Decision Making with Asymmetric Information

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Decision Making with Asymmetric Information

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Preface

This thesis is the result of four years of research in Economics. During these four years many people have contributed with their comments, suggestions and encouragements for which I am really grateful. I would like to use this opportunity to thank some of them individually.

First and foremost, I want to thank Otto. Thank you for giving me the opportunity to do a PhD and for collaborating with me on four of the papers contained in this thesis. I have benefited greatly from your guidance and advice. Thank you for always having time to talk about my research and for the many useful comments on my work. In the past few years you also tried to improve my soccer skills, but without success. Sorry that I am a lousy soccer player.

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Many PhD-students claim that doing research is a solitary experience. For me the last four years have been pleasant and fun. For this I would like to thank our 'public economics' group. Hein, Herman, Ioulia, Josse, Klaas, Klaas, Phongthorn, and Robert, I have benefited much from our discussions during the internal seminars. Besides I enjoyed our drinks after internal seminars and our conference trips. Of course, Josse deserves special mention. For four years we shared an office. Josse, I really enjoyed the many discussions we had about research and the conversations we

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Contents

Chapter 1

Introduction

Every day individuals make numerous choices. What is important for making the right choice is that individuals have good information about the consequences of the different alternatives. However, investigating the full consequences of the different alternatives is complicated and costly. Consequently, individuals sometimes do not possess all relevant information to take a decision.

This thesis discusses models in which an agent decides whether or not to perform a task on behalf of the principal. A key element in the models we consider is incomplete and asymmetric information. Broadly, the thesis can be split up into two parts. The first part of the thesis deals with models in which the principal is better informed than the agent. The agent has to decide whether or not to perform a task, but lacks information about his ability. We analyze how the agent makes a self-assessment of his ability, based on appraisals of others (the principal) and experience. Based on this self-assessment the agent takes a decision. The second part of the thesis deals with models in which the agent is better informed than the principal. On behalf of the principal the agent takes a decision about a project. Sometimes agents do not act in the interest of the principal. We analyze how the principal can use retention contracts to discipline the agent.

In the remainder of the Introduction we discuss the two parts of the thesis and we provide an overview of the chapters of this thesis.

1.1 Self-assessment

Individuals often misjudge their abilities. There is a considerable amount of evidence that agents rate themselves above average on certain domains. For instance, 93% of US drivers and 69% of Swedish drivers find themselves to be better drivers than the median (Svenson, 1981). College Board (1976-77) reports this so-called 'above average' effect for a couple of abilities. For example, a majority of students rate themselves above average on the ability to get along with others and leadership ability (see Kruger, 1999). When asked about their ability to play chess, however, a majority of individuals rate themselves as below average (Kruger, 1999).

The relationship between an individual's perception of his ability and an individual's actual ability has predominantly been discussed by social psychologists. Social psychologist have shown that an individual's perception of his ability may affect the choices he makes. For example, Felson (1984) shows that more favourable self-appraisals of ability of high school boys have a positive effect on later grades. One possible reason for this result is that students with favourable self-appraisals work harder in school. Given that an individual's perception is important for the choices he makes, it is hardly surprising that economists have become interested in the topic. Recently, several economic papers have appeared on the topic of self-assessment of abilities. These papers investigate why people are overoptimistic about certain life-events (see Van den Steen, 2004) and why people may decide not to collect information for strategic purposes (Carrillo and Mariotti (2000) and Bénabou and Tirole (2002)). Weinberg (2005) shows that moderately overestimating one's ability makes an individual choose more often a challenging task, resulting in a higher expected utility. Extreme overconfidence, however, involves considerable costs.

A shortcoming of these studies is that they only explain overconfidence, while underconfidence is also important. Underconfidence also affects the individual's choice. For instance, intellectually competent children with a low perception of their abilities may avoid tasks that could provide evidence about their abilities. An implication is that negative and distorted self-appraisals may persist (Phillips, 1984). One possible reason why women disproportionately avoid careers in science is that they underestimate their scientific reasoning ability (Ehrlinger and Dunning, 2003). Both examples point out that a possible consequence of underestimating one's ability is passivity. On the basis of his perceived ability an individual decides not to perform a task and as a consequence does not obtain new information to adjust his perception.

The economic literature focuses primarily on overconfidence. In Chapter 2 and 3 we try to fill this gap in the literature by explaining both overconfidence and underconfidence. To our knowledge, there is only one other paper in which a negative self-image is theoretically possible, namely Santos-Pinto and Sobel (2005).

1.2 Retention contracts

Delegation of tasks is necessary for a variety of reasons. For instance, in an organization, the director (the principal) lacks time to take decisions concerning the daily routine. Therefore, the director delegates these decisions to a manager (the agent). In representative democracies, citizens have a weak incentive to investigate the full consequences of alternative policies. Therefore, citizens delegate policy decisions to politicians. In both situations there is a clear advantage to delegating decision-making. However, delegation may be problematic if the agent does not share the same preferences as the principal. Specially, when there is asymmetric information.

The classical example of principal-agent problems is the conflict of interest between shareholders and the CEO. The board of directors, on behalf of shareholders, has the power to run the organization. Directors, however, lack the time and information necessary to take decisions. Therefore, decision-making is delegated to the CEO. The task of the board of directors is twofold. First, the board has to select and hire executives. Second, the board has to monitor the executives' performance and replace them when necessary (see Bebchuk and Fried, 2004). The problem is that to carry out these tasks the board has limited information. To discipline executives, the board may have to stick to a norm or rule. Sometimes sticking to a rule is the only means to discipline executives. "Social behavior, particularly in small groups, is more complex, and norms of behavior that are culturally inculcated or developed over time play a large role in shaping societies." (Laffont and Martimort, 2002, p. 2).

In this thesis, we consider the use of retention contracts as a means to discipline and screen executives in an environment in which the board has limited information about the outcomes of executives' actions. Similar, we consider the use of re-election strategies to discipline politicians. The contracts we consider are implicit and are not enforced by a third party. The contract specifies the conditions under which an agent (executive or politician) is retained or dismissed. We can think of the contract as a norm shared by the principal and the agent. For example, a CEO who has implemented an extremely unprofitable project knows he will have to leave the organization once this becomes public. If the executive is competent, the board may find it difficult to dismiss the executive, but the board has to stick to the norm. In this case dismissals stemming from bad performance are considered regrettable, yet inevitable.

1.3 Overview

This thesis deals with a variety of principal-agent problems in which asymmetric information is a key feature. As mentioned in the previous section, the chapters can be grouped in two parts. The first part contains two chapters (chapter 2 and 3) on self-assessment. In these chapters we pay attention to both overconfidence and underconfidence. The second part contains three chapters (chapter 4, 5 and 6) in which the principal uses retention contracts to discipline the agent. In chapter 4 we consider the relationship between the board of directors and the top executive. Chapters 5 and 6 focus on the relationship between voters and politicians.

Chapter 2 presents a model that describes individuals' self-assessment of their abilities. In line with the self-assessment theory in social psychology (Trope, 1979; Dunning, 1995; Taylor et al., 1995), individuals want to learn their abilities to make better decisions in the future. They can learn about their abilities from appraisals of others and from experience. We find that if communication is imperfect, then (i) appraisals of others tend to be too positive, and (ii) overconfidence leading to too much activism is more likely than underconfidence leading to too much passivity. The reason is that underconfidence is permanent and overconfidence is temporary because of learning by doing.

The model can be used to describe the interaction between a senior and a junior. We find that the senior tends to deflate the ability of a junior who is just able. For such a junior, the costs of overconfidence (too much effort) exceed the costs of underconfidence (mistaken passiveness). The senior tends to inflate the ability of a talented junior. The senior wants to avoid the situation that such a junior abstains from performing a task. On average, the senior exaggerates the junior's ability.

In Chapter 3 individuals use their performance on a task to make an inference of their abilities. However, performance not only depends on the individual's ability, but also on the unknown difficulty of the task. In line with Kruger (1999), we show that an individual who has performed a difficult task underestimates his ability and an individual who has performed an easy task overestimates his ability. A junior employee could be an example of an individual who faces the uncertainties that lead to this finding. The implication of underestimating one's ability after performing a difficult task may be that a talented junior decides not to perform a task in the future. An organization can prevent this by appointing a senior employee who acts as the junior's mentor. A senior employee has more experience and therefore is better able to determine the difficulty of different tasks. Besides, the senior employee has seen many junior employees and may, therefore, be better able to assess the junior's ability. The benefits of appointing a mentor, with the same preferences as the junior, are that a mentor takes care of a better match between task difficulty and the junior's ability.

In many settings the preferences of the mentor and the junior are not perfectly aligned. A reason may be that the junior has to incur costs to perform a task and the mentor does not. In such an environment, the mentor may have an incentive not to reveal all information to the junior. The reason is that performing a task is costly for the junior, therefore, if the mentor reveals all information a low ability junior may decide not to perform a task. The mentor, however, wants all juniors to perform a task. Consequently, he decides to lie to low ability juniors. An implication is that some juniors do not learn their ability and sometimes a talented junior, performing a difficult task, decides to stop performing the task. To prevent a talented junior from not performing a task, the mentor assigns an easy task to him. After observing performance on an easy task, the junior decides to continue and he learns his ability.

In chapter 4 we consider the use of retention strategies as a means to discipline and screen executives in an environment in which the board has limited information about the outcomes of executives' actions. Each period an executive designs a project and decides whether or not to implement the project. The quality of the project depends on the competence of the executive and on exogenous circumstances. The executive knows his competence and observes the exogenous circumstances, implying that the executive knows the full consequences of his decision. The board of directors only observes whether a project has been implemented and it sometimes learns the quality of the project. A key feature of the model is that a competent executive designs better projects than a less competent one. Therefore, he is more likely to implement a project than a less competent executive. Consequently, the fact that a project has been implemented signals competence. The board can use the implementation decision to screen executives. The drawback of using the implementation decision as a screening device is that it creates a moral-hazard problem. An executive who cares much about prestige may decide to implement an unprofitable project to reduce the probability of being replaced. The board may reduce the moral-hazard problem by dismissing an executive who has been found to have implemented too bad a project. However, because of the signalling function of the implementation decision an undesirable project is more likely to be implemented by a competent executive. Occasionally dismissing competent executives is the price the board has to pay for discipline.

