting, the family owner uses a loyalty holdup to exploit the family manager's willingness to accept lower compensation because of kinship. The loyalty holdup reduces family value but may increase firm, i.e., owner, value. The holdup works because the human capital required to manage the firm is family specific. As human capital becomes less specific, and thus alternative candidate managers become available, the force of the loyalty holdup diminishes and the manager's reservation compensation demands increase. In general, determining the equilibrium compensation for the family manager when rival candidate managers exist is fairly complex because compensation of the family manager affects the difference in firm value under the family and external manager while, at the same time, this difference in value affects compensation. In the interests of brevity, we do not consider the entire feasible range of human capital specificity but rather simply contrast family-specific human capital with completely general human capital. That is, we assume that a "clone" candidate external manager exists who provides exactly the same production technology, is monitored at the same cost, c, and has the same reservation compensation value, v_R as the family manager. As in the agency model analysis of the hiring decision, we superscript value and utility variables with K when the owner hires the family (kin) manager and with E when the external manager is hired. We assume that the family owner first approaches the family manager and makes a take-it-or-leave-it compensation offer; if the offer is rejected, the family manager works outside the firm receiving a value of $v_R > 0$ and the family owner hires the external clone. If the owner's offer is accepted, the family manager works for the family firm. Value and utility are determined by the results in Section 7, with h set to 0 in the case where the family owner hires the clone external manager. Our basic result is that when human capital is general, family owners not only are not nepotistic, they will actually always prefer hiring an external manager of equal competence to hiring the family manager.

Proposition 14. *In the labor market setting, when human capital is completely general, family owners follow anti-nepotistic hiring policies, i.e., a family owner will strictly prefer to hire a clone external manager rather than a family member.*

Proof. See the Appendix.

The intuition behind this result is that, when a clone external candidate exists, rejecting the family owner's offer will not impose costs on the family as a whole. Thus, the family manager does not internalize a loss in family value from rejecting the family owner's employment offer. For this reason, the loyalty holdup has no force and the family manager's compensation demands are the same as those of the clone. Given the same level of compensation, as shown in Section 4, monitoring expense is greater under family ownership. Because increased monitoring expense is not offset by reduced compensation, the owner prefers to hire outside the family. Of course, Proposition 14 is a *certis paribus* result and thus requires that the cost of monitoring family members is the same as monitoring external managers. If the cost of monitoring family members were lower, the family owner would minimize monitoring expense by trading off this cost effect against the commitment effect in a straightforward fashion. What the result does show is that, when the agency frontier is closed, and human capital is general, as would be the case in world described accurately by a simple positive assortative matching model (e.g., Gabaix and Landier (2008)), genetic relatedness per se cannot explain family firm formation. Some other factor, positively correlated with relatedness, e.g., family-specific tacit knowledge or lower costs of intra-family monitoring, is required.

8 Extensions

8.1 Inheritance

In the previous sections we examined the behavior of family firms—firms in which ownership rights, control, and human capital are concentrated within a family. Such firms might be created by the initiative of two kin, e.g., two brothers launching a grocery store. However, many family firms are descendant firms, firms bequeathed by a founding entrepreneur. Here we sketch out why founders might create descendant firms in which ownership and management are separated and compare the founder's preferences over descendant-firm policies with policies that the descendants themselves select. Our basic result is "founder benevolence"—for "typical" family pedigrees, inclusive fitness maximization implies that the founder's preferences are more "pro-family," i.e., attach more weight to overall family value, than any of her descendants.

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 from the bequest decision. The founder's decision will be determined by kin altruism. 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

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

We also assume that the kinship coefficient h_{NS} satisfies all the conditions imposed on h in the baseline model. Because, by assumption, the founder is deceased at date 0, the only family agents involved in managing the firm are N and S. Thus, the monitoring, reporting, and effort decisions of the descendant firm will be identical to the decisions made in the baseline model. The key new 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. A 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) if S is the son of the founder and N is the founder's nephew, then $h_S = 1/2$, $h_N = 1/4$, and $h_{NS} = 1/8$. We also assume that S is incapable of managing the firm, i.e., under S's management, $\bar{x} = 0$. This implies that, if the firm is to operate under S's ownership, S must hire a manager. N is capable of managing the firm and its value under N given an uptick is $\bar{x} = \bar{x}^N$. We assume, without loss of generality, that $\bar{x}^N = 1$. Consider the founder's preferences over the value received by N and S subsequent to her demise. The founder's utility is the relationship-weighted sum of N's and S's values, i.e., the utility of the founder is given by

$$u_F = h_S\, v_S + h_N\, v_N,$$

where v_S, and v_N represent value to N and S. Next, note that the founder's utility function is only unique up to increasing affine transformations. Thus, dividing by h_S, we can and will express the founder's utility in the following equivalent form:

$$u_F = v_S + h_F\, v_N, \quad h_F = \frac{h_N}{h_S}$$

As in the baseline model, the potential heirs' preferences are given by the kin altruism utility function. Thus, S's preferences are determined by

$$u_S = v_S + h_{NS}\, v_N,$$

and N's preferences are determined by

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

Family members' decisions trade off family welfare against selfish gain. This is a bit more obvious if we rewrite the utility functions of the family members using expression (6). This yields

$$u_S = h_{NS}\, v + (1 - h_{NS})\, v_S, \tag{47}$$

$$u_N = h_{NS}\, v + (1 - h_{NS})\, v_N. \tag{48}$$

$$u_F = h_F\, v + (1 - h_F)\, v_S, \tag{49}$$

where $v = v_S + v_N$ represents family value. For the founder, $h_F = h_N/h_S$ represents the degree to which her preferences are aligned with family value as opposed to the value received by S while h_{NS} represents the degree to which N and S weigh family value relative to their selfish value. If $h_F > h_{NS}$, then we will term the founder's preferences *benevolent*. If founder preferences are benevolent, her preferences tilt more toward family value as opposed to the value received by particular family members. Are founders benevolent? A model of altruism based on social connectedness or friendship would provide little guidance in answering this question. However, the logic of kinship-based altruism provides us with a fairly definitive answer—typical family structures imply founder benevolence.

Proposition 15. *The following conditions are sufficient for founder benevolence:*

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 ii, the founder's benevolence exceeds S's by a considerable margin, i.e., because

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

Proof. See the appendix.

The logic behind Proposition 15 is transparent given the mathematics of kinship relations. If S and N are collateral relatives, and the family tree is not too bushy, either because of consanguineous or affinity marriages, the primary path connecting collateral relatives runs through the founder. Thus, the primary path connecting the founder to S and N is shorter than the path connecting S and N to each other. Because relatedness declines geometrically with the number of arcs connecting relatives, collateral relatives are less closely related to each other than each is related to the founder. Given the weak restrictions on family pedigree required to support founder benevolence, we will focus on this case in the subsequent analysis.

The most direct consequence of founder benevolence is that the founder, if restricted to a simple bequest of the entire firm to one of the descendants, may prefer to bequest the firm to the more distant relation, N. To see this, consider the case where no rival candidate manager to N exists. The founder's utility from bequeathing the firm to N is the same as the utility the founder would have if the founder were the owner of the firm and the founder hired N to manage the firm but set N's compensation equal to the entire cash flow, $\bar{x}$. In both the agency and labor market models, we have shown that if $(1-h)\bar{x} < c$, the owner's preferred policy is to hand ownership to the manager. Thus, if $(1-h_F)\bar{x} < c$, the founder's utility from bequest to N will exceed the founder's payoff from any other compensation policy. If the founder bequests the firm to S, then the founder's payoff is $u_F = v_S + h_F\, v_N$. Because h_{NS} satisfies the restriction that $(1-h_{NS})\bar{x} > c$, S will never offer compensation equal to the entire cash flow to the manager. Benevolence implies that $h_F > h_{NS}$, and in the simplest case of unilateral family trees it is greater by a considerable margin. Thus, it is quite possible for $(1-h_F)\bar{x} < c$ even when $(1-h_{NS})\bar{x} > c$. In which case, the founder will prefer a simple bequest of the firm to N to a simple bequest to S. In essence, the simple bequest to N increases efficiency by eliminating the agency-conflict and thus increases family value at the cost of value to S. The benevolent founder is more willing to accept reductions in S's payoff that increase family value than S. Thus, we have established that

Lemma 3. *There exists parameters of both the labor market model and agency model under which the founder prefers a simple bequest of the entire firm to the more distant relative, N to bequests to the closer relative S.*

In contrast if h_F is sufficiently close to 0, the founder will never bequest the firm to the more distant relative, N. In this case, absent a viable external candidate manager, ownership and management will be separated, with N managing a firm owned by S. This is the case considered in the baseline model. In the presence of rival candidate managers of sufficient quality so that both N and S would hire one of these candidates, bequests to distant relatives will also not occur. In this case, N and S would set the same compensation policy for the external candidate manager and both, if bequeathed the firm, would receive the owner's value. Because value is the same under both N and S, the founder would prefer that her closer relative receive this value.

If the founder bequests the firm to N, then N will either manage that firm or hire an external manager. In either case, N's decisions will not affect the value received by S. N will be the only family member involved in the firm and N's actual policy choices will align completely with the preferences of the founder. The situation is more complex if the founder bequests the firm to S. In this case, because N is a potential manager of the family firm, the compensation and manager selection policies adopted by S affect both N's and S's value. Thus, because of founder benevolence, it is conceivable that the preferences of the descendant owner S will not coincide with the preferences of the founder. The next proposition shows that, in fact, in the labor market setting, founder preferences over the compensation of non-managing relatives are generally aligned with heir preferences. In contrast, their preferences are never aligned in the agency setting.

Proposition 16. *If the founder bequests the firm the closer relative, S then*

i. In the agency setting, when the founder's preferences are benevolent,

a. If the more distant relation, N, is hired to manage the firm, the compensation offered by the founder's closer relative, S, to N will always be less than the compensation level preferred by the founder.

ii. In the labor market setting, provided the manager's compensation is positive, the compensation policy of the descendant owner will coincide with the founder's preferred actions.

Proof. See the Appendix.

The logic behind this result is that, in the agency setting, increasing the compensation of the related manager increases output and lowers monitoring expense and thus increases family value. Because the founder weighs family value more than S, she will prefer more generous compensation for N. the labor market setting, where labor market value rather than the pay/performance tradeoff determines compensation, both the owner and founder prefer to put the distant relative, N, on his reservation utility level. They will be able to do this so long as they are not blocked by the limited-liability constraint. If N accepts employment elsewhere, N will also capture his reservation utility. As equation 5 shows, between alternatives that leave N's reservation utility fixed, both S and N will prefer the alternative that maximizes family value. Thus, their preferences are aligned.

