A Theory of Succession in Family Firms

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Abstract

Succession is one of the most important issues for the most common type of firms. The literature on family firm succession has straggled as a part of different paradigms, setting forth stylized facts, informal arguments and observations. In this paper, we present a theory of family firm succession that unifies and synthesizes scattered and dispersed contributions depicted in family business research; specifically, the key role of the training activity in preparing the potential candidate, the importance of amenity potentials that is inherent to family businesses, the incumbent's reluctance to step aside, the underperforming succession, the role of trust in the succession process, and the barriers to a "non-family" succession. Within a simple microeconomics framework, we find that these different facts and arguments spelt out in the literature are reflections of the same fundamental economic trade-off between proficiency (skills) and honesty (incentives) when choosing among potential successors.

Keywords Family firm · Succession · Professionalisation · Retirement · Amenity Potential

JEL Classifications M1 · M5

Introduction

Succession is one of the most important issues for the most common type of firms: it plays a key role in determining not only the future performance of the firm, but also its very own survival.[1] Succession in family firms has been extensively studied across different fields of research, mainly in management studies but also in psychology, sociology and law (see the reviews by Handler 1994; Baù et al. 2013). Despite its crucial relevance, the literature in economic theory has almost neglected this issue.

In this work, we present a theory to understand the process of succession in family firms within the realm of economic analysis. Our theory is developed within a simple microeconomics framework, with a family founder (or a small number of owners) choosing between two options concerning succession: she may either *stay on* in the firm and run it alone, or hire a successor that might be a *professional manager* or a *family member*. Our setting comprises key elements that the literature has ascribed to the succession process in family-owned business (see Le Bretton-Miller et al. 2004 for a review): the training activity and the costs of monitoring the successor, the role of trust and communication, the personal features of the founder and potential successors, and the non-monetary benefits that are inherent to family businesses.

The main contribution of this paper is to unify and synthesize scattered contributions and observations spelt out in the literature of family firm succession within a common economics framework. Specifically, we claim that these different facts and arguments are reflections of the same fundamental economic trade-off between proficiency (skills) and honesty (incentives). Our theory provides further insights concerning four commonly mentioned outcomes of the succession process: the incumbent's reluctance to step aside, the underperforming succession, the barriers to a "non-family" succession, and the role of trust in the

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[1] See, for example, Smith and Amoaku-Adu (1999), Shepherd and Zacharakis (2000), Pérez-González (2006), Villalonga and Amit (2006), Bennedsen et al. (2007), Cucculelli and Micucci (2008), Anderson et al. (2009), Eklund et al. (2013), Isakov and Weiskopf (2014) or Merchant et al. (2018).

succession process. The *incumbent's reluctance to step aside* is understood in light of our theory as the origin of two disparate decisions: the choice to postpone the succession process, and the decision to stay on to carry out managerial activities for the firm once a successor has been chosen (i.e. a partial retirement). In both cases, we find that the proficiency and the honesty of potential successors fail to be high enough to require full retirement from the incumbent. With respect to an *underperforming succession*, our setting allows us to demonstrate that the decision of the incumbent could be inefficient from the firm's point of view, but optimal for the family goals. In this regard, our framework is useful to identify *barriers to "non-family" succession*, as it is typically the case that a family manager heading the firm provides high non-monetary benefits to the family members. When these barriers exist, the incumbent prefers a non-family manager only if this candidate is markedly better—in proficiency and/or honesty. Finally, the *role of trust* is embedded in the honesty dimension of the succession process, and we find that the more honest a potential successor is, the more likely succession is implemented.

Interestingly, an appealing feature of our setting is that it additionally allows us to characterize a number of stereotypes of family and non-family managers, some of them depicted in the literature of family business, concerning the relative successor's capabilities, career alternatives, honesty, family culture and commitment, etc. (see Handler 1994; Kets de Vries 1993, or Levinson 1974). This is the case of the good child, the rotten kid, the loyal servant, the "like a son" manager, etc., profiles that have been accommodated in our framework to provide general results regarding succession.

The paper is organized as follows. First, we provide a review on the formal literature on family firm succession. Second, we outline the basic characteristics of the model and depict the options concerning succession. Third, we analyze the outcome of the incumbent's decision between these options. Finally, the paper concludes by discussing the contributions of our work and suggesting several possible extensions, in particular those related to the existence of information imperfections and to the interdependence between the incumbent and her successor. We also provide some practical implications of our analysis to founders, potential successors, practitioners and consultants working with family firms.

Literature Review

Family firm succession has not been extensively analyzed in formal literature. Kimhi (1997), Chami (2001), Burkart et al. (2003), Lee et al. (2003), Bhattacharya and Ravikumar (2010) and Michael-Tsabari and Weiss (2015) are the few attempts to clarify the succession decisions in family firms within a decision-making framework. Kimhi (1997) developed a model of intertemporal consumption-investment

decisions to study the timing of succession as a solution to the interaction of human and financial capital in the business-operating family. However, his setting exhibited two flaws. First, no transmission of the firm's culture exists—so the human capital of the young successor falls below that of the owner–manager. Second, the succession process is not planned: an heir, working outside the family firm but endowed with enough financial resources, is called back to fully substitute for the family manager and capitalize the family firm. Instead in our model, the training process becomes central to the family firm succession decision. In particular, we emphasize the key role of the characteristics of the transmission of specific knowledge, firm's culture and skills from the incumbent to the successor.[2]

Chami (2001) presented an agency model with a purely altruistic parent and her child, who is working for the family firm, and restricts his analysis to intra-family transmission. Our framework also differs in three ways. First of all, we consider both a family candidate as well as an outside-the-family alternative to run the firm. Second, our work explicitly considers a training process, with a founder transmitting the firm's insides and specific knowledge to the successor. And third, our work does not take into account purely altruistic motivations seeking to attain more robust results. The presence of pure altruism would only reinforce our results concerning firm transmission within the family. Yet, a kind of *impure altruism* can be identified in two elements of our framework: the incumbent is more prone to leave the firm to a specific person with close links to the family; and the incumbent obtains higher non-pecuniary welfare in the case where a family-heir manager becomes the successor. Both elements are based on some of the essential features of family business and are deeply rooted in the literature.

Burkart et al. (2003) is the closest work to our paper. They presented a model where the founder decides whether to hire a professional manager or leave management within the family, as well as the fraction of the company to be sold to outside shareholders. However, their model could not be considered as a theory of succession strictu sensu: the founder's decision to either stay on as the manager or keep succession inside the family results in an identical productive revenue; i.e., an implicit (and costless) training process makes the heir a perfect substitute for the old family manager. Actually, Burkart et al.'s is a theory of separation of ownership from management—a theory of how and when to hire a professional manager, and how and when to sell the family firm property totally or partially. Four important features distinguish our framework from Burkart et al.'s: (1) we do not deal with ownership transitions or the legal

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[2] See for example Handler (1994), Chrisman et al. (1998), Cabrera-Suárez et al. (2001) or Le Bretton-Miller et al. (2004).

shareholder protection, given that firm property remains in the family hands; (2) hiring a family or a professional manager does not preclude the founder from staying on in the firm to develop production and monitor activities; (3) our model explicitly considers the possibility of postponing the succession process; and (4) our setting explicitly considers a family heir: an individual who is not a perfect substitute for the founder and whose success in running the firm depends on his own management qualities as well as the founder's efforts to train him.

Lee et al. (2003) described a two-period bargaining model to emphasize the role of idiosyncratic knowledge in family business as a key element in succession. In the first period, the family decides to hire a family successor or an outside manager, whose ability to obtain profits (high or low) is uncertain. If hired, the outside manager increases his bargaining power in wage negotiations, once his true ability is uncovered at the second period, because his (acquired) idiosyncratic knowledge running the family firm increases the firm profits. In fact, the succession decision is restricted to the first period in the Lee et al.'s model. Thereafter in period two, there is a separation between ownership and management—as in Burkart et al. Thus, the exogenous performance of the outside manager in our model can be reinterpreted as the expected outcome of the uncertain bargaining process resolved in the second period. Our model also differs in two ways. First, while Lee et al. characterize the family candidate by his exogenous idiosyncratic knowledge of the firm—in addition to his exogenous ability, in our model the heir's idiosyncratic knowledge (or any candidate) is endogenous as the result of training. Second, although our setting shares what the family considers relevant elements for the firm performance as key for the succession choice—namely, a successor's ability and idiosyncratic knowledge, in our model we additionally consider that the successor's honesty also pays a role in succession. Interestingly, Lee et al.'s results concerning the choice of a family manager in the first period[3] can only be reproduced in our setting provided the heir is sufficiently honest.

Bhattacharya and Ravikumar (2010) developed an overlapping generations model of family business where each generation faces the decision of operating the family business or hiring a professional. There is uncertainty in terms of the professional's level of effort and generated output (but there is no uncertainty in terms of the family candidate's effort and output). Although the productivity of the

professional non-family manager dominates the productivity of the family manager, the family chooses only to professionalize management after the firm reaches a critical size, with the benefits of hiring a manager exceeding the costs. Our work differs in several ways: (1) in their model the costs of hiring a non-family manager are given by his participation constraint, while we additionally consider the incumbent's welfare and temporal costs of training and monitoring the successor's appropriation activities; (2) in their model each generation is altruistic, while we do not consider any direct altruism towards descendants within the family; and, (3) in their model the productive features of the family successor for every generation result in an identical productive revenue and do not rely on any training or culture transmission process, while our work explicitly considers training.

Finally, Michael-Tsabari and Weiss (2015) addressed the intra-family succession process by considering the strategic interaction (game-theoretic) perspective[4] concerning the importance of the quality of the communication process between the founder and the heir, an interaction also considered in our (exogenous) training technology. Unlike our work, Michael-Tsabari et al. only consider two alternatives for the founder: the stay-on and the family succession option, and their work does not consider the outside option as in our model.

A Model of Family Firm Succession

In this section, we develop a formal model of family firm succession, which considers a firm initially run by its family owner—in many cases, its founder, who will be denoted as F. Hereafter we will refer to this manager as the *incumbent*. The incumbent is endowed with $T = 1$ unit of time and her preferences are represented by the following utility function

$$U(c, C; \gamma, B) = c - \breve{\beta} C + \gamma B,$$

where c is the consumption purchased by family members with the income obtained from the family firm revenues; C represents the incumbent's welfare loss for being involved in monitoring and training activities, because monitoring a manager involves lack of trust and nurturing the successor requires effort and patience; $\breve{\beta} > 0$ is a parameter, which allows the incumbent's welfare loss in monitoring and training activities to be expressed as a cost; B represents the amenity benefits derived from the firm[5]; and, $\gamma \geq 0$ is
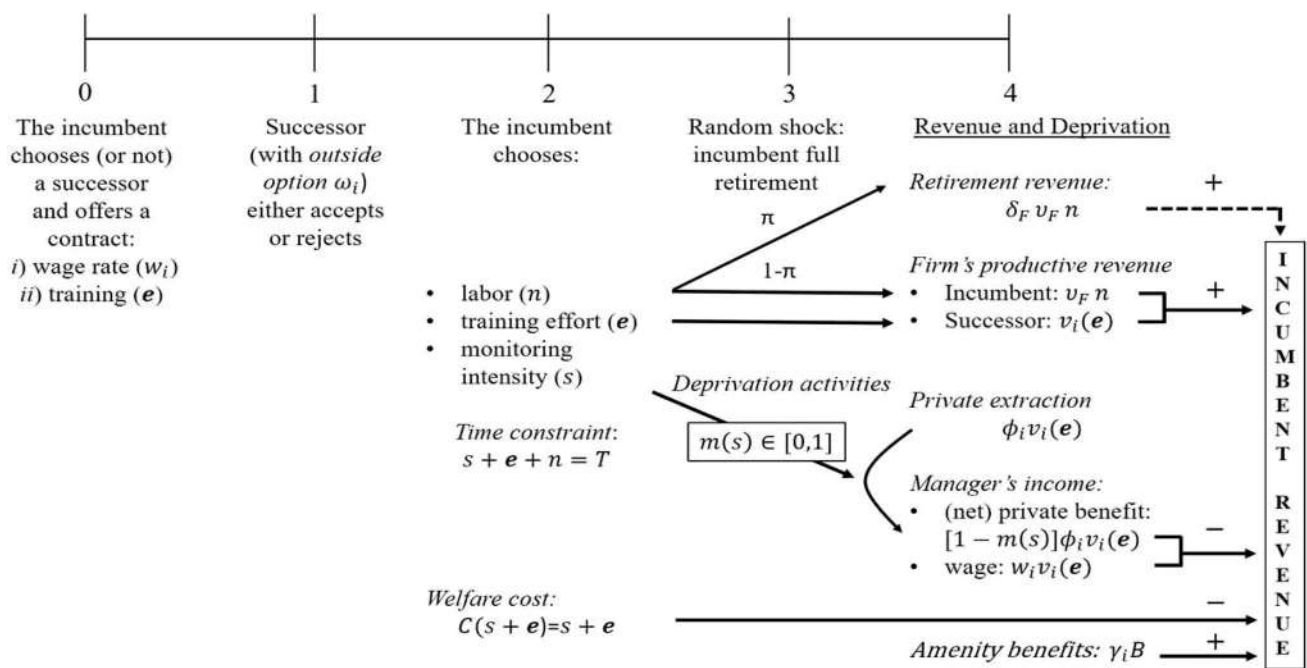

Fig. 1 The timing of the model

a parameter value dependant on the management profile that allows the incumbent's amenities to be expressed as a benefit.

At a given moment in time, the incumbent considers the possibility of stepping down from the management of the firm, either totally or partially. Figure 1 presents the model's timeline. At date 0, the incumbent decides whether or not to continue managing the firm. If the incumbent decides not to do so, ownership and management are (partially or fully) separated, and the incumbent appoints a manager i, either an external or a family manager, to run the firm. The incumbent offers a contract to lure the manager. For any manager i, the contract consists of a wage, a percentage $w_i \in [0, 1]$ of the revenue originated by the manager, and formally or informally—the incumbent's commitment to training the manager to become more productive.

The manager accepts or rejects the offer to run the company at date 1. This decision depends on the outside option ω_i, denoting the manager i's utility when pursuing the outside option net of the foregone amenity potential, and the prospect of diverting a share of the firm's revenue to private benefits once heading the business. These private benefits take the form of higher salaries and perquisites, transactions with related parties, expropriation of corporate opportunities, transfer pricing, and so on (see Johnson et al. 2000).