Chapter 5 and 6 focus on electoral competition in two-party systems. A well-known rationale for representative democracy is that direct democracy leads to a free-rider problem as to the collection of information. A problem with this rationale is that it takes for granted that representatives collect information. In chapter 5 we examine whether or not electoral competition induces political parties or candidates to collect information about policy consequences. We consider a model in which two parties compete for office. Before elections are held, parties may collect information. In a campaign, parties may use this information to make a case for their platform. We show that whether or not parties collect information depends on the cost of information collection. More surprisingly, we find that endogenizing information may lead to divergence of policy platforms.

The model we consider in chapter 5 relates to the literature of spatial models of elections in which each voter compares the platforms of the political parties, and votes for the party whose platform yields highest expected utility. Chapter 6 presents a principal-agent model in which voters are modeled as a principal who has to keep the officeholder, the agent, in check. The electorate wants parties to perform two task. The first task is acquiring information. Both the incumbent party and the opposition party can collect information concerning different policy alternatives. The second task is making a decision about policy. The incumbent party performs this task. We identify the conditions under which voters can induce political parties to collect information and to select policies which are optimal from the representative voter's point of view. We show that when parties are office motivated the voting rule should encourage parties to collect information. Voting rules that focus on the opposition party sometimes dominate voting rules that focus on the incumbent party. When parties are policy motivated, parties have also to be motivated to select good policies. Generally, it is easier to stimulate policy motivated parties to collect information than office motivated parties. However, in contrast to office motivated parties, policy motivated parties will sometimes select policies that conflict with the representative voter's interest.

Chapter 7 summarizes the main findings.

Part I

Self-Assessment

Chapter 2

A Simple Model of Self-Assessment

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2.1 Introduction

A person's perception of his abilities may have substantial consequences for his actions.[1] If Shakespeare had had a low perception of his writing ability, perhaps nobody would have known Hamlet. A young musician's impression of her talent for music may determine whether she decides to become a professional violinist. One possible reason why women disproportionately avoid career in science is that they underestimate their scientific reasoning ability (see Ehrlinger and Dunning, 2003). Given that people's assessments of their abilities are important for their choices, one would expect that economists have paid much attention to the relationship between people's perceptions of their own abilities (self concepts) and people's actual abilities (the self). After all, isn't economics pre-eminently the study of how people choose? However, until very recently, research on this relationship has been done predominantly by social psychologists. Their research has resulted in "a large, fascinating,

[1]Phillips (1984) shows a strong correlation between children's subjective perceptions of their abilities and their achievement behavior.

yet sometimes confusing and contentious literature" (Sedikides and Strube, 1995, p. 1277). Baumeister (1998) gives a very interesting survey of this literature.

A high degree of consensus among social psychologists seems to exist on the following three findings. First, people often misjudge their own abilities. For example, College Board (1976-1977) reports small correlations between objective abilities and persons' perceptions of their own abilities for a wide range of domains (see also Kruger, 1999). Of course, this finding is the raison d'être of a voluminous literature on self-assessments. Second, although many individuals have distorted self-concepts, people are neither generally overconfident nor generally underconfident. It is well-known that for some dimensions a majority of people see themselves better as average (famous examples are intelligence, attractiveness and car driving). For other dimensions, a majority of people see themselves as worse than average (music, art, mechanics, chess playing).[1] Ackerman et al. (2002) report experimental results suggesting that for broad items, say intelligence, people have higher self-estimates of ability than for specific items, say being able to study long hours (see also Klar et al., 1996). The third important finding of social psychologists is that accurate feedback on one's ability is rare (see Jones and Wortman, 1973). In particular, feedback tends to be too positive (Brown and Dutton, 1995; Felson, 1993). Own perceptions of abilities often do not resemble the way abilities are perceived by others. On the other hand, in their survey of the early literature Shrauger and Schoeneman (1979) conclude that own perceptions of abilities are closely related to how people believe they are perceived by others.

In this chapter we develop a simple model that yields predictions that are broadly consistent with the three findings discussed above. Our model describes the interaction between a senior and her junior. The senior cares about her junior. She knows the junior's ability, but the junior does not know his own ability. In line with the self-assessment theory in social psychology (Trope, 1979; Dunning, 1995; Taylor et al., 1995), the junior wants to learn his ability to make better decisions in the

[1] Of course, the observation that a majority of people see themselves better (worse) than the average does not imply the existence of overconfidence (underconfidence). It may also be the result of a skewed distribution of abilities.

future. Specifically, the junior has to make decisions on two successive tasks. For each task, the junior must choose between performing the task or not. Furthermore, if the junior chooses to perform the task, he has to determine how much effort to put in it. Effort and ability are complementary, in the sense that the higher is the junior's ability, the more effort he wants to put in a task. If the junior's ability is below a certain threshold, he should not perform the task at all. At the beginning of the game, the senior sends a noisy message to the junior. Noisy in the sense that with some probability the junior receives another message than the senior has sent. Apart from learning about his ability through his senior's message, the junior can learn his ability by doing. Performing the first task yields information about his ability which can be used when making a decision on the second task.

We derive the following results. First, the senior tends to deflate the ability of a junior who is just able to perform a task. For such a junior, the cost of overconfidence - too much effort - is higher than the cost of underconfidence - mistaken passiveness. Second, the senior is inclined to inflate the ability of a talented junior. For a very able junior, the cost of overconfidence is smaller than the cost of underconfidence. The senior wants to avoid a situation that a talented junior abstains from performing a task. She does so by exaggerating the junior's ability. Third, we show that on average the senior exaggerates a junior's ability. The reason for this result is that the cost of underconfidence (passiveness) is permanent, whereas the cost of overconfidence (too much effort) is temporary because of learning by doing. This last result is in line with Felson (1989) who observes that experience is a better predictor of self-appraisals than appraisals of others.

Recently, several economic papers have appeared on the topic of judgement biases. Here we discuss some papers that focus on self-assessments of abilities. We thereby ignore the literature that is concerned with questions like when and why are people too certain about events or why are people overoptimistic about certain life-events (see Van den Steen, 2004). Why should economists be interested in self-assessments of abilities in the first place? At the beginning of this introduction, we have already mentioned that people's choices may depend on how they see themselves. Fang and Moscarini (2005) nicely illustrate this point in the context of a principal-agent problem. Assuming that effort and ability are complements, and that agents overestimate their abilities, they show that performance evaluations may reduce a firm's profit. The reason is that through performance evaluations agents may learn their actual abilities. Because agents on average overestimate their abilities, learning may reduce average effort.

In Fang and Moscarini, overconfidence is assumed, not explained. Let us now discuss economic studies that try to explain self-assessments. Two strands in this literature can be distinguished. In the first, people form beliefs about their abilities that are most useful to them. The benefit of a particular belief can be direct or indirect. A direct benefit exists when a positive view of your abilities makes you happier. In the social psychological literature, this is referred to as the self-enhancement approach to self-appraisals. Brunnermeier and Parker (2004) and Weinberg (2005) show that the optimal belief depends on the direct benefit of a positive self view and the cost of making incorrect decisions. In Hvide (2002), the benefit of a particular belief is indirect. He shows that overconfidence strengthens the agent's bargaining power versus firms. Carrillo and Mariotti (2000) show that individuals with time inconsistent preferences may decide not to collect information for strategic purposes. Building on Carrillo and Mariotti (2000), Bénabou and Tirole (2002) show that time inconsistent preferences are the reason that people may want to forget information on their ability. Forgetting negative information on your ability makes that you feel better now. The cost of forgetting information is distorted future decision making. Time inconsistent preferences may imply that the present benefit outweighs the future cost. By relying on time-inconsistent preferences Bénabou and Tirole follow the self-enhancement approach. Concerning the supply of information on ability, Bénabou and Tirole focus on communication between two selves, your current self, who possesses information, and the future self who may receive information. Because of the time-inconsistent preferences, the two selves have conflicting preferences.

In the second strand of the literature, people learn their abilities. Zábojník (2004) presents a model in which an agent can choose for receiving a signal about his ability at the cost of foregone production. He shows that an agent keeps buying signals until his self-assessment is sufficiently favourable (see also Brocas and Carrillo, 2002). Compte and Postlewaite (2004) assume that an agent's confidence has a direct effect on his performance. The agent's confidence depends on his perception of the frequency of past successes. Thus agents learn by doing.[2] Our model belongs to the second strand in the literature. The agent learns his ability from others and may learn by doing.

A drawback of most of the studies mentioned above is that they only explain overconfidence. It is true that many studies have reported a bias toward overconfidence. However, one cannot deny that people exist who are plagued by self-doubt, and hold unrealistically negative impressions of their abilities. This suggests that self–enhancement cannot be the only explanation of self-assessments. More generally, we need a theory that can explain the existence of both overconfidence and underconfidence.

The remainder of this chapter is organized as follows. The next section presents the model. Section 2.3 discusses an equilibrium of the model. Section 2.4 presents a numerical example. Section 2.5 discusses the consequences of relaxing two assumptions for our main results.

2.2 The model

We consider a simple model of a senior (she) and a junior (he). The model consists of three stages. The last two stages represent the junior's future. In the first stage the senior coaches the junior. In each of the last two stages, the junior must independently make a binary decision, say, whether or not to perform some ambitious task.

At the beginning of the game, the junior's ability (the self), a, is drawn from a distribution, $f(a)$, on $[0,1]$. The senior observes a, but the junior does not. The junior only knows $f(a)$. In stage 0, the senior tries to inform the junior about his ability by sending a message $m \in [0,1]$. Communication is not perfect. We model this as follows. Let r denote the message the junior receives. We assume that r

[2] Another way of learning is through the performance incentives offered by an informed principal. Bénabou and Tirole (2003) show that performance incentives affect the agent's perception of his own ability.

results from a continuous density function, $g_m(r)$ defined over $[0,1]$. Moreover, we assume that $g_m(r) > 0$ and that it has one maximum, defined by $g'_m(r = m) = 0$. This assumption implies that small communication errors are more likely to occur than large communication errors. Finally, we assume that $g_i(r = i) = g_j(r = j)$. This assumption ensures that in equilibrium $E(a \mid r)$ is an increasing function of m.