From the above discussion it is clear that, in the labor market setting, simple bequests either to the closer or more distant relative, go a long way to implementing founder preferences for descendant firm policies. However, in the agency setting, when the firm is bequeathed to the closer relation S, the founder's preferences over descendant firm policies will not always coincide with the policies that S will actually adopt. In this case, kin altruism predicts that the founder has an incentive to design more complex bequest mechanisms with the aim of increasing the compensation of managing relatives at the expense of non-managing relatives. Depending on the legal and institutional environment, a number of mechanisms might be employed to achieve this goal. One mechanism is a split bequest which offers N a non-controlling stake in the firm. Because cash flows are verified only by the reports of the manager, the manager and owner payoffs when the manager holds a non-controlling stake in the firm that pays w in the event of a the high reported cash flow (and 0 otherwise) are exactly the same as in the baseline model when the manager receives compensation of w. The problem with a noncontrolling stake of this sort is that it would lower the utility to S from retaining the family manager and thus would only be effective if viable rival candidates were not present or if it was combined with some mechanism to ensure that S hires N. One such mechanism would be for the founder to hire N before her demise and grant him a very generous severance package, thus increasing the cost of external hiring. Another possibility would be to grant controlling ownership to N and a non-controlling stake to S. This mechanism would fix S's payoffs equal to the residual between cash flows and the founder-preferred compensation to N.[13]

8.2 Outside ownership, monitoring and the cost of capital

The baseline model assumed that the firm is entirely family owned. The advantage of this modeling approach is that it permits us to abstract from agency conflicts generated simply by minority share ownership. Such agency conflicts are important but they are not per se caused by family ownership. In this section, we extend the baseline model to consider the effect of passive external capital on family firm dynamics. Our approach is to consider the marginal effect of introducing external capital into the family firm. We focus on two issues: the marginal effect of external capital on the monitoring reporting problem and the marginal cost of outside capital.

Specifically, we assume that outside shareholders own a fraction o of the firm's equity and consider the marginal effect of outside ownership as $o \to 0$.[14] Because only reported cash flows are verifiable, the outside owners' claim is written on reported cash flows in excess of compensation. Thus, if reported cash flow equal $\bar{x}$, outside shareholders will receive $o(\bar{x} - w)$, the family owner receives $(1-o)(x-w)$, and the family manager receives w. When reported cash flow equals 0, outside shareholders receive 0 and the payoffs to the family owner and manager are the same as in the baseline model. That is, if the owner does not monitor the owner receives 0 and the manager captures the cash flow (which can equal either 0 or $\bar{x}$). If the owner monitors, the owner incurs the non-pecuniary monitoring cost c and captures the cash flow.

First, consider the effect of marginal outside capital on the monitoring and reporting problem. Note that monitoring only occurs when reported cash flows equal 0 and, when reported cash flows equal 0, all cash flows are received by family members. Thus, conditioned on a report of 0, the value received by family members is unaffected by the introduction of outside shareholdings. Because owners monitor only in response to a report of 0, and because the equilibrium probability of underreporting is fixed to make monitoring by the owner a best response, the equilibrium probability of underreporting, σ^* is not affected by outside capital. The tradeoffs governing the monitoring probability are different. The monitoring probability is set to deter managerial underreporting. The utility gain from underreporting is affected by outside ownership. When the cash flow equals $\bar{x}$ and the manager truthfully reports, the manager's utility equals $w + h(1-o)(\bar{x} - w)$, where the second term reflects internalization of the cash flow accruing to the family owner. If the manager underreports his utility is $(1-m)\bar{x} + m0 +$

[13]Such a mechanism would require augmenting the cash flow verification technology assumed in this paper.

[14]Because we will only evaluate marginal injections of outside capital, we do not need to reformulate our parametric conditions and restrictions to accommodate this extension.

$h(m(\bar{x}-c)+0(1-m))$, where the second term represents the manager's internalization of the effect of underreporting on the owner. Solving for the monitoring probability that equates the manager's utility from underreporting with his utility from truthful reporting yields the equilibrium probability of monitoring zero reports in the presence of outside ownership, m^{o*}, given by

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

From inspection it is clear that

$$\frac{\partial m^{o*}}{\partial o} > 0 \text{ and } \frac{\partial^2 m^{o*}}{\partial o \partial h} > 0.$$

Because the probability of underreporting, σ^*, is not affected by outside ownership and the probability of monitoring underreports increases with outside ownership at a rate that is increasing in kinship we have established the following result.

Lemma 4. *For any fixed uptick probability, p and compensation level, w, increasing outside ownership increases monitoring expense and the rate of increase is increasing in kinship, h.*

This result is not too surprising. Within the family firm, the gains to the owner from reported income are partially internalized by the manager and this effect deters underreporting. Outside ownership transfers some of these gains to outside shareholders thus increasing diversion incentives. To counter this effect, the intensity of monitoring must increase, thereby increasing monitoring expense.

What happens when we endogenize compensation? In the labor market setting, the results are particularly simple and striking. Thus, we will first consider this setting. In order to focus on the interesting case, we assume that the limited liability constraint is not binding, i.e., the manager's compensation is positive. If we follow the same approach to determining the compensation as used in the labor market analysis in Section 7, but replace m^* with m^{o*}, and, in the family-owner value function, account for the fact that the family owner receives $(1-o)(x-w$ of reported cash flows rather than $x-w$, we obtain the compensation for the family manager, which we represent by w^{oL}.

$$w^{oL} = w^{L*} + o\,h\,(p\,\bar{x}-v_R)\,\frac{(c\,h+\bar{x}\,(1-h))}{(1-h)\,(1-h\,(1-o))\,(c\,h+(1-h)\,p\,\bar{x})}, \tag{50}$$

where w^{L*} is the compensation schedule in the labor-market setting (absent outside ownership) provided by equation (42) in Section 7. Our first observation is that the family manager's compensation is always increased by outside ownership. Kinship's effect on the outside capital–compensation relation is given by the cross-partial of compensation with respect to kinship and outside ownership evaluated at $o=0$.

$$\left.\frac{\partial^2 w^{oL}}{\partial o \partial h}\right|_{o=0} = \frac{c\,(1+h)+\bar{x}\,(1-h)}{(1-h)^3} > 0.$$

Thus, the rate at which compensation increases with the introduction of outside ownership is increasing in the degree of kinship between the owner and manager. Outside capital reduces the losses to the family from the manager rejecting the owner's compensation offer and thus outside ownership weakens the force of the loyalty hold up. The higher the degree of kinship, the more significant the loyalty hold up and thus the greater the effect of loosening the hold up generated by outside capital. If we insert the equilibrium compensation level into the monitoring probability function m^{o*} we can determine the equilibrium probability of monitoring zero reports in the labor market setting, which we represent by m^{oL}:

$$m^{oL} = \frac{p\bar{x} - v_R}{c\,h + (1-h)\,p\,\bar{x}}$$

As one can see by inspecting (8.2), this function is invariant to the level of outside capital. This result follows because, while the introduction of outside capital increases the monitoring probability for any fixed level of compensation, outside capital also increases compensation sufficiently to exactly counter this effect. In the labor market setting, family value is determined by monitoring expense which in turn is determined by the probability of monitoring. As we have shown, these probabilities are not affected by outside ownership. Therefore, family value is not affected. The introduction of outside capital generates a 1–1 transfer of value from the owner to the related manager. Thus, outside capital increases the value and utility of the family manager and reduces the value and utility of the family owner.

Now consider the marginal cost of capital. We define the marginal cost of capital for the owner as the marginal cost to the owner of selling $do \approx 0$ fraction of the firm to outside passive investors before negotiating compensation with the manager. Assuming perfect competitive and risk neutral capital markets, the price received for shares sold will equal their expected payoff based on outside investors' conjectures regarding the compensation, monitoring, and diversion policies followed by the family owner and family manager. In equilibrium, outsiders' conjectures will be correct. The above analysis shows that this cost will always be positive for family owners and will be zero when the owners and managers are unrelated. Thus, family owners are "allergic" to outside capital in the labor market setting because outside capital reduces their leverage over the family manager.

In the agency setting, computing the marginal cost of capital is more involved because outside ownership affects the owner's willingness to concede agency rents to the manager in exchange for a higher uptick probability, p. Thus, to determine the owner's marginal cost of outside capital, more explicit calculations are required: If the owner sells o fraction of the firm to outside investors, the owner's value will equal the value of the portion of the firm he retains plus the value of shares sold, i.e., the owner's value will equal total firm value, the value of the family owner's claim plus the outsiders' claim. Represent total firm value by V. We assume, as in the labor market discussion, that the owner sells before setting compensation policy and thus, at the time the family owner and manager choose their actions, the proceeds of the sale are fixed and thus do not affect incentives. As in the labor market model, we can solve for the actions chosen by the family manager and owner using the baseline model. We use the agency analysis in Section 5 but replace the monitoring function m^* with m^{o*}, and adjust the family owner value function to account for the fact that the family owner receives $(1-o)(x-w$ of reported cash flows rather than $x-w$. Then, we compute the total firm value given these actions, V^{oA*}, and the manager's value, v_M^{oA*}. The marginal effect of introducing outside capital on the owner is given by

$$\frac{\partial}{\partial o}\left(V^{oA*} + h\,v_M^{oA*}\right)\bigg|_{o=0}.$$

We define the owner's marginal cost of outside capital as the negative of this expression and represent the owner's marginal cost of outside capital with MCC. Preforming the required calculation yields

$$\mathrm{MCC} = -\frac{\partial}{\partial o}\left(V^{oA*} + h\, v_M^{oA*}\right)\Big|_{o=0} = h\,\frac{(1+h)\,(1-h(1-\chi))^2\,(1-h-\chi)}{(1-h)^2\,((1-h)\,(2+h)+h\chi)^2} \tag{51}$$

Inspection of (51) shows that the marginal cost of outside capital is positive if and only if the owner and manager are related, i.e., $h > 0$. In the agency setting, the kin manager's willingness to exert effort is attenuated by outside ownership because the manager only internalizes the family owner's portion of value. Thus, at a fixed compensation level, output falls with outside ownership. In addition, at fixed compensation, outside ownership increases monitoring expense both by increasing the probability of monitoring zero reports and, by reducing effort, and thus increasing the probability of truthful zero reports. At the same time increased outside ownership, by reducing the family owner share of firm cash flow, increases the fraction of owner gains that result from internalizing payoffs to the kin manager. Thus, the owner's willingness to increase the family manager's compensation also increases with outside ownership. Thus, outside ownership leads to increased managerial compensation and reduced firm value. These effects are anticipated by outsiders buying into the family firm and reflected in the price of shares issued to outsiders.