Once the new manager is at the firm at date 2, the incumbent can allocate her time resources to monitoring activities (denoted as s), in addition to training activities (denoted as e). The incumbent's remaining time (denoted as n) is devoted either to work (if the incumbent remains in the firm) or to activities outside the firm (if the incumbent retires), depending on a shock realization at date 3. Thus, the time constraint stands for

$$s + e + n \leq T = 1. \qquad (1)$$

An important feature of our model is that the decisions concerning the monitoring level and training intensity are not simultaneous, despite the fact that they are both chosen at date 2. Training takes place prior to the acquisition of management responsibilities, while monitoring is implemented once the manager secures the management of the firm. Hiring a manager i entails an additional opportunity cost for the incumbent at date 2: monitoring and training activities cause a direct welfare loss for the incumbent, a welfare cost assumed to be linear, following Burkart et al. (2005); i.e.,

$$C(s_i, e_i) = s_i + e_i. \qquad (2)$$

At date 3, the incumbent retires or keeps on working for the firm. If the incumbent chooses a level of monitoring intensity and training effort such that the time constraint is binding (i.e., $s_i + e_i = 1$), then the incumbent chooses full retirement since there are no additional time resources to perform any other activities within the firm (i.e., $n = 0$). Yet, this need not be the case. In addition to monitoring and training, a fraction $n > 0$ of time could still be available for the incumbent, so she could either keep on working at the firm or leave the management. We will assume that this event cannot be anticipated by the manager, or by the incumbent. Several circumstances related to the incumbent's characteristics (e.g.

the incumbent's health, age or family problems) or to the firm (e.g. circumstances affecting the evolution of the business, its life cycle, etc.) might make the incumbent more or less likely to retire. We formalized the event of full retirement by a stochastic process, a binomial distribution with a probability of retirement π. If the stochastic outcome requires the incumbent to leave the firm's management, then the succession process is completed and the incumbent receives a reservation utility; otherwise, the incumbent's working time yields productive revenues at date 4.

At date 4, the firm generates productive revenues (in monetary terms) from the incumbent's contribution, if not retired, and from the manager's contribution, if hired. In the case where both work for the firm, there might exist technological complementarities and/or external effects between their productive activities. Yet, for simplicity, we assume that the firm's technology is additive in the generated revenues, so the manager's contribution—if hired—is a perfect substitute for that of the incumbent. The incumbent's productive (monetary) revenue depends on the realization of the stochastic event of retirement at date 3. If she stays on in the firm, we assume that the incumbent's revenue technology is linear and time to work is the only input; specifically, $v_F(n) = v_F n$ are the revenues if the incumbent devotes $n \in [0, 1]$ units of time to the firm, with v_F representing the incumbent's productivity (that gathers her specific knowledge about the firm and business, her human capital, etc.).

The manager's revenue technology is a function of the effectiveness of the training process—a distinctive feature in our model, which depends on the set of the incumbent's and family manager's characteristics, how the learning and transmission process is developed and the knowledge of the firm's inner workings revealed in this transmission. We abstract from general elements on learning and assume that the productive outcome monotonically depends on the *effort exerted by the incumbent* in the training process, i.e. $v_i(e_i)$ with $v_i'(e_i) > 0$ for all e_i. In terms of our model, a *smooth* training process can be interpreted as an increasing returns-to-scale learning technology represented by a convex revenue function, i.e. $v_i''(e_i) > 0$, indicating a quick manager that grasps the incumbent's teaching, a specific firm's inside knowledge transmitted by the incumbent's teachings, a good and patient incumbent, or a good feeling and communication in the relationship between the incumbent and the manager. Alternatively, a *harsh* training process presents decreasing returns-to-scale and can be represented by a concave revenue function—i.e., $v_i''(e_i) < 0$.[6]

The revenues obtained by the firm at date 4 are devoted to paying out the manager wage compensation, paying dividends to the incumbent as the firm owner, and also diverted by the manager to generate private benefits. Whoever is hired to manage the firm will be able to divert a fraction $\phi_i \in [0, 1]$ of revenues for private benefits, so the rate of expropriation is $\phi_i v_i$, an amount that already incorporates compensations in excess of market value. The fraction that is actually diverted by the manager, however, depends on the monitoring activities carried out by the incumbent, who may, thereby, deprive the manager of at least a share of his private benefits. Deprivation technology, which represents how productive the incumbent is at monitoring the manager, is assumed to be an increasingly monotone and concave function of the time the incumbent spends monitoring, s, and it takes the same form for any manager: $m(s_i; \kappa_i) = \left(2s_i/\kappa_i\right)^{1/2}$, with $\kappa_i \geq 0$. Since $m = 1$ entails full deprivation of private benefit extraction to the manager, deprivation is upper bounded, i.e. $m \in [0, 1]$. Thus, the time cost in monitoring activities becomes the function[7]

$$s_i = \frac{\kappa_i}{2} m_i^2, \tag{3}$$

with the parameter κ_i representing how cumbersome it is for the incumbent to monitor the manager i.[8] This parameter has, in our opinion, two interpretations. A first interpretation refers to the personal characteristics of the incumbent—not all incumbents are equally skilled at monitoring the decisions taken by the manager—and the quality of the relationship with the successor—for instance, regarding the way they communicate with each other. The second interpretation has to do with the characteristics of the monitoring technology, specifically the extent to which monitoring activities can be pursued depending on the legal framework (particularly the regulatory protection of the company owner's rights). Observe also that, given the temporal constraint (1), the time devoted to monitoring is upper bounded, i.e. $s_i \in [0, 1]$.[9] If the incumbent decides to devote s_i units of time to monitoring activities, the private benefit extraction is reduced by $m(s_i)\phi_i v_i$; thus, the benefits finally accrued by the incumbent from the manager's revenue become $(1 - [1 - m(s_i)]\phi_i)v_i$.

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[6] Observe that the labels "smooth" and "harsh" are related to the efficiency of the training process, not to the candidate's capacity as a manager. Thus, the revenue, $v_i(e_i)$, could be higher for a harsh process than for a smooth one.

[7] This specification is taken from Pagano and Röell (1998) and Burkart et al. (2003).

[8] For an easy monitoring ($\kappa_i < 2$) the incumbent needs not to spend all the time at this activity even in the case of full deprivation, i.e. $s_i < 1$ for $m_i(s_i; \kappa_i) = 1$; alternatively, for a burdensome monitoring ($\kappa_i > 2$) the incumbent cannot fully deprive the manager even if all her time is devoted to this activity, i.e. $m_i(1; \kappa_i) < 1$ even if $s_i = 1$.

[9] The specific existence of a time constraint differs our framework from Burkart et al.'s. Thus, their notion of "monitoring intensity" m_i becomes "deprivation intensity" in our setting and depends on the time devoted to monitoring activities s_i that is restricted by the temporal feasibility.

At the end of date 4, the incumbent receives the net firm's productive revenue and the amenity revenues. In the case the incumbent decides to work at $t = 2$ but she is exogenously retired at date 3, she would additionally accrue a welfare (in monetary terms) following a technology that transforms time into leisure activities or other activities developed outside the firm. We assume that the reservation utility per unit of time is proportional to the incumbent's labor productivity, so $v_F^R(n) = \delta_F v_F n$ is the revenue if the incumbent devotes $n \in [0, 1]$ units of time to "outside" activities, with $\delta_F \in [0, 1)$ a parameter related to the incumbent's capacity to obtain utility from activities other than managing the firm. For instance, a very low value for δ_F depicts the case of an incumbent with no interests other than the firm, and who is prone to continue devoting all her time to the firm. Finally, concerning amenity revenues, we assume that the incumbent need not give up amenity potential B at full retirement or whenever a manager is hired. An intuitive assumption at this point is that the incumbent retains a higher proportion of the amenity when he chooses the stay-on option, i.e. $\gamma_F \geq \gamma_i \geq 0$.

Succession Options

In this section, we present the three options available to the incumbent when facing a succession decision: postponing the decision—i.e. remaining in charge, or hiring a manager (whether a non-family or a family manager). For each option, we find the respective incumbent's welfare that solves the model through backward induction for each case.

Option 1. The Incumbent Retains Management

We first consider the possibility of postponing the manager transition. The process has not been initiated either because the incumbent has no intention of transferring managerial control to another person or no family member meets the appropriate characteristics—from the incumbent's point of view—to take over the firm.[10]

At date 4, the revenues received by the incumbent depend on whether the incumbent is retired or working. If the incumbent works for the firm, then the total revenues generated are $v_F n$; if retired, the incumbent receives a (monetarized) welfare $\delta_F v_F n$. All amenity potential B accrues to the incumbent. At date 3 a stochastic variable is realized determining whether or not the incumbent will work for the firm. Observe that in our model, if the incumbent has not initiated the succession process, then the family firm

closes with a probability π. In this case there are no dates 2 or 1. The expected incumbent's budget constraint at date 0 is $E[c_F] = (1 - \pi)v_F + \pi\delta_F v_F$, and the expected welfare is given as

$$E[V^F] = E[U(v_F; \gamma_F, B)] = \rho v_F + \gamma_F B, \qquad (4)$$

with $\rho = 1 - \pi(1 - \delta_F)$.

Option 2. The Succession is Implemented: Optimal Deprivation, Monitoring, Training and Wage Rate

At the time the incumbent aims to leave the firm's management, she must appoint a new manager for the firm. We solve the incumbent's problem by backward induction, beginning at date 4. The incumbent receives revenue originating from three sources. The first source consists of the dividends originated by the new manager's revenue (v_i), after paying out the manager's salary compensation ($w_i v_i$) and subtracting the resources the manager actually diverted from the firm ($[1 - m_i]\phi_i v_i$).[11] The second source of revenue depends on the stochastic outcome at date 3: an incumbent working for the firm receives a productive revenue ($v_F n$), whereas a retired incumbent receives an outside-of-the-firm revenue ($\delta_F v_F n$). Finally, the incumbent additionally receives a fraction of the amenity benefits ($\gamma_i B$).

At date 2, the incumbent allocates time resources. Our specification, which assumes that training precedes monitoring, allows us to obtain the optimal level of monitoring intensity (s_i) for any given training decision (e_i). Given the wage rate w_i^*—proposed at date 0 and, then, accepted at date 1—and any feasible time devoted to training (e_i), the expected incumbent's budget constraint is

$$E[c_i(e_i)] = \rho v_F[1 - (s_i + e_i)] + v_i(e_i)\big[1 - \phi_i + \phi_i m(s_i) - w_i^*\big];$$

that is, the (expected) consumption equals the (expected) net revenue from the incumbent's and the manager's productive activities. Substituting the welfare cost (2), the expected consumption and the time devoted to monitoring activities in (3) and after rescaling—for notational purposes—the welfare parameter $\breve{\beta} = \beta v_F$ with $\beta > 0$, the expected incumbent's welfare, $E[U(c_i, C_i; \gamma_i, B)] = E[c_i] - \breve{\beta}C_i + \gamma_i B$, turns out to be[12]

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[10] Handler (1988) or Sharma et al. (2001) point out that the most cited barrier to effective succession is the personal sense of attachment of the incumbent with the business.

[11] Our specification—in which wages and monitoring are simultaneously and optimally determined—circumvents the time consistency problems found in Burkart et al. (2003, Sect. II.B). There, once the manager has signed on to run the firm and revenues realized, the incumbent has an incentive to reduce the manager's private benefits by monitoring more.

[12] The incumbent's welfare (5) is a generalization of the Burkart et al. (2013, p.2176)'s founder's welfare V^s with $\breve{\beta} = 1$ and $\rho = 0$ —for these authors consider the incumbent fully retires ($\pi = 1$) and receives no outside-of-the-firm welfare ($\delta_F = 0$).

$$E[U(c(m_i, e_i); \gamma_i, B)] = v_F\left[\rho - (\rho + \beta)\left(\frac{\kappa_i}{2}m_i^2 + e_i\right)\right]$$
$$+ v_i(e_i)\left[1 - \phi_i + \phi_i m_i - w_i^*\right] + \gamma_i B. \tag{5}$$

Hence, for any given e_i, the level of deprivation of private benefits m_i that maximizes the incumbent's welfare (5) subject to the intensity constraint $0 \le m_i \le \min\left\{1, [(2/\kappa_i)(1-e_i)]^{1/2}\right\}$—where the upper bounds stem from the maximum monitoring level (i.e. $m_i \le 1$) and the time constraint ($s_i \le 1 - e_i$), is given by

$$m_i^*(e_i) = \min\left\{\lambda_i \mu_i(e_i), \min\left\{1, \left(\frac{2}{\kappa_i}[1-e_i]\right)^{\frac{1}{2}}\right\}\right\}, \tag{6}$$

which depends on the relative performance of the manager with respect to the incumbent, $\mu_i(e_i) = v_i(e_i)/v_F$, and the ratio $\lambda_i = \phi_i/[\kappa_i(\rho + \beta)]$, which will be interpreted along the paper (unless indicated) as the manager's honesty profile.[13] Accordingly, the optimal monitoring $s_i^*(e_i)$ is found from (3).

At date 1, the manager agrees to run the firm if the sum of the private benefits exceeds the outside utility ω_i. Thus, at date 0 the incumbent has to offer the potential manager a (non-negative) wage such that the overall revenue equals his opportunity cost,

$$w_i^*(e_i) = \frac{\omega_i}{v_i} - \left[1 - m_i^*(e_i)\right]\phi_i. \tag{7}$$

This is the manager's *participation constraint*. A necessary condition for the incumbent to offer a non-negative wage is that the firm's revenue originated by manager i must at least afford his salary compensation, $v_i \ge \omega_i$ (see "Appendix 2: Necessary and Sufficient Conditions to Offer a Contract at Date 0").

Additionally, at $t = 0$ the incumbent commits to training the manager by devoting e_i units of her time at the beginning of date 2, before the manager takes on management responsibilities. The optimum training effort e_i^* is obtained by maximizing the incumbent's expected welfare (5) evaluated at the optimal deprivation function (6) and subject to the time constraint ($s_i^*(e_i) + e_i + n_i = 1$), the monitoring time cost function (3) and the manager's participation constraint

(7). After substituting constraints, the incumbent chooses e_i to maximize the expected objective function

$$E[V^i(e_i)] = v_F\left\{\mu_i(e_i) + \rho - (\rho + \beta)\left[\frac{\kappa_i}{2}\left(m_i^*(e_i)\right)^2 + e_i\right]\right\} - \omega_i + \gamma_i B, \tag{8}$$

subject to (7) and $0 \le e_i \le 1 - s(e_i) = 1 - (\kappa_i/2)[m_i^*(e_i)]^2$ with $m_i^*(e_i)$ previously defined in (6).

The detailed characterization of the optimal level of training can be found in Appendix 4: Characterizing Potential Optimal Levels of Training. A prominent feature of this characterization is the role of the effectiveness of the training process. In the case of a smooth training process (i.e. $v_i'' > 0$), the incumbent is prone to prioritize nurturing the manager over the work for the firm, but the manager might require some monitoring intensity if he is not honest enough.[14] In the case of a harsh training process (i.e. $v_i'' < 0$), the opportunity cost of every additional unit of time resources—in terms of the incumbent's productive revenue—increases more than proportionally. If the opportunity cost increases quickly and the manager is not honest, then the manager optimally receives a minimum level of training to become productive, and the incumbent finds it optimal to partially retire.[15]

The Succession Decision

In this section, we apply the decision-making model described in the previous section to the decision faced by the incumbent concerning whether to stay in charge or hire a manager—whether an outsider or a family heir. Toward this aim, it will be convenient to explore two polar cases usually addressed in the literature on family firm succession. One case is the non-family manager—hereafter denoted to by $i = M$, an outside professional with no ties to the incumbent's family circle and already prepared to assume management responsibilities, thus requiring no training (i.e., $e_M = 0$) and exogenously endowed with a constant revenue technology (i.e., $v_M(0) = v_M$).[16] Hiring an outsider also entails giving up amenity benefits such as relinquishing management control from the family (i.e. $\gamma_M \ll \gamma_F$). The other polar case is a family manager, a candidate within the family circle—an heir or heiress, hereafter denoted by $i = H$, whose productivity as a manager is likely to require some degree of nurturing from the incumbent (i.e., $e_H \ge 0$).

