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FAMILY FIRM SUCCESSION

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Family firm succession*

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Abstract

We present a theory of family firm succession in which the incumbent regards a family member as a potential successor, as well as an outside candidate. Our setting considers that the incumbent can spend resources on training the family manager, as a key element in the intra-family transmission. The choice is explained in terms of quality of the candidates, monitoring costs, effectiveness of the training process and amenities. Our results account for observed findings, such as the partial retirement, the underperformance after succession, or the selection of a non-family manager only if he is markedly better than the family candidate.

Keywords: Family firm, succession.

JEL: M1, M5

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1 Introduction

The prevalence of family controlled firms makes succession one of the most important issues for the most common type of firms. The literature on family business has shown that this decision plays a key role in determining not only the future performance of the firm but also its very own survival.[1] It is reported empirically that about 30% of family business survive the transition to the second generation, while only 10% survive the transition to a third generation (Handler, 1994). A number of reasons may account for this: for instance, diffuse and unclear succession plans, the choice of an inadequate successor, or family rivalries after the retirement of the founder. This failure may stem from the fact that this decision is strongly influenced by the founder's (or the controlling family's) preferences to be succeeded by a family member rather than an unrelated manager or the (indefinite) deferment in time of the CEO transition in absence of a suitable candidate.

In this paper, we present a theory of family firm succession with the founder explicitly considering a family-related member as a potential successor, along with an outside managerial alternative. This issue has not been extensively analyzed in formal literature. Kimhi (1997), Chami (2001), Burkart et al (2003) and Bhattacharya et al (2010) are the few attempts to clarify the succession decisions in family firms within a theoretical framework. Kimhi develops 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. In this specification, however, the succession process is not planned: a heir, working outside the family firm but endowed with financial capital, is called back to fully substitute the family CEO and capitalize the family firm. There is no transmission of the firm's culture; thus, the human capital of the young successor falls below that of the owner-manager. Instead, in our model the training process becomes central in 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, as pointed out in the literature.[2]

Chami (2001) proposes a framework to study the interaction between the founder of the firm and her child, who is working for the family firm. This work presents a model based on the agency theory, and considers a purely altruistic parent –i.e., a parent deriving welfare from her child's utility–, who is both the founder and the manager of the firm. However, Chami restricts his analysis to intra-family transmission, and his setting does

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

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

not consider the option of an outside manager as an alternative. In contrast, our work considers both a family candidate as well as a professional manager –an outside-the-family alternative– to run the firm. Our framework also differs in two ways. First of all, our work explicitly presents a training process to nurture the family successor while Chami, just like Kimhi, does not consider that the founder transmits any firm's insides and knowledge to the successor. Secondly, and in sharp contrast to Chami's setting, our work does not take into account pure 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 weak altruism can be identified in our framework: the incumbent is more prone to leave the firm to a specific person with close family links with the incumbent. Accordingly, the incumbent is keener on training and teaching her family successor –rather than on carrying out welfare-enhancing activities (such as labor or leisure)– to improve his productive capacity and future prospects for successfully running the family firm. In addition, the incumbent obtains a higher non-pecuniary welfare in the case a family-heir manager becomes the successor.

Burkart et al (2003) present an alternative setting to analyze family firm succession. 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 CEO. Actually, Burkart et al's is a theory of separation of ownership from management; that is, a theory of how and when to hire a professional manager, and how and when to sell totally or partially the family firm property. Instead, we model the family firm succession bearing in mind that the founder explicitly considers a family member as a potential successor who must be trained into the culture of the family firm. Although our model could be considered an extension of Burkart et al's framework –in fact our setting shares their perfect information analysis–, four important features distinguish our framework: (i) we do not deal with property issues or the legal shareholder protection, given that firm property remains in the family hands; (ii) hiring a family or a professional manager does not preclude the founder from staying on in the firm to develop production and monitor activities; (iii) our model explicitly considers the possibility of postponing the CEO transition; and, (iv) our setting explicitly considers a *family heir*: an individual who is not a perfect substitute for the family CEO and whose success in running the firm depend on his own management qualities as well as the founder's efforts to train them.

Finally, our paper is also related to Bhattacharya et al (2010). These authors develop 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 (but this is not the case in terms of the family candidate's) and generated output. Although the productivity of the professional non-family manager dominates the productivity of the family manager, the family only chooses to professionalize management after the firm reaches a critical size and the benefits of hiring a manager exceed the costs. However, our work differs from theirs in several ways: (i) they consider that the costs of hiring a non-family manager are given by his participation constraint, while we additionally consider the costs of monitoring his appropriation activities; (ii) in their model each generation is altruistic (i.e. bequest generates utility), while we do not consider any direct altruism towards descendants within the family; and, (iii) the productive features of any family member successor managing the firm are constant and identical to those of the successor's ancestors and do not rely on any training or culture transmission process, while our work explicitly considers training and therefore yields different productive firm outcomes for family heirs with close characteristics.

In our model, outlined in Section 2, we begin by considering a family firm with no separation of property and management. The incumbent runs the firm alone and, at some point in time, must explicitly choose among three options concerning succession, depicted in Section 3. The incumbent may either stay on in the firm and run it alone, hire an outside professional manager, or keep the firm inside the family by passing management on to a family member –i.e., an *intra-family transmission*.[3] For each option, the incumbent allocates time resources (one unit of time) among a number of activities –labor, monitoring and training– to maximize her welfare. This welfare is comprised of the revenues of the firm (net of monetary costs for the succession option), plus the "amenity potential" retained by the incumbent,[4] and net of the welfare costs of carrying out monitoring and training activities. The succession choice, analyzed in Section 4, is the outcome of the incumbent's decision among these three options. The optimal decision depends on the specific profiles of the candidates –concerning productive quality and honesty– with respect to those of the incumbent and the size of the amenity potential lost.[5]

If the incumbent stays on in the firm to run it alone (Section 3.1), she retains all amenity potential and does not carry out any monitoring and training activities. Then, a random

[3] Our framework also allows us to consider an intermediate case: the family founder may pass management on to a non-family insider, as suggested by Smith et al (1999); that is, to a person of trust, unrelated to the incumbent's family, who is in a senior management position prior to the retirement of the founder. (This issue is briefly explored in Section 4.2.1.5.)

[4] The concept of amenity potential refers to non-pecuniary private benefits of control, meaning utility to the owner that does not come at the expense of profits (see Demsetz et al, 1985).

[5] See, for example, Le Bretton-Miller et al (2004) for a systematic review of the most important variables that the literature has ascribed to the succession process in family-owned business.

shock (following a binomial distribution) is realized to determine whether the incumbent devotes time resources to labor activities or she fully retires. This shock represents circumstances related to characteristics of the incumbent (her health, age, etc.) or to the firm (the business life cycle, etc.). The stay-on option is the benchmark case because the corresponding incumbent's (expected) welfare sets a lower threshold for hiring a successor.

If the incumbent chooses a successor, a relevant cost arises: whoever manages the firm (family or the non-family manager) can expropriate profits. We consider the incumbent capable of depriving the new manager a share of his private benefits by monitoring the firm in the interest of the family property. Monitoring activities involve both welfare and temporal costs (i.e., less time is devoted to produce) for the incumbent.

Hiring a non-family manager as a successor calls for the incumbent to decide the optimal deprivation intensity –i.e., the fraction of time devoted to monitoring. The incumbent either works for the firm or retires depending on the realization of the stochastic shock. If the non-family manager is the best succession alternative (Section 4.1), his relative productive quality (with respect to that of the incumbent) and his honesty profile determine the chances of being hired. Theorem 1 shows that the non-family manager is hired if his productive performance is relatively better than that of the incumbent or, otherwise, if his relative performance is good enough (it offsets the costs of hiring other than private appropriation) *and* he is honest enough. Interestingly, *partial retirement* might be an optimal outcome: for each manager's productive profile, the succession process is "not-fully completed" if the manager is honest enough, because the incumbent (ex-ante) optimally chooses to keep participating in the firm's management after the successor is hired.

Hiring a family manager as a successor calls for the incumbent to additionally decide on the optimal fraction of time to be dedicated to nurturing the heir, besides the optimal monitoring choice. The training process increases the heir's prospective abilities to run the firm (i.e., the potential revenue of the firm under his management). In some sense, the incumbent forges the successor. The effectiveness of such a training process depends on the family successor's capacity to transform the incumbent's training effort into firm revenues, the incumbent's ability to transmit knowledge and to create a good communication among them, and the specific characteristics of the key knowledge transmitted.[6] The optimal level of training hinges on the effectiveness of the training process and the heir's honesty profile because the time restriction constraint the allocation of time between monitoring and training activities. An increasingly effective training process leads the incumbent to training the heir the most –depending on the heir's honesty profile which in turn shapes monitoring–, and to full retiring; a decreasingly effective process, however, may result in the incumbent

[6] Along this line, our work is also related to other theoretical papers on succession in family business, such as Lee et al (2003), concerning the role of idiosyncratic knowledge in family business, and Michael-Tsabari et al (2015) concerning the quality of the communication process among the founder and the heir.

not being optimally interested in fully training the heir and choosing to stay on working for the firm. Thus, not only the more honest the heir is, the higher training he receives (and then, the lower monitoring intensity is carried out); but also, the more effective the training process is, the more training he receives. Once the incumbent chooses the optimal level of training, the heir's relative productive quality is determined. Hence, if the family manager is the best succession alternative (Section 4.2), we can characterize a hiring option for the family manager akin to the non-family manager. Theorem 2 shows that, given the optimal level of training, the family manager is hired if his productive performance is relatively better than that of the incumbent or, otherwise, if his performance is good enough and he is honest.

Providing results that consider the incumbent's optimal decisions concerning training, monitoring and labor –(ex-ante) partial or full retirement– together with the optimal decision of hiring the family heir is a more difficult task, unless particular features of the family manager are considered. To this end, we characterize a number of stereotypes of family managers, some of them depicted in the literature of family business (see Levinson 1974, Kets de Vries 1993, or Handler, 1994), concerning the relative successor's capabilities, career alternatives, honesty, family culture and commitment, etc. This is the case of the *good child*, the *rotten kid*, the *loyal servant*, etc., profiles that have been accommodated to our framework to provide general results in Section 4.2.1.[7]

Finally, if the incumbent finds out both managers (family and non-family) are better alternatives than his staying-on (Section 4.3), we can characterize a hiring option for the family manager. Theorem 3 shows that, for every given optimal level of training to the family manager, the family manager is hired only if his productive performance is relatively better than that of the non-family manager or, otherwise, if his performance is good enough and he is more honest than the non-family manager. The result reports that the higher the difference of monitoring costs among candidates –according to the predictions of the agency approach– and the higher the amenity potential lost by the incumbent, the less interested she is in hiring an outside manager or even stepping aside. Again, further results are only possible by restricting the analysis to particular stereotypes of family managers (Section 4.3.1).[8]

Noticeably, as an additional merit, the framework displayed in this paper allows us to address two issues commonly mentioned in the literature: the incumbent's reluctance to step aside and an underperforming succession. In the former case, our setting allows us to explain the incumbent's reluctance to retire in two ways: as a decision to postpone the

[7]For instance, the incumbent fully trains a *good child* –a fully honest manager– exhibiting an increasing effective training process, but does not monitor him at all and she also fully retires (Corollary 5.(i)).

[8]For instance, a *good child* is always chosen as successor unless the non-family manager is remarkably more productive (Corollary 16).

succession process, or as a propensity to stay on to carry out managerial activities for the firm once the successor has been chosen. The components of the model can define a situation where the incumbent obtains a higher welfare from staying on to work at the firm than from a fully retiring.

In the latter case, our setting –characterized by non-altruistic preferences of the incumbent and perfect information about the characteristics of the potential successors– also 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. More concretely, the model explains the possibility of an *underperforming succession*; that is, the fact that in some cases the incumbent chooses a family manager even though the non-family is a better manager, or conversely, the incumbent prefers a non-family manager only if this candidate is markedly better than the family candidate (according to the evidence shown in Agrawal et al, 2006). More specifically, when the training process has a moderate cost, the differential of monitoring costs are high and amenity potentials are important, management is retained within the family even though in some cases this may imply that the selected candidate is not the best option from the firm's point of view (Lemmas 13 and 19).

Finally, in Section 5 we extend the model to encompass the implications of pure descendant altruism on the incumbent's, a typical subject in the analysis of the motivations and characteristics of succession processes in family firms. Our findings reinforce those results previously obtained for a non-altruistic incumbent setting. In Section 6, we summarize the main results and displays several possible extensions.

2 A model of family firm succession

In this section, we develop a formal model of family firm succession. We consider a firm initially run by its family owner –who, in many cases, is the founder–, who will be denoted as F, and hereafter referred to as the *incumbent*. This person holds the top management position in a family business and has to choose a potential successor before relinquishing that position. The incumbent chooses a successor manager, between a family and an external candidates, or postpones the succession process. If the succession is carried out, the incumbent could be involved in performing additional activities to watch over family interests in the firm, besides working for the firm. These additional activities can include monitoring the new manager's activities and benefit extractions, or training the family manager successor in business insights. The incumbent may optimally (ex-ante) decide to keep working for the firm. However, an unexpected random shock (which depends on the incumbent's characteristics) might force the incumbent to step aside. In any case, once the successor has been hired, the succession process can be partially or fully completed –that is, the incumbent the incumbent may keep on working for the firm or may fully retire.

Let us consider that the incumbent is endowed with $T = 1$ unit of time, and her preferences are represented by the following monotone utility function

$$U(c, C; \gamma, B) = c - \beta' C + \gamma B,$$

where c is consumption; C is the incumbent's welfare loss for being involved in monitoring and training activities, with $\beta' > 0$ as a welfare parameter; and, γB are the amenity benefits derived from the firm, with $\gamma \geq 0$ as a parameter value dependant on the management profile.[9]

2.1 The model timeline

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.

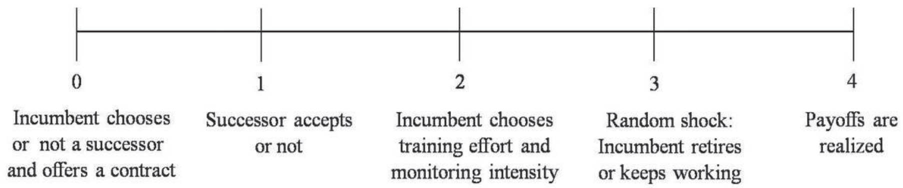

Figure 1: **The timing of the model.**

2.1.1 Date 0: The incumbent chooses a successor and offers him a contract At date 0, the incumbent decides whether or not to keep on managing the firm. If the incumbent decides not to do so, ownership and management are (partially or fully) separated,[10] and the incumbent appoints either an external or a family manager to run the firm. Hereafter we will refer to the professional manager candidate –an outsider with no ties to the incumbent's family circle– as the *non-family manager* (denoted as M), while the candidate within the family circle –a heir or heiress– will be referred to as the *family manager* (denoted as H). The incumbent offers a contract to lure the manager. For any manager i, with $i = M$

[9] The existence of non-pecuniary sources of utility derived from the control over the firm can be found in Burkart et al (2003) and Bhaumik et al (2010) in the context of family-owned firms.

[10] Unlike Burkart et al (2003), we do not consider any ownership decision: the fraction of the shares to be sold to dispersed shareholders will be zero and the family retains the full property; i.e., $\alpha = 1$ in their notation.

and H, the contract consists of a wage, a percentage $w_i \in [0,1]$ –i.e. a wage rate– of the output originated by the manager; in the case of intra-family succession, the contract additionally comprises –formally or informally– the incumbent's commitment to training the family manager to become him more productive.

2.1.2 Date 1. The successor accepts (or rejects) the contract The manager accepts or rejects the offer to run the company at date 1. When deciding, the manager takes into account that some monetary resources may be diverted as in addition to the wage. The manager always has an outside option. Following Burkart et al, we economize the notation by letting ω_i denote the manager i's utility when pursuing the outside option net of the foregone amenity potential, with $i = M, H$.

2.1.3 Date 2. The incumbent chooses training effort and monitoring intensity Once the new manager is at the firm at date 2, the incumbent can allocate her time resources to monitoring activities (denoted as s), besides training activities (denoted as θ) in the case of intra-family succession. The incumbent's remaining time (denoted as n) will be 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 $s+\theta+n \leq T$. An important feature of our model is that the decisions concerning the monitoring level and training intensity given to the family successor are not simultaneous, despite the fact that they are both undertaken at date 2. Training takes place prior to the acquisition of management responsibilities while monitoring is implemented once the family manager secures the management of the firm.

The incumbent's training effort. In the case of intra-family succession, the family manager is a kind special successor for the incumbent, who is prone to not only transmit entrepreneurial knowledge and values, but also the insides of the firm itself. We will consider that this effort entails a welfare cost to the incumbent and a proportion of her time resources (θ).