As in the labor market case, the owner is allergic to the introduction of outside capital. Do his allergies worsen as the degree of kinship increases? In the agency model, the answer to this question is less transparent than in the labor-market setting. The derivative of the marginal cost of outside capital with respect to kinship is a ratio between high order polynomials and thus is hard to interpret. However, the effect of kinship on the marginal cost of outside capital is easy to compute numerically. A plot of the effect is presented in Figure 8.

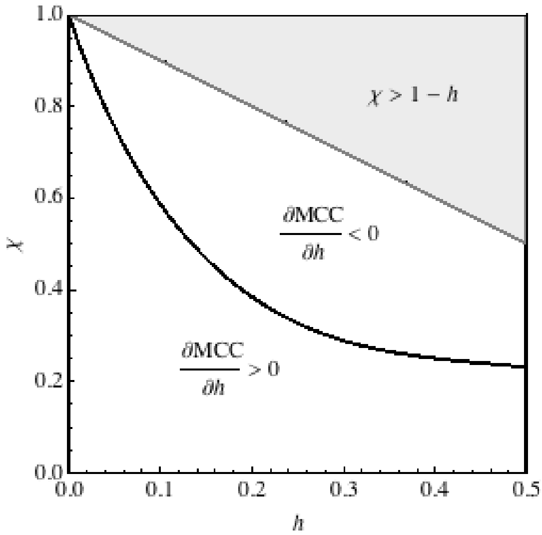


Figure 8: *Effect of kinship on the marginal cost of outside capital in the agency setting.* In the figure, the degree of kinship, h, is plotted on the horizontal axis and the normalized level of monitoring cost, $\chi = c/\bar{x}$ on the vertical axis. The marginal cost of outside capital, MCC, is always positive for the family firm and 0 for the non-family firm. The regions where the marginal cost of outside capital is increasing in kinship $d\,\mathrm{MCC}/dh > 0$ and decreasing in kinship $d\,\mathrm{MCC}/dh > 0$ are depicted in the graph.

From the figure we see that the marginal cost of outside capital is increasing in kinship except when the degree of kinship approaches the constraint boundary $1-h>\chi$. At the constraint boundary, the owner prefers to hand the firm over to the manager rather than have the family bear the costs of the division between ownership and management. Close to the constraint boundary, managerial compensation is quite high. Thus, the owner's primary source of utility is internalized manager gains. Further increases in h in this region increase the owner's gain from internalization and this more than offsets the negative effect on his rather small direct claim on firm value. In all other cases, as in the labor market setting, increasing kinship increases the marginal cost of outside capital.

In like fashion, we compute the marginal effect of outside ownership on family value. Performing this calculation yields,

$$\frac{\partial}{\partial o}\left(V^{oA*}+v_M^{oA*}\right)\Big|_{o=0}=h\,\frac{(1+h)(1-h+\chi)\left(1+h^2(1-\chi)-\chi-h\left(2-2\chi+\chi^2\right)\right)^2}{(1-h)^3\left((1-h)+(1-h)(1+h)+h\chi\right)} \tag{52}$$

Provided the manager and owner are kin, $h>0$, the marginal family value effect of outside ownership is always positive. This result follows because outside ownership increases the family owner's willingness to concede rents to the family manager in exchange for more output. Because of outside owners the family owner pays only part of the management compensation cost but still internalizes the manager's value at the same rate, h. Thus, management compensation increases at a sufficient rate to more than offset the reduced performance incentives at a fixed level of compensation. The increase in compensation both increases output and reduces the need for monitoring, resulting in higher firm value. Because the introduction of outside capital raises family value and lowers the utility of the owner, the kin altruism relationship given in equation (5) and (6) imply that firm value falls with the introduction of outside capital and the manager's utility and value increase. Thus, as in the labor market setting, owners lose and managers gain from the introduction of passive outside capital. These results are summarized in the following Lemma.

Lemma 5. *For non-family firms $h=0$, the marginal cost to the owner of passive outside capital is 0. For family firms, the marginal cost to the owner of passive outside capital is always positive. In the agency setting, the positive marginal cost to the owner from outside capital results because the family value gain from outside capital discounted by kinship h is never sufficient to offset the reduction in owner value caused by the increased value capture by the manager. In the labor market setting, the marginal effect of outside capital is simply to transfer value 1-1 from the owner to the manager and thus such capital's marginal cost to the owner is also always positive. In either case, family firms face higher costs of external finance and thus higher hurdle rates for projects that must be financed with outside capital than non-family firms.*

8.3 Kinship vs. Friendship

The extent to which other bonds between agents substitute for kinship altruism is a subject of considerable controversy in the social sciences. Affinity bonds arising from marriage into a family are fairly easy to incorporate into the kin altruism paradigm. Affine relations have offspring who are genetically related. Thus, if agents' actions primarily affect the fitness of their descendants, the conditions for kin altruism are satisfied by affinity bonds (see Hughes (1988)). For example, under the Japanese practice of adopting candidate CEOs into the family, which is usually accompanied by marriage of the adopted son to a family member, adopted and blood relations should exhibit kinship altruism.[15] Thus, there are good reasons to conjecture that the kinship altruism model extends to firms owned and managed by affine relations.

The case of friendship bonds is more problematic. There are two approaches to arguing for substitutability between kinship and friendship. The first is to argue that both friendship and kinship bonds result from the same mechanism and thus share the same properties. The second is to argue that kinship bond and friendship bonds are produced by different mechanisms but that friendship bonds happen to have essentially the same properties as kinship bonds, i.e., friendship mimics kinship. We consider each argument in turn.

Theoretically, friendship bonds might be the product of inclusive fitness maximization. Generalizations of Hamilton's model show that the necessary and sufficient condition for inclusive-fitness-based altruism between two agents is that the probability of an altruism allele being present in one agent, conditioned on the presence of the allele in the other agent, exceeds the population mean. Hamilton's classic model of inclusive fitness assumes random mating and no inbreeding. Under these assumptions, inclusive-fitness-based altruism can only occur between agents related by descent and the degree of mutual altruism is determined by their relatedness coefficient. However, in general, selection for inclusive-fitness based altruism only requires a positive correlation between the altruism alleles of the agents. A number of researchers have documented that friends share more genes than non-friends (Fowler, Settle, and Christakis, 2011). Thus, actual friendships, to the extent that they reflect genetic similarity, should mimic kin altruism. However, whether the degree of genetic similarity between friends is sufficient to have meaningful effects is seriously disputed (Roberts and Dunbar, 2011). Thus, to the extent that friendship bonds are founded on inclusive fitness, we would expect "friendly" managers and owners to behave altruistically toward each other. However, non-family owners and managers would exhibit a much lower degree of altruism.

The question remains as to whether there are other mechanisms which generate friendship bonds between unrelated agents that effectively mimic kin altruism. Kinship altruism is symmetric between kin, limited by the degree of relatedness, stable over time, and not dependent on reciprocal benefits or continuous social interaction. Whether friendship altruism between close friends has these characteristics is disputed. For example, Korchmaros and Kenny (2001) argues that altruism between close friends mimics kinship altruism while Roberts and Dunbar (2011) presents evidence that friendship bonds and kin bonds are fundamentally different. If intimate friendships mimic kin bonds, then we would expect firm's where shareholder and managers are close, intimate, friends to behave much like family firms. The only caveat being that the bequest decisions of founders of such firms, because the strength of friendship is not governed by the relatedness calculus, might be quite different.

Regardless of the position one takes on these questions, it is clear that, even if friendship bonds to some extent substitute for kinship altruism, the altruism level, h in our model, is likely, on average, to be far greater among related owners and managers. The genetic similarity between friends is far less

[15] See Mehrotra, Morck, Shim, and Wiwattanakantang (2013) for an empirical analysis of Japanese adoption practices and corporate governance

than between relatives, and even advocates of substitutability between friendship and kinship altruism concede that substitutability is restricted to intimate friendships. Intimate friendships between unrelated owners and managers are likely to be present only in a small subset of non-family firms. Almost all of our results concern the effects of continuous variation in the altruism parameter, h and thus these results do not depend on the altruism coefficient, h, in non-family firms equaling zero, only on the altruism coefficient for family firms, on average, being substantially greater than the altruism coefficient for non-family firms.

9 Conclusion

This paper explored the effects of kin altruism on family firms by injecting kin altruism into a fairly standard model of monitoring and effort provision. A number of implications were derived, some of which are consistent with empirically documented regularities and others which are potentially testable. The key insight is that although kin altruism predicts some unconditional differences between family and non-family firms, e.g., that family firms will exhibit higher levels of resource diversion by managers, less efficient internal control at fixed compensation levels, and higher costs of external finance, most of its predictions are conditional. Family firms are more efficient than non-family firms when compensation is set by incentive constraints and human capital is firm specific. When incentive constraints determine compensation, but human capital is general, family firms are more efficient under family management than they would have been absent kinship bonds but kinship bonds may inefficiently tilt managerial hiring decisions toward hiring relatives. When managerial participation constraints bind, family firms are less efficient than non family firms. When the participation constraint determines compensation and human capital is completely general, family owners, in fact, will prefer hiring external managers. The division of the gains or losses from family control between managers and owners depends on the costs of enforcement. When these costs are low, firms will be the primary beneficiaries of family control. When costs are high, managers will be the primary beneficiaries.

This paper is only a first-step in addressing the role of kin altruism in business relations. As well as the obvious technical extensions of the analysis, e.g., enlarging the space of potential cash flow realizations, the most interesting directions for extension are dynamics and scope. Dynamics are interesting at two time scales, the dynamics within a single generation and the dynamics of inter-generational inheritance. Within a single generation, an interesting issue is how kin altruism affects the ability of owners to enforce non-opportunistic managerial behavior through dynamic compensation and retention strategies. Across generations, the issue of how current owners can implement their relatively family altruistic preferences for firm policy through bequests to the next generation when potential heirs differ both in ability and degree of relatedness is both interesting and rather subtle. With regard to scope, the obvious extension is to expand the analysis of outside capital beyond simply considering the marginal effect of introducing passive outside capital into an entirely family owned firm. Extensions could analyze how family firms operate when they have extensive outside ownership and how the introduction of active outside capital, e.g., private equity, affects family firm behavior. This paper provides a foundation for such research.