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[13] Observe that in Burkart et al. the founder deprives a fraction of the total revenue ($m_i v_i$), while in our work she deprives a fraction of the manager's private benefit appropriation ($m_i \phi_i v_i$). Thus, they find a different interior optimal deprivation, $m_i^* = v_i/\kappa_i$, which forces them to set exogenous bounds to deprivation: $m_i \in [0, 1]$ and $m_i \le \bar{\phi}$, with $\bar{\phi}$ set by legal protection to shareholders. Interestingly, all bounds on deprivation in (6) are endogenously obtained within our framework.

[14] See Proposition A.1 in "Appendix 4: Characterizing Potential Optimal Levels of Training".

[15] See Proposition A.2 in "Appendix 4: Characterizing Potential Optimal Levels of Training".

[16] Unlike Burkart et al. (2005) and Bhattacharya and Ravikumar (2010), we will not assume that the manager is better than the incumbent at managing the firm (i.e., $v_M > v_F$).

Fig. 2 Theorem 1, cases (i) and (iii): Hiring a non-family manager with $\kappa_M \leq 2$ in the relative-performance−honesty plane (i.e., the μ_H-λ_H−plane). If the costs of monitoring are not high enough, the incumbent will always have available time to work/outside-of-the-firm activities, $n^* > 0$. (Above the full-deprivation frontier, $\lambda_M \mu_M = 1$, full deprivation is optimal.)
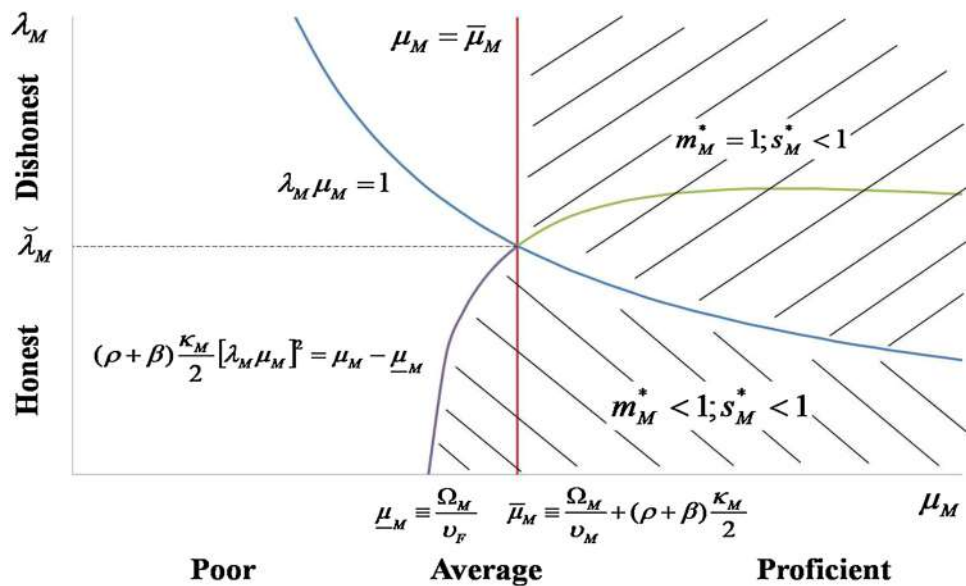
An intuitive assumption of a manage who is a member of the familyis that the incumbent retains a higher proportion of the amenity benefits when management remains within the family, i.e. $\gamma_F \geq \gamma_H > \gamma_M \geq 0$.[17]

Hiring an (Already-Trained) Non-family Manager or Staying in Charge

We begin by studying the conditions under which the incumbent hires a non-family manager or, alternatively, continues to run the firm. This case represents a situation in which an already-trained non-family executive is needed to run the family firm, as the incumbent faces the problem of having no successor inside the family or no family member who is willing or qualified for management.[18]

In terms of our model, hiring an already-trained non-family manager assumes that the incumbent does not nurture the successor (i.e., $e_M = 0$), so the revenue technology is exogenous and constant, $v_M(0) = v_M$. The optimal incumbent's expected welfare (8) in the case of hiring a non-family manager becomes

$$E[V^M] = v_F \left\{ \mu_M + \rho - (\rho + \beta)\frac{\kappa_M}{2}\left[m_M^*\right]^2 \right\} - \omega_M + \gamma_M B,$$
(9)

with the optimal deprivation of private benefits $m_M^* \equiv m_M^*(0)$ and the optimal non-negative wage rate $w_M^* \equiv w_M^*(0)$ respectively found in (6) and (7), while the relative performance of the non-family manager with respect the incumbent is $\mu_M(\equiv \mu_M(0)) = v_M/v_F$, a constant.

In this case, the difference between the expected welfare functions $E[V^M]$ and $E[V^F]$ in (9) and (4), becomes

$$\Delta E[V^{MF}] = v_F \left[\mu_M - (\rho + \beta)\frac{\kappa_M}{2}\left(\min\left\{ \lambda_M \mu_M, 1, \left(\frac{2}{\kappa_M}\right)^{\frac{1}{2}} \right\} \right)^2 - \frac{\Omega_M}{v_F} \right],$$
(10)

where $\Omega_M = \omega_M + B(\gamma_F - \gamma_M)$ are the *non-appropriation costs*—i.e., the costs of hiring a non-family manager other than private benefit deprivation. The incumbent will hire the non-family manager provided (10) is positive. Observe that $\Delta E[V^{MF}]$ in (10) is the addition of three terms: (*i*) it is positively affected by the non-family manager productive

[17] Some authors such as Kandel and Lazear (1992) and Davis et al. (1997) have argued that family managers could be exposed to higher non-monetary rewards associated to firm success that other managers do not share. More recently, Puri and Robinson (2013) find evidence of the existence of non-pecuniary benefits (measured as attitudes towards retirement) in family business owners and in those who inherit a business.

[18] See, for example, Friedman and Olk (1995), Shen and Cannella (2002) or Klein and Bell (2007).

Table 1 Theorem 1: hiring a non-family manager, with the honesty and performance thresholds defined as: $\check{\lambda}_M \equiv \min\{1, (2/\kappa_M)^{1/2}\}/\overline{\mu}_M$; $\underline{\mu}_M = \Omega_M/\upsilon_F$; and, $\overline{\mu}_M = (\Omega_M/\upsilon_F) + (\rho + \beta)\min\{1, (\kappa_M/2)\}$

		Poor $\mu_M < \underline{\mu}_M$	Average $\mu_M \in (\underline{\mu}_M, \overline{\mu}_M)$	Proficient $\mu_M > \overline{\mu}_M$
Dishonest	$\lambda_M > \check{\lambda}_M$	Not hired	Not hired	Hired, with $m_M^* = 1$ or $s_M^* = 1$
Honest	$\lambda_M < \check{\lambda}_M$	Not hired	Hired under restrictions, with $m_M^* < 1$	Hired, with $m_M^* < 1$

performance (υ_M) and negatively affected by both (*ii*) the deprivation costs (influenced by κ_M and ϕ_M) and (*iii*) the non-appropriation costs (Ω_M). The joint analysis of these elements will be key to understanding the succession decision. To this end, it is useful to distinguish among relative types of non-family managers in terms of two dimensions: relative performance (μ_M) and relative honesty (λ_M), see Fig. 2. Concerning the non-family manager's relative performance with respect to that of the incumbent (μ_M), we initially identify two extreme cases. A (**relatively**) **proficient manager** is one who will always be hired, since his performance is greater than the non-appropriation and the deprivation costs: $\mu_M > \overline{\mu}_M \equiv (\Omega_M/\upsilon_F) + (\rho + \beta)\min\{1, (\kappa_M/2)\}$. At the other extreme, a (**relatively**) **poor manager** is one who will never be hired, since his performance cannot cover the non-appropriation costs: $\mu_M < \underline{\mu}_M \equiv \Omega_M/\upsilon_F$ (i.e., $\upsilon_M < \Omega_M$). For an intermediate performance, $\mu_M \in [\underline{\mu}_M, \overline{\mu}_M]$, we identify a (**relatively**) **average manager**, whose prospects of getting the job will depend on his honesty dimension.

Concerning the non-family manager's honesty[19] (λ_M)—i.e. the degree of appropriation relative to the monitoring parameter, we can distinguish two types of managers based on the monitoring and deprivation intensity[20]: a non-family manager is (**relatively**) **dishonest** provided he is fully monitored or fully deprived, $\lambda_M \geq \check{\lambda}_M \equiv \min\{1, (2/\kappa_M)^{1/2}\}/\overline{\mu}_M$; otherwise, we will consider the manager to be (**relatively**) **honest** provided $\lambda_M \in [0, \check{\lambda}_M)$.

The next result, proved in Appendix 1: Proof of Theorem 1, shows the conditions under which a non-family manager is or is not hired. Generally speaking, we find that he is hired if the manager's performance is relatively better than that of the incumbent or, otherwise, if his performance is good enough *and* he is honest enough.

Concerning the hiring conditions we distinguish two cases, depending on whether full deprivation of private benefits is possible (monitoring is relatively cheap) or not (monitoring is relatively costly). Under cheap monitoring (i.e., $\kappa_M < 2$) the incumbent finds it optimal to keep on working, and the monitoring intensity depends on how honest the non-family manager is. In contrast, under costly monitoring (i.e., $\kappa_M > 2$) the incumbent finds it optimal to spend all her time monitoring, unless the non-family manager is sufficiently honest. Figure 2 and Table 1 summarize the results.

Theorem 1 *Hiring a non-family manager.* *Consider that* $\upsilon_M \geq \omega_M$ *is satisfied, and let the honesty and performance thresholds be defined as:* $\check{\lambda}_M \equiv \min\{1, (2/\kappa_M)^{1/2}\}/\overline{\mu}_M$; $\underline{\mu}_M \equiv \Omega_M/\upsilon_F$; *and,* $\overline{\mu}_M \equiv (\Omega_M/\upsilon_F) + (\rho + \beta)\min\{1, (\kappa_M/2)\}$. *A non-family manager is hired under the following conditions (and is not hired otherwise):*

(i) *Hiring a proficient manager with low monitoring costs* ($\mu_M > \overline{\mu}_M$ *and* $\kappa_M < 2$). *If the manager is* relatively dishonest *(i.e.* $\lambda_M \geq \check{\lambda}_M$), *the incumbent finds full deprivation optimal,* $m_M^* = 1$ *so* $s_M^* = \kappa_M/2$; *otherwise, if the manager is* relatively honest *(i.e.,* $\lambda_M < \check{\lambda}_M$), *the incumbent does not fully deprive,* $m_M^* = \mu_M \lambda_M < 1$. *In both cases, the incumbent has available time to work/outside-of-the-firm activities (i.e.,* $n_M^* = 1 - s_M^* > 0$).

(ii) *Hiring a proficient manager with high monitoring costs* ($\mu_M > \overline{\mu}_M$ *and* $\kappa_M \geq 2$). *If the manager is* relatively dishonest *(i.e.* $\lambda_M \geq \check{\lambda}_M$), *the incumbent finds full monitoring optimal,* $s_M^* = 1$ *so* $m_M^* = (2/\kappa_M)^{1/2} < 1$, *and retires (i.e.,* $n^* = 0$); *otherwise, if the manager is* relatively honest, *the incumbent deprives* $m_M^* = \mu_M \lambda_M < (2/\kappa_M)^{1/2}$ *and has available time to work/outside-of-the-firm activities (i.e.* $n_M^* = 1 - s_M^* > 0$).

(iii) *Hiring an average non-family manager* ($\mu_M \in (\underline{\mu}_M, \overline{\mu}_M)$). *If the manager is sufficiently honest (i.e.* $\lambda_M < \check{\lambda}_M$) *and*

[19] Our interpretation of the ratio λ_M in the subsequent analysis focuses on the honest features of the manager, ϕ_M, for a given monitoring parameter κ_M.

[20] These two types are characterized by two frontiers, the non-family-manager deprivation and monitoring frontiers, formally defined in "Appendix 3: The Non-family Manager Deprivation and Monitoring Frontiers".

$$(\rho + \beta)\frac{\kappa_M}{2}\left[\lambda_M \mu_M\right]^2 < \mu_M - \underline{\mu}_M$$

is satisfied, then the incumbent finds it optimal not to fully deprive, $m_M^* = \mu_M \lambda_M < 1$, and has available time to work/outside-of-the-firm activities (i.e. $n_M^* = 1 - s_M^* > 0$).

Theorem 1 can be understood as a formal depiction of informal theoretical arguments addressing family business succession.[21] Theorem 1 is also consistent with extensive empirical literature on non-family managers. This literature shows that the decision to hire an outsider as a successor is based on a trade-off between the manager's quality and the character and integrity of the candidates as necessary personality traits required to gain credibility.[22] These latter factors are more important in family businesses, since these type of companies typically rely on dynamics, such as trust and comfort in both hiring and governing senior managers, to a greater extent than they do on structured control mechanisms (Blumentritt et al. 2007).

The remainder of the section discusses the role of these aspects in terms of our characterization of the attributes of non-family candidates and addresses the incumbent's hiring decision regarding different types of non-family managers.

Character and Integrity of the Manager: An Honest Manager

For a high degree of honesty—that is, as ϕ_M (and λ_M) tends to zero, a sufficient condition to hire an average manager ($\Delta E[V^{MF}] > 0$ in (10)) becomes $\mu_M > \underline{\mu}_M$. Thus, integrity is a vastly overrated virtue in a family business that places the manager's performance into the background. Accordingly, an average (on the boundary, a "quasi-poor") non-family manager would be hired because of his integrity even if his quality as a manager is low. This is indeed the case of a truly honest manager that is less productive than the incumbent ($v_M < v_F$), yet satisfying $\mu_M \in (\Omega_M/v_F, 1]$.

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[21] For instance, Zellweger (2018, Chap. 7.7.5) poses two key dimensions of the 'right' successor: *willingness*—the successor's commitment with the firm—and *ability*—the successor's capacity for the job profile. These dimensions completely fit with our variables *honesty* and *relative performance*. Interestingly, our Fig. 2 provides a formal depiction (as well as a deeper insight) of the succession options informally displayed in Zellweger's Fig. 7.10, *willingness and ability diagram*.

[22] For example, the "outsider successor" in the typology proposed by Shen and Cannella (2002).