Our way of modeling the communication between the senior and the junior tries to capture the psychological model of the reflected appraisal process (see Kinch, 1963, and for a more recent discussion, Felson, 1993). This process consists of three elements. The first element is self-appraisal. Self-appraisal refers to the way a person views a certain feature of himself. Examples of features are academic ability, an ability to perform a task, physical attractiveness and popularity. In our model, self-appraisal is modeled as the junior's equilibrium belief about his ability. The second element is actual appraisals of others. In our model, this is denoted by m. The last element is reflected appraisals, meaning a person's perception of actual appraisals. In our model, this is denoted by r. Empirical research by social psychologists shows that there are only weak correlations between actual appraisals, m, and reflected appraisals, r (Felson, 1993). We capture this by $g_m(r)$. Furthermore, experimental research suggests that if reflected appraisals are taken into account, actual appraisals do not explain self-appraisals (Schrauger and Schoeneman, 1979). In our model, reflected appraisals lead to self-appraisals through Bayes' rule.

As mentioned above, in stage $t = 1$ and stage $t = 2$, the junior chooses whether or not to perform a task. In these stages, the junior works independently and cannot rely on the senior anymore. The payoff of performing a task depends on the junior's ability and his effort, $e_t > 0$:

$$U_t(X_t = 1) = ae_t - \frac{1}{2}e_t^2 \tag{2.1}$$

Not performing a task $X_t = 0$ yields,

$$U_t(X_t = 0) = z > 0 \tag{2.2}$$

The implication of z is that only if a exceeds a certain threshold, then the junior should perform the task. Throughout, we assume that $z < \frac{1}{2}$, implying that juniors exist who should perform the task.

If the junior chooses $X_1 = 1$ in stage 1, then he observes his payoff and consequently infers a. If $X_1 = 0$, then the junior does not obtain new information about his ability. Our model thus allows for two ways of developing a self-concept: appraisal (the senior's message) and experience. Notice that $z > 0$ implies that learning is possibly costly. If $z = 0$, then he junior could exert a little effort to learn a.

The senior cares about the junior. Her payoff is also given by (2.1) and (2.2). The problem of both the senior and the junior is that the latter should perform the task only if the task yields a payoff higher than z. This requires that the junior is sufficiently able. Another problem is that in case the junior performs the task, he must choose an effort level that accords with his ability.

Remark. In our model the senior provides information about the junior's ability by means of a simple message. For us, this simple message is a shortcut for something much broader. For example, a message may reflect the way the senior coaches a junior. A senior who gives the junior responsibilities may signal something else as a senior who always assists her junior.

2.3 Equilibrium

Our game is a dynamic cheap-talk game. To solve the game, we apply the standard Nash-Bayesian equilibrium concept, so that strategies are best responses to each other, given beliefs, and beliefs follow from the strategies according to Bayes' rule.[3]

2.3.1 Stage 2

Suppose that in stage 1 it is a best response of the junior to choose $X_1 = 1$ with $e_1 = a_r^e = E(a \mid r)$ if $r > r^*$, and to choose $X_1 = 0$ if $r \leq r^*$. When analyzing the

[3]It is well-known that in cheap-talk games a pooling equilibrium always exists (see Crawford and Sobel, 1982). This is also true for our model. We ignore this pooling equilibrium.

second stage of the game, two cases have to be distinguished.

Case 1: $X_1 = 0$

If it were optimal for the junior to choose $X_1 = 0$ in stage 1, it is also optimal for him to choose $X_2 = 0$. To understand why, first recall that if $X_1 = 0$, the junior does not learn his ability. Learning requires that $X_1 = 1$. As learning has not taken place, the junior's view on the project has not changed. Thus, there is an indirect benefit of performing the task in stage 1. By choosing $X_1 = 1$, the junior would have learned his ability. This knowledge could be used when making a decision on X_2. The total expected benefit of $X_1 = 1$ therefore exceeds the total expected benefit of $X_2 = 1$. Hence, if it were optimal for the junior to choose $X_1 = 0$, it is optimal for him to choose $X_2 = 0$ too.

Case 2: $X_1 = 1$

In this case, the junior has learned his ability. His decision on X_2 is then relatively easy. From (2.1) and (2.2) it is easy to see that if a junior opts for $X_2 = 1$, he chooses $e_2 = a$. Moreover, $X_2 = 1$ yields a higher payoff than $X_2 = 0$ if $\frac{1}{2}a^2 > z$ or $a > \sqrt{2z}$.

Notice that ideally the senior wants the junior to act similarly in stage 1. The senior knows the junior's ability from the beginning, and the senior's and junior's preferences are perfectly aligned. Consequently, if the senior's message were without any noise, $r = m$, then an equilibrium would exist in which the senior sends $m = a$. This strategy would induce the junior to act in his own interest. For future references, we would like to emphasize three features of the outcomes for the case that $r = m$. First, the senior's appraisal would not be biased. Second, underconfidence $(a > a_r^e)$ or overconfidence $(a < a_r^e)$ would not exist. Finally, learning by experience would not play a role. Performing the task in stage 1 would not deliver useful information for the junior's decision on the task in stage 2 in addition to the senior's message.

2.3.2 Stage 1

The senior

For the moment we assume that in stage 1 it is a best response of the junior to choose $X_1 = 1$ with $e_1 = a_r^e$ if $r > r^*$, and to choose $X_1 = 0$ if $r \leq r^*$. Furthermore we assume that the junior's beliefs imply that a higher value of m increases a_r^e.

Let us begin by showing why truthfully revealing, that is *always* sending $m = a$, cannot be part of an equilibrium. First suppose that a is low. We have already established that if $a \leq \sqrt{2z}$, the junior should not perform the task. Therefore, for $a \leq \sqrt{2z}$, the senior should minimize the probability that the junior performs the task. She does so by sending $m = 0$.

Now suppose that a is just above $\sqrt{2z}$. In that case, $e_1 = a$ would yield a payoff to the junior that is slightly higher than z in both periods. However, as a result of imperfect communication, it is unlikely that the junior actually chooses $e_1 = a$. In particular, overconfidence would result in $e_1 > a$ and consequently in $U_1 (X = 1) < z$. The implication is that for a just above $\sqrt{2z}$ performing the task is likely to yield a payoff below $2z$. The more a deviates from $\sqrt{2z}$, the higher is the expected payoff of performing the task and the lower is the cost of overconfidence. More generally, a value of $a = a^* > \sqrt{2z}$ exists, for which the senior is indifferent between sending $m = 0$ and sending $m > 0$.

Now consider high values of a. Let us start with $a = 1$. Clearly, in that case, the senior has no incentive to send $m < 1$. She wants the junior to perform the task with $e_1 = 1$. The best the senior can do is sending $m = 1$. Now suppose that a is slightly below 1. Through the posterior beliefs, sending $m < 1$, in expectation, impels the junior to choose a lower level of effort than sending $m = 1$. We now argue that also in this case it is optimal for the senior to send $m = 1$. The reason is twofold. First, by sending $m = 1$, the senior maximizes the probability that the junior performs the task ($\Pr (r > r^* \mid m)$ increases in m). Staying passive rather than performing the task does not only affect the payoff in period 1. As learning by doing does not take place when $X_1 = 0$, period 2 payoff falls from $\frac{1}{2}a^2$ to z. The benefit of sending $m = 1$ instead of $m < 1$ is thus an increase in the probability that the junior learns.

The cost of sending $m = 1$ is a higher probability that the junior exerts too much effort because of overconfidence $(E(a \mid m = 1) > a)$. However, as a is close to 1, both the probability of overconfidence and the cost of overconfidence are low. The second reason why the senior may want to send $m = 1$ is that communication errors are to some extent systematic. When a is close to 1, noise of communication is likely to imply that $a_r^e < a$. To compensate, the senior sends $m = 1$.

From the above discussion it follows that for high values of a, there are two benefits of sending $m = 1$ rather than sending $m < 1$: first, it increases the probability of learning, and second, it may correct a systematic error. The magnitude of these benefits increases in a. The cost of sending $m = 1$ is a higher probability of overconfidence. This cost diminishes as a increases. More generally, there exists a value of $a = a^{**}$ for which the senior is indifferent between sending $m = 1$ and sending $m < 1$.

So far, we have established three ranges of a: $a \leq a^*$, $a \geq a^{**}$ and $a^* < a < a^{**}$. For each of the first two ranges, the senior does not discriminate among juniors. For $a \leq a^*$, she sends $m = 0$, and for $a \geq a^{**}$, she sends $m = 1$. For $a^* < a < a^{**}$, the senior neither wants to protect the junior fully against overconfidence nor wants to protect the junior fully against passiveness. That is, the senior trades off the costs of overconfidence and the costs of passiveness. Clearly, the higher is a, the higher are the costs of passiveness, and the lower are the costs of overconfidence. For $a^* < a < a^{**}$, the senior's strategy can now be characterized by $m(a)$ with $m \in (0, 1)$ and $m'(a) > 0$. For a's just above a^*, m is smaller than a, whereas for a's just below a^{**}, m is larger than a.