Appendix

Proof of Lemma 2. We start by demonstrating i. Differentiating u_O^A twice with respect to p yields

$$\frac{\partial^2 u_O^A}{\partial^2 p} = -\frac{\bar{x}\left(ch+\left(2-h-h^2\right)\bar{x}\right)}{(1-h)\bar{x}-c}. \tag{A-1}$$

The denominator is positive by assumption (13). Because the numerator is positive for all $h<1$ and thus *a fortiori* for $h<1/2$, $ch+\left(2-h-h^2\right)\bar{x}>0$. Thus, $\partial^2 u_O^A/\partial^2 p<0$, showing that u_O^A is strictly concave. Next consider ii. We need to show that neither $p=p_{\min}$ nor $p=1$ are optimal solutions to problem (26). Note that

$$u_O^A(p) = \bar{x}\,\hat{u}_O(p), \tag{A-2}$$

where

$$\hat{u}_O(p) = \frac{2p\left(1+h+\alpha+h\alpha^2\right)-2\alpha(1+h\alpha)-p^2(2+h+h\alpha)}{2(1-\alpha)} \quad \text{and } \alpha = \frac{c}{(1-h)\bar{x}}. \tag{A-3}$$

$\hat{u}_O$ is simply a scaled version of u_O^A where the cost of monitoring, c, is expressed as a fraction of $(1-h)\bar{x}$. Thus, the sign of derivative $\hat{u}_O$ with respect to p is always the same as the sign of u_O^A. Note also that assumption (13) implies that $\alpha\in[0,1)$. Expressing $p^{w=0}$ in terms of α yields

$$p^{w=0} = \frac{h(1+\alpha)}{1+h\alpha}. \tag{A-4}$$

We first show that $p^A>p^{w=0}$. We differentiate $\hat{u}_O$ with respect to p and evaluate the derivative at $p=p^{w=0}$. This yields

$$\left.\frac{\partial \hat{u}_O}{\partial p}\right|_{p=p^{w=0}} = \frac{\left(1-h-h^2\right)+\left(1-h-h^2\right)\alpha+\left(2h-h^2\right)\alpha^2+h^2\alpha^3}{(1-\alpha)(1+h\alpha)}. \tag{A-5}$$

Because $h\in[0,1/2]$ and $\alpha\in[0,1)$, this expression is always positive. This implies, given result i of this lemma, that $p^A>p^{w=0}$. Now consider, $p=\alpha=c/(x(1-h))$. Evaluating the derivative of $\hat{u}_O$ at α yields $\hat{u}_O'=1+h>0$; thus, again, $p^A>\alpha$. Hence, $p^A>\max[p^{w=0},\alpha]=p_{\min}$. Finally, consider $p=1$. Following the same approach as followed for $p=p_{\min}$ shows that

$$\left.\frac{\partial \hat{u}_O}{\partial p}\right|_{p=1} = -(1+h\alpha)<0. \tag{A-6}$$

Thus, $p^A<1$. Hence, result ii has been established. Finally, result iii follows from i and ii. □

Proof of Proposition 2. The functional form of p^A, given in equation (28) is obtained, after some significant manipulation, from solving the first-order condition of Lemma 2.iii. To prove i, first note that

$$-\frac{\partial}{\partial h}\log\left(1-p^A(h,\chi)\right)=\frac{\partial_h p^A(h,\chi)}{1-p^A(h,\chi)}=$$
$$\frac{\chi}{(1-h)(1-h-\chi)}+\frac{(1-h)^2-\left(1+h^2\right)\chi}{(1-h(1-\chi))\left((1-h^2+\chi(1+h))+(1-h-\chi)\right)}. \quad \text{(A-7)}$$

Thus, to establish the result we need to show that

$$\frac{\chi}{(1-h)(1-h-\chi)}>\frac{-\left((1-h)^2-\left(1+h^2\right)\chi\right)}{(1-h(1-\chi))\left((1-h^2+\chi(1+h))+(1-h-\chi)\right)}. \quad \text{(A-8)}$$

Next note that $\chi\to\chi+(1-h)^2-\left(1+h^2\right)\chi$ is decreasing in χ. Thus, it attains is minimum value at the maximum permitted value of χ which equals $\chi=1-h$. Evaluated at this value, the expression is positive by our assumption that $h<1/2$ and thus,

$$\chi>-\left((1-h)^2-\left(1+h^2\right)\chi\right). \quad \text{(A-9)}$$

If the right-hand side of expression (A-9) is negative then (A-8) clearly holds and the proof is complete. So suppose that the right hand side of expression (A-9) is positive. Note that

$$1-h\le 1-h(1-\chi), \quad \text{(A-10)}$$
$$(1-h-\chi)<\left(\left(1-h^2+\chi(1+h)\right)+(1-h-\chi)\right), \quad \text{(A-11)}$$

and therefore,

$$\frac{1}{(1-h)(1-h-\chi)}>\frac{1}{(1-h(1-\chi))\left((1-h^2+\chi(1+h))+(1-h-\chi)\right)}. \quad \text{(A-12)}$$

Thus, if the right hand side of inequality (A-9) is positive, (A-9) and (A-12) imply that

$$\frac{\chi}{(1-h)(1-h-\chi)}>-\left(\frac{(1-h)^2-\left(1+h^2\right)\chi}{(1-h(1-\chi))\left((1-h^2+\chi(1+h))+(1-h-\chi)\right)}\right). \quad \text{(A-13)}$$

Thus, again, (A-8) holds, and the proof of result i is complete.

Next consider ii. Note that the manager's utility along the equilibrium compensation schedule w_M^A is given by

$$u_M^A(p,w_M^A(p))=\frac{(1-h)p^2-2h\chi(1-p)}{2(1-h)}. \quad \text{(A-14)}$$

Thus, the sign of $u_M^A(p,w_M^A(p))$ is determined by

$$\mathrm{SS}(p)=\frac{p^2}{1-p}-\frac{2\chi h}{1-h}. \quad \text{(A-15)}$$

SS(p) is increasing in p and from equation (28) we see that $p^A > (1+\delta)/2$. Thus,

$$\mathrm{SS}(p^A(h,\chi)) > \mathrm{SS}((1+\delta)/2) = \frac{(1+\chi)^2}{2(1-\chi)} - 2\chi\frac{h}{1-h}. \tag{A-16}$$

By assumption (3), $h < 1/2$. Thus, $h/(1-h) < 1$. Thus,

$$\mathrm{SS}((1+\delta)/2) > \frac{(1+\chi)^2}{2(1-\chi)} - 2\chi > 0, \quad \chi \in [0,1]. \tag{A-17}$$

Expressions (A-16) and (A-17) yield the result that $\mathrm{SS}(p^A(h,\chi)) > 0$. Because, *SS* determines the sign of $u_M^A(p, w_M^A(p))$, $u_M^A(p, w_M^A(p)) > 0$ and ii is established. □

Proof of Proposition 3. Define σ^A as the probability of underreporting given uptick probability p, kinship h and normalized cost of monitoring χ. Equation (14) provides the probability underreporting, σ^A, given p. Thus, σ^A is given by rewriting equation (14) in terms of χ. This yields,

$$\sigma^A(p,h,\chi) = \frac{(1-p)\chi}{p(1-h-\chi)}. \tag{A-18}$$

If we substitute in the equilibrium probability of monitoring given by equation (28) and differentiate with respect to h, we obtain

$$\frac{\partial}{\partial h}\sigma^A(p^A(h,\chi),h,\chi) = \frac{\chi\left(2h(1-h)^2 + \left(1+h+2h^2\right)\chi(1-h)\right)}{\left(1-h-h^2+h^3+\chi-h\chi+h\chi^2\right)^2}. \tag{A-19}$$

Inspection shows that this expression is always positive. □

Proof of Proposition 4. Define

$$\hat{w}^A(p,h,\chi) = \frac{p(1-h(1-\chi)) - h(1-h+\chi)}{(1-h)^2} \tag{A-20}$$

$$w^A(p,h,\chi,\bar{x}) = \bar{x}\,\hat{w}^A(p,h,\chi) \tag{A-21}$$

$\hat{w}^A$ represents the equilibrium compensation in the agency setting to the manager, w_M^A defined in equation (19) expressed in terms of the normalized cost of monitoring, χ when $\bar{x} = 1$. w^A represents the equilibrium compensation expressed in terms of χ for a general choice of $\bar{x}$. Since the sign of the relation between kinship, h, and compensation does not depend on $\bar{x}$ we will analyze the effect of h on $\hat{w}^A$. Substituting p^A into equation (A-20) and differentiating with respect to h yields

$$\frac{\partial}{\partial h}\hat{w}^A(p^A(h,\chi),h,\chi) = \frac{(1-h)(1-h(1-\chi))\frac{\partial}{\partial h}p^A(h,\chi) - (1-h(1-\chi)+\chi)(1-p^A(h,\chi))}{(1-h)^3}. \tag{A-22}$$

This expression will have the same sign as

$$\frac{\frac{\partial}{\partial h} p^A(h,\chi)}{1-p^A(h,\chi)} - \left(\frac{1-h(1-\chi)+\chi}{(1-h)(1-h(1-\chi))}\right). \tag{A-23}$$

If we apply equation (A-7), simplify, and then apply the variable transformation, $\chi = \alpha(1-h)$, we obtain the following form of expression (A-23).

$$\frac{2\alpha\left(-1+\alpha+\alpha^2\right)h^2+\left(-2-\alpha+6\alpha^2+\alpha^3\right)h+\left(-1+3\alpha^2\right)}{(1-h)(1-\alpha)(1+h\alpha)(2+h+h\alpha)}. \tag{A-24}$$