The incumbent's monitoring intensity. The incumbent can monitor whoever is hired to manage the firm and may, thereby, deprive the manager of at least a fraction of some private benefits. The incumbent's knowledge of the firm gives her a comparative advantage at monitoring. However this activity is costly in terms of time and welfare. 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: $m(s_i;\kappa_i) = (2s_i/\kappa_i)^{1/2}$, with $\kappa_i \geq 0$ and $i = M, H$. 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[11]

$$s_i = \frac{\kappa_i}{2} m_i^2, \tag{1}$$

with $i = M,\ H$. Given the temporal constraint, the time devoted to monitoring is upper bounded, i.e. $s_i \in [0, 1]$.[12] The parameter κ_i represents how cumbersome is for the incumbent to monitor manager i. For an easy monitoring ($\kappa_i < 2$) the incumbent need not to spend all the time at this activity even in the case of full deprivation, i.e. $s_i < 1$; alternatively, for a burdensome monitoring ($\kappa_i > 2$) the incumbent cannot fully deprive the manager even if all the incumbent's time is devoted to this activity, i.e. if $s_i = 1$ then $m_i(1; \kappa_i) < 1$.

This parameter κ_i has, in our opinion, two interpretations. A first interpretation refers to the personal characteristics of the incumbent –not all the incumbents are equally skilled at monitoring the decisions taken by the manager– and the quality of the relationship with the successor –for instance, as regards to the way they communicate with each other. A second interpretation of κ_i has to do with the characteristics of the monitoring technology, specifically it concerns the extent to which monitoring activities can be pursued and efficient depending on the legal framework (particularly the regulatory protection of the company owner's rights). As Pagano et al (1998, p.193) explain, monitoring activities can be exerted by spending time and effort gathering information, by insisting on audits and even by taking legal actions. In other words, the legal framework has an impact on the incentives to carry out monitoring activities (see Burkart et al 2006, and Song et al 2006) by determining the costs and effectiveness of monitoring (κ_i). In the paper, we will interpret our results along both interpretations.

The incumbent's opportunity cost of training and monitoring. Hiring a manager involves two opportunity costs for the incumbent at date 2. Monitoring and training activities require time, then reducing time resources for productive (or, respectively, outside-of-the-firm), n; in addition, they cause a direct welfare loss for the incumbent, because monitoring a manager involves lack of trust and nurturing the family manager requires effort and patience. This welfare cost (included in the incumbent's preferences) is assumed to be linear following Burkart et al (2005); that is, $C(s_i, \theta) = s_i + \theta$.

2.1.4 Date 3. A random shock is realized: the incumbent retires or keeps on working for the firm If the incumbent chooses a level of monitoring intensity (and training effort)

[11]This specification is taken from Burkart et al. Following Pagano and Röell (1998), they assume that the large shareholder can reduce private benefit extraction at a cost. In our model the incumbent, rather than the large shareholder, develops the monitoring activities to protect the family's interest in the firm.

[12]Note that 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.

such that the time constraint is binding –i.e., $s_i + \theta = T$–, the incumbent then fully retires since there are no additional time resources to perform any other activities within the firm (i.e., $n = 0$). Yet, this needs not be the case. Besides monitoring (and training), a fraction $n > 0$ of time could still be available for the incumbent. At this stage, the incumbent could decide either keep on working at the firm or leave the management. We assume that this event cannot be anticipated by the manager or even by the incumbent.[13] We formalized the event of full retirement by a stochastic process, a binominal distribution with a probability of retirement π. 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.

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 per unit of time available for outside-of-the-firm activities. Otherwise, the incumbent's working time yields productive revenues at date 4.

2.1.5 Date 4. Pay-offs are realized At date 4, the incumbent receives the firm's productive and amenity revenues, as well as the outside-of-the-firm revenues if the incumbent has retired.

Productive revenue technologies. At date 4 the firm generates monetary revenues depending on the identity of the manager. The incumbent's productive revenue depends on the realization of the stochastic event of retirement at date 3. If he stays-on, the incumbent's revenue technology makes use of time to work and we assume a linear technology, so

$$v_F(n) = v_F n$$

[13] An alternative specification is to allow the incumbent to take the discrete decision between either retiring or continuing to work. This would require the assumption that the incumbent, if retired, would receive a non-negative exogenous outside option. (For the endogenous specification taken in this paper, with outside-of-the-firm activities being less productive than working for the firm –see the remark The incumbent's outside-of-the-firm revenues in Section 2.1.5 below–, the incumbent will never retire.) Yet, this case might entail a time inconsistent labor contract proposed to the manager at date 1. More specifically, suppose the case the incumbent offers a wage contract at date 1 and finds an optimal level of monitoring at date 2 (depicted at equation (4) below), once the manager is in the firm. If the level of monitoring is lower than 1, the manager's acceptance of the contract at date 2 may result in the incumbent not retiring and working n units of time for the firm. But, once the manager is in charge of the firm, the incumbent might find it optimal to retire at date 3 and will then receive her outside option and devote additional units of available time to further monitoring activities: observe that the previous monitoring level obtained at date 2 –equation (4) below– is no longer optimal for the incumbent because the temporal opportunity cost of monitoring activities disappears. Under these new monitoring conditions, the manager could find it optimal not to accept the contract at date 1. This time inconsistency problem –present also in Burkart et al's work– is circumvented by convexifing the discrete retirement decision (in the spirit of Hansen 1985).

are the revenues if the incumbent devotes $n \in [0, T]$ units of time to the firm. The non-family manager's revenue technology

$$\upsilon_M$$

is assumed to be constant and exogenously given.[14] Finally, the family manager's revenue technology is a function of the effectiveness of the training process, which comprises four elements: the set of the incumbent's characteristics Ξ_F; those of the family manager Ξ_H; how the learning and transmission process is developed; and, the knowledge of the firm's insides revealed in this transmission. Different combinations of these features turn the training process into an increasing or decreasing returns-to-scale productive technology. 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

$$\upsilon_H(\theta; \Xi_F, \Xi_H),$$

with $\upsilon'_H(\theta) > 0$ for all θ and $\upsilon''_H(\theta)$ representing the increasing (i.e. $\upsilon''_H(\theta) > 0$) or decreasing (i.e. $\upsilon''_H(\theta) < 0$) returns-to-scale of the training process as a revenue technology. In section 3.4.3, we characterize the intra-family succession for different elements that take part in the training process and shape this function.

The revenues obtained by the firm at date 4 are devoted to paying out the manager wage compensation, to paying dividends to the incumbent as the firm owner, and they can also be diverted to generate private benefits. These private benefits take the form of transactions with related parties, expropriation of corporate opportunities, transfer pricing, excessive salaries and perquisites, and so on (see Johnson et al 2000). Whoever is hired to manage the firm will be able to divert a fraction $\phi_i \in [0, 1]$ of revenues for private benefits; thus, the maximum rate of expropriation is $\phi_i \upsilon_i$ with $i = M$ and H, an amount that already incorporates compensations in excess of market value. The fraction that is actually diverted depends on the monitoring activities carried out: if the incumbent decides to devote s_i units of time to monitoring activities, the private benefit extraction is reduced by $m(s_i)\phi_i \upsilon_i$ with $i = M$ and H; thus, the benefits finally accrued by the incumbent from the manager's revenue becomes $[1 - \phi_i(1 - m(s_i))]\upsilon_i$.

The incumbent's outside-of-the-firm revenues. If retired at date 4, the incumbent accrues a welfare (in monetary terms) following a technology that transforms time into leisure activities or other activities developed outside the firm. We assume a linear technology, so the reservation utility per unit of time is proportional to the incumbent's labor productivity; thus,

$$\upsilon_F^R(n) = \delta_F \upsilon_F n$$

[14] Unlike Burkart et al (2005) and Bhattacharya et al (2010), we do not assume that the manager is better than the incumbent at managing the firm (i.e., $\upsilon_M > \upsilon_F$).

are the revenues if the incumbent devotes $n \in [0, T]$ 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 keep devoting all her time to the firm –whether working alone, or whether working, (training) and monitoring the manager if hired–, unless a stochastic event forces the incumbent to step aside in the succession process.

The incumbent's amenity revenues. Finally, the firm also generates amenity revenues to the incumbent at date 4 that depend on the identity of the manager. 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 management remains within the family, i.e. $\gamma_F \geq \gamma_H > \gamma_M \geq 0$.[15]

2.2 Characterization of the managers

The evidence provided by the literature on the succession process in family firms presents successor managers as a complex set of attributes that include competence, personality traits, relationship with the incumbent and involvement in the family business, among others.[16] Among all of these features, we have identified a set of key parameters that fully characterize any manager i: the outside option (ω_i), an intrinsic maximum rate of expropriation (ϕ_i), the difficulty in monitoring him as a manager (κ_i), and the share of amenity benefits left to the incumbent (γ_i). In addition, the non-family manager accomplishes a firm revenue (υ_M), while the firm revenue under the family manager is the function $\upsilon_H(\theta; \Xi_F, \Xi_H)$. A non-family manager can be represented by a vector of characteristics $\Upsilon_M = (\upsilon_M, \omega_M, \phi_M, \kappa_M, \gamma_M)$, while the family manager is fully characterized by $\Upsilon_H = (\Xi_H, \upsilon_H, \omega_H, \phi_H, \kappa_H, \gamma_H)$. Finally the incumbent as a manager can also be represented by $\Upsilon_F = (\Xi_F, \upsilon_F, \delta_F, 0, 0, \gamma_F, \pi)$, with δ_F representing a kind of outside option per unit of leisure time, and π the probability of retirement.

Finally, to circumvent asymmetric informational problems on the quality of any manager, we assume that the incumbent knows the manager characteristics comprised of these parameters. That is, we study the succession decision in family firms taken by an incumbent in a perfect information set-up.

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

[16]See, for instance, Chrisman et al (1998), Chua et al (2003), Shepherd et al (2000) or Pérez-González (2006).

3 Succession options

In this section, we present the three options available to the incumbent when facing a succession decision: postponing the decision –i.e. keeping in charge–, hiring a non-family manager, and leaving management within the family by hiring a family manager. We solve the model for each case by backward induction.

3.1 Option 1. The incumbent retains management

We first consider the possibility of postponing the CEO transition. The succession process has not been initiated either because the incumbent has no intention to transfer managerial control to another person or no family or non-family member meets the appropriate characteristics –from the incumbent's point of view– to take over the firm.[17]

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 the total revenues generated are $\upsilon_F n$; if retired, the incumbent receives a (monetarized) welfare $\delta_F \upsilon_F n$. 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 our model shows that with a probability π the family firm closes because the incumbent has not initiated the succession process.

Absent a manager, there is neither date 2 monitoring (or training) activities –so no welfare costs apply and the incumbent's time resources are integrally devoted to production or outside-of-the-firm activities (i.e. $n = T$)–, nor a date 1 job acceptance decision. Hence, we move directly to the incumbent's date 0 decision. The expected incumbent's budget constraint is $E[c_F] = (1-\pi)\upsilon_F T + \pi\delta_F\upsilon_F T$, and the expected welfare is equal to the expected revenues under the incumbent's management plus the amenity potential of managing the company in solitary; that is,

$$E[V^F] = E[U(\upsilon_F; \gamma_F, B)] = \rho\upsilon_F T + \gamma_F B, \tag{2}$$

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

[17] Handler (1992), De Massis et al (2008) 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 or, in other words, her propensity to step aside based on her need of leadership role and social status, as well as her sense of indispensability with respect to the business. In this sense, it is also important to take into account that the incumbent generally has enough legitimacy within the firm and the family to remain in power as long as she desires.

3.2 Option 2. The succession is implemented

At the time the incumbent aims to leave –totally or partially– the firm management, the incumbent must appoint a new manager for the firm, whether a qualified outsider or a family manager. The hand-over process is similar in both cases, except that the incumbent commits to devoting time resources to training the family successor. Thus, to proceed within a common analysis we denote as T_i the time left for the incumbent to monitoring and work/outside-of-the-firm activities, for any $i = M, H$.

3.2.1 The succession is implemented: The optimal deprivation, monitoring and wage rate We solve the incumbent's problem by backward induction, beginning at date 4. The incumbent receives the firm revenues originated from two sources. The first source consists in the dividends originated by the new manager's revenue (υ_i), after paying out the manager's salary compensation ($w_i\upsilon_i$) and subtracting the resources the manager actually diverted from the firm ($(1 - m_i)\phi_i\upsilon_i$).[18] The second source of revenues depends on the stochastic outcome at date 3: an incumbent working for the firm receives a productive revenue ($\upsilon_F n$), whereas a retired incumbent receives an outside-of-the-firm revenue ($\delta_F\upsilon_F n$). Finally, the incumbent receives a fraction of the amenity benefits γ_i.

At date 2, the incumbent allocates time among monitoring, (training,) and productive/outside-of-the-firm activities. Our analysis allows us to study the incumbent's decisions on the level of monitoring intensity (s_i) –and, thus, on the optimal deprivation rate (m_i)–, for any type of successor manager i and any retirement stochastic event (given any training decision (θ) in the case the family manager is hired). Given the wage rate w_i^* proposed and accepted at date 1, the expected incumbent's budget constraint is $E[c_i] = \rho\upsilon_F[T_i - s_i] + \upsilon_i\left[1 - \phi_i + \phi_i m(s_i) - w_i^*\right]$, as the incumbent devotes time resource T_i to monitoring together with work/outside-of-the-firm activities. The expected incumbent's welfare $E[U(c_i, C_i; \gamma_i, B)] = E[c_i] - \beta' C_i + \gamma_i B$, after denoting $\beta' = \beta\upsilon_F$, turns out to be

$$E[U(c_i; \gamma_i, B)] = \upsilon_F\left[E[I_i(T_i)] - (\rho + \beta)\frac{\kappa_i}{2}m_i^2\right] + \upsilon_i\left[1 - \phi_i + \phi_i m_i - w_i^*\right] + \gamma_i B. \quad (3)$$

where $\upsilon_F E[I_i(T_i)]$ is the maximum expected contribution to the incumbent's welfare of work/outside-of-the-firm activities (net of training costs).[19] The incumbent chooses the

[18] Observe that our specification circumvents the intertemporal consistency problems found in Burkart et al (2003, Sec.II.B), in which, 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. In our paper this is not the case since monitoring decreases the incumbent's (expected) output yield, so wages and monitoring are simultaneously and optimally determined and these decisions are not time inconsistent.

[19] The incumbent's welfare (3) is a generalization of the Burkart et (2013)'s founder's welfare V^s (see p.2176) with $\beta' = 1$ and $\rho = 0$ –for these authors consider the incumbent fully retires ($\pi = 1$) and receives no outside-of-the-firm welfare ($\delta_F = 0$)–; thus, the incumbent's welfare is not further affected as

level of deprivation of private benefits m_i that maximizes the welfare subject to the intensity constraint $0 \leq m_i \leq \min\left\{1, [(2/\kappa_i)T_i]^{1/2}\right\}$, where the upper bound stems from the maximum monitoring level –i.e. $m_i \leq 1$– and the time constraint $s_i \leq T_i$. The optimal deprivation of private benefits is found from the first-order condition

$$m_i^*(T_i) = \min\left\{\lambda_i \mu_i, \min\left\{1, \left(\frac{2}{\kappa_i}T_i\right)^{\frac{1}{2}}\right\}\right\}, \tag{4}$$

which depends on the relative performance of the manager with respect the incumbent, $\mu_i = \upsilon_i/\upsilon_F$, and the manager's honesty, $\lambda_i = \phi_i/[\kappa_i(\rho + \beta)]$, i.e. the ratio of the private expropriation and the cost of (both a direct cost and an opportunity cost of) monitoring.[20] Accordingly, the optimal monitoring s_i^* is found from (1).

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

$$w_i^* = \frac{\omega_i}{\upsilon_i} - [1 - m_i^*(T_i)]\,\phi_i. \tag{5}$$

This is the manager's *participation constraint*. We find it reasonable to consider that the incumbent offers at $t = 0$ a positive wage to the potential manager,[21] i.e. $w_i^* \geq 0$. In this case, the firm revenue originated by manager i must at least afford his salary compensation, $\upsilon_i \geq \omega_i$ (so the wage rate is $w_i^* < 1$). This is a necessary condition for the incumbent to offer a non-negative wage. The condition becomes a sufficient one if full deprivation is optimal as shown in the following result, proved in the Appendix.

LEMMA 1. ***Necessary and sufficient conditions to offer a contract at date* 0.** *Consider a potential manager Υ_i 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 to a manager Υ_i at date 0 is $\omega_i/\upsilon_i \in [0, 1)$ (or analogously $\upsilon_i \geq \omega_i$);

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

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the incumbent does not perform additional activities –such as working for the firm or training the heir–, so $E[I_i(T_i)] = 0$.

[20] Observe that our reformulation slightly differs from the optimal result in Burkart et al. In their setting, the founder deprives a fraction of the total revenue ($m_i\upsilon_i$) –unlike our paper, who deprives a fraction of the manager's private benefit appropriation ($m_i\phi_i\upsilon_i$). Thus, they find a different interior optimal deprivation, $m_i^* = \upsilon_i/\kappa_i$, which forces them to set exogenous bounds to deprivation: $m_i \in [0, 1]$ and $m_i \leq \overline{\phi}$, with $\overline{\phi}$ an upper bound on expropriation set by legal protection to shareholders. Interestingly, all bounds on deprivation in (4) are endogenously obtained within our framework.