Personal and Legal Determinants of the Monitoring Cost

Theorem 1 shows that the monitoring cost (κ_M) plays a crucial role in the likelihood of hiring a non-family manager. As aforementioned, this parameter has two interpretations. A first interpretation refers to the personal characteristics of the incumbent and the quality of the relationship with the non-family manager. According to the literature (e.g., Dyer 1989 or Klein and Bell 2007) a typical barrier to hiring non-family managers in family firms are the differences in training and education between the incumbent and the potential non-family manager. In light of Theorem 1, a higher κ_M diminishes the prospects of hiring the non-family manager.

The second interpretation of κ_M has to do with the extent to which the monitoring activities are effective and can be pursued in accordance with the legal framework. Accordingly, Theorem 1 establishes that the requirements for hiring a non-family manager are tougher when the monitoring cost is high. For instance, this is the case whenever the legal protection of the owner's rights is low (see Song and Thakor 2006). Interestingly, our prediction complements Burkart et al.'s results. While Burkart et al. (2003, Corollary 1) states the requirements for hiring a non-family manager depend on the legal protection of minority shareholders against the diversion of profits by majority shareholders, Theorem 1 refers to the legal protection of the owner's interests against the diversion of profits by the manager.

The Competence and Ability of the Manager: Underperforming Succession

Concerning the manager's quality—μ_M in our terminology, we can depict a stereotype in the literature on succession: *underperforming succession*. That is to say, a situation in which the successor is hired even if his revenue achievements are worse than those of the incumbent, i.e. $v_M < v_F$. The following corollary provides a condition under which this outcome is feasible, a straightforward result from (10) satisfying $\Delta E[V^{MF}] > 0$ for $m_M^* = 1$, together with the manager exhibiting worse performance than the incumbent, $\mu_M < 1$.

Corollary 1 *An underperforming succession of a non-family manager is feasible if*

$$(\rho + \beta)\min\left\{1, \frac{\kappa_M}{2}\right\} + \frac{\Omega_M}{v_F} < 1.$$

Interestingly, an underperforming succession is more likely the bigger the v_F. This is typically the well-known stereotypical case of "bosses who replace titans"—that is, the case of a highly productive incumbent that hires an outsider who is not "as good as" the (overwhelming) incumbent.[23] The likelihood of hiring a manager worse than the incumbent increases the lower the costs of hiring

another, with the incumbent's involvement in the heir's training as a distinctive feature. In this section, we study the conditions under which the incumbent hires a family manager and commits himself to training the heir successor with an intensity e^* or, alternatively, continues running the firm. In this case, the difference between the expected welfare functions $E[V^H(e^*)]$ and $E[V^F]$ in (8) and (4), becomes

$$\Delta E\left[V^{HF}(e^*)\right] = v_F\left\{\mu_H(e^*) - (\rho + \beta)\left[\frac{\kappa_H}{2}\left(\min\left\{\lambda_H\mu_H(e^*), 1, \left(\frac{2}{\kappa_H}(1-e^*)\right)^{\frac{1}{2}}\right\}\right)^2 + e^*\right] - \frac{\Omega_H}{v_F}\right\}, \tag{11}$$

a manager other than appropriation (Ω_M), and also the lower the opportunity cost of monitoring the manager in terms of time resource and welfare ($\rho + \beta$).

The Reluctance to Step Aside

The discussion of Theorem 1 can be completed with an essential perspective of the analysis of the succession process: the role played by the incumbent once the succession is implemented. By noticing that (10) can also be written in terms of the role of the incumbent in the firm after succession, i.e. $\Delta E[V^{MF}] = v_F[\mu_M - (\rho + \beta)(1 - n_M^*) - \Omega_M/v_F]$, a straightforward consequence of Theorem 1 is that, other things being equal, it is more likely that a manager will be hired the higher the incumbent's implication in the management activities (n_M^*) once the successor is in charge. This preference illustrates one of the most commonly mentioned problems in succession processes: the *incumbent's resistance to succession*, as the following result states.

Corollary 2 *The incumbent's reluctance to step aside. If the incumbent chooses between staying in charge or hiring a manager, then the succession is more likely, ceteris paribus, in the case involving partial retirement.*

Hiring a Family Manager or Staying in Charge

The most common pattern of succession in family firms is the transition of leadership from one family member to

where $\Omega_H = \omega_H + B(\gamma_F - \gamma_H)$ are the *non-appropriation costs*. The incumbent will hire the family manager provided that the optimal training intensity e^* makes (11) positive.

Observe that once the incumbent chooses the optimal level of training e^*, the family manager's relative productive revenue $\mu_H(e^*)$ becomes fixed; as a consequence, the same intuitions for hiring a non-family manager (with an exogenous relative productive revenue) apply here with slight changes. Thus, analogously, $\Delta E[V^{HF}]$ in (11) is the addition of three terms: (*i*) it is positively affected by the family manager productive performance ($v_H(e^*)$); and negatively affected by both (*ii*) the deprivation costs (influenced by κ_H and ϕ_H), and (*iii*) the non-appropriation costs (Ω_H). Also, it will be useful to distinguish among relative types of family managers regarding two dimensions: relative performance and relative honesty. Concerning the family manager's relative performance, we initially identify two extreme cases: a (**relatively**) **proficient** family manager, who will always be hired, because his performance is greater than the non-appropriation and deprivation costs $\mu_H(e^*) > \overline{\mu}_H(e^*) \equiv (\Omega_H/v_F) + (\rho + \beta)\min\{1, (\kappa_H/2) + e^*\}$; and, a (**relatively**) **poor manager**, who will never be hired given that his performance cannot cover the non-appropriation costs, $\mu_H(e^*) < \underline{\mu}_H(e^*) \equiv \Omega_H/v_F + (\rho + \beta)e^*$. For an intermediate performance, $\mu_H(e^*) \in [\underline{\mu}_H(e^*), \overline{\mu}_H(e^*)]$, we identify a (**relatively**) **average manager**, whose prospects of getting the job will depend on his honesty profile.[24]

Concerning relative honesty we can distinguish between two types of managers based on monitoring and deprivation intensity: a manager is (**relatively**) **dishonest** provided

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[23] A recent example is the inability to find a suitable substitute for Sir Alex Ferguson in 2013. Over the course of his 27-years tenure, Manchester United won the Premier League title 13 times and the UEFA Champions League twice (see The Economist 2014).

[24] Unlike the case of the non-family manager case, the thresholds $\underline{\mu}_H(e^*)$ and $\overline{\mu}_H(e^*)$ are not constant values, and they depend on the optimal training e^*. Interestingly, as optimal training increases, the region that depicts relatively average family managers shrinks, and it fully vanishes at $e^* = 1$, i.e. $\underline{\mu}_H(1) = \overline{\mu}_H(1)$.

Table 2 Defining features of family manager profiles

Characteristics	Profile	Defining features
Honesty	Good child	$\phi_H = 0$
	Rotten kid	$\phi_H = 1$
Monitoring cost	Loyal servant	$\kappa_H = 0$ and $v_H'' < 0$
	Smuggler child	$\kappa_H = +\infty$ and $v_H'' < 0$
Outside option	Talented successor	High ω_H and $v_H'' > 0$
	Spoiled child	High ω_H and $v_H'' < 0$
	Predestined successor	$\omega_H = 0$ and $v_H'' > 0$
	No-penny-to-his-name successor	$\omega_H = 0$ and $v_H'' < 0$
	High family culture	$\omega_H = 0$ and $\gamma_H = \gamma_M$
Intermediate case	Like a son	A non-family manager that receives training

the incumbent has to fully monitor or fully deprive him, $\lambda_H \geq \check{\lambda}_H(\mathsf{e}^*) \equiv \min\{1, [(1 - \mathsf{e}^*)2/\kappa_H]^{1/2}\}/\overline{\mu}_H(\mathsf{e}^*)$; otherwise, provided $\lambda_H \in [0, \check{\lambda}_H(\mathsf{e}^*))$, we will consider the manager is (**relatively**) **honest**.[25]

Next, we can state a result akin to Theorem 1 that establishes the conditions for hiring a family successor. A family manager is hired if his performance is relatively better than that of the incumbent or, otherwise, if his performance is good enough and he is honest. In fact, the hiring region in Fig. 2 is analogous for the family manager (after replacing μ_M by $\mu_H(\mathsf{e}^*)$ and adapting the function for the hiring region for the average manager). The proof is straightforward after substituting the thresholds $\overline{\mu}_H(\mathsf{e}^*)$ and $\underline{\mu}_H(\mathsf{e}^*)$ in (11).

Theorem 2 *Hiring a family manager. Consider a family manager who, if hired, will be optimally trained with e^* units of the incumbent's time. Consider that $v_H(\mathsf{e}^*) \geq \omega_H$ is satisfied, and let the honesty and performance thresholds be defined as: $\check{\lambda}_H(\mathsf{e}^*) \equiv \min\{1, [(1 - \mathsf{e}^*)2/\kappa_H]^{1/2}\}/\overline{\mu}_H(\mathsf{e}^*)$; $\underline{\mu}_H(\mathsf{e}^*) \equiv \Omega_H/v_F + (\rho + \beta)\mathsf{e}^*$; and, $\overline{\mu}_H(\mathsf{e}^*) \equiv (\Omega_H/v_F) + (\rho + \beta)\min\{1, (\kappa_H/2) + \mathsf{e}^*\}$. The family manager is hired under the following conditions (and is not hired otherwise):*

(i) *A (relatively) proficient family manager. The family manager is hired if, and only if, $\mu_H(\mathsf{e}^*) > \overline{\mu}_H(\mathsf{e}^*)$ is satisfied;*

(ii) *A (relatively) average family manager ($\mu_H(\mathsf{e}^*) \in (\underline{\mu}_H(\mathsf{e}^*), \overline{\mu}_H(\mathsf{e}^*))$). The family manager is*

hired if, and only if, he is relatively honest enough (i.e. $\lambda_H \leq \check{\lambda}_H(\mathsf{e}^*)$) and

$$(\rho + \beta)\frac{\kappa_H}{2}\left[\lambda_H \mu_H(\mathsf{e}^*)\right]^2 < \mu_H(\mathsf{e}^*) - \underline{\mu}_H(\mathsf{e}^*)$$

is satisfied.

Given the optimal training e^*, the decision pattern of hiring a family manager (Theorem 2) is very close to the decision of hiring a non-family manager (Theorem 1). Yet, a crucial element in our analysis is that the incumbent chooses the family successor's level of training to increase his productivity, as a higher training effort increases the probability that offspring continue running the family business (Parker 2016). This means that the joint analysis of the optimal training-hiring decisions is very difficult to characterize. Thus, instead of providing general findings, we will focus next on particular results for specific types of family managers, commonly mentioned stereotypes and characterizations also found in the literature (see, for example, Levinson 1974; Kets de Vries 1993, or Handler 1994). We have proposed profiles for these breeds of family manager successors within the features of our model, see Table 2. However, it is extremely important to realize that our characterizations must be considered as *ex-ante* types of successors (who eventually may or may not succeed in business management), as opposed to the *ex-post* types of successor described in the literature to illustrate failed successions.

Character and Integrity of the Manager: An Honest Manager

Concerning honesty, in the context of easy monitoring (i.e. $\kappa_H < 2$), an extreme case of family manager breed is a "good child;" that is, a fully honest person who makes no profit diversion (i.e. $\phi_H = 0$), so no monitoring is required

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[25] Differently from the non-family manager case, the family manager's honesty is a relative concept that depends on the optimal training e^*. For an easy monitoring ($\kappa_H < 2$), the threshold of honesty decreases steadily as optimal training increases in the range $\mathsf{e}^* \leq 1 - \frac{\kappa_H}{2}$, beyond which is constant at $\check{\lambda}_H(\mathsf{e}^*) = 1/\overline{\mu}_H(1 - \frac{\kappa_H}{2})$ for any $\mathsf{e}^* > 1 - \frac{\kappa_H}{2}$. For a cumbersome monitoring ($\kappa_H > 2$), the threshold of honesty decreases steadily as the optimal training e^* increases up to $\check{\lambda}_H(1) = 0$.

and the incumbent fully retires or not depending on if the training process is smooth or harsh.

An opposite breed, also well-characterized in the literature, is the so-called "**rotten kid**" (a term borrowed from Becker 1981). In our setting, this is a fully dishonest person with the highest profit diversion, i.e. $\phi_H = 1$. If the **rotten kid** is hired, the incumbent has to devote all time resources to monitor and train the successor, and deprivation is full or not depending on the relative honesty of the family candidate.

Personal and Legal Determinants of the Monitoring Cost

The proceeding analysis has been developed along the lines of a constant monitoring parameter κ_H. We can also explore the incumbent's training-hiring decision for different values of this parameter. As aforementioned, this parameter has two interpretations: a first interpretation refers to the personal characteristics of the incumbent, as well as the quality of the relationship with the family manager; and, a second interpretation deals with the features of the legal framework. The analysis of the latter shares the same results and intuitions previously given for the non-family manager, so we will focus on the former interpretation.

If the monitoring cost is negligible ($\kappa_H = 0$)—for instance, because of the mutual knowledge of the incumbent and the family successor, we can find close characterizations to those found in the *good child* case. In the case that, additionally, the training process is harsh, $v''_H < 0$, this candidate can be regarded as reminiscent of the "**loyal servant**" profile, first characterized by Levinson (1974, p. 59), and also depicted in Handler (1994, p. 139) as a a reliable helper, but too poorly trained to fully replace the incumbent.

The opposite case is the one in which the incumbent finds it extremely costly to monitor the family manager ($\kappa_H = +\infty$, i.e. $\lambda_H = 0$), interestingly a close characterization to an honest family manager (i.e., $\phi_H = 0$). A particular breed of family manager, who may be called the "**smuggler child**," is the manager whose diversion of resources is nearly undetectable and exhibits a harsh training process. Any effort to deprive resources from the family manager is in vain; so, if he is hired, the incumbent gives up monitoring and, then, trains the family manager the least.

The Competence and Ability of the Manager: Underperforming Succession

Similar to the case of the non-family manager (Corollary 1), underperforming succession can also take place in intra-family succession. The condition for underperforming here becomes $(\rho + \beta) \min \left\{ 1, \frac{\kappa_H}{2} + e^* \right\} + \frac{\Omega_H}{v_F} < 1$, a straightforward consequence from $\Delta E[V^{HF}] > 0$ in (11) for $m^*_H = 1$

and the family manager exhibits worse performance than the incumbent ($\mu_H(e^*) < 1$).

Underperforming succession is more likely the lower the costs of hiring a manager other than appropriation (Ω_H) and the lower the opportunity cost of monitoring the manager in time resources and welfare terms ($\rho + \beta$). Analogous to the case of the non-family manager, there is also a special kind of underperforming succession that is caused more by the characteristics of the (successful, long-serving) incumbent than by the characteristics of the successor, namely a high v_F. In addition, it is interesting to point out that underperforming succession becomes more likely as the monitoring cost (κ_H) falls. Here, the alignment of ownership and management within the family, as well as the quality of the interpersonal dynamics, are commonly cited reasons for reducing monitoring costs in the agency literature on family business.