The denominator of this expression is positive so the sign of expression (A-43) is determined by its numerator. We can write the numerator in the following fashion:

$$\mathrm{NUM}(h) = C_2(\alpha)h^2 + C_1(\alpha)h + C_0(\alpha), \tag{A-25}$$

$$C_2(\alpha) = 2\alpha\left(\alpha^2+\alpha-1\right), \tag{A-26}$$

$$C_1(\alpha) = \alpha^3+6\alpha^2-\alpha-2, \tag{A-27}$$

$$C_0(\alpha) = -3\alpha^2-1. \tag{A-28}$$

If $\alpha \leq 1/\sqrt{3}$, C_1, C_2, and C_3 are all non positive and one of these terms at least is negative. Thus, if $\alpha < 1/\sqrt{3}$, NUM < 0. Now suppose that, $\alpha \geq 1/\sqrt{3}$, then C_0 is nonnegative and thus NUM evaluated at 0 is nonnegative. NUM, evaluated at $h = 1/2$, equals $1/2(2\alpha+1)\left(\alpha^2+6\alpha-4\right)$. The function $\alpha \to 1/2(2\alpha+1)\left(\alpha^2+6\alpha-4\right)$ is a polynomial that has only one root in the unit interval, $\sqrt{13}-3$, and the function increasing at its root. If $\alpha < \sqrt{13}-3$, then,

$$\mathrm{NUM}(h=0) \geq 0 \text{ and } \mathrm{NUM}(h=1/2) \leq 0. \tag{A-29}$$

$\alpha < \sqrt{13}-3$ implies that $C_1 < 0$ and $C_2 < 0$, and hence NUM is decreasing. Hence, if $\alpha < \sqrt{13}-3$ and $\alpha \geq 1/\sqrt{3}$, NUM has a unique root on the interval $[0, 1/2]$. If $\alpha > \sqrt{13}-3$,

$$\mathrm{NUM}(h=0) > 0 \text{ and } \mathrm{NUM}(h=1/2) > 0. \tag{A-30}$$

In this case, if NUM has any roots in $(0, 1/2)$ it would have to have two roots in the interval $(0, 1/2)$. For this to be possible, it would have to be the case that NUM is convex, i.e., $C_2 > 0$. We argue that these condition cannot be satisfied. If NUM had two roots in $(0, 1/2)$ it would also have to have minimum in $(0, 1/2)$. The minimum of NUM is achieved at $(-C_1)/(2C_2)$. For this minimum to be less than $1/2$ it would have to be the case that $C_2 > -C_1$. For NUM to have a root, its discriminant must be positive, i.e., $(-C_1)^2 \geq 4C_2C_0$. $C_2 > -C_1$ implies that $(-C_2)^2 \geq 4C_2C_0$ or $C_2 > 4C_0$. However,

$$C_2 - 4C_0 = 2\left(\alpha^3-5\alpha^2-\alpha+2\right). \tag{A-31}$$

This polynomial is concave, negative, and decreasing in α at $\alpha = \sqrt{13}-3$. Thus, the polynomial is negative, for all $\alpha > \sqrt{13}-3$. Thus, no root exists for $\alpha > \sqrt{13}-3$ thus, by expression (A-30), for

$\alpha > \sqrt{13} - 3$, NUM is positive. □

Proof of Proposition 5. If we express the equilibrium probability of monitoring zero reports, m^* given by (14) in terms of χ and replace w with its equilibrium value defined by equation (A-21) we obtain m^A which represents the probability of monitoring zero reports given that compensation is determined by (A-21). This yields

$$m^A(p,h,\chi) = \frac{(1-h)(1-\hat{w}^A(p,h,\chi))}{1-h(1-\chi)} = \frac{1-p}{1-h}. \tag{A-32}$$

The equilibrium level of monitoring is obtained by evaluating this expression at p^A. Thus, the equilibrium probability of monitoring is given by

$$m^{A*} = m^A(p^A(h,\chi),h,\chi) = \frac{1-p^A(h,\chi)}{1-h}. \tag{A-33}$$

The derivative of this expression with respect to h will have the same sign as

$$\frac{1}{1-h} - \frac{\frac{\partial}{\partial h}p^A(h,\chi)}{1-p^A(h,\chi)}. \tag{A-34}$$

If we apply equation (A-7), simplify, and then apply the variable transformation, $\chi = \alpha(1-h)$, we obtain the following form of expression (A-34).

$$\frac{1-\alpha(2+\alpha)+h\left(2-6\alpha^2\right)-2h^2\alpha\left(-1+\alpha+\alpha^2\right)}{(1-h)(1-\alpha)(1+h\alpha)(2+h+h\alpha)}. \tag{A-35}$$

The denominator of this expression is positive so the sign of expression (A-35) is determined by its numerator. We can write the numerator in the following fashion:

$$\mathrm{NUM}(h) = C_2(\alpha)h^2 + C_1(\alpha)h + C_0(\alpha), \tag{A-36}$$

$$C_2(\alpha) = 2\alpha\left(1-\alpha-\alpha^2\right), \tag{A-37}$$

$$C_1(\alpha) = 2\left(1-3\alpha^2\right), \tag{A-38}$$

$$C_0(\alpha) = 1-2\alpha-\alpha^2. \tag{A-39}$$

If $\alpha < \underline{\alpha}_m = \sqrt{2}-1$, then all three coefficients are positive and thus NUM > 0. If $\alpha \geq \underline{\alpha}_m$, then $C_0 \leq 0$. Next note that, when $\alpha \geq \underline{\alpha}_m$, if $C_2 < 0$ then $C_0 < 0$ and $C_1 < 0$. Thus, if $C_2 \leq 0$, then NUM < 0. Thus, NUM can have a real roots only when $\alpha > \underline{\alpha}_m$ and $C_2 > 0$. Over this region NUM is strictly convex and, because $C_0 < 0$, NUM will have one root if NUM$(h = 1/2) \geq 0$. Otherwise, NUM will have no roots and NUM < 0. Because NUM$(h = 1/2) \geq 0$ if and only if $4-\alpha^3-9\alpha^2-3\alpha \geq 0$, if a root exists, NUM is positive when h is less than the root and negative when h is greater than the root. The root itself is provided by the quadratic formula used to define equation (iii). □

Proof of Proposition 6. First note that monitoring expense is given by $cm(1-p(1-\sigma))$. Since monitoring expense is proportional to the total monitoring probability $m(1-p(1-\sigma))$, for fixed c, we will determine the effect of kinship on the probability of monitoring rather than the cost of monitoring. Using equations (A-18) and (A-32), we see that the equilibrium probability of monitoring is given by

$$\begin{aligned}\mathrm{PM}^{A*} = \mathrm{PM}^{A}(p^A(h,\chi),h,\chi) &= m^A(p^A(h,\chi),h,\chi)\,(1-p^A(h,\chi),h,\chi)\,(1-\sigma^A(p^A(h,\chi),h,\chi)))\\ &= \frac{(1-(p^A(h,\chi),h,\chi))^2}{1-h-\chi}.\end{aligned} \tag{A-40}$$

Differentiation with respect to h yields

$$\frac{\partial}{\partial h}\mathrm{PM}(p^A(h,\chi),h,\chi) = \frac{(1-p^A(h,\chi))\left((1-p^A(h,\chi))-2\,(1-h-\chi)\frac{\partial}{\partial h}p^A(h,\chi)\right)}{(1-h-\chi)^2}. \tag{A-41}$$

This expression will have the same sign as

$$\frac{1}{2\,(1-h-\chi)} - \frac{\frac{\partial}{\partial h}p^A(h,\chi)}{1-p^A(h,\chi)}. \tag{A-42}$$

If we apply equation (A-7), simplify, and then apply the variable transformation, $\chi = \alpha\,(1-h)$, we obtain the following form of expression (A-42).

$$\frac{\alpha\left(3-3\,\alpha-2\,\alpha^2\right)h^2+\left(3-\alpha-6\,\alpha^2\right)h-2\,\alpha^2}{(1-h)\,\left(4\,(1-\alpha)+2\,h^2\,(1-\alpha)\,\alpha\,(1+\alpha)+2\,h\,(1-\alpha)\,(1+3\,\alpha)\right)}. \tag{A-43}$$

The denominator of this expression is positive so the sign of expression (A-43) is determined by its numerator. We can write the numerator in the following fashion:

$$\mathrm{NUM}(h) = C_2(\alpha)\,h^2 + C_1(\alpha)\,h + C_0(\alpha), \tag{A-44}$$

$$C_2(\alpha) = \alpha\left(3-3\,\alpha-2\,\alpha^2\right), \tag{A-45}$$

$$C_1(\alpha) = 3-\alpha-6\,\alpha^2, \tag{A-46}$$

$$C_0(\alpha) = -2\,\alpha^2. \tag{A-47}$$

We consider the sign of NUM. When $\alpha = 0$, $\mathrm{NUM} = 3\,h \geq 0$. Now suppose that, $\alpha \in (0,1]$. In this case C_0 is negative, C_2 is a quadratic function of α which is positive between $(0,r_2)$, $r_2 = \frac{1}{4}\left(\sqrt{33}-3\right)$ and non positive otherwise. C_1 is a quadratic function of α which is positive between $(0,r_1)$, $r_1 = \frac{1}{12}\left(\sqrt{73}-1\right)$ and non positive otherwise. $r_2 > r_1$ thus for $\alpha \geq r_2$ both coefficients, C_1 and C_2 are non positive. Because C_0 is negative, it is thus not possible for NUM to have a root when $\alpha \geq r_2$. When $\alpha < r_2$, C_2 is positive and thus NUM is convex. Thus, because $C_0 < 0$, NUM has a root between 0 and 1/2, if and only if, when evaluated at $h = 1/2$, NUM is non-negative. Otherwise NUM as no root. NUM is non-negative when evaluated at $h = 1$ if and only if $\alpha \leq \frac{1}{2}\left(\sqrt{145}-11\right)$. This unique root NUM, used in equation (ii) is provided by the quadratic formula:

$$\mathrm{NUM}(h) = 0 \Leftrightarrow h = \frac{-6\,\alpha^2-\alpha-\sqrt{(1-\alpha)^2\,(2\alpha+1)(2\alpha+3)(3-4\,\alpha)}+3}{2\,\alpha(\alpha(2\alpha+3)-3)}. \tag{A-48}$$

If h is greater than the right hand side of (A-48), NUM is positive. Otherwise it is negative. This is the characterization provided in the proposition and thus completes the proof. $\square$

Proof of Proposition 6. First note that total firm value is given by output, $\bar{x}p$ less expense, $c\,m\,(1-p\,(1-\sigma))$, and less the manager's effort cost, $1/2\,\bar{x}\,p^2$. As in Section 3.3 , we can express family value as

$$\bar{x}\,\left(p-\chi\,m^A(p,h,\chi)\,(1-p\,(1-\sigma^A(p,h,\chi)))-1/2\,p^2\right). \tag{A-49}$$