[21] Like in agency models, our framework also allows for a negative wage. This is the case of a manager with low opportunity cost ω_i and high opportunities to divert income from the firm. This case, however, seems not to prevail in succession processes, so negative wages will not be addressed in this paper.

3.3 Option 2.1. A non-family member becomes the manager

This case represents a situation in which a non-family executive is needed. As noted by Klein et al (2007), this happens when the family business owner faces the problem of having no successor inside the family or no family member is willing or qualified for management. In other cases, the outsider is expected to be an *interim* solution between two family generations; the solution to a serious crisis or to a conflicting situation inside the family; or, in other words, the ousider is only a neutral non-family manager that is able to balance the interests of the different components of the family.

Hiring a non-family manager entails that the incumbent's available time for monitoring as well as for working/outside-of-the-firm activities is $T_M = 1$, and the maximum expected contribution to the incumbent's welfare of productive/outside-of-the-firm activities is $\upsilon_F E[I_M(T_M)] = \upsilon_F \rho T_M$. At date 1 the non-family manager Υ_M accepts to run the firm in exchange for a wage $\upsilon_M w_M^*$, with a wage ratio determined in (5). At date 2 the incumbent monitors s_M^*, with a deprivation rate m_M^*. If there is no full monitoring, then the incumbent performs productive activities or retires as a result of the stochastic outcome at date 3. In any case, the incumbent's expected welfare is $E[U(c_M; \gamma_M, B)] = \upsilon_F \Big[\rho T_M - (\rho+\beta)(\kappa_M/2)[m_M^*(T_M)]^2\Big] + \upsilon_M \Big[1 - \phi_M + \phi_M m_M^*(T_M) - w_M^*\Big] + \gamma_M B$, which can be computed taking into account the manager's participation constraint (5) and the incumbent's optimal deprivation function (4), to find that, if the non-family manager is hired, the expected incumbent's welfare becomes

$$E[V^M] = \upsilon_F \left\{\mu_M + \rho T_M - (\rho+\beta)\frac{\kappa_M}{2}\Big(m_M^*(T_M)\Big)^2\right\} - \omega_M + \gamma_M B, \tag{6}$$

in which the optimal deprivation of private benefits $m_M^*(T_M)$ defined in (4) for $T_M = 1$ and the wage rate paid w^* in (5) is non-negative. Note that when the optimal monitoring activities require all the incumbent's available time (i.e. $s_M^* = 1$), full retirement becomes an optimal decision as a consequence of the time constraint.

3.4 Option 2.2. A family member becomes the manager

The most common pattern of succession in family firms is the transition of leadership from one family member to another. In fact, intergenerational transfer is one of the defining features of family businesses. One key for the succeess of intra-family succession is the incumbent's concern and involvement in the heir's training, a distinctive feature from the non-family succession option studied in the previous Section 3.3. In terms of the model, in the case of intra-family transmission the incumbent has to additionally decide on the training time θ to be devoted to preparing the family manager at date 2. A key element of our model is that the decisions concerning monitoring level and training intensity are not simultaneous, despite implemented at date 2: training takes place prior to the acquisition of management responsibilities, while monitoring is implemented once the family manager is in charge of the firm's management.

Hiring a family manager entails that the incumbent's time left for monitoring and working/outside-of-the-firm activities is $T_H(\theta) = 1 - \theta$, and the maximum expected contribution to the incumbent's welfare of work/outside-of-the-firm activities net of training costs now becomes $\upsilon_F E[I_H(T_H(\theta))] = \upsilon_F\ [\rho T_H(\theta) - \beta\theta]$. At date 1 the family manager Υ_H accepts running the firm in exchange for a (non-negative) wage ratio w_H^* of the revenues determined in (5) and (a commitment to receive) a level of training time θ^*. At date 2 the incumbent allocates the time among monitoring and training activities. We have already computed in (4) the optimal deprivation rate $m_H^*(\theta)$ –and, accordingly, the optimal level of monitoring $s_H^*(\theta)$. What remains to be found is the optimum training effort θ^*. The incumbent determines this variable at the beginning of date 2 by maximizing her expected welfare

$$E[U(c_H(\theta);\gamma_H,B)] = \upsilon_F\left\{\rho - (\rho+\beta)\left[s_H^*(\theta)+\theta\right]\right\} + \upsilon_H(\theta)\left[1-\phi_H+\phi_H m_H^*(T_H(\theta)) - w_H^*\right] + \gamma_H B,$$

subject to the time constraint ($s_H^*(\theta) + \theta + n_H = 1$), the manager's participation constraint (5), the monitoring time cost function (1) and the optimal deprivation function (4) for $T_H(\theta) = 1 - \theta$. After substituting constraints, the incumbent chooses θ to maximize the expected objective function

$$E[V^H(\theta)] = \upsilon_F\left\{\mu_H(\theta) + \rho - (\rho+\beta)\left[\frac{\kappa_H}{2}\Big(m_H^*(1-\theta)\Big)^2 + \theta\right]\right\} - \omega_H + \gamma_H B, \qquad (7)$$

subject to (5) and $0 \le \theta \le 1 - s(\theta) = 1 - (\kappa_H/2)[m_H^*(1-\theta)]^2$ with $m_H^*(1-\theta)$ previously defined in (4). Note that if the optimal training and monitoring activities require all the incumbent's available time (i.e. $s_H^* + \theta^* = 1$), full retirement becomes an optimal decision ($n_H^* = 0$) as a consequence of the time restriction.

3.4.1 Characterizing potential optimal levels of training The optimal level of training θ^* depends on particular values of the parameters and specific functional forms. In this section, we characterize potential optimal levels of training –displayed in Table 1– for different regions of parameters. Specifically, we are able to identify potential maxima to the incumbent's problem (7) after determining a key threshold in the training intensity: $\breve{\theta} \equiv 1 - \frac{\kappa_H}{2}$ for any given value of the monitoring cost (κ_H) –a threshold found at the maximum deprivation level (see the inside bracket at the optimal deprivation condition (4)). This threshold allows us to distinguish between two cases: full deprivation is feasible for

		FD Feasible $\theta^* \leq \breve{\theta}$	FD Not Feasible $\breve{\theta} < \theta^*$	Corner Solution (if (5) holds)
FD Optimal	$\lambda_h \mu_H(\theta^*) \geq 1$	$\begin{cases} \tilde{\theta}_1 < \tilde{\theta}_3; \text{ or} \\ \tilde{\theta}_3 = \breve{\theta} \end{cases}$	–	$\tilde{\theta}_5 = 1$
FD Not Optimal	$\lambda_h \mu_H(\theta^*) < 1$	$\tilde{\theta}_2(\lambda_H)$	$\begin{cases} \tilde{\theta}_2(\lambda_H) < \tilde{\theta}_4(\lambda_H); \text{ or} \\ \tilde{\theta}_4(\lambda_H) \end{cases}$	$\tilde{\theta}_5 = 1$

Table 1: **Potential optimal levels of training** with $\breve{\theta} = 1 - \frac{\kappa_H}{2}$; $\tilde{\theta}_1$ a root of $\mu'_H(\theta) - (\rho + \beta)$; $\tilde{\theta}_2(\lambda_H)$ a root of $\mu'_H(\theta)[1 - \phi_H \lambda_H \mu_H(\theta)] - (\rho + \beta)$; and $\tilde{\theta}_4(\lambda_H)$ a root of $\theta + \frac{\kappa_H}{2}[\lambda_H \mu_H(\theta)]^2 - 1$. **FD** for full deprivation.

the incumbent (*case i.*) or it is not (*case ii.*). In the following section it is shown that these cases are useful to identify the optimal training intensity for certain types of family managers.

Case *i.* Full deprivation is feasible: $\theta^* \leq \breve{\theta} \equiv 1 - \frac{\kappa_H}{2}$**.** We begin by considering that full deprivation in (4) is feasible, i.e. $1 \leq [\frac{2}{\kappa_H}(1 - \theta^*)]^{1/2}$; that is, the (non-negative) optimal training level must satisfy $\theta^* \leq 1 - \frac{\kappa_H}{2}$. The region of training values satisfying this full deprivation condition is fully characterized by the following frontier (see this frontier at the μ_H-λ_H–space in Figure 2):

Definition 1. ***The (family manager) full-deprivation frontier***. *For each honesty parameter λ there exists a training intensity $\overline{\theta}(\lambda)$ such that those combinations $\left(\mu_H\left(\overline{\theta}(\lambda)\right), \lambda\right)$ satisfying*

$$\lambda \mu_H\left(\overline{\theta}(\lambda)\right) = 1, \tag{8}$$

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

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 ($\theta^* \leq \breve{\theta}$) and optimal ($m_H(1 - \theta^*) = 1$). If full deprivation is optimal for the incumbent, then $\lambda_H \mu_H(\theta^*) \geq 1$ is satisfied in (4). This means that the value of the parameters results in a combination $(\mu_H(\theta^*), \lambda_H)$ located at the upper contour set of the full-deprivation frontier (8). In this case, the first order condition in (7) is

$$[\mu'_H(\theta) - (\rho + \beta)]\left[\theta + \frac{\kappa_H}{2} - 1\right] = 0.$$

Here, there are two potential optimal levels of training: the interior potential maximum $\tilde{\theta}_1$, a root of $\mu'_H(\theta) - (\rho + \beta)$; and, the corner no-working potential maximum $\tilde{\theta}_3 = 1 - \frac{\kappa_H}{2}$.

Observe that the former is a marginal condition stating that the incumbent stops training the family manager at $\tilde{\theta}_1$ because the benefits derived from devoting one additional unit of time in training activities ($\mu'_H(\tilde{\theta}_1)$) equals the time and welfare cost of this additional unit of time ($\rho + \beta$). Because of the time constraint, $\tilde{\theta}_1$ must satisfy $\tilde{\theta}_1 \leq 1 - \frac{\kappa_H}{2} \equiv \tilde{\theta}_3$ to be considered a potential maximum.

Case *i.ii*. Full deprivation is feasible ($\theta^* \leq \breve{\theta}$), but not optimal ($m_H(1-\theta^*) < 1$). If full deprivation is feasible but not optimal for the incumbent, then $m^*(\theta^*) = \lambda_H \mu_H(\theta^*) < 1$ must be satisfied in (4). The value of the parameters results in a combination $(\mu_H(\theta^*), \lambda_H)$ located below the full-deprivation frontier (8), and the first order condition in (7) becomes

$$\Big[\mu'_H(\theta)[1 - \phi_H \lambda_H \mu_H(\theta)] - (\rho + \beta)\Big] \left[\theta + \frac{\kappa_H}{2}[\lambda_H \mu_H(\theta)]^2 - 1\right] = 0. \tag{9}$$

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

Case *ii*. Full deprivation is not feasible ($\theta^* > \breve{\theta} \equiv 1 - \frac{\kappa_H}{2}$ and $m_H(1 - \theta^*) < 1$). 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 $\theta^* > 1 - \frac{\kappa_H}{2}$ and, then, the value of the parameters results in a combination $(\mu_H(\theta^*), \lambda_H)$ located below the full-deprivation frontier (8), i.e. $\lambda_H\mu_H(\theta^*) < 1$. Here, the optimal monitoring can only be $m^*_H = \lambda_H\mu_H(\theta^*) < [\frac{2}{\kappa_H}(1 - \theta^*)]^{1/2}$.[22] For each given $\lambda_H \geq 0$, the first-order condition (9) provides us with two potential optimal levels of training: the interior potential maximum $\tilde{\theta}_2(\lambda_H)$; and, the corner no-working potential maximum $\tilde{\theta}_4(\lambda_H)$. Analogous to the *case i.ii.*, for any given λ_H, the training level $\tilde{\theta}_2$ must satisfy the following three conditions to be considered a potential maximum: $\tilde{\theta}_2 < \tilde{\theta}_4$, $\tilde{\theta}_2 > 1 - \frac{\kappa_H}{2}$ and $\lambda_H\mu_H(\tilde{\theta}_2) < 1$.[23] Observe that the root $\tilde{\theta}_4(\lambda_H)$ can

[22] The reason is the following. The condition $m^*(1 - \theta^*) = [\frac{2}{\kappa_H}(1 - \theta^*)]^{1/2} < \lambda_H\mu_H(\theta^*)$ entails that the resulting first-order condition in (7) –i.e. $\mu'_H(\theta) = 0$– has no solution because of the monotonicity of the family manager's revenue technology.

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

be considered now as a potential maximum, since it does not satisfy the full deprivation condition, $\tilde{\theta}_4(\lambda_H) > 1 - \frac{\kappa_H}{2}$.

What remains to be shown is that $\tilde{\theta}_4(\lambda_H)$ is always below the full-deprivation frontier (8) for any λ_H. To prove this, we previously characterize the following no-working frontier (see this frontier at Figure 2).

Definition 2. ***The no-working frontier***. *For each λ there exists a $\overline{\overline{\theta}}(\lambda)$ such that those combinations $(\mu_H(\overline{\overline{\theta}}(\lambda)), \lambda)$ satisfy $s(\overline{\overline{\theta}}(\lambda)) + \overline{\overline{\theta}}(\lambda) = 1$; that is,*

$$\frac{\kappa_H}{2}\left[\lambda\mu_H\left(\overline{\overline{\theta}}(\lambda)\right)\right]^2 + \overline{\overline{\theta}}(\lambda) = 1, \tag{10}$$

delineates a frontier beyond which the incumbent only monitors and trains, but does not work.[24]

Next we can state the following result, proved in the Appendix, characterizing the functional relationships (8) and (10) (see also Figure 2), which guarantees that the incumbent never fully deprives her family manager when the level of training chosen is $\tilde{\theta}_4$.

Lemma 2. ***Characterizing the full-deprivation frontier and the no-working frontier.*** *The functional relationships defined in conditions (8) and (10) at the λ_H-μ_H−plane have a negative slope, the former is steeper, and both intersect only once at the training intensity $\breve{\theta} = 1 - \frac{\kappa_H}{2}$.*

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 $\tilde{\theta}_5 = 1$ and the no-training potential maximum $\tilde{\theta}_6 = 0$. The former entails that no time for monitoring or working activities is available to the incumbent –i.e., $m^*(1 - \tilde{\theta}_5) = 0$ and $n^*(\tilde{\theta}_5) = 0$–, and $\tilde{\theta}_5 = 1$ can be considered as a potential maximum provided the incumbent offers a contract at date 0 to the family manager with a non-negative wage rate w^* in (5), i.e. $\frac{\omega_H}{\upsilon_F\kappa_H(\rho+\beta)} \geq \lambda_H\mu_H(\tilde{\theta}_5)$ (see Lemma 1.*ii*).

The latter, $\tilde{\theta}_6 = 0$, is the case already studied in Section 3.3, since managers are hired because of their own abilities alone. Yet, we consider the incumbent to be prone to devoting time to the successor. Precluding the no-training potential ($\tilde{\theta}_6 = 0$) to be optimal depends on the value of the cost of monitoring: if $\kappa_H < 2$ –the case depicted in Figure 2– it must be required that $\tilde{\theta}_1$ or $\tilde{\theta}_2(\lambda_H)$ for any λ_H cannot take zero as an optimal value; if $\kappa_H > 2$ –the area at the right of $\mu_H(\tilde{\theta}_3)$ in Figure 2– it must be required that $\tilde{\theta}_4(\lambda^{max}) > 0$ with $\lambda_H^{max} \equiv 1/[\kappa_H(\rho + \beta)]$. To this end, we state the following assumption:[25]

[24] *Observe that whenever the family manager is fully honest, $\lambda_H = 0$, the no-working frontier (10) intercepts the μ_H−axes at $\mu_H(1)$, that is the incumbent only performs training activities $\overline{\overline{\theta}}(0) = 1(\equiv \tilde{\theta}_5)$.*

[25] Among the conditions defining $\tilde{\theta}_1$ and $\tilde{\theta}_2(\lambda_H)$ for any λ_H, we had to choose the more restrictive one (namely, the marginal condition in (9)) to prevent the existence of a root that could intercept with the λ_H−axis (see Figure 2). Note, however, that both marginal conditions match if the family manager is only productive with the incumbent's nurture, $\upsilon_H(0) = 0$.