The junior

After the junior has received r, he forms a belief about a. Let the density function $h_r(a)$ [with cumulative distribution $H_r(a)$] denote this belief. As $m'(a) \geq 0$ and the probability of small errors exceeds the probability of large errors, the expected value of a, $a_r^e = \int_0^1 a h_r(a)\, da$, is an increasing function of r. It is now easy to characterize the junior's best response. First, suppose that $X_1 = 1$. Then, (2.1) implies that the junior chooses $e_1 = a_r^e$. Second, the junior chooses $X_1 = 1$ if and only if $r > r^*$, with r^* solving

$$\frac{1}{2}\left[\int_0^1 ah_{r^*}(a)\,da\right]^2 + H_{r^*}\left(\sqrt{2z}\right)z + \left[1 - H_{r^*}\left(\sqrt{2z}\right)\right]\frac{\int_{\sqrt{2z}}^1 \frac{1}{2}a^2 h_{r^*}(a)\,da}{\left[1 - H_{r^*}\left(\sqrt{2z}\right)\right]} = 2z$$

$$\frac{1}{2}\left[\int_0^1 ah_{r^*}(a)\,da\right]^2 + H_{r^*}\left(\sqrt{2z}\right)z + \int_{\sqrt{2z}}^1 \frac{1}{2}a^2 h_{r^*}(a)\,da = 2z \qquad (2.3)$$

The first term of (2.3) simply denotes the expected period 1 payoff when $e_1 = a_r^e$. The second and third term of (2.3) denote the expected period 2 payoff for a junior who has exerted effort in period 1. Because the junior only exerts effort in period 2 if $a > \sqrt{2z}$, together the second and third term are larger than z. This reflects learning by doing. The implication is that the junior chooses $X_1 = 1$ even if the expected payoff for period 1 is lower than z. The difference between the first term of (2.3) and z can be interpreted as the price the junior is willing to pay for learning his ability.

Finally, we have to ensure that $0 < r^* < 1$. Two conditions must hold. First, for $r = 1$, the left-hand side of (2.3) must be larger than $2z$. Second, for $r = 0$, the left-hand side of (2.3) must be smaller than $2z$. These conditions require that communication is not too noisy. In case communication is very noisy, it is optimal for the junior not to rely on his senior when deciding on whether or not to perform the task. For instance, if for $r = 1$, the left-hand side of (2.3) is lower than $2z$, the junior always abstains from performing the task. In that case, only a pooling equilibrium exists. If for $r = 0$ the left-hand side of (2.3) is larger than $2z$, then the junior always performs the task. The senior's message may affect the junior's effort. If an interior solution of r^* exists, then the equilibrium is best characterized as a semi-separating equilibrium. For some kinds of junior the senior chooses the same action (for $a \leq a^*$, the senior sends $m = 0$ and for $a \geq a^*$, she sends $m = 1$), while for other kinds the senior chooses different actions (for $a^* < a < a^{**}$, the senior sends $m(a)$).

The discussion above can be summarized by the following proposition.

Proposition 2.1 *Suppose a value of r^*, $0 < r^* < 1$, for which (2.3) holds. An equilibrium exists in which (i) the junior chooses $X_2 = 0$ if $X_1 = 0 \vee a < \sqrt{2z}$, and chooses $X_2 = 1$ with $e_2 = a$ if $X_1 = 1 \wedge a \geq \sqrt{2z}$; (ii) the junior chooses $X_1 = 1$ with $e_1 = \int_0^1 ah_r(a)\,da$ if $r > r^*$, and $X_1 = 0$ if $r \leq r^*$; (iii) the senior sends $m = 0$ if $a \leq a^*$, $m = 1$ if $a \geq a^{**}$, and $0 < m(a) < 1$ with $m'(a) > 0$ if $a^* < a < a^{**}$, and $0 < a^* \leq a^{**} < 1$; and (iv) posterior beliefs, $h_r(a)$, result from the senior's strategy according to Bayes' rule.*

How does Proposition 2.1 relate to the psychological literature discussed in the introduction? One finding by social psychologists was that appraisals by others are not accurate (Jones and Wortman, 1973). In our model seniors systematically distort their feedback to the juniors. In particular, feedback is too positive to highly able juniors (Brown and Dutton, 1995; Felson, 1993), and too negative to the least able juniors. Another result of our model that is consistent with the literature is that both over- and underconfidence exist (Kruger, 1999). A novel implication of our model is that underconfidence leads to passivity and is therefore more persistent than overconfidence. To produce more comparative-static results, we consider an example in the next section.

2.4 An example

Assume that a is drawn from a uniform distribution on $[0,1]$, that is $f(a) = 1$. Moreover, assume that the senior can send three messages, $m \in \{l, n, h\}$, $m = l$, meaning "low ability", $m = n$, meaning "normal ability", and $m = h$, meaning "high ability". The junior receives $r \in \{l, n, h\}$. Because of noise of communication r may deviate from m. As to this noise, we assume:

Assumption 2.1 $\Pr(r = l \mid m = l) = \Pr(r = n \mid m = n) = \Pr(r = h \mid m = h) = \alpha$

Assumption 2.2 $\Pr(r = n \mid m = l) = \Pr(r = n \mid m = h) = 1 - \alpha$

Assumption 2.3 $\Pr(r = l \mid m = n) = \Pr(r = h \mid m = n) = \frac{1}{2}(1 - \alpha)$

Assumption 2.4 $\alpha > \frac{1}{2}$.

Assumption 2.1 states that the probability that the junior receives the correct message equals α, and that this probability is independent of m. Assumption 2.2 and 2.3 imply that small communication errors are more likely than large ones. Notice that by sending $m = l$ $(m = h)$, the senior can avoid that the junior receives $r = h$ $(r = l)$.[4] The assumption that $\alpha > \frac{1}{2}$ implies that the probability that $r = m$, is higher than the probability that $r \neq m$. This assumption ensures that if the senior wants the junior to receive message $r = i$ the best she can do is sending message $m = i$.

Finally, we simplify the model of the previous section by restricting the choice of effort to three alternatives, $e_t \in \left\{0, \frac{1}{2}, 1\right\}$. As before, $e_t = 0$ amounts to maintaining status quo, and learning requires $e_t > 0$. As in the present model the junior cannot learn his ability by exerting an infinitesimal level of effort, we can assume that $z = 0$. Let us now discuss the equilibrium for this example.

2.4.1 Stage 2

Suppose that in stage 1 it is a best response of the junior to act in line with the message he has received: choose $X_1 = 0$ if $r = l$, $X_1 = 1$ with $e_1 = \frac{1}{2}$ if $r = n$, and $X_1 = 1$ with $e_1 = 1$ if $r = h$. Suppose $X_1 = 0$. Then, as in the general model, it is also optimal for the junior to choose $X_2 = 0$. Now suppose $X_1 = 1$, implying that the junior learns his ability. His decision then depends on the answer to the question: for which values of a should the junior choose $X_2 = 0$, $X_2 = 1$ with $e_2 = \frac{1}{2}$, or $X_2 = 1$ with $e_2 = 1$? Let a_L denote the value of a for which the junior, knowing a, is indifferent between $X_2 = 0$ and $X_2 = 1$ with $e_2 = \frac{1}{2}$. a_L follows from [see (2.1)

[4] We have set $\Pr(r = h \mid m = l) = \Pr(r = l \mid m = h)$ at zero rather than at small positive values to reduce notation. What matters for the results is that by choosing $m = h$ $(m = l)$, the senior minimizes the probability that the junior receives $r = l$ $(r = h)$.

and (2.2) with $z = 0$]

$$\frac{1}{2}a - \frac{1}{8} = 0 \Rightarrow a = a_L = \frac{1}{4} \tag{2.4}$$

Furthermore, let a_H denote the value of a for which the junior, knowing a, is indifferent between $X_2 = 1$ with $e_2 = \frac{1}{2}$ and $X_2 = 1$ with $e_2 = 1$. a_H follows from

$$\frac{1}{2}a - \frac{1}{8} = a - \frac{1}{2} \Rightarrow a = a_H = \frac{3}{4} \tag{2.5}$$

Equations (2.4-2.5) imply that in stage 2 all three options may be optimal for the junior. For $a \in [0, \frac{1}{4}]$, the junior chooses $X_2 = 0$; for $a \in (\frac{1}{4}, \frac{3}{4})$, the junior chooses $X_2 = 1$ with $e_2 = \frac{1}{2}$; and for $a \in [\frac{3}{4}, 1]$, the junior chooses $X_2 = 1$ with $e_2 = 1$.

2.4.2 The senior

Generally, the senior wants the junior to choose $X_1 = 0$ for low values of a, to choose $X_1 = 1$ with $e_1 = \frac{1}{2}$ for intermediate values of a, and to choose $X_1 = 1$ with $e_1 = 1$ for high values of a. Against this background, it is natural to assume that the senior's strategy can be represented by:

$$m(a) = \begin{cases} m = l & \text{if } a \leq a^* \\ m = n & \text{if } a^* \leq a < a^{**} \\ m = h & \text{if } a \geq a^{**} \end{cases} \tag{2.6}$$

Let us first establish that $\alpha < 1$ has consequences for the senior's strategy.

Lemma 2.1 *Suppose that the junior chooses $X_1 = 0$ if $r = l$, $X_1 = 1$ with $e_1 = \frac{1}{2}$ if $r = n$, and $X_1 = 1$ with $e_1 = 1$ if $r = h$. Then, $a_L < a^*$ and $a^{**} < a_H$.*

Proof. Suppose that $a = a_L$. Then, for $\alpha = 1$, both players are indifferent between $X_1 = 0$ and $X_1 = 1$ with $e_1 = \frac{1}{2}$. Clearly, $X_1 = 1$ with $e_1 = 1$ yields a lower payoff. The inequality $\alpha < 1$ implies that $m = n$ may impel the junior to choose $X_1 = 1$ with $e_1 = 1$. Sending $m = l$, by contrast, never leads the junior to choose $X_1 = 1$ with $e_1 = 1$. Hence, the senior strictly prefers sending $m = l$ to sending $m = n$. Now suppose that $a = a_H$. Then, both players are indifferent between $X_1 = 1$ with

$e_1 = \frac{1}{2}$ and $X_1 = 1$ with $e_1 = 1$, while $X_1 = 0$ yields a lower payoff. By sending $m = h$, the senior can avoid that the junior chooses the inferior option $X_1 = 0$. Hence, the senior strictly prefers sending $m = h$ to sending $m = n$. Q.E.D. ■

To understand the intuition behind Lemma 2.1, first consider a junior whose ability is just above a_L. In this situation, the senior ideally wants the junior to perform the task with moderate effort. However, the senior really wants to prevent the junior to exert too much effort. The costs of overconfidence are much higher than the costs of underconfidence. To avoid overconfidence, and in turn $e_1 = 1$, the senior sends $r = l$. Now consider a junior whose ability is just below a_H. In that situation, the worst case is that the junior chooses not to perform the task. Then, the benefits of the project in period 1 are foregone, and the junior will not learn his ability. Clearly, the cost of underconfidence are now higher than the costs of overconfidence. By sending $m = h$ the senior is sure to avoid a situation in which the junior chooses not to perform the task.