Using the definition of the equilibrium monitoring and diversion strategies provided in equations (14), and substituting out w using equation (20), we can express family value as a function of p, the uptick probability as

$$v^A(p,h,\chi,\bar{x})=\bar{x}\,\hat{v}^A(p,h,\chi),\quad \hat{v}^A(p,h,\chi)=\tfrac{1}{2}\,(p+p\,(1-p))-\frac{\chi(1-p)^2}{1-h-\chi}. \tag{A-50}$$

Evaluating this expression at p^A, given by equation (28), yields

$$\frac{\partial}{\partial h}\hat{v}^A(p^A(h,\chi),h,\chi)=\frac{(1-p^A(h,\chi))\left(\left((1-h)^2-\chi^2\right)\frac{\partial}{\partial h}p^A(h,\chi)-\chi(1-p^A(h,\chi))\right)}{(1-h-\chi)^2}. \tag{A-51}$$

This expression will have the same sign as

$$\frac{\frac{\partial}{\partial h}p^A(h,\chi)}{1-p^A(h,\chi)}-\frac{\chi}{(1-h)^2-\chi^2}. \tag{A-52}$$

If we apply equation (A-7), simplify, and then apply the variable transformation, $\chi=\alpha\,(1-h)$, we obtain the following form of expression (A-52).

$$\frac{\frac{\partial}{\partial h}p^A(h,\chi)}{1-p^A(h,\chi)}-\frac{\chi}{(1-h)^2-\chi^2}=\frac{\text{NUM}}{\text{DENOM}}. \tag{A-53}$$

$$\begin{aligned}
\text{NUM}&=(1-h)-\left(1+h^2\right)\,\alpha+(1+2h)\alpha^2+(1+h)\,(1+2h)\alpha^3+h^2\,\alpha^4,\\
\text{DENOM}&=(1-h)\,(1-\alpha)\,(1+\alpha)\,(1+h\,\alpha)\,(2+h+h\,\alpha),\\
\alpha&=\frac{\chi}{1-h}.
\end{aligned} \tag{A-54}$$

Note that the parameter restriction given by equation (13), implies that $\alpha\in[0,1]$. This implies, combined with our parameter restriction that $h\in[0,1/2]$, that DENOM is always positive. Thus sign the of NUM/DENOM will depend on the sign of NUM. Evaluated at $\alpha=0$, NUM $=1-h>0$; Evaluated at $\alpha=1$, NUM $=(1+h)+(1+h)\,(1+2h)>0$. Thus if NUM were ever negative for $\alpha\in(0,1)$ it would have to have at least two roots in this interval. For a fixed h, NUM is a polynomial in α and, under our assumption that $h\in[0,1/2]$, has only one sign change. Thus, by Descartes rule of signs, NUM has at most one real root. Thus NUM has no roots and hence NUM >0. Because DENOM >0, this implies, by equation (A-53), that $\frac{\partial}{\partial h}\hat{v}(p^A(h,\chi),h,\chi)>0$ and thus family value is increasing in kinship, h. $\square$

Proof of Proposition 8. We prove part i of the proposition. The derivation of part ii is quite similar and thus is omitted. Owner value is given by

$$\bar{x}\,p-(p\,(\sigma\,(m0+(1-m)\,\bar{x})+(1-\sigma)\,w)+(1-p)\,0)-c\,m\,(1-p\,(1-\sigma))$$

Owner value consists of the total expected terminal cash flow, $\bar{x}\,p$, less the manager's payoff (excluding effort costs), and monitoring expense. When the cash flow is $\bar{x}$, the manager's payoff which equals w if the manager does not underreport and the cash flow is $\bar{x}$. If the manager underreports, the manager's payoff is $\bar{x}$ if the owner does not monitor and 0 if the owner monitors. If the cash flow is 0, the manager's payoff is 0. Monitoring expense equals the cost of monitoring multiplied by the probability of monitoring. If the owner monitors a low report, then monitoring will occur unless the cash flow is $\bar{x}$ and the manager does not underreport. Thus, the probability of monitoring is $m\,(1-p\,(1-\sigma)$. Using the definitions of σ^A, m^A and w^A provided in (A-32), (A-32), and (A-21), we can express owner value for a given uptick probability p as follows:

$$\begin{aligned} v_O^A(p,h,\chi,\bar{x}) &= \bar{x}\,\hat{v}_O^A(h,\chi) \\ \hat{v}_O^A(p,h,\chi) &= \frac{(1-p)\,\left((1-h)^2\,p-\chi\,(1-h\,((1-h)+(1-\chi)))\right)}{(1-h)^2\,(1-h-\chi)} \end{aligned} \tag{A-55}$$

Because owner value, v_O^A is a positive scale multiple of normalized owner value, $\hat{v}_O^A$, we will assume without loss of generality that $\bar{x}=1$ and thus owner value equals normalized value. Substituting the definition of p^* from equation (28) into $\hat{v}_O^A$ defined by equation (A-55), and then differentiating with respect to h yields the marginal affect of kinship on owner value:

$$\frac{\partial \hat{v}_O^{A*}}{\partial h}=\frac{\text{NUM}}{\text{DENOM}}, \tag{A-56}$$

$$\begin{aligned} \text{NUM} = &-h^3\,(2h+1)\chi^5-h^2(h+2)(4h+3)(1-h)\chi^4-h\,\left(10h^2+18h+9\right)\,(1-h)^2\,\chi^3+ \\ &2h\,\left(2h^2+3h+3\right)\,(1-h)^4\,\chi+2\,\left(h^2+h+1\right)\,(1-h)^5- \\ &\left(-2h^4-4h^3+2h^2+9h+4\right)\,(1-h)^3\,\chi^2, \end{aligned} \tag{A-57}$$

$$\text{DENOM}=(1-h)^4\,\left(2-h-h^2+h\,\chi\right)^3. \tag{A-58}$$

The sign of this expression depends only on the numerator, NUM. If we make the substitution and $\chi=\alpha\,(1-h)$ in the numerator and then divide out the common positive factor, $(1-h)^5(1+\alpha\,h)$, we obtain the polynomial $\mathscr{P}$ which has the same sign as $\partial v_O^{A*}/\partial h$.

$$\begin{aligned} \mathscr{P}(\alpha,h) &= C_0(h)+C_1(h)\,\alpha-C_2(h)\,\alpha^2-C_3(h)\,\alpha^3-C_4(h)\,\alpha^4, \\ C_0(h) &= 2\,\left(1+h+h^2\right), \\ C_1(h) &= 2h\,\left(2+2h+h^2\right), \\ C_2(h) &= 4+9h+6h^2, \\ C_3(h) &= h\,(1+h)\,(5+4h), \\ C_4(h) &= h^2\,(1+2h). \end{aligned} \tag{A-59}$$

Because, C_2, C_3, and C_4 are positive and $\alpha \geq 0$, $\mathscr{P}$ is strictly concave in α. Evaluated at $\alpha = 0$, $\mathscr{P} > 0$ and evaluated at $\alpha = 1$, $\mathscr{P} < 0$. Thus, there exists a unique $\alpha_0(h)$ such that, $\mathscr{P}(\alpha_0(h), h) = 0$ and, for all for all $\alpha < \alpha_0(h)$, $\mathscr{P}(\alpha, h) > 0$ and for all $\alpha > \alpha_0(h)$, $\mathscr{P}(\alpha, h) < 0$. Next note that the partial derivatives of $\mathscr{P}$ are given by

$$\frac{\partial \mathscr{P}}{\partial h} = 2(1+2h) + 2\left(2+4h+3h^2\right)\alpha - 3(3+4h)\alpha^2 - \left(5+18h+12h^2\right)\alpha^3 - 2h(1+3h)\alpha^4. \tag{A-60}$$

$$\frac{\partial \mathscr{P}}{\partial \alpha} = 2h\left(2+2h+h^2\right) - 2\left(4+9h+6h^2\right)\alpha - 3h(1+h)(5+4h)\alpha^2 - 4h^2(1+2h)\alpha^3. \tag{A-61}$$

Like $\mathscr{P}$, both $\partial \mathscr{P}/\partial h$ and $\partial \mathscr{P}/\partial \alpha$ are concave in α, positive at $\alpha = 0$, and negative at $\alpha = 1$. Because they are concave and cross the *x*-axis from above, $\partial \mathscr{P}/\partial h$ and $\partial \mathscr{P}/\partial \alpha$ are decreasing whenever they are nonpositive.

Now, let $b = 3/5$. Note that, evaluated at b,

$$\mathscr{P}(\alpha = b, h) = \frac{2}{625}(175 + h(25 + 4h(13 + 6h))) > 0.$$

Thus, $\alpha_0(h)$, the root of $\mathscr{P}$, is greater than b, i.e.,

$$\alpha_0(h) \in (b, 1). \tag{A-62}$$

Now consider the partial derivative of $\mathscr{P}$ with respect to α evaluated at b,

$$\left.\frac{\partial \mathscr{P}}{\partial \alpha}\right|_{\alpha=b} = -\frac{1}{125}\left(600 + 1525h + 1723h^2 + 506h^3\right) < 0. \tag{A-63}$$

Because $\partial \mathscr{P}/\partial \alpha$ is decreasing in α whenever it is negative, inequality (A-63) implies that

$$\frac{\partial \mathscr{P}}{\partial \alpha} < 0, \quad \alpha \in [b, 1]. \tag{A-64}$$

Expression (A-62) and inequality (A-64) then imply that

$$\frac{\partial \mathscr{P}}{\partial \alpha}(\alpha_0(h), h) < 0. \tag{A-65}$$

Next, we show that it is also the case that

$$\frac{\partial \mathscr{P}}{\partial h}(\alpha_0(h), h) < 0. \tag{A-66}$$

The proof of (A-66) is a bit more involved. To establish (A-66), we will show that

$$\frac{\partial \mathscr{P}}{\partial h} < \mathscr{P}(b, h), \quad \alpha \in [b, 1]. \tag{A-67}$$

To establish inequality (A-67), first consider the difference between $\partial \mathscr{P}/\partial h$ and $\mathscr{P}$ evaluated at b. This difference is given by

$$\mathscr{P}(b,h) - \frac{\partial \mathscr{P}}{\partial h}(b,h) = \frac{12}{25} - \frac{158\,h}{625} - \frac{8\,h^2}{125} + \frac{48\,h^3}{625} > \frac{211}{625} > 0, \tag{A-68}$$

where the last inequality is obtained by dropping the positive cubic term from the middle equation and maximizing the negative terms by setting $h = 1/2$.