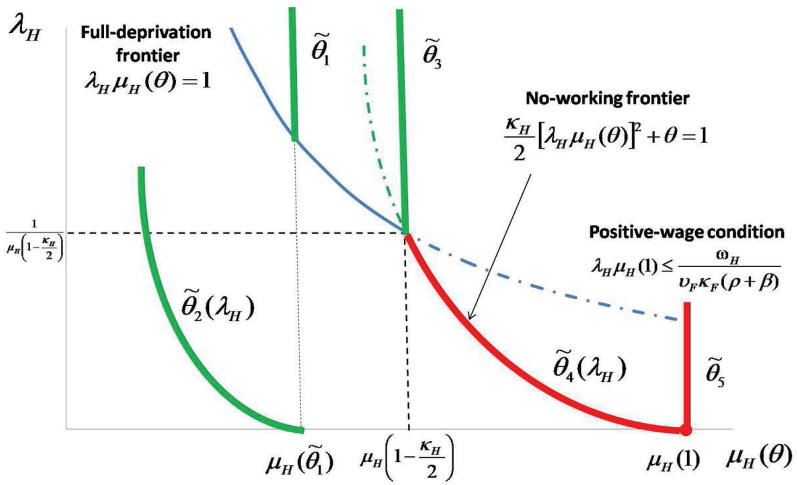


Figure 2: **The full-deprivation frontier, the no-working frontier and the potential optimum levels of training in the relative-performance−honesty plane (i.e., the μ_H-λ_H−plane)**. It is represented, for any given $\kappa_H < 2$, the case the training process exhibits decreasing returns-to-scale, and Assumption 2 and $\tilde{\theta}_1 < \tilde{\theta}_3$ are satisfied.

Assumption 1. *$\mu'_H(0)\Big[1 - \phi_H \lambda_H \mu_H(0)\Big] > \rho + \beta$ for $\kappa_H < 2$; and, $\frac{\kappa_H}{2}[\lambda^{max}\mu_H(0)]^2 < 1$ for $\kappa_H > 2$, with $\lambda_H^{max} \equiv 1/[\kappa_H(\rho+\beta)]$.*

All the proceeding analysis and interpretation have been developed for a given cost of monitoring, κ_H. It is worth noting that if there is no cost of monitoring, i.e. $\kappa_H = 0$, then the number of potential optimal levels of training are reduced to $\tilde{\theta}_1$ and $\tilde{\theta}_5 = 1$; while if the cost of monitoring is high, $\kappa_H > 2$, then the potential optimal levels of training are restricted to $\tilde{\theta}_5 = 1$, and $\tilde{\theta}_2(\lambda)$ and $\tilde{\theta}_4(\lambda)$ for $\lambda < \lambda_0$ with λ_0 satisfying $\frac{\kappa_H}{2}[\lambda_0 \mu_H(0)]^2 = 1$ (i.e., the λ_0 is the level of the family manager's honesty, such that $\tilde{\theta}_4(\lambda_0) = 0$).

3.4.2 Representation of potential optimal levels of training The potential optimal levels of training obtained in *cases i.* to *iii.* can be depicted at the relative-performance−honesty plane. In Figure 2 we present a particular case in which all the potential maxima that are feasible for any λ_H.

Observe that for any set of parameters, all potential maxima are fully identified except $\tilde{\theta}_2$. More specifically, the profile of the function $\tilde{\theta}_2(\lambda)$ defined in (9) does not necessarily characterize a potential maximum at every λ. This is because this function may cross the full-deprivation frontier for some honesty level $\lambda \geq 1/\mu_H(\breve{\theta})$; it may cross the no-working frontier at some honesty level $\lambda \leq 1/\mu_H(\breve{\theta})$; or, it may cross both and cause $\tilde{\theta}_2$ to disappear as a potential maximum, which greatly complicates the analysis. To guarantee that $\tilde{\theta}_2(\lambda_H)$ can always be considered a candidate for any λ_H, we present the following Assumption 2 stating that the function $\tilde{\theta}_2(\lambda)$ never crosses either the full-deprivation frontier (Assumption 2.1.) nor the no-working frontier (Assumption 2.2., a requirement that guarantees that the two brackets in (9) have no common root).

Assumption 2.
2.1. There exists no $\lambda \leq 1/[\kappa_H(\rho+\beta)] \equiv \lambda_H^{max}$ such that $\mu_H'(\tilde{\theta}_2(\lambda))(1-\phi_H) = \rho+\beta$.
2.2. $\mu_H'(\tilde{\theta}_2(\lambda))(1-\phi_H) > \rho+\beta$ is satisfied for any $\lambda \leq 1/\mu_H(\breve{\theta})$.

3.4.3 Effectiveness of the training process and optimal training decision We can conclude from our analysis in Section 3.4.1 that the incumbent's optimal level of training (θ^*) belongs to the set of potential optimal level of training previously found in cases *i.*–*iii.*. The one eventually chosen 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 section we focus on particular characterizations of the training process: we begin by describing different types of this process within our model, and then we identify the optimal training.

3.4.3.1. Effectiveness of the training process. A distinctive feature in our model is the existence of a training process. The interaction of the elements affecting this process, enumerated in Section 2.1.5 (namely, the incumbent's and family manager's character, how the transmission process is developed and the particularities of the firm's insides), critically conforms the family manager's revenue technology (v_H) and allows us to distinguish two types of revenue functions. First, the learning process can be smooth and fluid, indicating a quick family 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 family manager. Alternatively, the learning process may become harsh and tough, indicating a dim family manager in learning, a non-specific firm's inside knowledge transmitted by the incumbent's teachings, a bad and impatient incumbent or an awkward relationship between the incumbent and the family manager.

In terms of our model, we consider that a smooth learning process exhibits increasing returns-to-scale and can be represented by a convex revenue function –i.e., $v_H''(\theta) > 0$–, while a harsh process presents decreasing returns-to-scale and can be represented by a concave revenue function –i.e., $v_H''(\theta) < 0$.[26]

[26]Several parametrized forms can be proposed for these functions. First, in the case that the incumbent's

3.4.3.2. Effectiveness of the training process and optimal training. Next, we find the optimal training for different profiles of the effectiveness of the training process, represented by the increasing or decreasing returns-to-scale of the family manager's relative revenue technology ($\mu_H(\theta) \equiv \upsilon_H(\theta)/\upsilon_F$).

2.*i*. Increasingly effective training process: $\mu_H(\theta)$ 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 family manager the most (i.e. $\theta = 1$) and not to work for the firm. However, this needs not be the case, since the family manager's honesty profile might require some monitoring intensity. The less honest the family manager is –i.e., the higher λ_H–, the more time resources the incumbent has to devote to monitoring activities. All these intuitions are easy to characterize, as shown by the following result.

PROPOSITION 1. *Consider Assumption 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 family manager, with*

$$\theta^* = \begin{cases} \tilde{\theta}_3 = 1 - \frac{\kappa_H}{2} & \text{if } \lambda_H > \max\left\{1/\mu_H(1 - \frac{\kappa_H}{2}); \frac{\omega_H}{\upsilon_F \kappa_H(\rho+\beta)}/\mu_H(1)\right\} \\ \tilde{\theta}_4(\lambda_H) & \text{if } \lambda_H \in \left(\frac{\omega_H}{\upsilon_F \kappa_H(\rho+\beta)}/\mu_H(1), 1/\mu_H(1 - \frac{\kappa_H}{2})\right] \\ \tilde{\theta}_5 = 1 & \text{if } \lambda_H \leq \frac{\omega_H}{\upsilon_F \kappa_H(\rho+\beta)}/\mu_H(1) \end{cases}$$

and $s_H^* = 1 - \theta^* \in [0, \frac{\kappa_H}{2}]$.

The proof is straightforward, given that $\tilde{\theta}_1$ and $\tilde{\theta}_2$ are local minima –because of the convexity of the family manager's revenue technology–, and $\tilde{\theta}_3 < \tilde{\theta}_4 < \tilde{\theta}_5 = 1$ implies

training is a required input for the family manager production,

$$\upsilon_H(\theta; \upsilon_H, \rho) = \upsilon_H \theta^{\frac{1}{\rho}},$$

with $\rho > 0$ representing the family manager's ability to transform the knowledge transmitted and learnt into revenues, capturing the head's advantage in devoting the time to teaching the heir. Observe that this function is increasingly monotone ($\upsilon_H'(\theta) = \upsilon_H(\theta)/(\rho\theta) > 0$) and, since $\upsilon_H''(\theta) = (1-\rho)\upsilon_H(\theta)/(\rho\theta)^2$, it is convex if $\rho \in (0,1)$, linear if $\rho = 1$ and concave if $\rho > 1$. (Note that since $\theta \in [0,1]$, the training technology exhibits *increasing return-to-scale* provided $\rho > 1$ –i.e., $\upsilon_H(\lambda\theta) > \lambda\upsilon_H(\theta)$ for $\lambda \in (0,1)$–, while it exhibits *decreasing return-to-scale* in the case $\rho < 1$ –i.e., $\upsilon_H(\lambda\theta) < \lambda\upsilon_H(\theta)$ for $\lambda \in (0,1)$.)

A second parametrization refers to the case that the incumbent's training input is an externality in the family manager production: the heir could manage the firm without the incumbent's nurturing, since the firm's revenue solely depends on his own abilities. However, the time the incumbent spends on him (on the firm's culture, the firm-way-of-doing business, etc.) triggers his output. A functional form that represents this case is

$$\upsilon_H(\theta; A, \rho) = \upsilon_H e^{\rho\theta},$$

Since the heir is a manager "on his own" and the training time acts as an externality in his revenue function, the case $\rho = 0$ is the one studied in Section 4.1 for the non-family manager. Observe that if $\rho > 0$, the revenue function $\upsilon_H(\theta)$ is increasingly monotone ($\upsilon_H'(\theta) = \rho\upsilon_H(\theta) > 0$) and convex ($\upsilon_H''(\theta) = \rho^2\upsilon_H(\theta) > 0$). The case of a negative externality could also be studied. If $\rho < 0$ the time the incumbent devotes to training the heir "bothers" him and decreases this individual's revenue,i.e, i.e. $\upsilon_H'(\theta) < 0$.

$V^H(1) = \upsilon_H(1) - \beta\upsilon_F - \omega_H + \gamma_H B > V^H(\tilde{\theta}_4) > V^H(\tilde{\theta}_3)$ in (7) –because of the monotonicity of the revenue technology.

2.*ii*. Decreasingly effective training process: $\mu_H(\theta)$ 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 and carry out other tasks in the firm instead. Here, the family manager's honesty profile results crucial. For a less honest family manager –i.e. for a higher λ_H– the incumbent could find it beneficial to stop training the family manager and devote an additional unit of time to monitoring (instead of working), and then deprive her heir.

Here, we can identify two extreme cases in light of Figure 2. If the opportunity cost of training the manager remains low for high θ, then full training –i.e. $\theta^* = 1$– could be the case for a (relatively) honest heir. Alternatively, if the opportunity cost increases quickly and the family manager is not honest, then the heir optimally receives a minimum level of training to become productive –i.e., $\theta^* = \widetilde{\theta}_2(\lambda_H)$ (see Figure 2)–, 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 case are presented in the following result, proved in the Appendix.

Proposition 2. *Consider Assumption 1 and 2 are satisfied, and the training process exhibits decreasing returns-to-scale. The following is satisfied:*
(i) If $\tilde{\theta}_1 < 1$, *then the incumbent finds it optimal a level of training* $\theta^* = \tilde{\theta}_2(\lambda_H)$ *for each* $\lambda_H \leq 1/\mu_H(\breve{\theta})$, *a monitoring intensity* $s_H^* = \frac{\kappa_H}{2}\left[\lambda_H \mu_H(\tilde{\theta}_2(\lambda_H))\right]^2$, *and work at the firm* $n_H^* = 1 - s_H^* - \theta^* > 0$ *units of time.*
(ii) If $\tilde{\theta}_1 > 1$, *then the incumbent's optimal level of training* θ^* *is the same as in Proposition 1.*

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

4 The succession decision

In the previous section 3 we explored three scenarios: either the succession has been implemented and a new (family or a non-family) manager is in charge of the firm management, or succession has not been initiated yet. In this section, we analyze the incumbent's succession choice among these three options and identify the key conditions that play a role in this decision. Initially, we seek the conditions under which the incumbent hires a manager –either a non-family or family manager (Sections 4.1 and 4.2, respectively)– or, alternatively, keeps on running the firm. To analyze this decision, we compare the expected revenues by defining the function $\Delta E[V^{iF}]$ as the difference between the incumbent's expected welfare after hiring the manager i (i.e. $E[V^i]$ with $i = M$ or H), and the expected welfare upon retaining management (i.e. $E[V^F]$ in (2)). Finally, after assuming that both managers would eventually be hired, we analyze the choice between the family and non-family successor in Section 4.3 by defining the function $\Delta E[V^{MH}]$ as the difference between the expected welfare the incumbent obtains after hiring the family manager (i.e. $E[V^H]$ in (7)) and the non-family manager $E[V^M]$ in (6)). The optimal decision in each case relies in the combination of three elements: the relative performance between managers, the relative cost of monitoring and the relative costs other than appropriation.

4.1 Hiring a non-family manager or staying in charge

We begin by studying the conditions under which the incumbent hires a non-family manager Υ_M (Option 2.1 in Section 3.3) or, alternatively, keeps on running the firm (Option 1 in Section 3.1). In this case, the difference between the expected welfare functions $E[V^M]$ and $E[V^F]$ in (6) and (2), becomes

$$\Delta E[V^{MF}] = \upsilon_F \left[\mu_M - (\rho+\beta)\frac{\kappa_M}{2} \left(\min\left\{ \lambda_M \mu_M, 1, \left(\frac{2}{\kappa_M}\right)^{\frac{1}{2}} \right\} \right)^2 - \frac{\Omega_M}{\upsilon_F} \right], \tag{11}$$

where $\Omega_M = \omega_M + B(\gamma_F - \gamma_M)$ are the non-appropriation costs, i.e., the costs of hiring a manager other than private benefit deprivation.

Provided (11) is positive, the incumbent will hire the non-family manager. This decision will depend on the manager's characteristics Υ_M with respect those of the incumbent, Υ_F. In particular, we can distinguish among relative types of non-family managers in terms of two dimensions: relative performance and relative honesty. 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 (λ_M), i.e. the degree of appropriation relative to the cost of monitoring,[27] it will be useful to identify brands of managers to characterize the non-family-manager deprivation and monitoring frontiers.[28]

Definition 3. The (non-family manager) full-deprivation frontier. *If monitoring costs are not high, $\kappa_M < 2$, 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 4. The (non-family manager) full-monitoring frontier. *If monitoring costs are high, $\kappa_M \geq 2$, 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 $m_M^* = (2/\kappa_M)^{1/2}$.

These two frontiers allow us to distinguish two types of managers based on the monitoring and deprivation intensity: a non-family manager Υ_M is (**relatively**) **dishonest** provided he is fully monitored or fully deprived, $\lambda_M \geq \breve{\lambda}_M \equiv \min\{1, (2/\kappa_M)^{1/2}\}/\overline{\mu}_M$; otherwise, we will consider the manager to be (**relatively**) **honest** provided $\lambda_M \in [0, \breve{\lambda}_M)$.

The next result, proved in the Appendix, shows the conditions under which a non-family manager is hired or not. 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. Contrarily, under costly monitoring (i.e., $\kappa_M > 2$) the incumbent finds it optimal to spend all the time monitoring, unless the non-family manager is sufficiently honest. Figure 3 displays these cases and Table 2 summarizes the results.

THEOREM 1. ***Hiring a non-family manager.*** *Consider a family firm headed by an incumbent Υ_F, and let Υ_M be a non-family manager. Consider that Lemma 1.(i) is satisfied,*

[27] Our interpretation of the ratio λ_M in the subsequent analysis focuses on the honest features of the manager, ϕ_M. Thus, the interpretations of the results follow along the consideration that for a given monitoring cost κ_M, a manager with different honesty ϕ_M is more or less likely to be hired and/or monitored.

[28] Unlike the case of the family-manager (Definition 1), in this case we must distinguish two frontiers.

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

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

and let the honesty and performance thresholds be defined as: $\breve{\lambda}_M \equiv \min\{1, (2/\kappa_M)^{1/2}\}/\overline{\mu}_M$; $\underline{\mu}_M \equiv \Omega_M/\upsilon_F$; 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. $\lambda_M \geq \breve{\lambda}_M$), the incumbent finds full deprivation optimal, $m^*_M = 1$ so $s^*_M = \kappa_M/2$; otherwise, if the manager is relatively honest (i.e., $\lambda_M < \breve{\lambda}_M$), the incumbent does not fully monitor, $m^*_M = \mu_M\lambda_M < 1$. 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. $\lambda_M \geq \breve{\lambda}_M$), 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 monitors $m^*_M = \mu_M\lambda_M < (2/\kappa_M)^{1/2}$ and has available time to work/outside-of-the-firm activities (i.e. $n^*_M = 1 - s^*_M > 0$).*

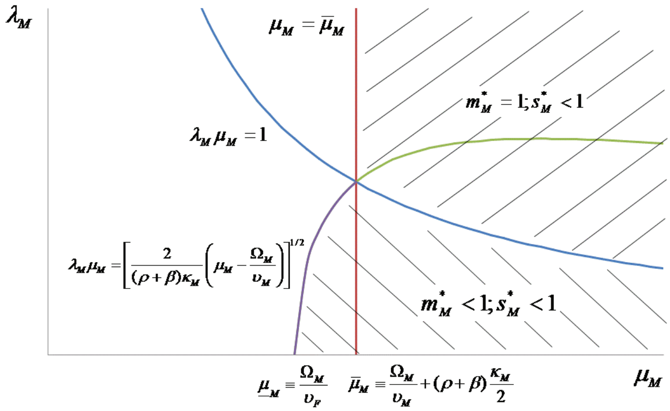
(iii) ***Hiring an average non-family manager ($\mu_M \in (\underline{\mu}_M, \overline{\mu}_M)$).*** *If the manager is sufficiently honest (i.e. $\lambda_M < \breve{\lambda}_M$) and*

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

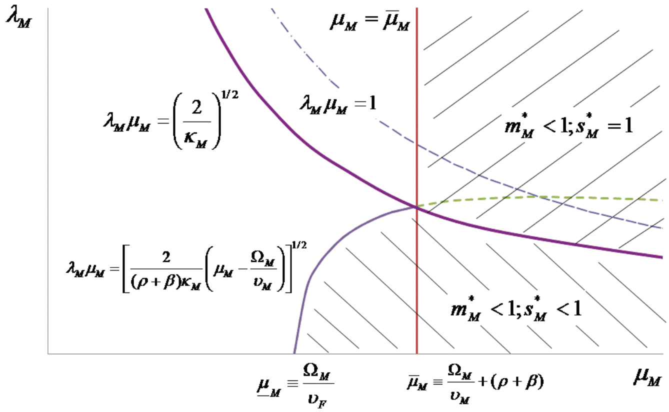
is satisfied, then the incumbent finds it optimal not to fully monitoring, $m^*_M = \mu_M\lambda_M < 1$, and has available time to work/outside-of-the-firm activities (i.e. $n^*_M = 1 - s^*_M > 0$).