Family Manager Outside Option

In the case of intra-family succession, the opportunity cost or outside option (ω_H) is subject to ambiguous interpretation. A first interpretation is an outside option, a consequence of the working opportunities available to the family manager outside the family business. A second interpretation is a reservation value; that is, the minimum level of salary the family candidate would be willing to accept to become a manager. Of course, this second meaning is related to a variety of personal traits such as family norms, values and nurture, acquired standards of consumption, etc. Both interpretations are reminiscent of a similar profile of family manager coined in the literature as the "willing successor" (Parker 2016), the CEO heir apparent (Cannella and Shen 2001), or the "crown heir" (Friedman and Olk 1995). Next, we explore a number of profiles of potential heirs based on their outside opportunity.

(i) *A family manager with a high outside option ($\omega_H >> 0$).* A high outside option is actually comprised of two opposite meanings, and therefore characterizes two candidates. The "**talented successor**" is a highly-educated and qualified professional manager inside the family circle capable of achieving high performance in the family firm.[26] The incumbent finds it optimal to fully train this proficient successor ($e^* = 1$) regardless of the honesty profile, because of his high opportunity cost. Interestingly, the case of a talented manager with a fully honest profile ($\lambda_H = 0$) is

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[26] This profile corresponds to the "high potential" type of successor in Blumentritt (2016).

equivalent to a proficient *good child* exhibiting a smooth training process. In contrast, the second profile is characterized by a poor performance and can be specified in terms of a "spoiled" child (a term borrowed from Kets de Vries 1993, p. 64): a person under the influence of the "disincentive effects caused by abundant wealth" (Pérez-González 2006, p. 1561). This heir is characterized by a harsh training process, so he will be considered a potential successor provided he is productive enough. If hired, he will be monitored by the (partially retired) incumbent.

(ii) *A family manager with no outside option* ($\omega_H = 0$). A family manager with no opportunity cost can also be interpreted along two opposing profiles. The "predestined" successor refers to a family member exhibiting a smooth training process with no outside option, either because he feels destined to manage the family firm as a consequence of having devoted a life-time to the firm and grown as a (potential) manager successor within the firm, or because there is a strong and deeply rooted family

$\Omega_H = 0$). Here, the family manager will be hired only if he offsets the costs of training and monitoring (and then, under-performing succession becomes more likely), as the following result shows.

Corollary 3 *A high family culture or tradition in the family business* (i.e., $\gamma_H = \gamma_F$ and $\omega_H = 0$). *The predestined family manager is hired if* $\mu_H(e^*) > (\rho + \beta)$.

An Intermediate Candidate: A Non-family, Insider Successor

To conclude this section, it is interesting to point out that the preceding analysis can also be applied to an intermediate case between a family successor and a non-family manager (as noted by Smith and Amoaku-Adu 1999) because "it is not always clear-cut who is a 'family' and who is a 'non-family' actor when involved in strategic work" (Nordqvist 2011 p. 31). This is the case of a non-family professional who works at the firm prior to the retirement of the incumbent, and who is promoted to the top position. This candidate could also experience a training process similar to the one previously described for a family successor. In our framework the expected objective function that corresponds to that case is similar to (8)

$$E[V^M(e)] = \upsilon_F\left\{\mu_M(e) + \rho - (\rho + \beta)\left[\frac{\kappa_M}{2}\left(m_M^*(1-e)\right)^2 + e\right]\right\} - \omega_M + \gamma_M B,$$

culture. The second profile is a family manager characterized by a harsh training process—thus becoming a profile very similar to the case of the aforementioned *spoiled child*—and with no working options at all outside the family firm. Interestingly, in either of these profiles, having no outside opportunity improves the incumbent's capacity to appropriate the family manager revenue by reducing wage costs. That is, the conditions the incumbent offers to the manager at date 1 can be very tight. Observe that due to $\omega_H = 0$, the manager participation constraint (7) entails that the optimal wage rate offer is $w_H^* = 0$. This requires the incumbent to optimally fully deprive the family manager ($m_H^* = 1$), unless he is fully honest ($\phi_H = 0$). Thus, the honesty profile plays (again) a key role in the incumbent's optimal decisions.

Within this profile, an interesting case of high family culture arises by additionally considering an incumbent who does not perceive any amenity potential loss when the management remains inside the family (i.e. $\gamma_H = \gamma_F$). This could represent a case of a successor and a founder who are culturally aligned, so there exists no-appropriation costs (i.e.,

and the analysis for this insider follows along the same lines as previously described (i.e., the Hiring a Family Manager or Staying in Charge) for the family manager in situations characterized by a close relationship between the incumbent and the insider in which the parameter values for the insider are closer to those of the family manager: this employee is "like a son" to the incumbent who, in a close day-to-day relationship, has forged a personal link between them. This candidate is reminiscent of the "Simmelian stranger" in Nordqvist (2011), and also corresponds to the "follower successor" and the "contender successor" in the typology proposed by Shen and Cannella (2002).

Choosing Between Potential Successor Managers

The incumbent must decide on a successor whenever non-family and family managers are both relatively better than is the incumbent, i.e., (10) and (11) are both positive. To analyze this decision, we compare the revenues under both candidates by defining the function $\Delta E\left[V^{HM}(e^*)\right]$ as the difference between the expected welfare functions $E[V^H(e^*)]$ and $E[V^M]$ in (8) and (9); that is,

$$\Delta E\left[V^{HM}(\mathsf{e}^*)\right] = \upsilon_F \left\{ \left[\mu_H(\mathsf{e}^*) - \mu_M\right] - (\rho + \beta)\left[\frac{\kappa_H}{2}\left(m_H^*(\mathsf{e}^*)\right)^2 - \frac{\kappa_M}{2}\left(m_M^*\right)^2 + \mathsf{e}^*\right] - \frac{\Omega_H - \Omega_M}{\upsilon_F} \right\} \quad (12)$$

The incumbent will hire the family manager provided (12) is positive; otherwise, the incumbent will hire the non-family manager.

Next, we present a general result for hiring the family manager, that is very similar to Theorems 1 and 2. If the family manager is proficient, there exists a threshold for the (relative) revenue such that there will be a preference for the family over the non-family manager. Recall that the upper thresholds $\overline{\mu}_M$ and $\overline{\mu}_H(\mathsf{e}^*)$ previously defined set a maximum to the overall costs of hiring for each manager (i.e., $\overline{\mu}_M \equiv (\Omega_M/\upsilon_F) + (\rho + \beta)\min\{1, (\kappa_M/2)\}$ and $\overline{\mu}_H(\mathsf{e}^*) \equiv (\Omega_H/\upsilon_F) + (\rho + \beta)\min\{1, (\kappa_H/2) + \mathsf{e}^*\}$). Thus, a proficient family manager will indeed be chosen if $\mu_H(\mathsf{e}^*) - \overline{\mu}_H(\mathsf{e}^*) > \mu_M - \overline{\mu}_M$; and, an average family manager will be hired if a condition relating relative revenue, monitoring and non-appropriation costs is satisfied. The proof is straightforward after substituting the thresholds $\overline{\mu}_M$, $\underline{\mu}_M$, $\overline{\mu}_H(\mathsf{e}^*)$, $\underline{\mu}_H(\mathsf{e}^*)$ in (12).

Theorem 3 *Hiring a successor. Consider a family firm headed by an incumbent that must choose between a non-family manager and a family manager who, if hired, will be optimally trained with e^* units of the incumbent's time. Let the relative performance thresholds be defined as $\underline{\underline{\mu}}_H(\mathsf{e}^*) \equiv \underline{\mu}_H(\mathsf{e}^*) + [\mu_M - \underline{\mu}_M]$ and $\overline{\overline{\mu}}_H(\mathsf{e}^*) \equiv \overline{\mu}_H(\mathsf{e}^*) + [\mu_M - \overline{\mu}_M]$. The family manager is hired under the following conditions (otherwise, the non-family manager becomes the successor):*

(i) *A (relatively) proficient family manager ($\mu_H(\mathsf{e}^*) > \overline{\mu}_H(\mathsf{e}^*)$). If $\mu_H(\mathsf{e}^*) > \overline{\overline{\mu}}_H(\mathsf{e}^*)$ the family manager is chosen as the successor.*

(ii) *A (relatively) average family manager ($\mu_H(\mathsf{e}^*) \in (\underline{\mu}_H(\mathsf{e}^*), \overline{\mu}_H(\mathsf{e}^*))$). If $\mu_H(\mathsf{e}^*) \in \left[\underline{\underline{\mu}}_H(\mathsf{e}^*), \overline{\overline{\mu}}_H(\mathsf{e}^*)\right]$ the family manager becomes the successor if, and only if*

$$\begin{aligned}(\rho + \beta)&\left[\frac{\kappa_H}{2}[\lambda_H \mu_H(\mathsf{e}^*)]^2 - \frac{\kappa_M}{2}[\lambda_M \mu_M]^2\right] \\ &< \mu_H(\mathsf{e}^*) - \underline{\underline{\mu}}_H(\mathsf{e}^*).\end{aligned} \quad (13)$$

To understand Theorem 3 we can decompose the expected welfare function (12) for a given training intensity e^* into three key components: (*i*) the *relative quality* of the managers, expressed in terms of their capacity to generate revenues to the firm, i.e., $\Delta\mu_{HM}(\mathsf{e}^*) \equiv \mu_H(\mathsf{e}^*) - \mu_M$; (*ii*) the *relative costs of monitoring* each type of manager, namely the extent to which depriving a family manager is (or is not) cheaper than depriving a non-family manager, i.e. $\Delta m_{HM}(\mathsf{e}^*) \equiv (\rho + \beta)\{(\kappa_H/2)[m_H^*(\mathsf{e}^*)]^2 - (\kappa_M/2)[m_M^*(1)]^2\}$; and, (*iii*) their *relative non-appropriation costs*, encompassing the amenity loss and the outside option associated to each kind of candidate, i.e., $\Delta\underline{\mu}_{HM}(\mathsf{e}^*) \equiv \underline{\mu}_H(\mathsf{e}^*) - \underline{\mu}_M \equiv (\rho + \beta)\mathsf{e}^* + (\Omega_H - \Omega_M)/\upsilon_F$. Thus, (12) can be represented as

$$\Delta E\left[V^{HM}(\mathsf{e}^*)\right] = \Delta\mu_{HM}(\mathsf{e}^*) - \Delta m_{HM}(\mathsf{e}^*) - \Delta\underline{\mu}_{HM}(\mathsf{e}^*). \quad (14)$$

These three blocks allow us to provide general results concerning the appointment of the successor manager. As we will see, one common feature of our discussion on the characteristics of potential successors is the possibility of hiring a family manager even if this candidate is not the most productive one. This can be interpreted in terms of a commonly claimed succession problem in family business: the "outsider" is hired only if he is markedly better than the insider (see Agrawal et al. 2006); or, in other words, the family manager could be chosen even if he is not the most feasible candidate (see Pérez-González 2006). The following result systematizes this possibility, which can be identified as barriers to non-family succession.

Corollary 4 *Choosing a less qualified successor. A (relatively) less proficient family manager, i.e. $\Delta\mu_{HM}(\mathsf{e}^*) \equiv \mu_H(\mathsf{e}^*) - \mu_M < 0$, is chosen as the successor under the following conditions:*

(i) Large monitoring costs if a non-family manager is hired. If the non-family manager optimally requires a much higher deprivation intensity than that for the family manager, so that $\Delta m_{HM}(\mathsf{e}^*) < 0$ with $-\Delta m_{HM}(\mathsf{e}^*) > -[\Delta\mu_{HM}(\mathsf{e}^*) - \Delta\underline{\mu}_{HM}(\mathsf{e}^*)]$.

(ii) Disproportionate non-appropriation costs if a non-family manager is hired. If the non-appropriation costs are much higher when hiring the non-family manager ($\Omega_M >> \Omega_H$), so that $\Delta\underline{\mu}_{HM}(\mathsf{e}^*) < 0$ with $-\Delta\underline{\mu}_{HM}(\mathsf{e}^*) > -[\Delta\mu_{HM}(\mathsf{e}^*) - \Delta m_{HM}(\mathsf{e}^*)]$.

The discussion of Theorem 3 can be also completed to address the role played by the incumbent once the succession is implemented: specifically, the incumbent's reluctance to step aside when choosing between two potential

successors. By writing (14) in terms of the role of the incumbent in the firm after succession, i.e. $\Delta E\left[V^{HM}(e^*)\right] = v_F\left[(\mu_H(e^*) - \mu_M) \quad -(\rho+\beta)(n_M^* - n_H^*) - \frac{\Omega_H - \Omega_M}{v_F}\right]$, if the candidates are roughly the same in terms of quality and non-appropriation costs, then the incumbent prefers the succession option that results in a higher level of optimal working decision; that is, she prefers a succession option entailing partial retirement over the one entailing full retirement (a result similar to Corollary 2). This intuition points to an interesting extension of the model: the complementarity or substitutability of the incumbent's and the successor's managerial activities when partial retirement is optimal.

The remainder of the section discusses the role of the attributes of both family and non-family candidates. All results are straightforward consequences of Theorems 1–3 and the results noted in the previous Sections.

Character and Integrity of the Manager: An Honest Manager

Comparing candidates in terms of honesty mainly affects the relative cost of monitoring ($\Delta m_{HF}(e^*)$). A first general result relates this relative cost of monitoring and the proficiency of the family manager. It indicates that becoming a successor calls for a higher quality family manager (either in productivity or honesty) as the honesty of the non-family manager increases, and vice versa. The key to choosing the family heir is the relative high cost of monitoring the non-family manager, i.e. $\Delta m_{HF}(e^*) < 0$.

Corollary 5 *Family manager's proficiency versus non-family manager's honesty.*

(i) *A (relatively) dishonest non-family manager. If $\lambda_M \geq \check{\lambda}_M$ and $\mu_H(e^*) > \underline{\underline{\mu}}_H(e^*)$ (i.e., $\Delta\mu_{HF}(e^*) > \underline{\Delta\mu}_{HF}(e^*)$), then the family manager is chosen as the successor.*

(ii) *A (relatively) honest non-family manager. If $\lambda_M < \check{\lambda}_M$ and $\mu_H(e^*) > \overline{\mu}_H(e^*)$, then a* proficient *family manager is chosen as the successor. An* average *family manager becomes the successor if $m_H^*(e^*) < \lambda_M \mu_M$ (i.e., $-\Delta m_{HF}(e^*) > 0$) is additionally satisfied.*

Concerning the two extreme cases depicted as regards the honesty of the family manager, the good child and the rotten kid, we can write the following results. First, a good child will always be chosen as a successor unless (13) is not satisfied; that is, in the case where the non-family manager

is either remarkably more productive (i.e., $\Delta\mu_{HM}(1) << 0$) or the family manager's opportunity cost is remarkably higher (i.e., $\omega_H >> \omega_M$, so that $\underline{\Delta\mu}_{HM}(1) >> 0$). Second, as a straightforward consequence of Theorem 3, a rotten kid will be chosen as a successor provided he is remarkably more productive or the non-appropriation costs are remarkably lower.