Let us now determine the equilibrium values of a^* and a^{**}. For $a = a^*$, the senior is indifferent between sending $m = l$ and sending $m = n$. Suppose that the senior sends $m = l$. Then, with probability α, the junior receives $r = l$ and does not perform the task. With probability $1 - \alpha$, the junior receives $r = n$ and chooses $X_1 = 1$ with $e_1 = \frac{1}{2}$. In that case, the junior learns that $a = a^* > a_L$, implying that he will also choose $X_2 = 1$ with $e_2 = \frac{1}{2}$ in stage 2. Thus, $m = l$ yields an expected payoff to the junior equal to

$$2(1-\alpha)\left(\frac{1}{2}a^* - \frac{1}{8}\right) \tag{2.7}$$

Now suppose that the senior sends $m = n$. Then, with probability $\frac{1}{2}(1-\alpha)$ the junior receives $r = l$ and does not perform the task. With probability α the junior receives $r = n$, and performs the task with $e_1 = \frac{1}{2}$. Finally, with probability $\frac{1}{2}(1-\alpha)$, the junior performs the task with effort $e_1 = 1$. In the latter two cases, the junior learns that $a = a_L$, leading him to choose $X_2 = 1$ with $e_2 = \frac{1}{2}$ in stage 2. Sending $m = n$

yields an expected payoff to the junior equal to

$$\frac{3}{4}a^* + \frac{1}{4}\alpha a^* - \frac{5}{16} + \frac{1}{16}\alpha \tag{2.8}$$

It is easy to verify that (2.7) equals (2.8) for

$$a^* = \frac{1+3\alpha}{20\alpha - 4} \tag{2.9}$$

Equation (2.9) illustrates the trade-off the senior faces when she must choose between sending $m = l$ and sending $m = n$. On the one hand, she knows that the junior is (just) sufficiently able to perform the task when $a = a^*$. Therefore, the more confident the senior is that $m = n$ induces the junior to choose $X_1 = 1$ with $e = \frac{1}{2}$ (that is the higher is α), the more she tends to send $m = n$. On the other hand, the senior fears that by sending $m = n$ the junior will put too much effort on the task.

For $a = a^{**}$, the senior is indifferent between sending $m = h$ and sending $m = n$. Lemma 2.1 states that for $a = a^{**}$, a junior, knowing his ability, chooses to perform the task with moderate effort. Thus, if the junior chooses $X_1 = 1$ in stage 1, he will choose $X_2 = 1$ with $e_2 = \frac{1}{2}$ in stage 2. Consequently, sending $m = n$ yields a payoff equal to (2.8) with a^{**} instead of a^*. Moreover, straightforward algebra shows that sending $m = h$ yields a payoff to both the senior and the junior equal to

$$a^{**} + \frac{1}{2}\alpha a^{**} - \frac{1}{4} - \frac{3}{8}\alpha \tag{2.10}$$

Equation (2.8), with a^* replaced by a^{**}, equals (2.10) for

$$a^{**} = \frac{7\alpha - 1}{4(1+\alpha)} \tag{2.11}$$

Equation (2.11) shows that the lower is α, the more the senior is inclined to send $m = h$. In deciding to send $m = h$ or $m = n$, the senior compares two costs. First, the costs of underconfidence. By sending $m = n$, the senior runs the risk that the junior receives $r = l$ and consequently does not perform the task in stage 1. In that case, the junior does not learn her ability and will not perform the task in stage

2 either. Second, the costs of overconfidence. By sending $m = h$ the junior will expend too much effort (recall $a^{**} < a_H = \frac{3}{4}$). Notice that this cost is limited to stage 1. As learning by doing takes place, the junior will choose $X_2 = 1$ with $e_2 = \frac{1}{2}$ in stage 2.

The following proposition summarizes the above discussion.

Proposition 2.2 *Suppose that the junior chooses $X_1 = 0$ if $r = l$, $X_1 = 1$ with $e_1 = \frac{1}{2}$ if $r = n$, and $X_1 = 1$ with $e_1 = 1$ if $r = h$. Then, the senior sends $m = l$ if $a \leq \frac{1+3\alpha}{20\alpha-4}$, $m = h$ if $a \geq \frac{7\alpha-1}{4(1+\alpha)}$ and $m = n$ otherwise.*

A direct implication of the above proposition is that if $\alpha = \frac{1}{2}$, then the senior never sends $m = n$.

2.4.3 Evaluation of the example

Let us now go back to the social psychologists' findings on self-assessments discussed in the introduction. Data on self-assessments are usually based on experiments. In these experiments, persons - often undergraduates - are asked to rate a certain skill on some scale. Researchers use different scales. For example, Kruger (1999) uses a scale from 1 to 10, while Ehrlinger and Dunning (2003) use a 3-point scale in one of their experiments. How would juniors from our model rate themselves?

In our example 25 percent of the juniors should not perform the task; 50 percent should perform the task with moderate effort; and 25 percent should perform the task with high effort. Suppose that the juniors are asked to rate their abilities in stage 1, that is, after they have received message r. In line with the senior's message space we assume a 3-point scale: low ability, normal ability, and high ability. It seems natural to assume that when asked to their ability, the juniors from our model report the message they have received from their senior. This means that if $\alpha = 1$, abilities and self-assessments do not differ (see Figure 2.1)

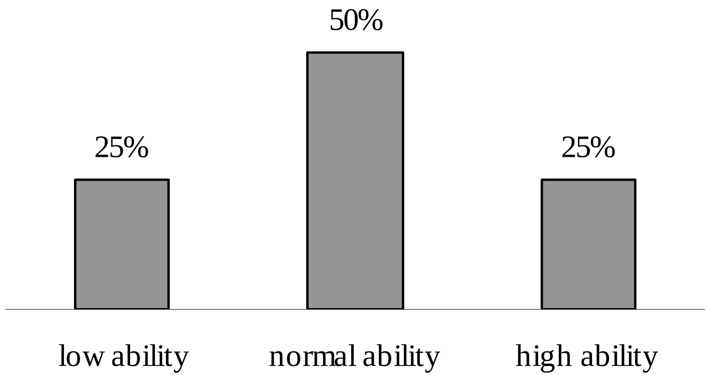

Figure 2.1

Now suppose that $\alpha = 0.7$. With the help of Proposition 2.2, it is easy to calculate the frequencies with which the senior sends the three possible messages. Figure 2.2 gives the distribution of m.

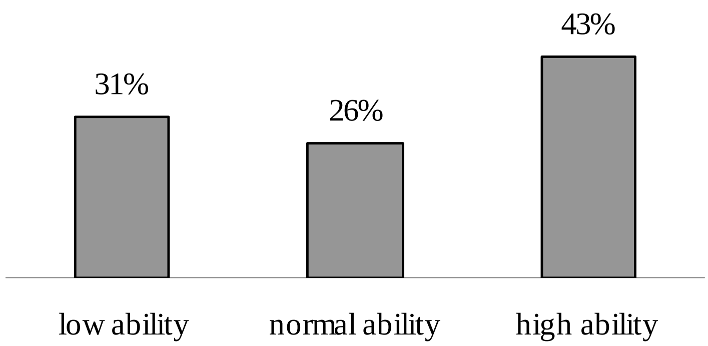

Figure 2.2

Using Assumption (2.1-2.3) and the percentages given in Figure 2.2, we can calculate the messages the juniors receive and thus their self-assessments. Figure 2.3 gives the results.

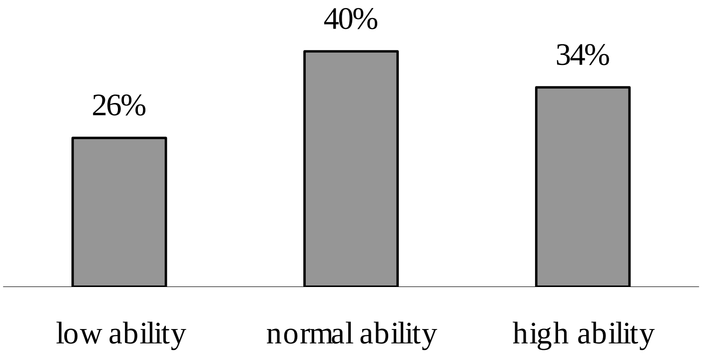

Figure 2.3

A comparison between Figure 2.1 and Figure 2.3 shows that the tails in Figure 2.3 are thicker than in Figure 2.1. Almost 35 percent of the juniors report that they have a high ability, while only 25 percent of the juniors actually have a high ability. Another feature of Figure 2.3 is that the distribution of self-assessments is skewed to the right. It is tempting to conclude from this skewness that our model predicts inflated self-assessments. As the distribution of actual abilities is symmetric, there is an "above average effect". However, as long as the juniors make correct statistical inferences, overconfidence (or underconfidence) does not exist on average. To understand why, consider a junior who has received $r = h$. If rational, this junior takes into account that (1) the senior may have sent $m = n$ or $m = h$; and (2) the senior has sent a message in line with the values of a^* and a^{**} reported in Proposition 2.1. In that case, the junior does not make a systematic error when assessing his ability.