4.1.1 Hiring different types of non-family managers: a discussion of Theorem 1. Theorem 1 is consistent with extensive empirical literature on non-family CEOs.[29] 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 (Klein et al 2007). These latter

[29]Numerous contributions in this field are anecdotal by nature, comprising personal experiences of family business owners, non-family executives and consultants, or these works simply report results from interviews without any clearly rooted leading question. See Klein et al (2007) for a survey.



(a) **Cases (i) and (iii). Hiring a non-family manager with $\kappa_M \leq 2$.** If the costs of monitoring are not high enough, the incumbent will always has available time to work/outside-of-the-firm activities, $n^* > 0$.



(b) **Case (ii) and (iii). Hiring a non-family manager with $\kappa_M \geq 2$.** If the costs of monitoring are high enough, the incumbent prefers to retire ($n^* = 0$) and monitors all her time ($s_M^* = 1$), unless the manager is honest enough.

Figure 3: **Theorem 1: Hiring a non-family manager Υ_M.**

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).

Next, we discuss the role of these aspects in terms of our characterization of the attributes of non-family candidates.

4.1.1.1. Character and integrity of the manager: an honest manager. We begin by exploring how the non-family manager's honesty profile increases his chances of getting hired. For a high degree of honesty, i.e. ϕ_M –and λ_M– tends to zero, a sufficient condition to hire an average manager ($\Delta E[V^{MF}] > 0$ in (11)) becomes $\mu_M > \underline{\mu}_M$. Thus, integrity is a vastly overrated virtue in family business that places 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 the case, for instance, of a truly honest manager that is less productive than the incumbent yet satisfying $\mu_M \in (\Omega_M/\upsilon_F, 1]$.

4.1.1.2. Personal and legal determinants of the monitoring cost. Theorem 1 shows that the cost of monitoring parameter (κ_M) plays a crucial role in the likelihood of hiring a non-family manager, regardless of whether monitoring is hindered by either the manager's (or the incumbent's) profile or the characteristics of the prevalent legal system. As aforementioned in Section 2.1.3, 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 Chua et al 2003) 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 this diminishes the prospects of hiring the non-family manager (see also Figure 3(a) as compared to Figure 3(b)).

The second interpretation of κ_M has to do with the characteristics of the monitoring technology, specifically 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 monitoring costs are high. For instance, this is the case whenever the legal protection of the owner's rights is low (see Song et al 2006). Interestingly, this prediction complements the results of Burkart et al's. While Burkart et al (2003, Corollary 1)[30] states the requirements for hiring a non-family manager depend on the legal protection of minority shareholders against the diversion

[30]In their setting, legal shareholder protection is modelled by assuming that law sets an upper bound on the fraction of revenues that can be diverted by the professional non-family manager; so the separation of ownership and management requires higher managerial skills in regimes with weaker legal regimes.

of profits by majority shareholders, Theorem 1 refers to the protection of the family firm owner from the non-family manager.

4.1.1.3. 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:[31] *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. $\upsilon_M < \upsilon_F$. The following Corollary provides a condition under which this outcome is feasible, a straightforward result from (11) satisfying $\Delta E[V^{MF}] > 0$ for $m_M^* = 1$, together with the manager exhibiting worse performance than the incumbent, $\mu_M < 1$.

COROLLARY 3. ***A necessary condition for underperforming succession.*** *An underperforming succession of a non-family manager is feasible if*

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

Interestingly, an underperforming succession is more likely the bigger υ_F is. 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 that is not "as good as" the (overwhelming) incumbent.[32] Underperformance may also arise as the costs of hiring a manager other than appropriation (Ω_M) decrease. Finally, a lower opportunity cost of monitoring the manager in terms of time resource and welfare ($\rho+\beta$) increases the likelihood of hiring a manager worse than the incumbent; that is, (a) the higher the probability of retirement (π); (b) the lower the incumbent's capacity to obtain utility from activities other than managing the firm (δ_F); and/or, (c) the disutility of monitoring and training activities (β).

4.2 Hiring a family manager or staying in charge

In this section, we study the conditions under which the incumbent hires a family manager Υ_H and commits himself to training the heir successor with an intensity θ^* (Option 2.2 in Sections 3.4) or, alternatively, keeps on running the firm (Option 1 in Section 3.1). In this case, the difference between the expected welfare functions $E[V^H(\theta^*)]$ and $E[V^F]$ in (7) and (2), becomes

[31] Some references on this topic are Villalonga et al (2006), Bennedsen et al (2007), Anderson et al (2009) or Isakov and Weisskopf (2014).

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

$$\Delta E\left[V^{HF}(\theta^*)\right] = \upsilon_F \left\{ \mu_H(\theta^*) - (\rho+\beta)\left[\frac{\kappa_H}{2}\left(\min\left\{\lambda_H\mu_H(\theta^*), 1, \left(\frac{2}{\kappa_H}(1-\theta^*)\right)^{\frac{1}{2}}\right\}\right)^2 + \theta^*\right] - \frac{\Omega_H}{\upsilon_F}\right\}, \tag{12}$$

where $\Omega_H = \omega_H + B(\gamma_F - \gamma_H)$ are the costs of hiring a family manager other than appropriation. The incumbent Υ_F will hire the family manager Υ_H provided that the optimal training intensity θ^* makes (12) positive.

Observe that once the incumbent chooses the optimal level of training θ^*, the family manager's relative productive revenue $\mu_H(\theta^*)$ becomes fixed; and the same intuitions for hiring a non-family manager (with an exogenous relative productive revenue) analyzed in Section 4.1 apply here with slight changes. Thus, we can 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 $\mu_H(\theta^*) > \overline{\mu}_H(\theta^*) \equiv (\Omega_H/\upsilon_F) + (\rho+\beta)\min\{1, (\kappa_H/2) + \theta^*\}$; and, a (**relatively**) **poor manager**, who will never be hired given that his performance cannot cover the non-appropriation costs, $\mu_H(\theta^*) < \underline{\mu}_H(\theta^*) \equiv \Omega_H/\upsilon_F + (\rho+\beta)\theta^*$. For an intermediate performance, $\mu_H(\theta^*) \in [\underline{\mu}_H(\theta^*), \overline{\mu}_H(\theta^*)]$, we identify a (**relatively**) **average manager**, whose prospects of getting the job will depend on his honesty dimension.[33]

Concerning relative honesty we can distinguished between two types of managers based on monitoring and deprivation intensity: a manager Υ_H is (**relatively**) **dishonest** provided the incumbent has to full monitor or full deprive him, $\lambda_H \geq \breve{\lambda}_H(\theta^*) \equiv \min\{1, [(1-\theta^*)2/\kappa_M]^{1/2}\}/\overline{\mu}_H(\theta^*)$; otherwise, provided $\lambda_H \in [0, \breve{\lambda}_H(\theta^*))$, we will consider the manager (**relatively**) **honest**. Observe that, differently from the non-family manager, the family manager's honesty is a relative concept that depends on the incumbent's optimal training effort θ^*. If the costs of monitoring are low ($\kappa_H < 2$), the threshold of honesty decreases steadily as optimal training increases in the range $\theta^* \leq \breve{\theta}$, beyond which is constant at $\breve{\lambda}_H(\theta^*) = 1/\overline{\mu}_H(\breve{\theta})$ for any $\theta^* > \breve{\theta}$ (see also Figure 2). If the costs of monitoring are high ($\kappa_H > 2$), the threshold of honesty decreases steadily as the optimal training increases θ^* up to $\breve{\lambda}_H(1) = 0$.

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

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

fact, the hiring region in Figure 3 is analogous for the family manager (after replacing μ_M by $\mu_H(\theta^*)$ and adapting the function for the hiring region for the average manager). The proof is straightforward after substituting the thresholds $\overline{\mu}_H(\theta^*)$ and $\underline{\mu}_H(\theta^*)$ in (12).

THEOREM 2. ***Hiring a family manager.*** *Consider a family firm headed by an incumbent Υ_F, and let Υ_H be a family manager who, if hired, will be optimally trained with θ^* units of the incumbent's time. Consider that Lemma 1.(i) is satisfied, and let the honesty and performance thresholds be defined as: $\breve{\lambda}_H(\theta^*) \equiv \min\{1, [(1-\theta^*)2/\kappa_M]^{1/2}\}/\overline{\mu}_H(\theta^*)$; $\underline{\mu}_H(\theta^*) \equiv \Omega_H/\upsilon_F + (\rho+\beta)\theta^*$; and, $\overline{\mu}_H(\theta^*) \equiv (\Omega_H/\upsilon_F) + (\rho+\beta)\min\{1, (\kappa_H/2) + \theta^*\}$. The conditions to hire a family manager are the following (otherwise, the family manager is not hired):*
(i) ***A (relatively) proficient family manager.*** *The family manager is hired if, and only if, $\mu_H(\theta^*) > \overline{\mu}_H(\theta^*)$ is satisfied;*
(ii) ***A (relatively) average family manager ($\mu_H(\theta^*) \in (\underline{\mu}_H(\theta^*), \overline{\mu}_H(\theta^*))$).*** *The family manager is hired if, and only if, he is relatively honest enough (i.e. $\lambda_H \leq \breve{\lambda}_H(\theta^*)$) and*

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

is satisfied.

4.2.1 Hiring different types of family managers: a discussion of Theorem 2. Given the optimal training θ^*, 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; that is, the incumbent forges the successor. Thus, the optimal joint training-hiring analysis would require overlapping the hiring decision in Figure 3 (for the family manager) and Figure 2 (characterizing the optimal training θ^* for every range of feasible parameters). This issue involves the great difficulty of providing definite patterns – such as in Theorem 1– concerning the incumbent's optimal training, monitoring and working levels together with the hiring decision, unless further characterizations are considered.[34] The only general result we can state are the following sufficient conditions to determine whether or not to hire the family manager (a straightforward consequence of Theorem 2 –see also Figure 3 adapted for the family manager–).

LEMMA 4. ***Sufficient conditions for hiring a family manager.***
• ***Hiring a non-trained, proficient family manager.*** *If $\mu_H(0) > \overline{\mu}_H(0)$, the family*

[34]For example, we can consider the following parameter characterization. In the case $\kappa_H < 2$ and both $\mu_H(\tilde{\theta}_3) = \Omega_H/\upsilon_H + (\rho+\beta)(\equiv \overline{\mu}_H(\tilde{\theta}_3))$ and $\mu_H(\tilde{\theta}_1) < \Omega_H/\upsilon_H$ are satisfied, then –as can easily be seen by overlapping Figures 2 and 3– the incumbent hires the family manager and does not work for the firm ($n^* = 0$) provided the optimal training is $\theta^* = \tilde{\theta}_3$, $\tilde{\theta}_4(\lambda_H)$ for $\lambda_H \leq \breve{\lambda}(\tilde{\theta}_3)$, or $\tilde{\theta}_5 = 1$. This is indeed the case for the increasingly-effective training process (see Proposition 1).

manager is always hired.
• ***Not hiring a full-trained, poor family manager.*** *If* $\mu_H(1) < \underline{\mu}_H(1)$*, he will never be hired.*

Other results for the optimal joint training-hiring analysis are very difficult to characterize. Thus, instead of providing general findings, we will focus 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. 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.[35] In this sense, this subsection identifies sufficient conditions to hire a particular type of family manager profile, and does not deal with the success or failure of each kind of candidate as a successor. All the results, stated as corollaries, are straightforward consequences of Theorem 2 and Propositions 1 and 2.

4.2.1.1. Character and integrity of the manager: an honest manager. We begin by exploring how the non-family manager's honesty profile increases his chances of getting hired. Concerning honesty, in a context of low monitoring cost (i.e. $\kappa_H < 2$), a well-characterized family manager breed is the "good child." In our framework this is a fully honest person who makes no profit diversion, i.e. $\Upsilon_H = (\Xi_H, \omega_H, 0, \kappa_H, \gamma_H)$, so this manager need not be monitored by the incumbent. Yet, the good child will be hired provided his revenue offsets the training and the non-appropriation costs as summarized by the following result.

Corollary 5. ***The "good-child": sufficient conditions for hiring.*** *Assume that the family manager is fully honest,* $\phi_H = 0$*.*
(i) ***A proficient good-child.*** *Consider the training process is increasingly effective, or it is decreasingly effective with* $\tilde{\theta}_1 \geq 1$ *satisfying Assumption 2. If* $\mu_H(1) \geq \underline{\mu}_H(1)$ *is satisfied, then the family manager is always hired and the incumbent finds it optimal to devote all the time to training activities, i.e.* $(m^*_H, \theta^*, n^*_H) = (0, 1, 0)$*.*
(ii) ***A (relatively) average good-child.*** *Consider the training process is decreasingly effective satisfying* $\tilde{\theta}_1 < 1$*. If* $\underline{\mu}_H(\tilde{\theta}_1) \leq \mu_H(\tilde{\theta}_1)$ *is satisfied, then the family manager is hired and the incumbent finds it optimal to train the family manager with an intensity* $\tilde{\theta}_2(0) = \tilde{\theta}_1$ *and to keep on working for the firm, i.e.* $(m^*_H, \theta^*, n^*_H) = (0, \tilde{\theta}_1, 1 - \tilde{\theta}_1)$*.*

[35] As an illustration, profiles such as the false prophet or the watchful waiter depicted by Handler (1994) do not fit within the framework presented in Section 2. The reason is that these profiles are characterized as a failed succession, a feature that cannot be considered in our full information setting.

An opposite breed, also well-characterized in the literature, is the so-called "rotten kid."[36] In our setting, this is a fully dishonest person with the highest profit diversion, i.e. $\Upsilon_H = (\Xi_H, \omega_H, 1, \kappa_H, \gamma_H)$. We obtain the following result for this profile. If hired, the rotten child will receive minimum training to provide positive resources for the firm owner, as summarized by the following result.

COROLLARY 6. ***The "rotten kid": sufficient conditions for hiring.*** *Assume that $\kappa_H < 2$, the family manager is fully dishonest ($\phi_H = 1$ –i.e. $\lambda_H = 1/[\kappa_H(\rho+\beta)] \equiv \lambda_H^{max}$–), and the training process is increasingly effective, or decreasingly effective with $\tilde{\theta}_1 \geq 1$, satisfying Assumption 2.*
(i) ***Relatively dishonest rotten kid.*** *If $\lambda_H^{max} > 1/\mu_H(\breve{\theta})$ and $\mu_H(\tilde{\theta}_3) \geq \overline{\mu}_H(\tilde{\theta}_3)$ are satisfied, then the family manager is hired and the incumbent finds it optimal to retire and devote all time resources to fully deprive and train the family manager with an intensity $\tilde{\theta}_3$, i.e. $(m_H^*, \theta^*, n_H^*) = (1, \tilde{\theta}_3, 0)$;*[37] *and,*
(ii) ***Relatively honest rotten kid.*** *If $\lambda_H^{max} \leq 1/\mu_H(\breve{\theta})$ and $\mu_H(\tilde{\theta}_4(\lambda_H^{max})) \geq \overline{\mu}_H(\tilde{\theta}_4(\lambda_H^{max}))$ are satisfied, then the incumbent finds it optimal to train the family manager with an intensity $\tilde{\theta}_4(\lambda_H^{max})$, fully retire*[38] *and not fully deprive him, i.e. $(m_H^*, \theta^*, n_H^*) = (\lambda_H \mu_H(\tilde{\theta}_4(\lambda_H^{max}))$, $\tilde{\theta}_4(\lambda_H^{max}), 0)$.*

4.2.1.2. Personal and legal determinants of the monitoring cost The proceeding analysis and interpretation have been developed along the lines of a constant monitoring cost κ_H. We can also explore the incumbent's training-hiring decision for different values for this parameter. As noted in Section 2.1.3, 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 given in Section 4.1.1.2. for the non-family manager, so we will focus on the former interpretation.