Personal and Legal Determinants of Monitoring Costs

Another commonly claimed feature of family firms is that monitoring costs are lower with relatives than with outsiders because of mutual knowledge, faster communication and social interaction. This affects the size of the relative monitoring cost ($\Delta m_{HF}(e^*)$). For optimal values of monitoring and training, hiring a family manager (i.e. $\Delta E\left[V^{HM}(e^*)\right] > 0$) is more feasible as the difference between κ_M and κ_H increases. More specifically, as already noted in Corollary 4, when monitoring the non-family manager is more costly than monitoring the family manager ($-\Delta m_{HM}(e^*) > 0$), the family manager is indeed hired if his relative productive quality is higher than the relative non-appropriation costs: $\Delta\mu_{HM}(e^*) > \underline{\Delta\mu}_{HM}(e^*)$.

Concerning the extreme cases depicted in terms of the monitoring cost, we can write the following results. The condition for choosing a successor with $\kappa_H = 0$ and displaying a smooth training process is similar to those described for the good child; the condition for choosing either the loyal servant or the smuggler child as the successor is given by $\mu_H(e^*) > \underline{\underline{\mu}}_H(e^*)$ (i.e. $\Delta\mu_{HM}(e^*) > \underline{\Delta\mu}_{HM}(e^*)$).

Competence and Ability of the Manager

Concerning the candidates's quality, we previously focused on underperformance in the succession of a new manager with respect to the incumbent (see sections The Competence and Ability of the Manager: Underperforming Succession and The Competence and Ability of the Manager: Underperforming Succession). Next, we compare the quality of both managers using the analysis presented in Corollary 4, that establishes the conditions for hiring a less qualified successor. Since $\overline{\mu}_H(e^*) - \overline{\mu}_M \geq max\{\Delta m_{HM}(e^*) + \underline{\Delta\mu}_{HM}(e^*)\}$ after substituting the definitions of the thresholds, a proficient family manager will be hired provided $\Delta\mu_{HM}(e^*) > \overline{\mu}_H(e^*) - \overline{\mu}_M$ (Theorem 3.(i)). Such a condition (i.e., $\mu_H(e^*) - \overline{\mu}_H(e^*) > \mu_M - \overline{\mu}_M$) entails that if the non-family candidate is proficient ($\mu_M - \overline{\mu}_M > 0$), a necessary condition for hiring a family manager is that he is also proficient ($\mu_H(e^*) - \overline{\mu}_H(e^*) > 0$).

Opportunity Cost

Comparing candidates in terms of their opportunity cost mainly affects the relative non-appropriation costs ($\Delta\underline{\mu}_{HF}(\mathrm{e}^*)$). Corollary 4.(*ii*) partially deals with the role of opportunity costs. In particular, the conditions included in this lemma can hold even if the family manager's opportunity cost is higher than that of the non-family's, i.e. $\omega_H > \omega_M$. Greater remuneration, however, does not preclude the heir becoming the successor as the condition in (*ii*) might be satisfied, i.e. $\Omega_M >> \Omega_H$. Indeed, choosing a family successor with a higher opportunity cost than the non-family manager can be interpreted as a representation of the incumbent's stereotype that overrates amenity benefits. The following result shows that there is always a lower threshold $\underline{B}$ such that the family manager is always preferred, regardless of the quality of both candidates.

Corollary 6 *High enough amenity loss. Consider a family firm headed by an incumbent that must choose between a non-family manager and a family manager who, if hired, will be optimally trained with e^* units of the incumbent's time. Then, there is always a threshold $\underline{B} \equiv [\omega_H - \omega_M]/\upsilon_F + [\mu_M - \mu_H(\mathrm{e}^*)] + (\rho + \beta)[n_M^* - n_H^*(\mathrm{e}^*)]$ such that if the incumbent's amenity parameter satisfies $B \geq \underline{B}/(\gamma_H - \gamma_M)$, then the family manager is chosen as a successor regardless of the quality of both candidates.*

Concerning opportunity cost, we could state results in terms of the family manager profiles. The conditions for choosing the talented successor and the fully-honest predestined manager (i.e. $\phi_H = 0$) are similar to those described for the good child, while the conditions for choosing the spoiled child, the no-penny-to-his-name successor and the not-so-honest predestined manager (i.e. $\phi_H > 0$) are analogous to those described for the rotten kid. Obviously, the spoiled child could be a feasible candidate if the amenity loss is large enough (see Corollary 6).

Finally, we focus on the conditions for choosing a family member as a successor under the existence of a high family culture or tradition when the incumbent and the family member are culturally aligned, as in Corollary 3.

Corollary 7 *A high family culture or tradition in the family business (i.e., $\gamma_H = \gamma_F$ and $\omega_H = 0$). The predestined family manager is chosen as the successor if $\mu_H(\mathrm{e}^*) - (\rho + \beta) > \mu_M - \overline{\mu}_M$.*

This result implies that the family manager is always hired if the non-family candidate is an average manager. However, if the non-family candidate is a proficient manager, then the family manager has to be productive enough to be hired.

Conclusions and Extensions

Despite its crucial relevance, economic analysis has mostly neglected succession in family firms. This work aims to fill this gap in the literature by proposing a microeconomic theory based on a fundamental economic trade-off between skills and incentives.

The main contributions of our paper can be summarized as follows. First, our setting considers all available choices an incumbent can take in a succession process. The available options are not limited to an intra-family succession (as in Chami 2001 or Kimhi 1997), and the incumbent can also choose to hire a non-family manager, remaining in charge or even partially retiring. Different from Burkart et al. (2003), our model considers explicitly an intrafamily succession and also the possibility of postponing the succession as an option the incumbent could rationally choose under certain circumstances.

Second, as a distinctive feature, our setting explicitly considers the role of effectiveness of the training process, as well as the education and experience of the successor, to catalyze the succession process. Accordingly, we model the family firm succession bearing in mind that the founder purposely considers a potential successor who must be trained. Previous literature does not consider training activities, and only Burkart et al. (2003) considers an implicit and costless training process that makes the heir a perfect substitute for the incumbent.

Third, our setting explicitly introduces personal traits and non-monetary incentives of both incumbent and successors that allow us to characterize different candidate typologies mentioned in the literature on family firm succession. For each profile, we have obtained results concerning succession outcomes. Also, this myriad of typologies has enabled us to provide a wider interpretation of monitoring costs as determined not only by the legal framework (as in Burkart et al. 2003), but also by the personal characteristics of the agents and the quality of their relationship (in terms of mutual knowledge, communication and trust).

In addition to these contributions, our analysis also provides a sound economic rationale for a number of commonly cited outcomes of the succession process and challenges faced by family firms:

(i) *Reluctance to step-aside.* Our results account for the frequently observed reluctance on the part of the incumbent to retire, either by postponing the succession process when no candidate is considered to be a better option to staying in charge, or as a propensity to continuing to work at the firm once the successor has been appointed. In addition to the personal traits of incumbent and candidates, the (perceived) probability of a forced retirement and non-monetary

variables can be determined in the stay-on decision (for example, the case of an incumbent who has a high valuation of the amenity benefits).

(ii) *Underperforming succession.* Our results also address a typical issue in the empirical literature on succession in family firms, namely, the (potential) firm underperformance as a consequence of an intra-family transmission of management responsibilities. This outcome of the succession process is usually explained in the literature in terms of private benefits—for instance, "the family may accept lower economic returns from their capital in return for the private utility of managerial control." Bloom and Van Reenen (2007, p.1359)–, or as a consequence of the legal protection of minority shareholders, as in Burkart et al. (2003) or Song and Thakor (2006). Our approach additionally emphasizes not only the role of the amenity potential to attain the underperforming outcome—according to the literature on non-monetary goals–but also the size of the monitoring costs.

(iii) *Intra-family succession bias.* The propensity for an intra-family succession has its roots in the same set of factors that motivate an underperforming succession. Our model explains this bias as an optimal choice given a set of variables and parameters (the quality of the potential manager being one of them), and not just as an ex-ante predetermined incumbent's preference, as frequently stated. In this sense, it is important to note that, different from most of the contributions on the field, in our model these outcomes are not explained in terms of the incumbent's altruistic preferences (Chami 2001) or legal determinants (Bjuggren and Sund 2001; Burkart et al. 2003). A natural extension of our setting is the consideration of different forms of altruism. Yet, we devise that the introduction of paternalistic altruism as an extension of the model will only reinforce our findings by adding a further bias towards an intra-family succession.

Interestingly, the fundamental economic trade-off—skill versus incentives—that has driven our analysis of the succession decision is not specific to family firms. For instance, it is also inherent in the managerial succession of non-family firms, in particular in voluntary turnovers when a new manager must be either promoted from inside the firm or hired from outside the firm. Although some incentives lack importance for non-family firm succession—such as the relevance of amenity potentials—and the analysis- confined to our section *Choosing between potential successors*, our main results still hold (e.g., Theorem 3 and Corollaries 4 and 5). Indeed, our findings are aligned with the evidence that outsiders will not be appointed unless an incremental improvement relative to inside candidates is expected because it is more costly to appoint an outsider in terms of monitoring mechanisms (see for example, Dalton and Kesner 1985 and Huson et al. 2004).

Regarding extensions, considering uncertainty and asymmetric information in our framework would further enrich our understanding of the succession process. For instance, the role of uncertainty facing the threat of a forced retirement (due to health reasons, for instance), or the role of *ex-ante* information on the quality of the candidates and the *ex-post* effort, honesty and commitment of the successor.

Other relevant extensions of our setting can be proposed. An interesting extension is to recognize the complementarity or substitutability of the incumbent's and the successor's managerial activities when partial retirement is optimal. In our setting, the revenue technology is additive in the generated revenues, and the manager's contribution is a perfect substitute for the incumbent's available time. However, this need not be the case since economies (or diseconomies) of scale could arise as a consequence of the joint work of the incumbent and the successor. Obviously, the existence of complementarities or substitutabilities can affect our results. One example is that complementarity [substitutability] would result in more [less] likely reluctance of the incumbent to step aside (a higher cost of leaving the company in terms of revenues).

Another extension of our work concerns the dynamic analysis of family firm succession. Succession is a multistage process that can be addressed within a dynamic setting that considers additional elements, such as personal commitment, the family successor's achievements as a part of the training process, or the strategic interaction among actors (as in Bjuggren and Sund 2001 or Mathews and Blumenttrit 2015). Although this dynamic framework would provide a more detailed description of succession in family firms, the key elements in play will likely be the same as those considered in our work.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Table 3 Potential optimal levels of training with $\breve{e} = 1 - \frac{\kappa_i}{2}$; $\tilde{e}_1$ a root of $\mu_i'(e) - (\rho + \beta)$; $\tilde{e}_2(\lambda_i)$ a root of $\mu_i'(e)[1 - \phi_i\lambda_i\mu_i(e)] - (\rho + \beta)$; and $\tilde{e}_4(\lambda_i)$ a root of $e + \frac{\kappa_i}{2}[\lambda_i\mu_i(e)]^2 - 1$

		FD Feasible $e^* \leq \breve{e}$	FD Not Feasible $\breve{e} < e^*$	Corner Solution (if (7) holds)
FD optimal	$\lambda_i\mu_i(e^*) \geq 1$	$\begin{cases} \tilde{e}_1 < \tilde{e}_3; \text{ or} \\ \tilde{e}_3 = \breve{e} \end{cases}$	–	$\tilde{e}_5 = 1$
FD not optimal	$\lambda_i\mu_i(e^*) < 1$	$\tilde{e}_2(\lambda_i)$	$\begin{cases} \tilde{e}_2(\lambda_i) < \tilde{e}_4(\lambda_i); \text{ or} \\ \tilde{e}_4(\lambda_i) \end{cases}$	$\tilde{e}_5 = 1$

FD full deprivation

Appendix 1: Proof of Theorem 1

Proof of Theorem 1 Initially, let us assume that $\kappa_M < 2$. From (10) we find the following three conditions relevant (see Fig. 2)

$$\mu_M \lambda_M = 1 \tag{A.1}$$

$$\mu_M = \frac{\Omega_M}{v_F} + \frac{\kappa_M}{2}(\rho + \beta) \tag{A.2}$$

$$\lambda_M = \frac{\left[\frac{2}{(\rho+\beta)\kappa_M}\left(\mu_M - \frac{\Omega_M}{v_F}\right)\right]^{1/2}}{\mu_M} \tag{A.3}$$

Note that equations (A.1)—the *full-deprivation frontier*—and (A.3) intersects at $(1/\hat{\mu}_M, \hat{\mu}_M)$ where $\hat{\mu}_M$ is the value found at (A.2).

The level of deprivation can take the following values $m_M^* = \min\{\mu_M\lambda_M, 1\}$. Consider first that $\mu_M\lambda_M > 1$, so $m_M^* = 1$ (i.e., $s_M^* = (\kappa_M/2) < 1$) and, then, (10) is positive provided $\mu_M > (\Omega_M/v_F) + (\rho + \beta)(\kappa_M/2)$. Accordingly, the incumbent will implement full deprivation of benefits at the upper contour set of the *full-deprivation frontier* (A.1) and rightwards of condition (A.2). Now, consider the case $m_M^* = \mu_M\lambda_M < 1$. Then, (10) is positive whenever $\lambda_M\mu_M > [(2/\kappa_M)(\mu_M - \Omega_M/[(\rho + \beta)v_F])]^{1/2}$. Accordingly, the incumbent will implement partial monitoring at the region below the conditions (A.1) and (A.3). In both cases, the manager still works at the firm, as $s_M^* < T = 1$.

Now assume that $\kappa_M \geq 2$. From (10) the relevant three conditions turn out to be

$$\mu_M \lambda_M = \left(\frac{2}{\kappa_M}\right)^{1/2} \tag{A.4}$$

$$\mu_M = \frac{\Omega_M}{v_F} + (\rho + \beta) \tag{A.5}$$

and (A.3). Note that equations (A.4)—the full-monitoring frontier—and (A.3) intersects at $(1/\hat{\mu}_M, \hat{\mu}_M)$ where $\hat{\mu}_M$ is the value found at (A.5).