In our model overconfidence induces juniors to put too much effort in the task. Underconfidence induces juniors to remain passive, while they would have benefited from performing the task. Misperceptions of abilities are partly caused by noise in the communication ($\alpha < 1$). For example, a moderately talented junior may abstain from performing a task because he mistakenly infers from his senior's message that he is untalented. More interesting are the cases in which the junior's misperception is "intended by the senior". We have seen that when $a \in [a^{**}, a_H)$, the senior sends a message which is likely to induce a junior to expend too much effort on the task. Such a junior is overconfident. Notice that overconfidence is temporary. Because the junior performs the task, he will learn his ability. This feature of the model is consistent with the observation that "performance is a better predictor of self-appraisals than the appraisals of others" (Felson, 1989, p. 965). When $a \in (a_L, a^*]$ the senior is likely to induce a junior who would benefit from performing the task to abstain from performing the task. In that case, the junior is underconfident. As for $a \in (a_L, a^*]$ underconfidence leads to passiveness, underconfidence is permanent. Also notice that because underconfidence leads to passiveness and overconfidence leads to activism, underconfidence is relatively hidden. It is easier to observe that somebody has overestimated his ability than that somebody has underestimated his ability.

In Figure 2.2, the distribution of the senior's messages is skewed to the right. To show that this result does not depend on the specific value of α chosen, we compare the length of the interval $(a_L, a^*]$ with the length of the interval $[a^{**}, a_H)$. Straightforward algebra shows that $a_H - a^{**} = \frac{(1-\alpha)}{1+\alpha} > a^* - a_L = \frac{1-\alpha}{10\alpha-2}$ for $\frac{1}{2} \leq \alpha < 1$. Hence, consistent with the empirical findings, our model predicts that on average appraisals are too positive. The reason for this result is that the costs of causing overconfidence (too much effort) are lower than the costs of underconfidence (passiveness). As discussed above, overconfidence disappears in stage 2, but underconfidence does not disappear in stage 2. Indeed, one can verify that if we eliminate stage 2 from our model, then we obtain $a_H - a^{**} = \frac{1}{4\alpha} - \frac{1}{4} = a^* - a_L$.

2.5 Concluding remarks

We have developed a simple model of self-assessments in order to explain some observations made by social psychologists. In this model, a junior has limited information about his ability. He can learn about his ability by information provided by a senior and by experience. We have shown that when communication between the senior and the junior is noisy, the senior may have an incentive to give too positive appraisals to more talented juniors and too negative appraisals to less talented juniors. On average, the senior's appraisals are too positive. Concerning self-assessments, our model predicts the well-known "above average effect": the distribution of self-assessments is skewed to the right, while the distribution of actual abilities is symmetric. Nevertheless, in our model some juniors believe they are less able than they actually are. In this respect, our model deviates from most other economic models of self-assessments that predict that all agents are overconfident (references are in the introduction). Finally, we have argued that when overconfidence or underconfidence matters for behaviour, there is an important difference between the two. Underconfidence leads to passiveness, which obstructs learning by experience. In contrast, overconfidence leads to activism, which enhances learning by experience. The implication is that underconfidence is more permanent, while overconfidence is more temporary.

In order to highlight the role of imperfect communication and the possibility of learning by doing in the self-appraisal process, we have made several restrictive assumptions. We have already discussed some of them. Let us elaborate on two other ones.

First, we have assumed that by performing the task, the junior fully learns his ability. In many situations, this assumption is not realistic. However, assuming that by performing the task the junior receives a noisy signal about his ability rather than a fully informative signal does not affect our results qualitatively. Relative to underconfidence, overconfidence remains a temporary phenomenon. Things become more complicated when the degree of learning depends on effort. One can imagine situations in which the degree of learning is positively related to effort. In that case, the junior will be more biased towards performing the task with higher effort.

A second important assumption is that the junior's and senior's preferences are perfectly aligned. A natural extension of our model is to allow for conflicting preferences. Suppose, for example, that the senior's preferences are identical to those of the junior, except that the senior attaches less cost to the junior's effort: $U_t^s\left(X_t = 1\right) = ae_t - \lambda_s e_t^2$, with $\lambda_s < \frac{1}{2}$. The junior's preferences are still represented by (2.1). It is easy to verify that in the resulting model, three types of equilibria exist. A separating equilibrium exists if λ_s is close to $\frac{1}{2}$. The outcomes are similar to those discussed in the previous section, save that the senior has a stronger incentive to exaggerate her junior's ability. Thus, $\lambda_s < \frac{1}{2}$ strengthens the senior's tendency towards too positive feedback. If λ_s is smaller than a certain threshold, it is not a best reply for the junior anymore to act in accordance with his senior's message. The senior inflates the junior's ability too much. For moderate values of λ_s a partially separating equilibrium exists, in which the senior only sends two messages, say $m = n$ and $m = h$. Finally, for very small values of λ_s, it is a best response for the junior to ignore the senior's message completely, and to base his decision on the task on his prior information. That is, only a pooling equilibrium exists. The upshot of this discussion is that $\lambda_s < \frac{1}{2}$ increases the senior's incentive to give too positive feedback. This stronger incentive may partially or fully distort communication between the senior and the junior.

Chapter 3

The Effect of a Mentor on a Junior Employee's Self-Assessment

3.1 Introduction

An individual's perception about his ability affects the choices he makes. A junior employee who has a low perception of his ability may decide that he is not sufficiently able to continue with his current job. As long as his perceived ability corresponds to his actual ability the junior takes the correct decision. A low perception, however, is problematic if the actual ability is high. Then, a low perception may be the reason that a talented junior employee decides to resign and leave the organization. Phillips (1984) shows that highly competent children with a low perception of their ability adopt lower standards and hold lower expectations for success than highly competent children with a more positive view of their ability. An implication may be that negative and distorted self-appraisals persist, because intellectually competent children avoid tasks that could provide evidence about their abilities. Ehrlinger and Dunning (2003) point out that one possible reason why women disproportionately avoid careers in science is that they underestimate their scientific reasoning ability.

The relationship between the individual's perception of his ability and the individual's actual ability has predominantly been investigated by social psychologists. A well-known finding in social psychology is that agents rate themselves above average. For car driving Svenson (1981) shows that individuals believe themselves to be better drivers than others in the group. Kruger (1999), however, shows that this bias is only observed if individuals are asked to rate their performance on easy tasks. He shows that for domains in which absolute skills tend to be high (using mouse, driving, riding bicycle, saving money), a majority of people see themselves better than average, while for domains in which absolute skills tend to be low (telling jokes, playing chess, juggling, and computer programming), a majority of people see themselves worse than average.[1,2]

We present a model that underpins the finding that people rate themselves above average on easy tasks and below average on difficult tasks. We consider a setting in which agents do not observe their ability, but they use their performance on a task to make an inference. The problem faced by the agent is that performance not only depends on the agent's ability, but also on the unknown difficulty of the performed task. Hence, an average performance may be the result of a competent agent performing a difficult task, or of an average agent performing an easy task. The agent only observes performance. Therefore, when making a self-assessment on the basis of his performance on a difficult task, the agent must take into account the possibility that the performed task was easy and he is of lower ability. The consequence is that an agent who has performed a difficult task underestimates his ability. A similar argument holds for an agent performing an easy task.

A junior employee could be an example of an agent who faces the uncertainties that lead to the above finding. At the beginning of his career, a junior employee rarely knows his own ability. Besides, a junior who has recently joined the organization is unable to assess the difficulty of different tasks in the organization. Frequently, the only available information to the junior is his performance on a task. Based on

[1]Kruger's result has been replicated in other experiments (Hoelzl and Rustichini, 2005; Moore and Kim, 2003; Hales and Kachelmeier, 2005).

[2]Within the psychology literature there is a strand that finds the opposite relationship between task difficulty and confidence. This strand presents evidence that greater task difficulty leads to greater absolute confidence, the so-called hard/easy effect in overconfidence (see Klayman et al. (1999) and other studies cited therein). The distinction is that Klayman et al (1999) investigate confidence in predicting absolute performance, whereas Kruger (1999) and related studies, look at performance relative to others (see Moore and Kim (2003) and Hales and Kachelmeier (2005) for greater detail on this distinction).

this performance, the junior can make an inference on his ability and the difficulty of the task. Having a more precise image of his ability, enables the junior to improve future decisions. The drawback of using performance to make an inference about his ability is that a junior who has performed a difficult task underestimates his ability. An implication is that sometimes a talented junior may decide to stop performing a task after learning his performance on a difficult task. The organization can prevent this by appointing a senior employee who acts as the junior's mentor. A senior employee has more experience and therefore is better able to discern easy tasks from difficult tasks. Besides, she is better able to assess the junior's ability.

The benefit of appointing a mentor, if the preferences of the junior and the mentor are perfectly aligned, is that a mentor takes care of a better match between task difficulty and the junior's ability. In many settings, however, the preferences of the mentor and the junior are not perfectly aligned. A reason may be that the junior incurs costs to perform a task and the mentor does not. In this situation the mentor sometimes has an incentive to conceal information. Consequently, some juniors do not learn about the difficulty of the task and about their ability. The implication is that if performing a task is sufficiently costly for the junior, some talented juniors may decide to stop performing the task. Having talented juniors leave the organization is both costly for the organization and for the mentor. The mentor can prevent these juniors from leaving the organization, by assigning them an easy task. After observing the performance on an easy task, the junior decides to continue performing a task and eventually he learns his ability.

This chapter sheds light on the benefits of appointing a mentor. The mentor relationship has been widely investigated in the management literature.[3] Kram (1985) defines the mentor relationship as "a relationship between a young adult and an older, more experienced adult that helps the younger individual learn to navigate in the adult world and the world of work" (p.2). Specially in early adulthood a mentor relationship can enhance development (see Kram, 1983). Fagenson (1989) shows that "mentored individuals reported having more satisfaction, career mobility/opportunity, recognition and a higher promotion rate than non-mentored

[3] See Burke and McKeen (1990) and Ehrich and Hansford (1999) for a review of the literature.

individuals" (p. 309). This chapter not only considers the benefits of introducing a mentor, but it also considers what happens if the preferences of the mentor and the junior are not perfectly aligned. Most of the management literature compares non-mentored to mentored individuals. Ragins, Cotton and Miller (2000), however, point out that a mentor alone does not automatically lead to better outcomes. What is important for outcomes is the quality of the mentor relationship. Ragins et al. show that satisfaction with the mentor relationship has a greater impact on attitudes than the presence of a mentor. Allen and Eby (2003) performed a survey under mentors. They find that the more similar the protégé and the mentor are, the higher the reported quality of the mentor relationship is. This chapter presents a similar result. The more aligned are the preferences of the mentor and the junior, the greater are the benefits the mentor and the junior derive from the relationship.