If the cost of monitoring is negligible ($\kappa_H = 0$) –for instance, because of the mutual knowledge of the incumbent and the successor–, we have two particular breeds of "trusted family managers," depending on the characteristics of the effectiveness of the training process. The following result is straightforward from the concavity profile of the family manager's revenue technology (Propositions 1 and 2).[39]

[36]The term is borrowed from Becker (1981) and refers to the characteristics of the interaction between a selfish child and an altruistic parent. In our context it simply refers to a selfish successor.

[37]*Observe that if $\kappa_H > 2$, full monitoring is the optimal decision, so no training or working activities are carried out, $(m_H^*, \theta^*, n_H^*) = ((2/\kappa_H)^{1/2}, 0, 0)$. If the rotten kid requires some learning for the job (i.e., $v_H(0) = 0$), then he will not be hired.*

[38]*Recall that the training intensity $\tilde{\theta}_4(\lambda_H^{max})$ falls on the no-working frontier.*

[39]We must recall that, as mentioned in Section 3.4.1, if $\kappa_H = 0$ then only $\tilde{\theta}_1$ and $\tilde{\theta}_5$ are candidates to

Corollary 7. ***The "trustworthy child": sufficient conditions for hiring.*** *Assume that* $\kappa_H = 0$.

(1) ***The "easy-to-see in his eyes"child.*** *Consider the training process is increasingly effective, or it is decreasingly effective with* $\tilde{\theta}_1 \geq 1$. *If* $\mu_H(1) \geq \underline{\mu}_H(1)$, *then the family manager is always hired and the incumbent finds it optimal to retire and fully train the family manager, i.e.* $(m_H^*, \theta^*, n_H^*) = (0, 1, 0)$.

(2) ***The loyal servant.*** *Consider the training process is decreasingly effective with* $\tilde{\theta}_1 < 1$. *If* $\mu_H(\tilde{\theta}_1) > \overline{\mu}_H(\tilde{\theta}_1)$, *then the family manager is hired and the incumbent finds it optimal to train the family manager with intensity* $\theta^* = \tilde{\theta}_1$, *i.e.* $(m_H^*, \theta^*, n_H^*) = (0, \tilde{\theta}_1, 1 - \tilde{\theta}_1)$.

The "loyal servant" profile, first characterized by Levinson (1974, p.59) and also depicted in Handler (1994, p. 139), is a well-known case of *ex-post* failed intra-family succession. In our model the characterizations of candidates have an *ex-ante* meaning, and this one accounts for a reliable helper, but too poorly trained to fully replace the incumbent.

Alternatively, if the incumbent finds it extremely costly to monitor the family manager –i.e. $\kappa_H = +\infty$ or $\lambda_H = 0$– is similar in the case of an honest family manager (i.e., $\phi_H = 0$). Here, we can characterize a particular breed of family manager, who may be called the smuggler child. This is a manager whose diversion of resources is nearly undetectable ($\kappa_H = +\infty$) and whose training process additionally exhibits decreasing returns-to-scale. 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 lowest, $\tilde{\theta}_2(0) = \tilde{\theta}_1$. We state this finding in the following result, a straightforward result from Proposition 2.(i).

Corollary 8. ***The "smuggler child": sufficient conditions for hiring.*** *Assume that* $\kappa_H = +\infty$. *If the training process is decreasingly effective with* $\tilde{\theta}_1 < 1$ *and* $\mu_H(\tilde{\theta}_1) > \underline{\mu}_H(\tilde{\theta}_1)$, *then the incumbent finds it optimal to train the family manager at an intensity* $\theta^* = \tilde{\theta}_2(0) = \tilde{\theta}_1$ *and give up monitoring, i.e.* $(m_H^*, \theta^*, n_H^*) = (0, \tilde{\theta}_1, 1 - \tilde{\theta}_1)$.

4.2.1.3. The competence and ability of the manager: underperforming succession. Similar to the case of the non-family manager, underperforming succession can also take place in intra-family succession.

Corollary 9. ***A necessary condition for underperforming succession.*** *An underperforming succession of a family manager is feasible if*

$$(\rho + \beta) \min\left\{1, \frac{\kappa_H}{2} + \theta^*\right\} + \frac{\Omega_H}{\upsilon_F} < 1.$$

optimal training and the positive-wage condition in (5) is always satisfied.

The proof is straightforward from $\Delta E[V^{HF}] > 0$ in (12) for $m_H^* = 1$, and the family manager exhibits worse performance than the incumbent $\mu_H(\theta^*) < 1$. 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 ($\rho + \beta$). Analogously to the case of the non-family manager (Section 4.1.1.3.), 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 this is due to a high υ_F. In addition, it is interesting to point out that underperforming succession becomes more likely as the cost of monitoring (κ_H) falls. Here, the alignment of ownership and management within the family is a commonly cited reason for reducing monitoring costs in the agency literature on family business, and a leading theoretical explanation for the distinctiveness of family firms (e.g., see Chrisman et al 2005).

4.2.1.4. Family manager outside option A distinctive feature of a family candidate is his opportunity cost or outside option (ω_H). As opposed to the case of the non-family manager, whose relatively high opportunity cost is considered indicative of professional quality, in the case of intra-family succession this parameter 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 or, in other words, his availability to work at the family firm. 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. Next, we explore a number of profiles of potential heirs based on their outside opportunity.

4.*i*. A family manager with a high outside option ($\omega_H >> 0$). A high outside option actually comprises two opposite meanings, and therefore characterizes two candidate profiles: "talented successor" and "spoiled" child. The intuition of these profiles, and the incumbent's corresponding decision, can be outlined within our framework as follows. The talented family manager is a highly-educated and qualified professional manager inside the family circle capable of achieve a high performance in the family firm. The incumbent finds it optimal to fully train this proficient successor ($\theta^* = 1$) 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 equivalent to a proficient good-child exhibiting an increasingly effective training process (see Corollary 5.(i)).

In contrast, the second profile is characterized by a poor performance and can be specified in terms of a "spoiled" child: a person under the influence of the "disincentive effects caused by abundant wealth" (Pérez-González 2006, p. 1561).[40] If this heir is considered a potential successor, he is monitored by the (partially retired) incumbent and exhibits good enough quality as a manager (intrinsically good, i.e. a high $\mu_H(\tilde{\theta}_2)$ because in this profile the training process is decreasingly effective). The conditions for hiring these types of family candidate profiles are summarized as follows.

COROLLARY 10. ***Hiring a family manager with high opportunity cost*** *($\omega_H >> 0$)**: sufficient conditions.*** *Consider a family manager is endowed with a high outside option ω_H, so that $\omega_H > \upsilon_H(1)\phi_H$ (i.e., the wage is always positive in (5), $w^* \geq 0$).*
(1) ***The talented family manager.*** *Assume that the training process is increasingly effective, or it is decreasingly effective with $\tilde{\theta}_1 > 1$ satisfying Assumption 2. If $\mu(1) \geq \overline{\mu}_H(1)$ then the family manager is always hired and the incumbent finds it optimal to fully train the family manager $\theta^* = 1$, i.e. $(m_H^*, \theta^*, n_H^*) = (0, 1, 0)$.*
(2) ***The spoiled child.*** *Assume Assumption 1 and 2 and the training process is decreasingly effective with $\tilde{\theta}_1 \leq 1$ satisfying Assumption 2. If $\mu_H(\tilde{\theta}_2(\lambda_H)) > (\Omega_H/\upsilon_F) + (\rho+\beta)\{\tilde{\theta}_2(\lambda_H) + \frac{\kappa_H}{2}[\lambda_H \mu_H(\tilde{\theta}_2(\lambda_H))]^2\}$, then the incumbent hires the family manager with an optimal training $\theta^* = \tilde{\theta}_2(\lambda_H)$ and keeps on monitoring and working at the firm, i.e. $(m_H^*, \theta^*, n_H^*) = (\frac{\kappa_H}{2}[\lambda_H \mu_H(\tilde{\theta}_2(\lambda_H))]^2, \tilde{\theta}_2(\lambda_H), 1 - \frac{\kappa_H}{2}[\lambda_H \mu_H(\tilde{\theta}_2(\lambda_H))]^2 - \tilde{\theta}_2(\lambda_H))$.*

4.*ii*. A family manager with no outside option ($\omega_H = 0$). The extreme situation –i.e., a family manager with no opportunity cost $\omega_H = 0$– can also be interpreted along two opposite profiles. The first one refers to a family manager with no outside option either because he feels "predestined" or 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 culture. Within our framework, the predestined successor is a family member that has been trained while working at the firm for a life-time, a nurture represented by an increasingly productive training process, and that makes full retirement optimal for the incumbent. The second profile is a family manager with no working options at all outside the family firm. This could be coined as no-penny-to-his-name successor. Noticeably, within our setting this profile is very similar to the case of the aforementioned *spoiled child*.

Interestingly, 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 (5) entails that the optimal wage rate offer is $w_H^* = 0$.

[40]This is the Carnegie conjecture, i.e. large inheritances decrease an individual's labor participation, empirically analyzed by Holtz-Eakin et al (1993). The term "*spoiled*" *child* is borrowed from Kets de Vries (1993, p. 64).

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 a key role in the incumbent's optimal decisions.

COROLLARY 11. ***Hiring a family manager with no opportunity cost*** ($\omega_H = 0$)***.*** *Consider a family manager with no outside option with* $\kappa_H < 2$.[41]
(1) ***The predestined successor.*** *Consider that the training process is increasingly effective, or it is decreasingly effective with* $\tilde{\theta}_1 > 1$ *satisfying Assumption 2. If* $\mu(\tilde{\theta}_3) \geq \overline{\mu}_H(\tilde{\theta}_3)$ *then the family manager is always hired and the incumbent finds it optimal to retire. In the case that* $\lambda_H > 0$*, the incumbent fully deprives the successor and trains him with an intensity*

$$\theta^* = \begin{cases} \tilde{\theta}_3 & \text{if } \lambda_H > 0 \\ 1 & \text{if } \lambda_H = 0 \end{cases},$$

so $(m_H^*, \theta^*, n_H^*) = (1, \tilde{\theta}_3, 0)$*; otherwise, in the case that* $\lambda_H = 0$*, then* $(m_H^*, \theta^*, n_H^*) = (0, 1, 0)$*.*
(2) ***The no-penny-to-his-name successor.*** *If the training process is decreasingly effective with* $\tilde{\theta}_1 \leq 1$ *satisfying Assumption 2. Then, for each* $\lambda_H \in (0, 1/\mu_H(\breve{\theta})]$ *the incumbent finds full deprivation optimal, a level of training* $\tilde{\theta}_2(\lambda)$*, and works at the firm, so* $(m_H^*, \theta^*, n_H^*) = (1, \tilde{\theta}_2(\lambda_H), 1 - (\kappa_H/2) - \tilde{\theta}_2(\lambda_H))$*.*

The proof of Corollary 11 deserves a comment. The manager participation constraint in this particular case of no outside opportunity –i.e., (5) for $\omega_H = 0$–, requires that $m_H^* = 1$ in the expected objective function (7). If a positive constraint on (5) has not exist and the family manager is relatively honest ($\lambda_H < 1/\mu_H(\breve{\theta})$, the incumbent would have find it optimal a lower deprivation intensity and a higher level of training if the process is increasingly effective (as in Corollary 11.(1)) or, alternatively, a lower training intensity if the training process is decreasingly effective (as in Corollary 11.(2)). Yet, lower deprivation entails a negative wage and the family manager will not accept the incumbent's offer at date 1. Then, for this boundary case, it is optimal for the incumbent to maintain the level of deprivation to guarantee that the manager will work for the firm.

4.*iii*. Family culture: A family manager with no outside option ($\omega_H = 0$) and no potential amenity loss ($\gamma_H = \gamma_F$). An interesting case is that of a high family culture or tradition in the family business. In our model, this would be a situation in which (i) the incumbent does not perceive any amenity potential loss when the management remains inside the family (i.e. $\gamma_H = \gamma_F$); and, simultaneously, (ii) the family manager profile corresponds to one such that the training process is increasingly effective, or it is decreasingly

[41] *If* $\kappa_H > 2$ *full deprivation is not possible, so the incumbent cannot offer the family manager a wage contract with non-negative wage.*

effective with $\tilde{\theta}_1 > 1$. Under these conditions the family manager will be hired only if he offsets the costs of training and monitoring, as the following result shows.

Corollary 12. ***A high family culture or tradition in the family business***. *Consider the case that $\gamma_H = \gamma_F$ and $\omega_H = 0$ (i.e., $\Omega_H = 0$). The family manager is hired if $\mu_H(\theta^*) > (\rho + \beta)$.*

The proof follows straightforwardly from (12) and Corollary 11. It is interesting to note that in family businesses with a high family culture, the quality required to be hired is lower and an underperforming succession becomes more likely.

4.2.1.5. 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 Amoak 1999). This is the case of a non-family professional who works at the firm prior to the retirement of the incumbent and is promoted to the top position. This candidate could also experience a learning 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 (7)

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

and the analysis for this insider goes along the same lines previously described in this Section 4.2 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" for the incumbent who, in a close day-to-day relationship, has forged a personal link between them. In other situations, the incumbent simply tries the option of preparing a qualified employee to become the successor, simply because there may not be any other feasible alternative within the family.

4.3 Choosing between potential successor managers

The incumbent must decide on a successor whenever non-family and family manager are both relatively better than the incumbent is, i.e., (11) and (12) are both positive. To analyze this decision, we compare the revenues under both candidates by defining the function $\Delta E\left[V^{HM}(\theta^*)\right]$ as the difference between the expected welfare functions $E[V^H(\theta^*)]$ and $E[V^M]$ in (7) and (6); that is,

$$\Delta E\left[V^{HM}(\theta^*)\right] = \upsilon_F \left\{ [\mu_H(\theta^*) - \mu_M] - (\rho+\beta)\left[\frac{\kappa_H}{2}\Big(m_H^*(T_H(\theta^*))\Big)^2 - \frac{\kappa_M}{2}\Big(m_M^*(T_M)\Big)^2 + \theta^*\right] - \frac{\Omega_H - \Omega_M}{\upsilon_F} \right\} \tag{13}$$

The incumbent will hire the family manager provided (13) is positive; otherwise, the incumbent will hire the non-family manager.

Next, we present a general result for 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 there will be a preference for the family over the non-family manager. Recall that the upper thresholds $\overline{\mu}_M$ and $\overline{\mu}_H(\theta^*)$, defined in Sections 4.1 and 4.2, 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 $\overline{\mu}_H(\theta^*) \equiv (\Omega_H/\upsilon_F) + (\rho+\beta)\min\{1, (\kappa_H/2) + \theta^*\}$). Thus, a proficient family manager will indeed be chosen if $\mu_H(\theta^*) - \overline{\mu}_H(\theta^*) > \mu_M - \overline{\mu}_M$; 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 $\overline{\mu}_M$, $\underline{\mu}_M$, $\overline{\mu}_H(\theta^*)$, $\underline{\mu}_H(\theta^*)$ in (13).

Theorem 3. ***Hiring a successor.*** *Consider a family firm headed by an incumbent Υ_F that must choose between a non-family manager Υ_M and a family manager Υ_H who, if hired, will be optimally trained with θ^* units of the incumbent's time. Let the relative performance thresholds be defined as $\underline{\underline{\mu}}_H(\theta^*) \equiv \underline{\mu}_H(\theta^*) + [\mu_M - \underline{\mu}_M]$ and $\overline{\overline{\mu}}_H(\theta^*) \equiv \overline{\mu}_H(\theta^*) + [\mu_M - \overline{\mu}_M]$. The conditions for hiring a family manager are the following (otherwise, the non-family manager becomes the successor):*
(i) ***A (relatively) proficient family manager ($\mu_H(\theta^*) > \overline{\mu}_H(\theta^*)$).*** *If $\mu_H(\theta^*) > \overline{\overline{\mu}}_H(\theta^*)$ the family manager is chosen as the successor.*
(ii) ***A (relatively) average family manager ($\mu_H(\theta^*) \in (\underline{\mu}_H(\theta^*), \overline{\mu}_H(\theta^*))$).*** *If $\mu_H(\theta^*) \in \left[\underline{\underline{\mu}}_H(\theta^*), \overline{\overline{\mu}}_H(\theta^*)\right]$ the family manager becomes the successor if, and only if*

$$(\rho+\beta)\left[\frac{\kappa_H}{2}[\lambda_H \mu_H(\theta^*)]^2 - \frac{\kappa_M}{2}[\lambda_M \mu_M]^2\right] < \mu_H(\theta^*) - \underline{\underline{\mu}}_H(\theta^*). \tag{14}$$

To understand Theorem 3 we can decompose the expected welfare function (13) for a given training intensity θ^* into three key components of the incumbent's succession decision in terms of the existing differences between the candidates: (*i*) the *relative quality* of the managers, expressed in terms of their capacity to generate revenues to the firm, i.e., $\Delta\mu_{HM}(\theta^*) \equiv \mu_H(\theta^*) - \mu_M$; (*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. $\Delta m_{HM}(\theta^*) \equiv (\rho+\beta)\{(\kappa_H/2)[m_H^*(1-\theta^*)]^2 - (\kappa_M/2)[m_M^*(1)]^2\}$; and (*iii*) their *relative non-appropriation costs*, encompassing the amenity loss and the outside option associated to each kind of candidate, i.e., $\Delta\underline{\mu}_{HM}(\theta^*) \equiv \underline{\mu}_H(\theta^*) - \underline{\mu}_M \equiv (\rho+\beta)\theta^* + (\Omega_H - \Omega_M)/\upsilon_F$. Then (13) can be represented as

$$\Delta E\left[V^{HM}(\theta^*)\right] = \Delta\mu_{HM}(\theta^*) - \Delta m_{HM}(\theta^*) - \Delta\underline{\mu}_{HM}(\theta^*). \tag{15}$$

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 Agraval et al 2006) or, in other words, the family manager could be chosen even if he is not the best feasible candidate (see Pérez-González 2006). In our model, a positive difference of (relative) monitoring costs (i.e. $\Delta m_{HM}(\theta^*) > 0$) and/or a positive difference of (relative) non-appropriation costs (i.e. $\Omega_H - \Omega_M > 0$) are necessary conditions for hiring a less qualified family manager (i.e. $\Delta E\left[V^{HM}(\theta^*)\right] > 0$ with $\Delta\mu_{HM}(\theta^*) < 0$). The following result, which is also discussed in the next subsection for specific candidate profiles, systematizes the possibility.