The level of deprivation can take the following values $m_M^* = \min\{\mu_M\lambda_M, (2/\kappa_M)^{1/2}\}$. Consider first that $\mu_M\lambda_M > (2/\kappa_M)^{1/2}$, so $m_M^* = (2/\kappa_M)^{1/2} < 1$ and, then, (10) is positive whenever $\mu_M > (\Omega_M/v_F) + (\rho + \beta)$. Accordingly, the incumbent will spend all her time monitoring, $s_M = T = 1$, at the region above condition (A.4) and rightwards of condition (A.5). Now, consider the case $m_M^* = \mu_M\lambda_M < (2/\kappa_M)^{1/2}$. Then, (10) is positive whenever $\lambda_M\mu_M > [(2/\kappa_M)(\mu_M - \Omega_M/[(\rho + \beta)v_F])]^{1/2}$. Accordingly, the incumbent will implement partial monitoring at the at the upper contour set of the full-monitoring frontier (A.4) and (A.3), $s_M^* < T = 1$, and thus she has available time to work/outside-of-the-firm activities. This concludes the proof of Theorem 1. $\square$
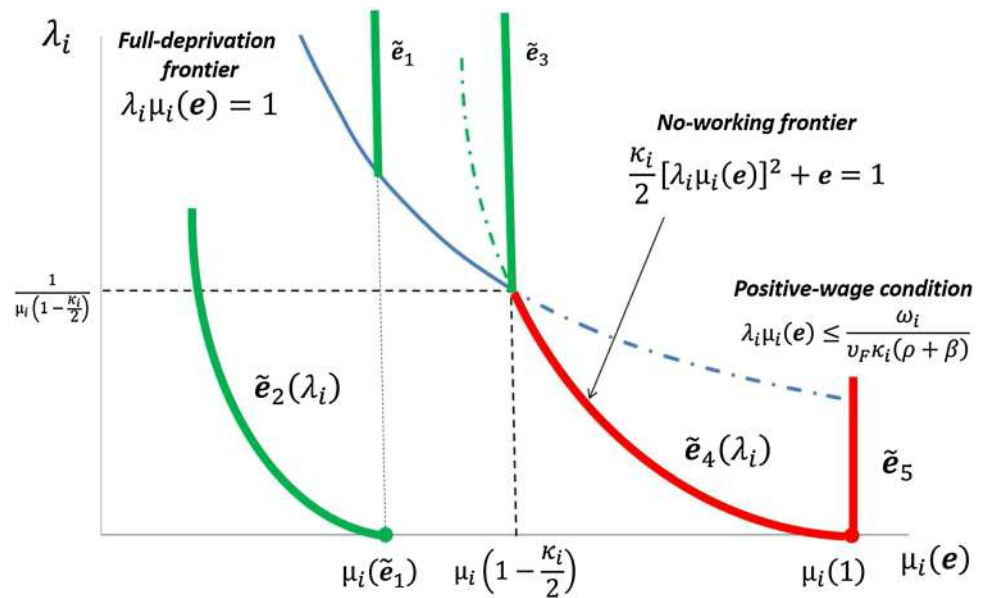
Appendix 2: Necessary and Sufficient Conditions to Offer a Contract at Date 0

Lemma A.1 *Necessary and sufficient conditions to offer a contract at date* 0. *Consider a potential manager with an outside utility ω_i and a level of expropriation ϕ_i. Then,*

(i) *A necessary condition for an incumbent to offer a non-negative wage at date 0 is $\omega_i/v_i \in [0, 1)$ (or analogously $v_i \geq \omega_i$);*

(ii) *A sufficient condition for an incumbent to offer a non-negative wage at date 0 is $\omega_i/v_i \in [\phi_i, 1)$. If full deprivation is optimal ($m_i^* = 1$), the condition in (i) becomes a sufficient condition.*

Proof The proof is simple. Given that the wage compensation has to offset the manager's opportunity cost, $v_i w_i^* \geq \omega_i$,

Fig. 3 The full-deprivation frontier, the no-working frontier and the potential optimum levels of training in the relative-performance−honesty plane (i.e., the μ_i-λ_i—plane). It is represented, for any given $\kappa_i < 2$, the case the training process exhibits decreasing returns-to-scale, and Assumption A.2 and $\tilde{e}_1 < \tilde{e}_3$ are satisfied

Appendix 3: The Non-family Manager Deprivation and Monitoring Frontiers

Concerning the already-trained non-family manager's honesty, it will be useful to identify brands of managers to formally characterize the non-family-manager deprivation and monitoring frontiers.

Definition A.1 The (non-family manager) full-deprivation frontier. If $\kappa_M < 2$, those combinations (μ_M, λ_M) satisfying

$$\lambda_M \mu_M = 1$$

delineate a frontier beyond which a non-family manager is fully deprived, i.e. $m_M^* = 1$ so $s_M^* = \kappa_M/2$.

Definition A.2 The (non-family manager) full-monitoring frontier. If $\kappa_M \geq 2$, those combinations (μ_M, λ_M) satisfying

$$\lambda_M \mu_M = (2/\kappa_M)^{1/2}$$

delineate a frontier beyond which a non-family manager is fully monitored, i.e. $s_M^* = 1$ so $m_M^* = (2/\kappa_M)^{1/2}$.

and the wage rate cannot be greater than 1, (*i*) is proved straightforwardly. Observe that the wage rate cannot be negative and the incumbent can deprive resources from the manager's appropriation in a range $m \in [0, 1]$. Then, it is easy to show in (7) that the condition in (*i*) is also a sufficient condition in the case of full deprivation ($m_i^* = 1$). Otherwise, if full deprivation is not optimal, the extreme case of no deprivation ($m_i^* = 0$) sets a lower threshold for the non-negative wage rate, characterized in (7) by $\omega_i \geq v_i \phi_i$. □

Appendix 4: Characterizing Potential Optimal Levels of Training

The optimal level of training e^* depends on particular values of the parameters and specific functional forms. In Table 3 we display the potential optimal levels of training for different regions of parameters, depicted at the relative-performance−honesty plane in Fig. 3 for a particular case. Specifically, we are able to identify potential maxima to the incumbent's problem (8) after determining a key threshold in the training intensity: $\breve{e} \equiv 1 - \frac{\kappa_i}{2}$ for any given value of κ_i—a threshold found at the maximum deprivation level (see the inside bracket at the optimal deprivation condition (6) for $T = 1$). This threshold allows us to distinguish between two cases: full deprivation is feasible for the incumbent (*case i.*) or it is not (*case ii.*).

Case i Full deprivation is feasible: $e^* \leq \breve{e} \equiv 1 - \frac{\kappa_i}{2}$. We begin by considering that full deprivation in (6) is feasible, i.e. $1 \leq [\frac{2}{\kappa_i}(1 - e^*)]^{1/2}$; that is, the (non-negative) optimal training level must satisfy $e^* \leq 1 - \frac{\kappa_i}{2}$. The region of training values satisfying this full deprivation condition is fully characterized by the full-deprivation frontier displayed in the following Definition (see this frontier at the μ_i-λ_i—space in Fig. 3):

Definition A.3 The full-deprivation frontier. For each honesty parameter λ there exists a training intensity $\bar{e}(\lambda)$ such that those combinations $(\mu_i(\bar{e}(\lambda)), \lambda)$ satisfying

$$\lambda \mu_i(\bar{e}(\lambda)) = 1, \tag{A.6}$$

delineate a frontier beyond which a manager is fully deprived, i.e., $m_i^* = 1$.

The *full-deprivation frontier* allows us to characterize potential optimal training levels when full deprivation is feasible and optimal (*case i.i.*) or is feasible and not optimal (*case i.ii.*).

Case i.i. Full deprivation is feasible ($e^* \leq \breve{e}$) **and optimal** ($m_i(e^*) = 1$). If full deprivation is optimal for the incumbent, then $\lambda_i \mu_i(e^*) \geq 1$ is satisfied in (6). This means that the value of the parameters results in a combination $(\mu_i(e^*), \lambda_i)$ located at the upper contour set of the *full-deprivation frontier* (A.6). In this case, the first order condition in (8) is

$$\left[\mu_i'(e) - (\rho + \beta) \right] \left[e + \frac{\kappa_i}{2} - 1 \right] = 0.$$

Here, there are two potential optimal levels of training: the interior potential maximum $\tilde{e}_1$, a root of $\mu_i'(e) - (\rho + \beta)$; and, the corner no-working potential maximum $\tilde{e}_3 = 1 - \frac{\kappa_i}{2}$. Observe that the former is a marginal condition stating that the incumbent stops training the manager at $\tilde{e}_1$ because the benefits derived from devoting one additional unit of time in training activities ($\mu_i'(\tilde{e}_1)$) equals the time and welfare cost of this additional unit of time ($\rho + \beta$). Because of the time constraint, $\tilde{e}_1$ must satisfy $\tilde{e}_1 \leq 1 - \frac{\kappa_i}{2} \equiv \tilde{e}_3$ to be considered a potential maximum.

Case i.ii Full deprivation is feasible ($e^* \leq \breve{e}$), **but not optimal** ($m_i(e^*) < 1$). If full deprivation is feasible but not optimal for the incumbent, then $m_i^*(e^*) = \lambda_i \mu_i(e^*) < 1$ must be satisfied in (6). The value of the parameters results in a combination $(\mu_i(e^*), \lambda_i)$ located below the *full-deprivation frontier* (A.6), and the first order condition in (8) becomes

$$\left[\mu_i'(e)[1 - \phi_i \lambda_i \mu_i(e)] - (\rho + \beta) \right] \left[e + \frac{\kappa_i}{2}[\lambda_i \mu_i(e)]^2 - 1 \right] = 0. \tag{A.7}$$

Again, there are two potential optimal levels of training: the interior potential maximum $\tilde{e}_2(\lambda_i)$, a root of the marginal condition $\mu_i'(e)[1 - \phi_i \lambda_i \mu_i(e)] - (\rho + \beta)$ for any given $\lambda_i \geq 0$; and, the corner no-working potential maximum $\tilde{e}_4(\lambda_i)$, a root of $e + \frac{\kappa_i}{2}[\lambda_i \mu_i(e)]^2 - 1$ for any given $\lambda_i \geq 0$. The training level $\tilde{e}_2$ must satisfy the following three conditions to be considered a potential maximum for any given λ_i: $\tilde{e}_2(\lambda_i) < \tilde{e}_4(\lambda_i)$ —because of the time constraint–, $\tilde{e}_2(\lambda_i) \leq 1 - \frac{\kappa_i}{2} \equiv \tilde{e}_3$— because of the full deprivation condition—and $\lambda_i \mu_i(\tilde{e}_2) < 1$ —since full deprivation cannot be optimal at $\tilde{e}_2$. (Note that if $\lambda_i = 0$ then $\tilde{e}_2(0) = \tilde{e}_1$.) Observe, however, that the root $\tilde{e}_4(\lambda_i)$ does not satisfy the full deprivation condition for any λ_i, due to $\tilde{e}_4(\lambda_i) > 1 - \frac{\kappa_i}{2} \equiv \tilde{e}_3$—because of $\lambda_i \mu_i(\tilde{e}_4) < 1$–, and accordingly this root cannot be considered as a potential maximum within this region of parameters.

Case ii Full deprivation is not feasible ($e^* > \breve{e} \equiv 1 - \frac{\kappa_i}{2}$ **and** $m_i(e^*) < 1$). The alternative case is the one in which full deprivation is not feasible ; that is, the case in which the optimal training level must satisfy $e^* > 1 - \frac{\kappa_i}{2}$ and, then, the value of the parameters results in a combination $(\mu_i(e^*), \lambda_i)$

located below the *full-deprivation frontier* (A.6), i.e. $\lambda_i \mu_i(e^*) < 1$. Here, the optimal monitoring can only be $m_i^* = \lambda_i \mu_i(e^*) < [\frac{2}{\kappa_i}(1 - e^*)]^{1/2}$.[27] For each given $\lambda_i \geq 0$, the first-order condition (A.7) provides us with two potential optimal levels of training: the interior potential maximum $\tilde{e}_2(\lambda_i)$; and, the corner no-working potential maximum $\tilde{e}_4(\lambda_i)$. Analogous to the *case i.ii.*, for any given λ_i, the training level $\tilde{e}_2$ must satisfy the following three conditions to be considered a potential maximum: $\tilde{e}_2 < \tilde{e}_4$, $\tilde{e}_2 > 1 - \frac{\kappa_i}{2}$ and $\lambda_i \mu_i(\tilde{e}_2) < 1$.[28] Observe that the root $\tilde{e}_4(\lambda_i)$ can be considered now as a potential maximum, since it does not satisfy the full deprivation condition, $\tilde{e}_4(\lambda_i) > 1 - \frac{\kappa_i}{2}$.

What remains to be shown is that $\tilde{e}_4(\lambda_i)$ is always below the *full-deprivation frontier* (A.6) for any λ_i. To prove this, we previously characterize the following no-working frontier (see this frontier at Fig. 3).

Definition A.4 The no-working frontier. For each λ there exists a $\bar{\bar{e}}(\lambda)$ such that those combinations $(\mu_i(\bar{\bar{e}}(\lambda)), \lambda)$ satisfy $s(\bar{\bar{e}}(\lambda)) + \bar{\bar{e}}(\lambda) = 1$; that is,

$$\frac{\kappa_i}{2} \left[\lambda \mu_i\left(\bar{\bar{e}}(\lambda)\right) \right]^2 + \bar{\bar{e}}(\lambda) = 1, \tag{A.8}$$

delineates a frontier beyond which the incumbent only monitors and trains the manager, but does not work.

Observe that whenever the manager is fully honest, $\lambda_i = 0$, the no-working frontier (A.8) intercepts the μ_i-axes at $\mu_i(1)$. In this case, the incumbent only performs training activities $\bar{\bar{e}}(0) = 1$. Next we can state the following result characterizing the functional relationships (A.6) and (A.8) (see also Fig. 3), which guarantees that the incumbent never fully deprives her manager when the level of training chosen is $\tilde{e}_4$.

Lemma A.2 *Characterizing the full-deprivation frontier and the no-working frontier. The functional relationships defined in conditions* (A.6) *and* (A.8) *at the λ_i-μ_i-plane have a negative slope, the former is steeper, and both intersect only once at the training intensity* $\breve{e} = 1 - \frac{\kappa_i}{2}$.

Proof Initially, note that the substitution of the right handside term in Condition (A.6) into (A.8), it is easy to find that $\breve{e} = 1 - \frac{\kappa_i}{2}$ is an intersection. Thus, it is only needed to compute the negativity for the slopes of conditions (A.6) and

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[27] The reason is the following. The condition $m_i^*(e^*) = [\frac{2}{\kappa_i}(1 - e^*)]^{1/2} < \lambda_i \mu_i(e^*)$ entails that the resulting first-order condition in (8)—i.e. $\mu_i'(e) = 0$—has no solution because of the monotonicity of the manager's revenue technology.

[28] Observe that if $\lambda_i = 0$ then $\tilde{e}_2(0) = \tilde{e}_1$, so a necessary condition for $\tilde{e}_2$ to be a potential maximum in this region is $\tilde{e}_1 > 1 - \frac{\kappa_i}{2}$.