Now, consider the difference between the derivatives of $\partial \mathscr{P}/\partial h$ and $\mathscr{P}$ with respect to α. We claim that

$$\frac{\partial}{\partial \alpha}\frac{\partial \mathscr{P}}{\partial h} < \frac{\partial}{\partial \alpha}\mathscr{P}, \quad \alpha \in [b,1]. \tag{A-69}$$

To see this, note that

$$\frac{\partial}{\partial \alpha}\Big(\frac{\partial \mathscr{P}}{\partial h} - \mathscr{P}\Big) = 2\,\left(2+2h+h^2-h^3\right) - 2\,\left(5+3h-6h^2\right)\,\alpha - \\ 3\,\left(5+13h+3h^2-4h^3\right)\,\alpha^2 - 4h\,\left(2+5h-2h^2\right)\,\alpha^3. \tag{A-70}$$

$\partial/\partial\alpha\Big(\partial \mathscr{P}/\partial h - \mathscr{P}\Big)$ is decreasing in α because the coefficients associated with the positive powers of α are all negative for $h \in [0, 1/2]$. Because $\partial/\partial\alpha\Big(\partial \mathscr{P}/\partial h - \mathscr{P}\Big)$ is decreasing, to show that it is negative for $\alpha \in [b,1]$ we need only show that it is negative when evaluated at b. Evaluating at b yields,

$$\frac{\partial}{\partial \alpha}\Big(\frac{\partial \mathscr{P}}{\partial h} - \mathscr{P}\Big)(b,h) = -\frac{37}{5} - \frac{1921\,h}{125} + \frac{41\,h^2}{25} + \frac{506\,h^3}{125} \leq -\frac{37}{5} < 0, \tag{A-71}$$

where the last inequality follows because $h \in [0,1/2]$. Inequality (A-71) establishes inequality (A-69) which, together with inequality (A-68), establishes inequality (A-67). Inequality (A-67) and expression (A-62), together with the fact that, by definition, $\mathscr{P}(\alpha_0(h),h) = 0$, imply that

$$0 = \mathscr{P}(\alpha_0(h),h) > \frac{\partial \mathscr{P}}{\partial h}(\alpha_0(h),h),$$

which establishes inequality (A-66).

Inequalities (A-66) and (A-65) imply, via the implicit function theorem, that,

$$\alpha_0'(h) = -\frac{\frac{\partial \mathscr{P}}{\partial h}(\alpha_0(h),h)}{\frac{\partial \mathscr{P}}{\partial \alpha}(\alpha_0(h),h)} < 0. \tag{A-72}$$

Therefore, α_0 is decreasing in h. Because $\mathscr{P}$ has the same sign as $\partial v_O^{A*}/\partial h$ and $\mathscr{P} < 0$, when $\alpha > \alpha_0(h)$, $\partial v_O^{A*}/\partial h < 0$ when $\alpha > \alpha_0(h)$. Because α_0 is decreasing, a sufficient condition for $\partial v_O^{A*}/\partial h < 0$ is for $\alpha > \alpha_0(0) = 1/\sqrt{2} \approx 0.707$. Similarly, a sufficient condition for $\partial v_O^{A*}/\partial h > 0$ is $\alpha < \alpha_0\,(1/2)$. $\alpha_0\,(1/2)$ is the unique root between 0 and 1 of the polynomial, $-6 - 10\alpha + 19\alpha^2 + 18\alpha^3 + 3\alpha^4$ and is approximately equal to 0.624. □

Proof of Proposition 9. The manager's value function, v_M^A, in the agency model, expressed in terms of

χ, is given by

$$p\left(\sigma^A(p,h,\chi)\left(m^A(p,h,\chi)\,0+(1-m^A(p,h,\chi))\,\bar{x}\right)+(1-\sigma^A(p,h,\chi))w^A(p,h,\chi)\right)$$
$$+(1-p)\,0-\frac{p^2}{2}. \quad \text{(A-73)}$$

Using the definitions of σ^A, m^A and w^A provided in (A-32), (A-32), and (A-21) we can express this the manager's value as for a fixed uptick probability, p, as follows:

$$\begin{aligned} v_M^A &= \bar{x}\,\hat{v}_M^A(p,h,\chi), \text{where} \\ \hat{v}_M^A(p,h,\chi) &= \frac{1}{2}\left(1+(1-p)\left((1-p)\left(\frac{2(1-\chi)}{1-h-\chi}-1\right)-\frac{2(1-h(1-\chi))}{(1-h)^2}\right)\right). \end{aligned} \quad \text{(A-74)}$$

Manager value in the agency setting, v_M^{A*} is then obtained by substituting the equilibrium uptick probability function p^A in equation (A-74), i.e.,

$$v_M^{A*} = \bar{x}\,\hat{v}_M^A(p^A(h,\chi),h,\chi). \quad \text{(A-75)}$$

First note that an inspection of equations (31) and (33) shows that the share-value gain from hiring the external manager exceeds the family owner's gain by $h\,v_M^K$. Thus, it is clear that the family owner's utility gain from hiring external manager is always less than the share-value gain. To prove that the family owner's gain from hiring the external manager exceeds the social welfare gain, we proceed as follows. First note that,

$$\Delta_O^E - \Delta_{\text{SW}}^E = (1-h)\,v_M^K - v_M^E. \quad \text{(A-76)}$$

Thus, if we can show that the right-hand side of equation (A-76) is negative the proof of i will be complete. We establish this result in two steps. From expression (A-74), the value of the external manager, v_M^E, equals $e\,\hat{v}_M^A(p^A(h=0,\chi),h=0,\chi)$. Because for the family manager, $\bar{x}=1$ by assumption, the value of the family manager, v_M^K, is given by $\hat{v}_M^A(p^A(h,\chi),h,\chi)$, where $h>0$. Thus, we can express equation (A-76) as

$$\Delta_O^E - \Delta_{\text{SW}}^E = (1-h)\,\hat{v}_M^A(p^A(h,\chi),h,\chi) - e\,\hat{v}_M^A(p^A(h=0,\chi),h=0,\chi). \quad \text{(A-77)}$$

In fact, we will show that

$$(1-h)\,\hat{v}_M^A(p^A(h,\chi),h,\chi) - \hat{v}_M^A(p^A(h=0,\chi),h=0,\chi) < 0, \quad \text{(A-78)}$$

which, because by assumption $e>0$, and the fact that the external manager's value is always positive, establishes that the right-hand side of equation (A-77) is negative. To establish (A-78), first note that, using the definition of the manager's value given by equation (A-74) and the definition of p^A given by equation (28), we see that

$$\hat{v}_M^A(p^A(h=0,\chi),h=0,\chi) = \frac{1}{8}(1+\chi)^2. \quad \text{(A-79)}$$

The expression for $\hat{v}_M^A(p^A(h,\chi),h,\chi)$ where $h > 0$ is considerably more complex but is obtained in the same fashion. Substituting the definition of p^A into the definition of $\hat{v}_M^A$ given in equation (A-74) yields

$$\begin{aligned}
\hat{v}_M^A(p^A(h,\chi),h,\chi) &= \frac{\text{Num}}{\text{Denom}}, \\
\text{Num} &= (1-h)^4\left(1-h-3h^2-h^3\right)+(1-h)^3 2\left(1-h-2h^2-h^3\right)\chi, \\
&\quad +(1-h)^2\left(1+5h-2h^2-2h^3\right)\chi^2+(1-h)\left(2h+4h^2\right)\chi^3+h^2(1+h)\chi^4 \\
\text{Denom} &= 2(1-h)^3\left(2-h-h^2+h\chi\right)^2.
\end{aligned} \tag{A-80}$$

Thus expression (A-78) is equivalent to

$$(1-h)\,\text{Num}-\left(\frac{1}{8}(1+\chi)^2\right)\text{Denom} < 0. \tag{A-81}$$

Using equation (A-80), we can express condition (A-81) as a polynomial, $\mathscr{P}$ in χ with coefficients C_i determined by h

$$\begin{aligned}
\mathscr{P}(\chi;C_1(h),\ldots C_4(h)) &= (1-h)\,\text{Num}-\left(\frac{1}{8}(1+\chi)^2\right)\text{Denom} = \\
&C_0(h)+C_1(h)\,\chi^1 = C_2(h)\,\chi^2+C_3(h)\,\chi^3+C_4(h)\,\chi^4,
\end{aligned} \tag{A-82}$$

where

$$\begin{aligned}
C_0(h) &= -\frac{1}{4}(1-h)^4 h\left(8+13h+4h^2\right), \\
C_1(h) &= -\frac{3}{2}(1-h)^3 h\left(2+2h+h^2\right), \\
C_2(h) &= \frac{1}{4}(1-h)^2 h\left(16-2h-6h^2-h^3\right), \\
C_3(h) &= \frac{1}{2}(1-h)\,h\left(2+10h+h^2-h^3\right), \\
C_4(h) &= \frac{1}{4}h^2\left(3+6h-h^2\right).
\end{aligned} \tag{A-83}$$

Note that for all $h \in [0, 1/2]$, C_2, C_3, and C_4 are positive. Thus, $\mathscr{P}$ is convex and for fixed C thus always attains its maximum at extreme values of χ. Because the range of permissible values of χ is 0 to $1-h$, we see that

$$\begin{aligned}
\mathscr{P}(\chi;C_1(h),\ldots C_4(h)) &\le \max[\mathscr{P}(0;C_1(h),\ldots C_4(h)),\mathscr{P}(1-h;C_1(h),\ldots C_4(h))] = \\
&\max\left[-\frac{1}{4}(1-h)^4 h\left(8+13h+4h^2\right),-(1-h)^4 h^2(1+h)^2\right] < 0,\ \forall h \in (0,1].
\end{aligned} \tag{A-84}$$

Thus, i is established.