Lemma 13. ***Choosing a less qualified successor.*** *A (relatively) less proficient family manager, i.e.* $\Delta\mu_{HM}(\theta^*) \equiv \mu_H(\theta^*) - \mu_M < 0$, *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* $\Delta m_{HM}(\theta^*) < 0$ *with* $-\Delta m_{HM}(\theta^*) > -[\Delta\mu_{HM}(\theta^*) - \Delta\underline{\mu}_{HM}(\theta^*)]$.
(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* $\Delta\underline{\mu}_{HM}(\theta^*) < 0$ *with* $-\Delta\underline{\mu}_{HM}(\theta^*) > -[\Delta\mu_{HM}(\theta^*) - \Delta m_{HM}(\theta^*)]$.

The discussion of Theorem 3 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; that is, whether the incumbent finds it optimal to fully or partially retire once a successor has been chosen. For this purpose, (13) can be also represented as

$$\Delta E\left[V^{HM}(\theta^*)\right] = \upsilon_F\left\{[\mu_H(\theta^*) - \mu_M] - (\rho+\beta)(n_M^* - n_H^*) - \frac{\Omega_H - \Omega_M}{\upsilon_F}\right\}$$

with the second element inside the brackets, $n_M^* - n_H^*$, representing the difference between the incumbent's optimal working decision at each succession option. The following result summarizes the feasible situations in terms of this "level of retirement" of the incumbent:

Lemma 14. ***The incumbent's reluctance to step aside.***
(i) If the incumbent chooses between two potential successors that are identical in terms of quality and non-appropriation costs, then she prefers the succession choice that results in a higher level of optimal working decision.
(ii) If the incumbent chooses between two potential successors that entails the same optimal working decision ($n_M^* = n_H^*$), then the family manager will be chosen in the case $\mu_H(\theta^*) - \mu_M > (\Omega_H - \Omega_M)/\upsilon_F$ is satisfied.

The intuition here is that if the candidates are roughly the same, the incumbent prefers working more hours –and monitoring less– to working fewer (or even zero) hours –and monitoring more–, because working more results in a higher firm's revenue. As a consequence, the incumbent prefers a succession option entailing partial retirement –or, more working hours– over one entailing full retirement. Interestingly, this preference for a higher implication in the management activities can help us to understand one of the most cited barriers to an effective succession: the incumbent's reluctance to step aside.[42] 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.

4.3.1 Hiring different types of managers: a discussion of Theorem 3. Next, we briefly discuss the role of our characterization of the attributes of both family and non-family candidates. Initially, it is reasonable to assume that the incumbent finds it easier to monitor a family member than a non-family manager, so $\kappa_H < \kappa_M$. Other characteristics, such as honesty (ϕ_i) and the outside option (ω_i) depend specifically on the type of manager. All results, stated as corollaries, are straightforward consequences of Theorems 1-3, Propositions 1-2 and previous results in Sections 4.1.1 and 4.2.1. Due to the fact that incumbents in family firms tend to be succeeded by their heirs, we biased our results to present conditions for choosing the family manager as the successor. We explore the incumbent's succession decision to find a positive value in (15) by comparing family and non-family manager profiles according to the different combinations of their relative productive quality ($\Delta\mu_{HF}(\theta^*)$), their relative cost of monitoring ($\Delta m_{HF}(\theta^*)$) and their relative non-appropriation costs ($\Delta\underline{\mu}_{HF}(\theta^*)$).

4.3.1.1. Character and integrity of the manager: an honest manager. Comparing candidates in terms of honesty mainly affects the relative cost of monitoring ($\Delta m_{HF}(\theta^*)$). 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 of the family manager (either in productivity or honesty) as the honesty of the non-family manager

[42]See the literature mentioned in subsection 3.1.

increases, and vice versa. The key to choosing the family heir is the relative high cost of monitoring the non-family manager, i.e. $\Delta m_{HF}(\theta^*) < 0$.

Corollary 15. ***Family manager's proficiency vs. non-family manager's honesty.***
(i) ***A (relatively) dishonest non-family manager.*** *If $\lambda_M \geq \check{\lambda}_M$ and $\mu_H(\theta^*) > \underline{\underline{\mu}}_H(\theta^*)$ (i.e., $\Delta\mu_{HF}(\theta^*) > \Delta\underline{\mu}_{HF}(\theta^*)$), then the family manager is chosen as the successor.*
(ii) ***A (relatively) honest non-family manager.*** *If $\lambda_M < \check{\lambda}_M$ and $\mu_H(\theta^*) > \overline{\overline{\mu}}_H(\theta^*)$, then a* proficient *family manager is chosen as the successor. An* average *family manager becomes the successor if $m^*_H(\theta^*) < \lambda_M\mu_M$ (i.e., $-\Delta m_{HF}(\theta^*) > 0$) is additionally satisfied.*

Concerning the two extreme cases depicted as regards the honesty of the family manager (see Section 4.2.1.1.), the good child and the rotten kid, we can write the following results. First, a good child will be always chosen as a successor unless (14) is not satisfied; that is, in the case the non-family manager is whether remarkably more productive (i.e., $\Delta\mu_{HM}(1) << 0$) or the family manager's opportunity cost is remarkably much higher (i.e., $\omega_H >> \omega_M$, so that $\Delta\underline{\mu}_{HM}(1) >> 0$).

Corollary 16. ***Good child vs. non-family manager.*** *Consider the family manager's profile in Corollary 5. If $\mu_H(1) > \underline{\underline{\mu}}_H(1)$ (i.e., $\Delta\mu_{HF}(1) > \Delta\underline{\mu}_{HF}(1)$), then the* good child *is always chosen as the successor. Moreover, a* good child *is always chosen as the successor unless*

$$-(\rho+\beta)(m^*_M)^2 > \mu_H(1) - \underline{\underline{\mu}}_H(1) \left[= \Delta\mu_{HF}(1) - \Delta\underline{\mu}_{HF}(1)\right].$$

Second, a rotten kid will be chosen as a successor provided he is remarkably more productive or the non-appropriation costs are remarkably lower. The result is a straightforward result from Corollary 6 and Theorem 3.

Corollary 17. ***Rotten kid vs. non-family manager.*** *Consider the family manager's profile in Corollary 6. A* rotten child *is chosen as a successor under the following conditions:*
(i) ***Relatively dishonest rotten kid.*** *If $\lambda_H^{max} > 1/\mu_H(\tilde{\theta}_3)$ and $\mu_H(\tilde{\theta}_3) \geq \overline{\overline{\mu}}_H(\tilde{\theta}_3)$ (i.e., $\Delta\mu_{HF}(\tilde{\theta}_3) - \Delta\underline{\mu}_{HF}(\tilde{\theta}_3) \geq \Delta m_{HF}(\tilde{\theta}_3)$), then the family manager is chosen as the successor; and,*
(ii) ***Relatively honest rotten kid.*** *If $\lambda_H^{max} \leq 1/\mu_H(\tilde{\theta}_3)$ and $\mu_H(\tilde{\theta}_4(\lambda_H^{max})) \geq \overline{\overline{\mu}}_H(\tilde{\theta}_4(\lambda_H^{max}))$ (i.e., $\Delta\mu_{HF}(\tilde{\theta}_4(\lambda_H^{max}) - \Delta\underline{\mu}_{HF}(\tilde{\theta}_4(\lambda_H^{max}) \geq \Delta m_{HF}(\tilde{\theta}_4(\lambda_H^{max}))$), then the family manager is chosen as the successor.*

Note that, because $V^H(\tilde{\theta}_4(\lambda)) > V^H(\tilde{\theta}_3)$ for any $\lambda < 1/\overline{\mu}_H(\theta^*)$, the family candidate must be more productive not only as the non-family manager's honesty increases (as in Corollary 15), but also when it is not feasible to fully deprive the family candidate (i.e., the lower λ_H^{max} is).

4.3.1.2. Personal and legal determinants of monitoring costs Another commonly claimed feature of family firms is that monitoring costs are lower than they are with relatives than with outsiders because of mutual knowledge, faster communication and social interaction. This affects the size of the relative monitoring cost ($\Delta m_{HF}(\theta^*)$). For optimal values of monitoring and training, a positive difference in (15) (i.e. $\Delta E\left[V^{HM}(\theta^*)\right] > 0$) is more feasible as the difference between κ_M and κ_H increases. That is, it increases whenever the incumbent finds it more costly to supervise the non-family manager than the family manager. More specifically, as already noted in Lemma 13, when monitoring the non-family manager is more costly than monitoring the family manager ($-\Delta m_{HM}(\theta^*) > 0$), the family manager is indeed hired if the relative productive quality is higher than the relative non-appropriation costs: $\Delta\mu_{HM}(\theta^*) > \Delta\underline{\mu}_{HM}(\theta^*)$.

Concerning the extreme cases depicted in terms of the cost of monitoring (see Section 4.2.1.2.), we can write the following results. The conditions for choosing the easy-to-see-in-his-eyes child (i.e., $\kappa_H = 0$ together with an increasingly effective training process) are similar to those described in Corollary 16 for the good child. The next result presents the condition for choosing either the loyal servant or the smuggler child as the successor, both cases for which no-monitoring is optimal (i.e., $m_H^* = 0$ and then $\Delta m_{HF} < 0$).

COROLLARY 18. ***The loyal servant and smuggler child vs. non-family manager.*** *Consider the training process is decreasingly effective with $\tilde{\theta}_1 < 1$ and $\mu_H(\tilde{\theta}_1) > \overline{\mu}_H(\tilde{\theta}_1)$ with $\kappa_H = 0$ (Corollary 7.2) or $\kappa_H = +\infty$ (Corollary 8). If $\mu_H(\tilde{\theta}_1) > \underline{\mu}_H(\tilde{\theta}_1)$ (i.e. $\Delta\mu_{HM}(\tilde{\theta}_1) > \Delta\underline{\mu}_{HM}(\tilde{\theta}_1)$), then the family manager is chosen as the successor.*

4.3.1.3. 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 4.1.1.3. and 4.2.1.3.). Next, we compare the quality of both managers using the analysis presented in Lemma 13, that establishes the conditions for hiring a less qualified successor. Since $\overline{\mu}_H(\theta^*) - \overline{\mu}_M \geq max\{\Delta m_{HM}(\theta^*) + \Delta\underline{\mu}_{HM}(\theta^*)\}$ after substituting the definitions of the thresholds, then a proficient family manager will be hired provided $\Delta\mu_{HM}(\theta^*) > \overline{\mu}_H(\theta^*) - \overline{\mu}_M$ (Theorem 3.(i)). Such a condition (i.e., $\mu_H(\theta^*) - \overline{\mu}_H(\theta^*) > \mu_M - \overline{\mu}_M$) 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 ($\mu_H(\theta^*) - \overline{\mu}_H(\theta^*) > 0$).

4.3.1.4. Opportunity costs Comparing candidates in terms of their opportunity cost mainly affects the relative non-appropriation costs ($\Delta\underline{\mu}_{HF}(\theta^*)$). Lemma 13.($ii$) 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 to become 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 preferable, regardless of the quality of both candidates.

Lemma 19. ***High enough amenity loss.*** *There is always a threshold* $\underline{B} \equiv [\omega_H - \omega_M]/\upsilon_F + [\mu_M - \mu_H(\theta^*)] + (\rho+\beta)[n^*_M - n^*_H(\theta^*)]$ *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.*

We can state the following results in terms of the characterizations concerning opportunity cost (see Section 4.2.1.4.). The conditions for choosing the talented family manager and the fully-honest predestined manager (i.e. $\phi_H = 0$) are similar to those described in Corollary 16 for the good child, while the conditions for choosing the spoiled kid, the no-penny-to-his-name successor and the not-so-honest predestined manager (i.e. $\phi_H > 0$) are analogous to those described in Corollary 17 for the rotten kid. Obviously, the spoiled kid could be a feasible candidate if amenity loss is big enough (see Lemma 19).

Finally, we focus on the conditions for choosing a family member as a successor under a particular environment within the family firm: the existence of a high family culture or tradition.

Corollary 20. ***A high family culture or tradition in the family business.*** *Consider the case that* $\gamma_H = \gamma_F$ *and* $\omega_H = 0$ *(i.e.,* $\Omega_H = 0$*). The family manager is chosen as the successor if* $\mu_H(\theta^*) - (\rho + \beta) > \mu_M - \bar{\mu}_M$ *with* m^*_H *and* θ^* *determined in Corollary 11.*

This result implies that the family manager is always hired when the non-family candidate is an average manager (i.e. the right-hand side of the inequality is non-positive) and, even if the non-family manager is a proficient manager, the family manager is chosen as the successor if his revenue technology net of the costs of training is big enough in relation to the "degree of proficiency" of the non-family candidate.

5 An extension: an altruistic incumbent

Altruism, as a typical feature of the incumbent's preferences and motivations, is an element that is deeply rooted in the literature on family firm decision-making.[43] Altruism, however, is almost absent from our previous analysis (besides the fact that there is a person

[43]See for example Chami (2001) or Schulze et al (2002).

within the family circle to whom the incumbent is prone to transmit the firm's insides, which can be considered a special case of impure altruism). In our view, altruism would not play a role other than bias the succession decision towards the family manager. In this section we will explicitly develop this intuition by exploring purely altruistic preferences; that is, how the incumbent values the family manager's overall utility.

Altruism is modelled by means of utility functions in which the welfare of one individual is positively linked to the welfare of another. For a pure altruistic incumbent, the welfare function (3) is rewritten as

$$\begin{aligned} E[U(c_H;\gamma_H,B,\alpha)] &= v_F\left[E[I_H(T_H)]-(\rho+\beta)\frac{\kappa_H}{2}[m_H(T_H(\theta))]^2\right]+ \\ &\quad +v_H(\theta)\left[1-\phi_H+\phi_H m_H(T_H(\theta))-w_H^*\right]+\gamma_H B+\alpha U_H(\theta). \end{aligned}$$

where $0<\alpha\leq 1$ is the altruism parameter, and U_H is the family manager's utility function being $U_H(\theta)=v_H(\theta)[\phi_H-\phi_H m_H(T_H(\theta))+w_H^*]+(\gamma_F-\gamma_H)B$. The optimal deprivation of private benefits is again found in the first-order condition

$$m_H^*(T_H;\alpha)=\min\left\{(1-\alpha)\lambda_H\mu_H,\min\left\{1,\left(\frac{2}{\kappa_H}T_H\right)^{\frac{1}{2}}\right\}\right\}, \tag{16}$$

and the altruistic incumbent chooses the optimal training θ^* to maximize an expected objective function similar to (7),

$$E[V^H(\theta;\alpha)]=v_F\left\{\mu_H(\theta)+\rho-(\rho+\beta)\left[\frac{\kappa_H}{2}\left(m_H^*(T_H;\alpha)\right)^2+\theta\right]\right\}+[\alpha\gamma_F+(1-\alpha)\gamma_H]B,$$

subject to (5) and $0\leq\theta\leq 1-(\kappa_H/2)[m_H^*(1-\theta;\alpha)]^2$ with $m_H^*(1-\theta)$ defined in (16). The potential optimal level of training is the same as that those obtained in subsection 3.4.1, except $\tilde{\theta}_2(\lambda_H;\alpha)$ is now the root of $\mu_H'(\theta)[1-(1-\alpha)^2\phi_H\lambda_H\mu_H(\theta)]-(\rho+\beta)$ for any given $\lambda_H\geq 0$, while $\tilde{\theta}_4(\lambda_H;\alpha)$ is now the root of $\theta+\frac{\kappa_H}{2}[(1-\alpha)\lambda_H\mu_H(\theta)]^2-1$ for any given $\lambda_H\geq 0$. Observe that a perfectly altruistic incumbent (i.e., $\alpha=1$) does not deprive the family manager since the incumbent also derives welfare from the family manager's appropriation, and the potential optimal levels of training depend on the effectiveness of the training process. More formally, we can provide a result similar to Propositions 1 and 2.