(A.8), and the value taken of both slopes at $e = 1 − \kappa_i/2$ and find that the latter is steeper than the former. For any given level of training, condition (A.6) becomes an equilateral hyperbola, $\lambda_{(A.6)}(\mu_i) = 1/\mu_i$, with slope $−1/\mu_i^2$. Condition (A.8) becomes the function,

$$\lambda_{(A.8)}(\mu_i) = \frac{1}{\mu_i}\left[\left(1 − \mu^{-1}(\mu_i)\right)\frac{2}{\kappa_i}\right]^{1/2} \qquad (A.9)$$

after defining the identity function $\mu^{-1}(\mu_i(e)) = e$, whose derivative with respect to e is $\mu^{-1\prime}(\mu_i(e)) = 1/\mu_i'(e)$ by the Chain Rule. Derivation of (A.9) with respects to μ_i is

$$\lambda'_{(A.8)}(\mu_i) = −\frac{1}{\mu_i^2}\left[\frac{1}{\kappa_i}\left[(1 − e)\frac{2}{\kappa_i}\right]^{-1/2}\frac{\mu_i}{\mu_i'} + \left[(1 − e)\frac{2}{\kappa_i}\right]^{1/2}\right].$$

The slope at $\breve{e} = 1 − \frac{\kappa_i}{2}$ results to be $\lambda'_{(A.8)}(\mu_i(\breve{e})) \leq −\frac{1}{(\mu_i(\breve{e}))^2} = \lambda'_{(A.6)}(\mu_i(\breve{e}))$. Then, $\lambda_{(A.8)}(\mu_i(e)) > \lambda_{(A.6)}(\mu_i(e))$ is satisfied for any $e < \breve{e}$, and vice versa for $e > \breve{e}$, which entails that (A.6) and (A.8) only intersect once. This concludes the proof of Lemma A.2. □

Case *iii*. Corner solutions for the level of training. Finally, the time constraint additionally provides us with two additional corner potential maxima: the full-training potential maximum $\tilde{e}_5 = 1$ and the no-training potential maximum $\tilde{e}_6 = 0$. The former entails that no time for monitoring or working activities is available to the incumbent—i.e., $m^*(\tilde{e}_5) = 0$ and $n^*(\tilde{e}_5) = 0$–, and $\tilde{e}_5 = 1$ can be considered as a potential maximum provided the incumbent offers a contract at date 0 to the manager with a non-negative wage rate w^* in (7), i.e. $\frac{\omega_i}{v_F \kappa_i(\rho + \beta)} \geq \lambda_i \mu_i(\tilde{e}_5)$ (see Lemma A.1.*ii*). The latter, $\tilde{e}_6 = 0$ is the case that the manager is hired because of his own abilities alone. Yet, we consider the incumbent to be prone to devoting time to the successor. Precluding the no-training potential ($\tilde{e}_6 = 0$) to be optimal depends on the value of κ_i: if $\kappa_i < 2$—the case depicted in Fig. 3—it must be required that $\tilde{e}_1$ or $\tilde{e}_2(\lambda_i)$ for any λ_i cannot take zero as an optimal value; if $\kappa_i > 2$—the area at the right of $\mu_i(\tilde{e}_3)$ in Fig. 3—it must be required that $\tilde{e}_4(\lambda^{max}) > 0$ with $\lambda_i^{max} \equiv 1/[\kappa_i(\rho + \beta)]$. To this end, we state the following assumption[29]:

Assumption A.1 $\mu_i'(0)\left[1 − \phi_i \lambda_i \mu_i(0)\right] > \rho + \beta$ for $\kappa_i < 2$; and, $\frac{\kappa_i}{2}[\lambda^{max}\mu_i(0)]^2 < 1$ for $\kappa_i > 2$, with $\lambda_i^{max} \equiv 1/[\kappa_i(\rho + \beta)]$.

Observe that for any set of parameters, all potential maxima are fully identified except $\tilde{e}_2$.[30] To guarantee that $\tilde{e}_2(\lambda_i)$ can always be considered a candidate for any λ_i, we present the following Assumption A.2 stating that the function $\tilde{e}_2(\lambda)$ never crosses either the full-deprivation frontier (Assumption A.2.1.) nor the no-working frontier (Assumption A.2.2.[31]).

Assumption A.2 A.2.1. There exists no $\lambda \leq 1/[\kappa_i(\rho + \beta)] \equiv \lambda_i^{max}$ such that $\mu_i'(\tilde{e}_2(\lambda))(1 − \phi_i) = \rho + \beta$. A.2.2. $\mu_i'(\tilde{e}_2(\lambda))(1 − \phi_i) > \rho + \beta$ is satisfied for any $\lambda \leq 1/\mu_i(\breve{e})$.

All the proceeding analysis and interpretation have been developed for a given κ_i. It is worth noting that if $\kappa_i = 0$, then the number of potential optimal levels of training are reduced to $\tilde{e}_1$ and $\tilde{e}_5 = 1$; while if $\kappa_i > 2$, then the potential optimal levels of training are restricted to $\tilde{e}_5 = 1$, and $\tilde{e}_2(\lambda)$ and $\tilde{e}_4(\lambda)$ for $\lambda < \lambda_0$ with λ_0 satisfying $\frac{\kappa_i}{2}[\lambda_0\mu_i(0)]^2 = 1$ (i.e., the λ_0 is the level of the manager's honesty, such that $\tilde{e}_4(\lambda_0) = 0$).

D.1 Optimal Training Decision and the Effectiveness of the Training Process

The incumbent's optimal level of training eventually chosen (e^*) depends on the particular values of the parameters that fulfill the corresponding restrictions (namely, the positive-wage, the full-monitoring and the no-working conditions). Among a myriad of cases, in this subsection we characterize the optimal training for different profiles of the effectiveness of the training process, represented by the increasing or decreasing returns-to-scale of the manager's relative revenue technology ($\mu_i(e) \equiv v_i(e)/v_F$).

D.1.1 Increasingly Effective Training Process: $\mu_i(e)$ is convex.

If the training activities increasingly contribute to the revenue technology, it is intuitively to be expected that the incumbent is prone to nurture the manager the most (i.e. $e = 1$) and not to work for the firm. However, this needs not be the case, since the manager might require some monitoring intensity if he is not honest enough. The less honest the manager is—i.e., the higher λ_i, the more time resources

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[29] Among the conditions defining $\tilde{e}_1$ and $\tilde{e}_2(\lambda_i)$ for any λ_i, we had to choose the more restrictive one—namely, the marginal condition in (A.7)—to prevent the existence of a root that could intercept with the λ_i− axis (see Fig. 3). Note, however, that both marginal conditions match if the manager is only productive with the incumbent's nurture, $v_i(0) = 0$.

[30] This is because $\tilde{e}_2(\lambda)$ may cross the full-deprivation frontier for some honesty level $\lambda \geq 1/\mu_i(\breve{e})$; it may cross the no-working frontier at some honesty level $\lambda \leq 1/\mu_i(\breve{e})$; or, it may cross both and cause $\tilde{e}_2$ to disappear as a potential maximum, which greatly complicates the analysis.

[31] This assumption is a requirement that $\tilde{e}_2(\lambda_i) \neq \tilde{e}_4(\lambda_i)$ for any $\lambda_i < 1/\mu_i(\tilde{e}_3)$ (i.e., the two brackets in (A.7) have no common root).

the incumbent has to devote to monitoring activities. All these intuitions are easy to characterize, as shown by the following result.

Proposition A.1 *Consider Assumption* A.1 *is satisfied. If the training process is increasingly effective, then the incumbent finds it optimal not to work (i.e., $n^* = 0$) and train and monitor her manager, with*

$$
\mathsf{e}^* = \begin{cases} \tilde{\mathsf{e}}_3 = 1 - \frac{\kappa_i}{2} & \text{if } \lambda_i > \max\left\{ \frac{\omega_i}{v_F \kappa_i (\rho+\beta)} / \mu_i(1); 1/\mu_i\left(1 - \frac{\kappa_i}{2}\right) \right\} \\ \tilde{\mathsf{e}}_4(\lambda_i) & \text{if } \lambda_i \in \left(\frac{\omega_i}{v_F \kappa_i (\rho+\beta)} / \mu_i(1), \max\left\{ \frac{\omega_i}{v_F \kappa_i (\rho+\beta)} / \mu_i(1); 1/\mu_i\left(1 - \frac{\kappa_i}{2}\right) \right\} \right] \\ \tilde{\mathsf{e}}_5 = 1 & \text{if } \lambda_i \leq \frac{\omega_i}{v_F \kappa_i (\rho+\beta)} / \mu_i(1) \end{cases}
$$

and $s_i^* = 1 - \mathsf{e}^* \in [0, \frac{\kappa_i}{2}]$.

The proof is straightforward, given that $\tilde{\mathsf{e}}_1$ and $\tilde{\mathsf{e}}_2$ are local minima—because of the convexity of the manager's revenue technology–, and $\tilde{\mathsf{e}}_3 < \tilde{\mathsf{e}}_4 < \tilde{\mathsf{e}}_5 = 1$ implies $V^i(1) = v_i(1) - \beta v_F - \omega_i + \gamma_i B > V^i(\tilde{\mathsf{e}}_4) > V^i(\tilde{\mathsf{e}}_3)$ in (8)—because of the monotonicity of the revenue technology.

D.1.2 Decreasingly Effective Training Process: $\mu_i(\mathsf{e})$ is Concave

The optimal level of training in the case of a harsh training process is much more difficult to characterize and, unlike in the case of increasing returns-to-scale, any potential maximum can now be an optimal level of training depending on the value of the parameters. The decreasing returns-to-scale of the revenue technology imply that as the incumbent devotes more time to nurture her heir, the opportunity cost of every additional unit of time resources—in terms of the incumbent's productive revenue—increases more than proportionally. So eventually, the incumbent can find it optimal not to keep training the successor any longer and carry out other tasks in the firm instead. Notice that the manager's honesty profile results crucial: the less honest the manager is—i.e. the higher λ_i, the sooner the incumbent finds it beneficial to stop training the manager.

Here, we can identify two extreme cases in light of Fig. 3. If the opportunity cost of training the manager remains low for high e, then full training—i.e. $\mathsf{e}^* = 1$—could be the case for a (relatively) honest heir. Alternatively, if the opportunity cost increases quickly and the manager is not honest, then the heir optimally receives a minimum level of training to become productive—i.e., $\mathsf{e}^* = \tilde{\mathsf{e}}_2(\lambda_i)$ (see Fig. 3), and the incumbent finds it optimal to partially retire (that is, to keep on devoting time to working at the firm together with the successor). These two extreme cases are presented in the

following result. Any other possible optimal training falls between these two extreme cases.

Proposition A.2 *Consider Assumptions* A.1 *and* A.2 *are satisfied, and the training process exhibits decreasing returns-to-scale. The following is satisfied:*

(i) If $\tilde{\mathsf{e}}_1 < 1$, then the incumbent finds it optimal a level of training $\mathsf{e}^* = \tilde{\mathsf{e}}_2(\lambda_i)$ for each $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$, a monitoring intensity $s_i^* = \frac{\kappa_i}{2}\left[\lambda_i \mu_i(\tilde{\mathsf{e}}_2(\lambda_i))\right]^2$, and work at the firm $n_i^* = 1 - s_i^* - \mathsf{e}^* > 0$ units of time.

(ii) If $\tilde{\mathsf{e}}_1 > 1$, then the incumbent's optimal level of training e^* is the same as in Proposition A.1.

Proof To prove the Proposition, we proceed by steps.

Step 1. Initially, we rank the potential maxima considering Assumption A.2. See Table 3 and Fig. 3 displaying the potential maxima to optimal level of training in the μ_i-λ_i– plane. Observe that the function $\tilde{\mathsf{e}}_2(\lambda_i)$ is decreasing.[32] In addition, the Assumption A.2 guarantees that the function $\tilde{\mathsf{e}}_2(\lambda_i)$ satisfying $\lambda_i \tilde{\mathsf{e}}_2(\lambda_i) < 1$ does not intersect the *full-deprivation frontier* (A.6) and the *no-working frontier* (A.8). The ranking of the potential optima is the following:

(a) If $\tilde{\mathsf{e}}_1 \leq 1 - \frac{\kappa_i}{2}$, then $\tilde{\mathsf{e}}_2(\lambda_i) < \breve{\mathsf{e}} < \tilde{\mathsf{e}}_4(\lambda_i) < \tilde{\mathsf{e}}_5 = 1$ is satisfied for any $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$;
(b) if $\tilde{\mathsf{e}}_1 \in \left(1 - \frac{\kappa_i}{2}, 1\right)$, then $\tilde{\mathsf{e}}_2(\lambda_i) < \tilde{\mathsf{e}}_4(\lambda_i) < \tilde{\mathsf{e}}_5 = 1$ is satisfied for any $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$; and,
(c) if $\tilde{\mathsf{e}}_1 > 1$, then $\breve{\mathsf{e}} < \tilde{\mathsf{e}}_4(\lambda_i) < \tilde{\mathsf{e}}_5 = 1$ is satisfied for any $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$.

Step 2. Next, we present a partial result: due to the concavity of the manager's welfare (8) for $m_i^*(\mathsf{e}) = \lambda_i \mu_i(\mathsf{e})$, optimality allows us to state that $E[V^i(\tilde{\mathsf{e}}_2(\lambda_i))] > E[V^i(\tilde{\mathsf{e}}_4(\lambda_i))]$ is satisfied for any given $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$.

Step 3. Proof of (*i*). Recall that the potential maxima to optimal training for the interval $\lambda_i \leq 1/\mu_i(\breve{\mathsf{e}})$ are $\tilde{\mathsf{e}}_2(\lambda_i)$ and $\tilde{\mathsf{e}}_5$, so it is indeed the case for $\lambda_i = 0$. Substituting $\tilde{\mathsf{e}}_2(0)$ and $\tilde{\mathsf{e}}_5$ in (8), and due to the concavity of the manager's

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[32] Recall that if $\phi_i = 0$—i.e. $\lambda_i = 0$–, then $\tilde{\mathsf{e}}_2(0) = \tilde{\mathsf{e}}_1$. Also, after denoting $F(\phi_i, \tilde{\mathsf{e}}_2) = \mu_i'(\tilde{\mathsf{e}}_2)[1 - \phi_i \lambda_i \mu_i(\tilde{\mathsf{e}}_2)] - 1$, the Implicit Function Theorem allows us to find that $\partial \tilde{\mathsf{e}}_2(\phi_i)/\partial \phi_i < 0$ due to the concavity of the manager's revenue technology.

revenue technology, we obtain that $E(V^i(\tilde{e}_2(0))) > E(V^i(\tilde{e}_5))$. Since the function $\tilde{e}_2(\lambda_i)$ is decreasing, it can be the case that $E[V^i(\tilde{e}_5)] > E[V^i(\tilde{e}_2(\lambda_i))]$ for some $\lambda_i > 0$. If so, this entails by the Bolzano Theorem that there exists a $\hat{\lambda}_i > 0$ such that $V^i(\tilde{e}_5) = V^i(\tilde{e}_2(\hat{\lambda}_i))$. This proves Proposition A.2.(*i*)

Step 4. Proof of (*ii*). From $\tilde{e}_1 \geq 1$ and Assumption A.2.2, the set of potential maxima is restricted to $\tilde{e}_3$, $\tilde{e}_4(\lambda_i)$ and $\tilde{e}_5$. So the Proposition A.1 applies. This proves Proposition A.2.(*ii*) and concludes the proof of Proposition A.2. □

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