To establish ii note that as $\alpha \to 1$, $v^A \to 0$. Thus shareholders always prefer the external manager. As $\alpha \to 1$ the utility of the family owner under the family manager converges to $h/2$ and the utility of the family owner under the external manager converges to $(e/2)(h/2)$. Thus if $e < 2$ the family owner prefers hiring the family manager, i.e., the hiring decision is share value nepotistic. The proof of iii is provided by the example furnished by Figure 6. □

Proof of proposition 12. Let $\bar{h}$ be defined as follows:

$$\bar{h} = \max\{h \in [0, 1 - c/(\bar{p}\bar{x})] : w_M^*(h) \geq 0\}. \tag{A-85}$$

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:

$$v_O^{L*}(h) = (\bar{p}\bar{x} - v_R)\frac{\mathbf{N}(h)}{\mathbf{D}(h)}, \tag{A-86}$$

$$\mathbf{N}(h) = \left(\left(c^2 + (1-h)\bar{x}(\bar{p}\bar{x} - c)\right) - \frac{c^2}{1-h} \right), \tag{A-87}$$

$$\mathbf{D}(h) = ((1-h)\bar{x} - c)(hc + (1-h)\bar{p}\bar{x}). \tag{A-88}$$

The functions, $h \hookrightarrow \mathbf{N}(h)$ and $h \hookrightarrow \mathbf{D}(h)$ are both positive under the assumptions given in (37) and (38). 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 $\mathbf{N}$ and $\mathbf{D}$ are smooth and positive over their domain, and the second derivative of $\mathbf{N}$ is negative while the second derivative of $\mathbf{D}$ is positive, implies that $\mathbf{N}(\cdot)$ is strictly concave and positive and $\mathbf{D}(\cdot)$ is strictly convex and positive. This implies that the ratio $\mathbf{N}(h)/\mathbf{D}(h)$ is strictly quasiconcave over $[0, \bar{h}]$ (Schaible, 1975). 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 (44) and (45) , has the same sign as the derivative of v_O evaluated at $h = 0$. □

Proof of Proposition 13 . 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

$$v_M^p(h) = \bar{p}\bar{x} - (\bar{p}\bar{x} - v_R)\mathbf{F}(h), \tag{A-89}$$

$$\mathbf{F}(h) = \frac{\mathbf{N}(h)}{\mathbf{D}(h)}, \tag{A-90}$$

$$\mathbf{N}(h) = \frac{(1-h)^2\bar{p}\bar{x}(\bar{x} - c) - c^2 h}{(1-h)\bar{x} - c}, \tag{A-91}$$

$$\mathbf{D}(h) = (1-h)(ch + (1-h)\bar{p}\bar{x}). \tag{A-92}$$

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 12 we can verify that **F** is quasiconcave. Because **F** is quasiconcave and the term multiplying **F** in equation (A-89) is negative and constant in h, we see, from inspecting (A-89) that v_M^p is quasiconvex.

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

$$v_M^p(h) - v_M(0) = v_M^p(h) - v_M^p(0) = v_M^p(h) - v_R. \tag{A-93}$$

Using the representation of v_M^p given in (A-89) we obtain,

$$v_M^p(h) - v_R = (1 - \mathbf{F}(h))\,(\bar{p}\bar{x} - v_R). \tag{A-94}$$

By the parametric restrictions imposed in (8) we see that $\bar{p}\bar{x} - v_R > 0$, because **F** is less than 1 over the region of admissible parameters,

$$(1 - \mathbf{F}(h))\,(\bar{p}\bar{x} - v_R) > 0. \tag{A-95}$$

Combining (A-94) and (A-95) shows that

$$v_M^p(h) < v_M(0), \quad h \neq 0. \tag{A-96}$$

Because v_M is quasiconvex in h, v_M attains is maximum 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 minimum. 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

$$(\bar{p}(3-\gamma) - 1)\,\frac{(\bar{p} - v_R)\,(1-\gamma)}{(1-\bar{p})\,(2-\gamma)^2\,\gamma^2}. \tag{A-97}$$

This term must be positive for an interior minimum to exist. Since the fraction in (A-97) is always positive the necessary and sufficient condition for (A-97) to be positive is that $\bar{p}\,(3-\gamma) - 1) > 0$ which is a condition given in the proposition. □

Proof of Proposition 14. First note that if an equilibrium exists in which the family owner hires the family manager, the owner will make a compensation offer that equates the family manager's utility when working for the family firm and working outside. Thus (5) show that the family owner will only hire the family manager when family value is weakly higher under family management, i.e.,

$$v^K(w^K) \equiv v_O^K(w^K) + v_M^K(w^K) \geq v_O^E(w^E) + v_M^E(w^E) = v^E(w_E). \tag{A-98}$$

The family manager's utility is the same from accepting the family owners's offer and working outside the firm. Using expression (6) we can express this condition as

$$h v^K(w^K) + (1-h)\, v_M^K(w^K) = h v^E(w^E) + (1-h)\, v_M^E(w^E). \tag{A-99}$$

Expressions (A-98) and (A-99) imply that

$$v_M^K(w^K) \le v_M^E(w^E). \tag{A-100}$$

Next, note that at any fixed compensation, the value of the family manager is higher when working for the family owner. This implies that the manager's value is higher at compensation w^E, i.e.,

$$v_M^E(w^E) < v_M^K(w^E). \tag{A-101}$$

Expressions (A-100) and (A-101) imply that

$$v_M^K(w^K) < v_M^K(w^E). \tag{A-102}$$

Because the manager's value is increasing in compensation, (A-102) implies that

$$w^K < w^E. \tag{A-103}$$

Increasing compensation increases total value because it reduces monitoring, m and does not affect the probability of underreporting low cash flows σ. Thus, it must be the case that

$$v^K(w^K) < v^K(w^E). \tag{A-104}$$

Family value when the related manager and owner are not matched equals the value of the owner's firm plus the value of the manager's compensation. The value of the owner's firm equals the total value,less the value of compensation to the unrelated manager, less monitoring expense. The value of compensation to the external manager working for the family owner equals the value of the compensation received by the kin manager working outside the faimly firm. Thus, the family value when the owner and manager are not matched equals total value under the external manager less monitoring expense under the external manager. This is the same as the total firm value when the manager and owner are unrelated as derived in Section 3.3. From Proposition 1 of this section we see that at a fixed compensation level, family value is always higher when the manager and owner are not related (i.e., $h = 0$). Thus,

$$v^K(w^E) < v^E(w^E). \tag{A-105}$$

Expressions (A-104) and (A-105) imply that

$$v^K(w^K) < v^E(w^E). \tag{A-106}$$

However, (A-106) contradicts (A-98) and thus establishes our result. □

Proof of Proposition 15. First consider condition i. Note that by Malécot's formula (see Malécot (1948) or Chapter 5 of Lange (2002)),

$$h_{NS} = \frac{1}{2}\left(h_N + h'_N\right). \tag{A-107}$$

Because the founder is not inbred and S is her son, $h_S = 1/2$. Using this fact and equation (A-107) we have that

$$\frac{h_{NS}}{h_N/h_S} = \frac{1}{4}\left(1 + \frac{h'_N}{h_N}\right), \tag{A-108}$$

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., $h_{NS} \le h_N/2$. Because the founder is not inbred, $h_S \le 1/2$. Thus, $h_N/h_S \ge 2\,h_{NS}$. The result follows. $\square$

Proof of Proposition 16. First consider part i. Assume $\bar{x} = 1$ without loss of generality. If the founder fixed compensation at w then the founder rationally anticipates that the manager, N, will exert effort based on the manager's kinship altruism toward the owner, S. Moreover the monitoring and reporting decisions of the descendants will be the same as the in the baseline model given the degree of kinship altruism between the manager and owner, h_{NS}. The values received by the manager and owner, for a fixed compensation level, are only affected by kin altruism in so far as kin altruism affects, effort, monitoring and reporting. Thus,NS the kin altruism between the owner, S and manager, N, will for fixed uptick probability and compensation policy be determined in exactly the same fashion as they were in Sections 4 and 5 except that the altruism between the two agents will be given by $h = h_{NS}$. Because of the monotone increasing relation between the uptick probability p and compensation w, the founder's preferences for higher compensation than the compensation level selected by S is equivalent to the founder's preference for a higher uptick probability. Thus utility of the founder and S for a given uptick probability when S inherits the firm and hires N to manage the firm is given by

$$u_F(p) = (1 - h_F)v^A_O(p) + h_F\, v^A(p) \tag{A-109}$$

$$u_S(p) = (1 - h_{NS})\, v^A_O(p) + h_{NS}\, v^A(p). \tag{A-110}$$

Therefore,

$$u_F(p) = u_S(p) + (h_F - h_{NS})\,(v^A(p) - v^A_O(p)) = u_S(p) + (h_F - h_{NS})\, v^A_M(p). \tag{A-111}$$

At S's preferred policy, the first-order condition implies that

$$\left.\frac{\partial u_S}{\partial p}\right|_{p=p^A} = 0. \tag{A-112}$$

Thus,

$$\left.\frac{\partial u_F}{\partial p}\right|_{p=p^A} = \left.\frac{\partial u_S}{\partial p}\right|_{p=p^A} + \left.\frac{\partial (u_F - u_S)}{\partial p}\right|_{p=p^A} = \left.\frac{\partial (u_F - u_S)}{\partial p}\right|_{p=p^A}. \tag{A-113}$$

Because,

$$u_F(p) - u_S(p) = (h_F - h_{NS})\, v_M^A(p)$$

The founder's marginal utility at S's optimal choice of p is given by

$$\left.\frac{\partial u_F}{\partial p}\right|_{p=p^A} = \left.\frac{\partial (u_F - u_S)}{\partial p}\right|_{p=p^A} = \left.\frac{\partial v_M^A}{\partial p}\right|_{p=p^A}. \tag{A-114}$$

By the assumption of benevolence, $h_F - h_{NS} > 0$. u_F is concave by the same argument given for the concavity of u_0^A in Lemma 2. Thus, to show that the founder's preferred policy implies a higher uptick probability (and thus higher compensation for N) we need only show that evaluated at p chosen by S, $u_F'(p^A) > 0$. To see this, use expressions total and owner value given by Proposition 6 and equation (A-55) respectively. Next, differentiate equation (9), substitute in p^A. Finally, simplify the expression using the transform $\chi = \alpha(1 - h_{NS})$ used in the analysis in Section 5. This yields

$$\left.\frac{\partial v_M^A}{\partial p}\right|_{p=p^A} = \frac{(1+\alpha)(1+h\alpha)}{(1-h)(2+h+h\alpha)} > 0 \tag{A-115}$$

□

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