LEMMA 21. ***A perfectly altruistic incumbent.*** *Consider $\alpha=1$ and Assumption 1 are satisfied. An altruistic incumbent never monitors the family manager (i.e., $m_H^*=0$). If the training process is increasingly effective or decreasingly with $\tilde{\theta}_1>1$, then the optimal training level is represented as in Proposition 1 with $n_H^*=0$; while if the training process is decreasingly effective with $\tilde{\theta}_1<1$, then the incumbent finds it optimal to train $\theta^*=\tilde{\theta}_1$ and work for the firm $n^*=1-\tilde{\theta}_1$.*

Concerning the previous sections, altruism only affects the the incumbent's decision to choose a family member or stay in charge (Section 4.2) and to choose among two equally qualified managers (Section 4.3).

5.1 Hiring a family manager or keeping in charge under pure altruism

The expected welfare function (12), defined as the difference between $E[V^H(\theta^*;\alpha)]$ and $E[V^F]$, now becomes

$$\Delta E\left[V^{HF}(\theta^*;\alpha)\right] = \upsilon_F\left[\mu_H(\theta^*) - (\rho+\beta)\left(\frac{\kappa_H}{2}\left(m^*(T_H;\alpha)\right)^2 + \theta^*\right)\right] - (1-\alpha)\frac{\Omega_H}{\upsilon_F}$$

Note that, interestingly, due to $m^*(T_H;\alpha) \leq m^*_H(T_H)$ for any $\alpha \in (0,1]$ the family manager is more likely to become the successor (or alternatively, a postponement of a succession decision is less probable) when the incumbent is altruistic than when she is not. We can provide a result for the perfectly altruistic incumbent case, similar to Theorem 2: the family manager is hired (i.e., $\Delta E\left[V^{HF}(\theta^*;1)\right] > 0$ is satisfied) if his relative productive revenue at least offsets the incumbent's training costs in nurturing him (that is, if the manager does not display a poor performance).

Proposition 3. ***Hiring a family manager under perfect altruism.*** *Consider a family firm headed by an altruistic incumbent $\Upsilon_F(\alpha)$, and let Υ_H be a family manager who, if hired, will be optimally trained with θ^* units of the incumbent's time. If $\alpha = 1$, then the family manager is hired if, and only if, $\mu_H(\theta^*) > (\rho+\beta)\theta^* \equiv \underline{\mu}_H(\theta^*;\alpha=1)$.*

5.2 Choosing between potential successor managers under pure altruism

The expected welfare function (13), defined as the difference between $E[V^H(\theta^*;\alpha)]$ and $E[V^M]$, is now rewritten as

$$\begin{aligned}\Delta E\left[V^{HM}(\theta^*;\alpha)\right] &= \upsilon_F\Bigg\{\left[\mu_H(\theta^*) - \mu_M\right] - (\rho+\beta) \\ &\left[\frac{\kappa_H}{2}\left(m^*_H(T_H(\theta^*;\alpha))\right)^2 - \frac{\kappa_M}{2}\left(m^*_M(T_M)\right)^2 + \theta^*\right] - \frac{(1-\alpha)\Omega_H - \Omega_M}{\upsilon_F}\Bigg\}\end{aligned}$$

The aforementioned comments indicated before apply here: a family heir increases the prospect of becoming the successor –with respect to a non-family candidate– the more and more altruistic the incumbent becomes. An interesting example is given again by a perfectly altruistic incumbent, as the following result, akin to Theorem 3, states: the family manager is chosen as a successor (i.e., $\Delta E\left[V^{HM}(\theta^*;1)\right] > 0$ is satisfied) provided that his relative productive revenue at least offsets the incumbent's training costs in nurturing him and the gross productive revenue of the non-family manager.

PROPOSITION 4. ***Hiring a successor under perfect altruism.*** *Consider a family firm headed by an altruistic incumbent $\Upsilon_F(\alpha)$ that must choose between a non-family manager Υ_M and a family manager Υ_H who, if hired, will be optimally trained with θ^* units of the incumbent's time. If $\alpha = 1$ and $\mu_H(\theta^*) > (\rho + \beta)\theta^* + [\mu_M - \overline{\mu}_M] \equiv \overline{\overline{\mu}}_H(\theta^*; \alpha = 1)$, then the family manager becomes the successor.*

Observe that even under perfect altruism the non-family manager still has a chance, provided the candidate is very honest (so that monitoring is not needed) and highly proficient.

6 Conclusions

In this paper we present a theory of family business succession. The incumbent's welfare is central to understanding the succession process. Our framework explores the decisions taken by the incumbent who chooses whether to stay on or leave management, keep the company in the family's leadership or appoint a non-family manager. The analysis allows us to identify a set of crucial economic and non-economic variables that play a role in the succession decision, such as the relative quality of candidates, the size of the amenity potential held by the incumbent after succession and the particular features of the relationship between the successor and the predecessor if a family manager is hired. More specifically, the interaction between the incumbent and the family successor are explicitly modelled by taking into account the degree of effectiveness of a training process and the intensity of the monitoring costs –both of which are explained by the level of trust and mutual knowledge, as well as the design of the legal framework.

A combination of these components have allowed us to study the succession decision by considering particular candidate typologies. Our setting permits us to explain a number of commonly cited outcomes of the succession process in family firms. First, we depict the commonly observed reluctance of the incumbent to retire. Our model presents this in two ways: as a decision to postpone the succession process (Section 3.1), or as a propensity to stay on working at the firm once the successor has been chosen (Lemma 14). We find that for a range of value of the parameters, the incumbent obtains a higher welfare from staying on at the firm than from fully retiring.

A second interesting outcome is the possibility of an underperforming succession; that is, the fact that sometimes the incumbent chooses a family candidate even if he is not the best option from the firm's point of view. This is indeed the case when the training process has a moderate cost, the difference between the monitoring costs of the candidates is high (Lemma 13), and amenity potentials are relevant and required to retain management within the family (Lemma 19).

It is important to remark that these kinds of outcomes are not explained in terms of the incumbent's altruistic preferences but rather in terms of the cost of a knowledge transmission mechanism, the personal characteristics of both the incumbent and the potential successors, and the existence of non-pecuniary profits. The introduction in Section 5 of paternalistic altruism as an extension of the model reinforces our previous findings. Other forms of altruism along with the inclusion of uncertainty and asymmetric information are natural extensions that will enrich the model in many ways; e.g., concerning the role of uncertainty in face of 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 and commitment of the successor.

An interesting extension of the model is to consider the complementarity or substitutability of the incumbent's and the successor's managerial activities when a partial retirement is optimal. In our model, the firm is productive with the contribution of the manager and the incumbent in the simplest way: the revenue technology is additive in the generated revenues, and the manager's contribution is a perfect substitute for the incumbent's available time ($v_i + v_F n_i$). However, this need not to be the case since economies (or diseconomies) of scale could arise as a consequence of the joint work of the incumbent and the successor.

Finally, this paper also provides a unified framework to guide empirical research in family firm succession. The empirical literature on this subject mainly focuses on how family management and intra-family succession affect firm performance, but the results are inconclusive (see Baù et al 2015 for a recent survey). From our point of view, a number of key variables should be integrated into the analysis to achieve a better understanding of the motivations and consequences of the succession process: industry characteristics (in terms of the specific training and knowledge required or the presence of particularly important amenities), the family (not only personal characteristics of the participants in the succession process but also those related to the existence of a specific culture) or the legal framework (as a determinant of the costs of monitoring), among others.

Appendix

Proof of Lemma 1. The proof is simple. Given that the wage compensation has to offset the manager's opportunity cost, $\upsilon_i w_i^* \geq \omega_i$, 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 (5) 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 ($m^* = 0$) sets a lower threshold for the non-negative wage rate, characterized in (5) by $\omega_i \geq \upsilon_i \phi_i$. ∎

Proof of Lemma 2. Initially, note that the substitution of the right hand-side term in Condition (8) into (10), it is easy to find that $\breve{\theta} = 1 - \frac{\kappa_H}{2}$ is an intersection. Thus, it is only needed to compute the negativity for the slopes of conditions (8) and (10), and the value taken of both slopes at $\theta = 1 - \kappa_H/2$ and find that the latter is steeper than the former. For any given level of training, condition (8) becomes an equilateral hyperbola, $\lambda_{(8)}(\mu_H) = 1/\mu_H$, with slope $-1/\mu_H^2$. Condition (10) becomes the function,

$$\lambda_{(10)}(\mu_H) = \frac{1}{\mu_H}\left[\left(1 - \mu^{-1}(\mu_H)\right)\frac{2}{\kappa_H}\right]^{1/2} \tag{17}$$

after defining the identity function $\mu^{-1}(\mu_H(\theta)) = \theta$, whose derivative with respect to θ is $\mu^{-1\prime}(\mu_H(\theta)) = 1/\mu_H'(\theta)$ by the Chain Rule. Derivation of (17) with respects to μ_H is

$$\lambda_{(10)}'(\mu_H) = -\frac{1}{\mu_H^2}\left[\frac{1}{\kappa_H}\left[(1-\theta)\frac{2}{\kappa_H}\right]^{-1/2}\frac{\mu_H}{\mu_H'} + \left[(1-\theta)\frac{2}{\kappa_H}\right]^{1/2}\right].$$

The slope at $\breve{\theta} = 1 - \frac{\kappa_H}{2}$ results to be

$$\lambda_{(10)}'(\mu_H(\breve{\theta})) \leq -\frac{1}{(\mu_H(\breve{\theta}))^2} = \lambda_{(8)}'(\mu_H(\breve{\theta})).$$

Then, $\lambda_{(10)}(\mu_H(\theta)) > \lambda_{(8)}(\mu_H(\theta))$ is satisfied for any $\theta < \breve{\theta}$, and vice versa for $\theta > \breve{\theta}$, which entails that (8) and (10) only intersect once. This concludes the proof of Lemma 2. ∎

Proof of Proposition 2. To prove the Proposition, we proceed by steps.

Step 1. Initially, we rank the potential maxima considering Assumption 2. See Table 1 and Figure 2 displaying the potential maxima to optimal level of training in the μ_H-λ_H−plane. Observe that the function $\tilde{\theta}_2(\lambda_H)$ is decreasing.[44] In addition, the Assumption 2 guarantees that the function $\tilde{\theta}_2(\lambda_H)$ satisfying $\lambda_H\tilde{\theta}_2(\lambda_H) < 1$ does not intersect the full-deprivation frontier (8) and the no-working frontier (10). The ordering of the potential optima is the following:

(a) If $\tilde{\theta}_1 \leq 1 - \frac{\kappa_H}{2}$, then $\tilde{\theta}_2(\lambda_H) < \breve{\theta} < \tilde{\theta}_4(\lambda_H) < \tilde{\theta}_5 = 1$ is satisfied for any $\lambda_H \leq 1/\mu_H(\breve{\theta})$;

(b) if $\tilde{\theta}_1 \in \left(1 - \frac{\kappa_H}{2}, 1\right)$, then $\tilde{\theta}_2(\lambda_H) < \tilde{\theta}_4(\lambda_H) < \tilde{\theta}_5 = 1$ is satisfied for any $\lambda_H \leq 1/\mu_H(\breve{\theta})$; and,

(c) if $\tilde{\theta}_1 > 1$, then $\breve{\theta} < \tilde{\theta}_4(\lambda_H) < \tilde{\theta}_5 = 1$ is satisfied for any $\lambda_H \leq 1/\mu_H(\breve{\theta})$.

[44] Recall that if $\phi_H = 0$ then $\tilde{\theta}_2(0) = \tilde{\theta}_1$. Also, after denoting $F(\phi_H, \tilde{\theta}_2) = \mu_H'(\tilde{\theta}_2)[1 - \phi_H\lambda_H\mu_H(\tilde{\theta}_2)] - 1$, the Implicit Function Theorem allow us to find that $\partial\tilde{\theta}_2(\phi_H)/\partial\phi_H < 0$ due to the concavity of the family manager's revenue technology.

Step 2. Next, we present a partial result: due to the concavity of the family manager's welfare (7) for $m_H^*(1-\theta) = \lambda_H \mu_H(\theta)$, optimality allows us to state $E[V^H(\tilde{\theta}_2(\lambda_H))] > E[V^H(\tilde{\theta}_4(\lambda_H))]$ for any given $\lambda_H \leq 1/\mu_H(\breve{\theta})$.

Step 3. Proof of (i). Recall that the potential maxima to optimal training for the interval $\lambda_H \leq 1/\mu_H(\breve{\theta})$ are $\tilde{\theta}_2(\lambda_H)$ and $\tilde{\theta}_5$, so it is indeed the case for $\lambda_H = 0$. Substituting $\tilde{\theta}_2(0)$ and $\tilde{\theta}_5$ in (7), and due to the concavity of the family manager's revenue technology, we obtain that $E(V^H(\tilde{\theta}_2(0))) > E(V^H(\tilde{\theta}_5))$. Since the function $\tilde{\theta}_2(\lambda_H)$ is decreasing, it can be the case that $E[V^H(\tilde{\theta}_5)] > E[V^H(\tilde{\theta}_2(\lambda_H))]$ for some $\lambda_H > 0$. If so, this entails by the Bolzano Theorem that there exists a $\hat{\lambda}_H > 0$ such that $V^H(\tilde{\theta}_5) = V^H(\tilde{\theta}_2(\hat{\lambda}_H))$. This proves Proposition 2.(i)

Step 4. Proof of (ii). Since $\tilde{\theta}_1 \geq 1$ and Assumption 2.2 entail that the set of potential maxima is restricted to $\tilde{\theta}_3$, $\tilde{\theta}_4(\lambda_H)$ and $\tilde{\theta}_5$. So the Proposition 1 applies. This proves Proposition 2.(ii) and concludes the proof of Proposition 2. ∎

Proof of Theorem 1. Initially, let us assume that $\kappa_M < 2$. From (11) we find the following three conditions relevant (see Figure 3(a))

$$\mu_M \lambda_M = 1 \tag{18}$$

$$\mu_M = \frac{\Omega_M}{\upsilon_F} + \frac{\kappa_M}{2}(\rho+\beta) \tag{19}$$

$$\lambda_M = \frac{\left[\frac{2}{(\rho+\beta)\kappa_M}\left(\mu_M - \frac{\Omega_M}{\upsilon_F}\right)\right]^{1/2}}{\mu_M} \tag{20}$$

Note that equations (18) –the full-deprivation frontier– and (20) intersects at $(1/\widehat{\mu}_M, \widehat{\mu}_M)$ where $\widehat{\mu}_M$ is the value found at (19).

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, (11) is positive provided $\mu_M > (\Omega_M/\upsilon_F) + (\rho+\beta)(\kappa_M/2)$. Accordingly, the incumbent will implement full deprivation of benefits at the upper contour set of the full-deprivation frontier (18) and rightwards of condition (19). Now, consider the case $m_M^* = \mu_M\lambda_M < 1$. Then, (11) is positive whenever $\lambda_M\mu_M > [(2/\kappa_M)(\mu_M - \Omega_M/[(\rho+\beta)\upsilon_F])]^{1/2}$. Accordingly, the incumbent will implement partial monitoring at the region below the conditions (18) and (20). In both cases, the manager still works at the firm, as $s_M^* < T_M = 1$.

Now assume that $\kappa_M \geq 2$. From (11) the relevant three conditions turn out to be (see Figure 3(b))

$$\mu_M \lambda_M = \left(\frac{2}{\kappa_M}\right)^{1/2} \tag{21}$$

$$\mu_M = \frac{\Omega_M}{\upsilon_F} + (\rho+\beta) \tag{22}$$

and (20). Note that equations (21) –the full-monitoring frontier– and (20) intersects at $(1/\widehat{\mu}_M, \widehat{\mu}_M)$ where $\widehat{\mu}_M$ is the value found at (22).

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, (11) is positive whenever $\mu_M > (\Omega_M/\upsilon_F) + (\rho+\beta)$. Accordingly, the incumbent will spend all her time monitoring, $s_M = T_M = 1$, at the region above condition (21) and rightwards of condition (22). Now, consider the case $m_M^* = \mu_M\lambda_M < (2/\kappa_M)^{1/2}$. Then, (11) is positive whenever $\lambda_M\mu_M > [(2/\kappa_M)(\mu_M - \Omega_M/[(\rho+\beta)\upsilon_F])]^{1/2}$. Accordingly, the incumbent will implement partial monitoring at the at the upper contour set of the full-monitoring frontier (21) and (20), $s_M^* < T_M = 1$, and thus she has available time to work/outside-of-the-firm activities. This concludes the proof of Theorem 1. ∎

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