A key aspect in this chapter is that the mentor is better informed and therefore has information that is valuable to the junior. A recent paper by Ertac (2005) pays attention to the decision of a principal about the amount of information to disclose about the agent's performance and the performance of other agents in the organization. She also considers a model in which performance depends on a common shock (for example, task difficulty) and the agent's ability. Her analysis focuses on exploring whether and when it is optimal for the principal to inform agents about each other's performance. Information about the performance of other agents is useful to separate the effect of the common shock from the effect of ability. The focus of this chapter is more on the consequences of incomplete information. In this chapter, the junior always observes his performance and he uses this information to make an inference on his ability and the difficulty of the task. The role of the senior is to take away some uncertainty on the part of the junior.

More broadly, this chapter is related to several economic papers that recently have appeared on the topic of self-assessment of abilities. These papers investigate why people are overoptimistic about certain life-events (see Van den Steen, 2004), why people may decide not to collect information for strategic purposes (Carrillo and Mariotti (2000) and Bénabou and Tirole (2002)), and why people may keep buying signals until their self-assessment is sufficiently favourable (Zábojník (2004) and Brocas and Carrillo (2002)). A drawback of these papers is that they only pay attention to overconfidence. In the experiments we have mentioned above, however, people exist who hold unrealistically negative impressions of their abilities.

In Chapter 2 we have presented a model that pays attention to both overconfidence and underconfidence. The main difference is that in this chapter individuals not only lack information about their ability but also have no information about the difficulty of the performed task.

Besides the model discussed in Chapter 2, there is one economic paper that takes into account underconfidence. Santos-Pinto and Sobel (2005) present a model in which negative self-image is a theoretical possibility. However, the skill acquisition model discussed in their paper provides a setting in which positive self-image can arise, but no negative self-image. "Negative self-image is a theoretical possibility within our model, but we do not have a realistic model to choice that generates negative self-image" (Santos-Pinto and Sobel, 2005, p. 1390). In their model, ability consists of different skills and individuals have heterogeneous production functions that determine ability as a function of multiple skills. Using their own production function, individuals make skill-enhancing investments to maximize ability and compare their final skills to the skills of other individuals. One result of their paper is that the easier is the task, the greater is the individuals positive self-image.

The remainder of the chapter is organized as follows. Section 3.2 presents the model. Sections 3.3 and 3.4 discuss an equilibrium of the model. Section 3.5 presents the consequences of introducing a mentor. Finally, section 3.6 concludes.

3.2 Model

We consider a simple model in which a junior has to perform a task in an organization. Tasks can be easy ($d = 0$) or difficult ($d = 1$). With a probability of γ the task is difficult and with a probability of $1 - \gamma$ the task is easy. The junior does not know which type of task he is performing. He only knows the prior probability that the task is difficult. Furthermore, we assume that juniors differ in ability. The junior does not know his own ability. He only knows that abilities are uniformly distributed on the interval $[0, 1]$.

At the beginning of the game, Nature draws the difficulty of tasks and the junior's ability. In stage 1, the junior performs a task. He observes his performance on the task. The junior's performance (p) on a task depends on the difficulty of the task and on the junior's ability (a). We model this in the following way.

Assumption 3.1 *If the performed task is difficult, then performance is* $p = a^2$*, implying a density function of* p*:* $g(p) = \frac{1}{2\sqrt{p}}$.

Assumption 3.2 *If the performed task is easy, then performance is* $p = a$*, implying a density function of* p*:* $f(p) = 1$.

Assumption 3.1 and Assumption 3.2 capture that the same ability leads to a better performance on an easy task than on a difficult task. Notice that, on average, the junior attains a better performance on an easy task ($E[p \mid d = 0] = \frac{1}{2}$) than on a difficult task ($E[p \mid d = 1] = \frac{1}{3}$).

In stage 2, the junior decides whether to (i) stop performing the task ($X = 0$), (ii) continue performing the same task ($X = 1$) or (iii) perform a new task ($X = 2$). In the latter case, Nature draws the difficulty of the new task.

The junior wants to make a contribution to the organization by performing a task, but performing a task is costly. Specifically, the utility of the junior is given by

$$U = d\alpha p + (1 - d)\,p - c \tag{3.1}$$

where $d \in \{0, 1\}$ is the difficulty of the performed task and c denotes the cost of performing a task.[4] The first two terms of (3.1) correspond to the junior's contribution to the organization. The junior's contribution depends on the difficulty of the performed task and on the junior's ability. The junior does not observe his contribution to the organization, he only observes his performance on the task. At this point my model deviates from traditional economic models where the junior knows

[4] We have assumed that performing an easy task costs the same to the junior as performing a difficult task. Assuming that the costs of performing a difficult task are larger than the costs of performing an easy task, does not change the results qualitatively.

the utility he derives from his actions.[5]

We assume that $\alpha > 1$. This assumption implies that, given p, the junior derives a higher utility from performing a difficult task than from performing an easy task. The idea behind this assumption is that, given the junior's performance, his contribution to the firm is greater if he performs a difficult task than if he performs an easy task. If the junior does not perform a task his utility is normalized to zero.

Let us summarize the timing of the model. (1) Nature determines the difficulty of tasks and Nature draws the junior's ability, a, from a uniform distribution on $[0, 1]$. (2) In stage 1, the junior performs a task and learns his performance, $p_1 \in [0, 1]$. (3) In stage 2, the junior decides whether to (i) stop performing the task, (ii) continue performing the same task, or (iii) perform a new task. In the latter case, Nature draws the difficulty of the new task, $d \in \{0, 1\}$. If the junior stops performing a task, the game ends.

3.3 First stage

In the first stage of the model, the junior does not have to take any decision. This stage can be seen as a learning stage for the junior. The junior performs a task to obtain information about his ability. By performing a task, the junior learns his performance on the task. The first thing a junior does, is updating his ability. The junior's expected ability, given his performance of p, equals

$$\begin{aligned} a_p^e &= E[a \mid p] \\ &= \Pr(d=0 \mid p) E[a \mid d=0 \wedge p] + \Pr(d=1 \mid p) E[a \mid d=1 \wedge p] \\ &= \frac{f(p)(1-\gamma)}{f(p)(1-\gamma)+g(p)\gamma} \cdot p + \frac{g(p)\gamma}{f(p)(1-\gamma)+g(p)\gamma} \cdot \sqrt{p} \\ &= \frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \end{aligned}$$

Because of the positive relation between ability and performance, it is not sur-

[5]Recently some economic paper assume that individuals derive utility from their beliefs (see Brocas and Carrillo (2003) for a discussion).

prising that the better is the observed performance, the higher is the expected ability ($\frac{\partial a_p^e}{\partial p} > 0$). Furthermore, the expected ability depends on the prior probability that the task is difficult. An increase in γ, has a positive effect on a_p^e ($\frac{\partial a_p^e}{\partial \gamma} > 0$). The reason is that an increase in γ indicates a greater probability of having performed a difficult task. To attain a performance of p on a difficult task the junior needs to have a higher ability than to attain the same performance on an easy task. Hence, the greater is γ, the greater is a_p^e.

Determining how juniors rate themselves

Next, we want to determine how juniors rate themselves on two tasks, task 1 ($t1$) and task 2 ($t2$). Task 1 is a difficult task and task 2 is an easy task. The junior does not know the difficulty of the task, he only observes his performance on the task. Suppose that a junior in the model is asked to rate himself after performing task 1. Then, the junior will report

$$a_{t1}^e = \int_0^1 a_p^e \cdot g(p)\, dp = \int_0^1 \frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot \frac{1}{2\sqrt{p}} dp$$

The average ability reported by juniors performing a difficult task is smaller than the average ability of juniors in the model (see Appendix A). This means that juniors performing a difficult task, on average, tend to rate themselves below average. The intuition is that a junior does not know that he has performed a difficult task. Therefore, when he determines his expected ability he takes into account the possibility that he has performed an easy task and is of lower ability.

Next, suppose that a junior in the model has performed task 2 ($t2$). Then the average expected ability reported by juniors that have performed task 2 equals

$$a_{t2}^e = \int_0^1 a_p^e \cdot f(p)\, dp = \int_0^1 \frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} dp$$

The average expected ability reported by juniors performing a difficult task is greater than the average ability of juniors in the model (see Appendix A). This means that juniors, who have performed an easy task, on average, rate themselves above average.

Again the explanation for this result lies in the fact that a junior does not know the difficulty of the task. Consequently, when determining his expected ability, the junior takes into account the possibility that he performed a difficult task and is of higher ability.

Proposition 3.1 *On average, juniors performing a difficult task rate themselves below average and juniors performing an easy task rate themselves above average.*

This feature of the model is consistent with the observation by Kruger (1999) that for easy domains a majority of people see themselves better as average, while for more challenging domains, a majority of people see themselves as worse than average.

3.4 Second stage

In this section we consider the decision of the junior in the second stage. We assume that the junior performs a task in the first stage.

Assumption 3.3 *If the junior has no information about his ability and the difficulty of the task, then he decides to perform a task.*

In the second stage, the junior has to decide whether to stop performing a task, continue with the same task, or perform a new task. First, We consider the benchmark situation where the junior is fully informed about the difficulty of tasks and about his ability. Second, we consider the situation where the junior only observes his performance on the task.

3.4.1 Benchmark: junior observes performance and difficulty of the task

Given his ability, the junior has to choose between (i) not performing a task, (ii) performing an easy task, and (iii) performing a difficult task.

Let a_0 be the ability of a junior who is indifferent between not performing a task and performing an easy task.

$$a_o - c = 0 \longrightarrow a_0 = c$$

Let a_1 be the ability of a junior who is indifferent between performing an easy task and performing a difficult task.

$$\alpha a_1^2 - c = a_1 - c \longrightarrow a_1 = \frac{1}{\alpha}$$

If $c < \frac{1}{\alpha}$, the strategy of the junior is: (i) perform no task if $a \in [0, c)$, (ii) perform an easy task if $a \in \left[c, \frac{1}{\alpha}\right)$, and (iii) perform a difficult task if $a \in \left[\frac{1}{\alpha}, 1\right]$. Throughout the rest of the chapter we assume that $c < \frac{1}{\alpha}$.

3.4.2 The junior only observes performance

In many settings, however, the junior does not know the difficulty of the task. Therefore, in this section, we consider the situation where the junior only observes his performance. Based on his observed performance, in stage 2, the junior decides whether to (i) stop performing the task ($X = 0$), (ii) continue performing the same task ($X = 1$), or (iii) perform a new task ($X = 2$). Suppose that the junior observes a performance of p. Then, performing the same task again leads to the same performance of p. The junior's utility of performing the same task again equals

$$E\left[U \mid X = 1\right] = \widehat{\gamma}\alpha p + (1 - \widehat{\gamma})\, p - c$$

where $\widehat{\gamma}$ is the posterior probability that the performed task is difficult

$$\begin{aligned}
\widehat{\gamma} &= \Pr\left(d = 1 \mid p\right) = \frac{g\left(p\right)\gamma}{f\left(p\right)\left(1 - \gamma\right) + g\left(p\right)\gamma} \\
&= \frac{\gamma}{2\sqrt{p}\left(1 - \gamma\right) + \gamma}
\end{aligned}$$

The better is performance, the greater is the probability that the performed task is easy. More precisely, for $p > \frac{1}{4}$, $\widehat{\gamma} < \gamma$.

The junior can also decide to perform a new task. With probability $\widehat{\gamma}$ the junior performed a difficult task in the first stage. Then a performance of p corresponds to a junior with an ability of $\sqrt{p}$. In the second stage the junior employee's contribution to the organization of performing a new task equals αp if the new task is difficult and equals $\sqrt{p}$ if the new task is easy. With probability $(1-\widehat{\gamma})$ the junior performed an easy task in the first stage. Then a performance of p corresponds to a junior with an ability of p. In this situation the junior's contribution to the organization of performing a new task in the second stage equals αp^2 if the new task is difficult and equals p if the new task is easy. Hence, the expected utility of performing a new task is

$$E\left[U \mid X=2\right] = \widehat{\gamma}\left(\gamma\alpha p + (1-\gamma)\sqrt{p}\right) + (1-\widehat{\gamma})\left(\gamma\alpha p^2 + (1-\gamma)\,p\right) - c$$

Finally not performing the task yields a payoff of zero.

First, we focus on the juniors choice between performing the same task again $(X=1)$ and performing a new task $(X=2)$. The junior is indifferent between the two options if

$$(1-\widehat{\gamma})\,\gamma\left(\alpha p^2 - p\right) - \widehat{\gamma}\,(1-\gamma)\left(\alpha p - \sqrt{p}\right) = 0 \tag{3.2}$$

Lemma 3.1 presents the roots of equation (3.2).

Lemma 3.1 *The junior is indifferent between $X=1$ and $X=2$ if $p=0$, $p=p_L$ and $p=p_H$, where $p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$ and $p_H \in \left(\frac{1}{\alpha}, 1\right)$.*

Proof. See Appendix B. ■

To understand the intuition behind Lemma 3.1 consider Figure 3.1. In the figure, curve A (curve B) gives the relationship between the junior's ability and his performance on a difficult task (an easy task). Curve C (B) gives for each ability the corresponding junior's utility derived from contributing to the firm by performing a difficult task (an easy task).[6] More precisely, curve C corresponds to αp. A junior who has an ability equal to $\frac{1}{\alpha}$ (intersection between curve B and curve C) is indifferent between performing an easy task and a difficult task.

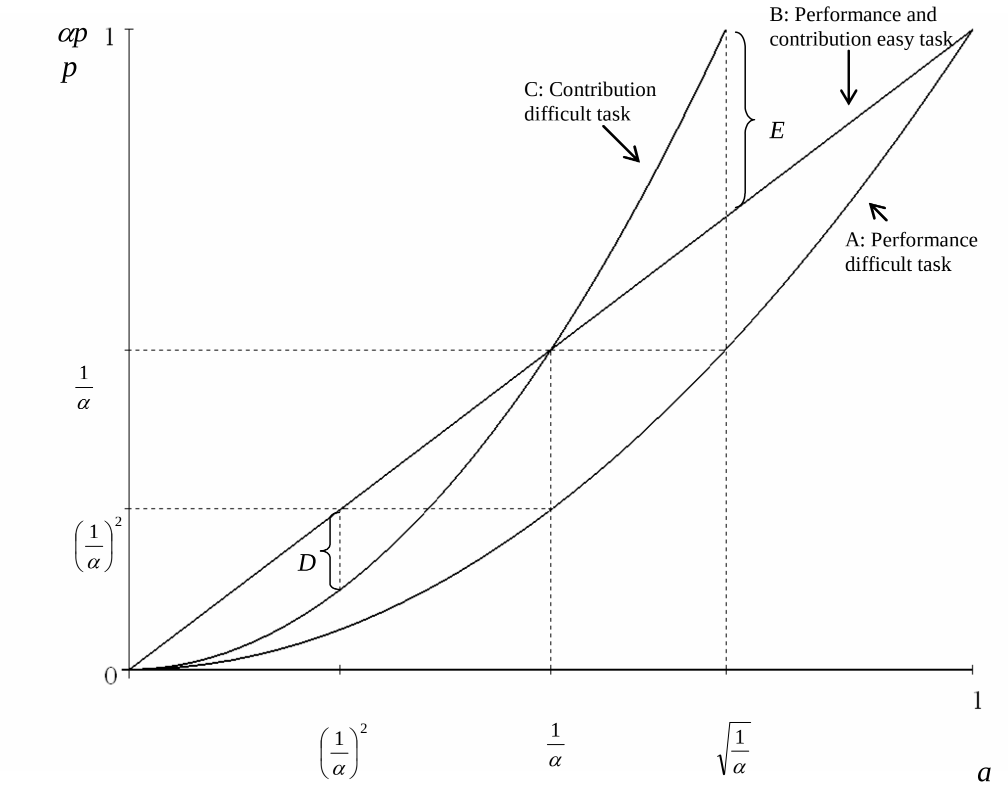

Figure 3.1

Suppose that the junior observes a performance of $p \in \left[\left(\frac{1}{\alpha}\right)^2, \frac{1}{\alpha}\right]$. This performance corresponds either to a junior with an ability $a \in \left[\frac{1}{\alpha}, \sqrt{\frac{1}{\alpha}}\right]$ performing a difficult task or to a junior with an ability $a \in \left[\left(\frac{1}{\alpha}\right)^2, \frac{1}{\alpha}\right]$ performing an easy task. Let us consider the two cases separately. First, let us consider a junior with an ability $a \in \left[\frac{1}{\alpha}, \sqrt{\frac{1}{\alpha}}\right]$ performing a difficult task. Ideally, a junior with an ability greater than $\frac{1}{\alpha}$ performs a difficult task (see benchmark in section 3.4.1). Also the figure

[6] Notice that if the junior performs an easy task, then his contribution to the firm equals his performance. Hence, the relationship between ability and performance and the relationship between ability and the junior's utility derived from his contribution to the firm, are represented by B.

shows that this junior derives a greater utility from performing a difficult task than from performing an easy task (curve C lies above curve B). Hence, the junior is performing the task that yields the highest possible utility. Second, let us consider a junior with an ability $a \in \left[\left(\frac{1}{\alpha}\right)^2, \frac{1}{\alpha}\right]$ performing an easy task. Ideally, a junior with an ability smaller than $\frac{1}{\alpha}$ performs an easy task (curve C lies below curve B). Hence, also in this case the junior is performing the task that yields the highest possible utility. Summarizing, a junior who observes a performance of $p \in \left[\left(\frac{1}{\alpha}\right)^2, \frac{1}{\alpha}\right]$ is performing the task he would perform under full information. Consequently, the junior has no incentive to perform a new task and chooses $X = 1$.

Now suppose that the junior observes a p just below $\left(\frac{1}{\alpha}\right)^2$. Then, there are two possibilities. First, a performance just below $\left(\frac{1}{\alpha}\right)^2$ can result from a junior with an ability just below $\frac{1}{\alpha}$ performing a difficult task. Ideally, this junior would like to perform an easy task. In this situation performing a new task would reduce the probability that the junior performs a difficult task in the second stage, increasing the junior's utility. With a probability of $(1 - \gamma)$ the new task is easy. Then the gains of option $X = 2$ are given by the difference between curve C and curve B at the point $a = \frac{1}{\alpha} - \varepsilon$. The figure immediately shows that the gains are infinitesimally small. With probability γ the new task is difficult and then there are no gains from performing a new task. Hence, the gains from option $X = 2$ in this case are nil. Second, a performance just below $\left(\frac{1}{\alpha}\right)^2$ can result from a junior with an ability just below $\left(\frac{1}{\alpha}\right)^2$ performing an easy task. In this situation, the junior is performing the task he would choose under full information. Choosing to perform a new task increases the probability that the new task is difficult, resulting in a smaller utility for the junior. With a probability of γ the new task is difficult. Then, the costs of performing a new task are given by D. With a probability of $(1 - \gamma)$ the new task is easy and there are no costs of choosing $X = 2$. When making the choice between $X = 1$ and $X = 2$ the junior trades-off the costs of performing a new task and the benefits. If performance is just below $\left(\frac{1}{\alpha}\right)^2$ the costs exceed the benefits. Consequently, the junior chooses to perform the same task again ($X = 1$). The figure also illustrates that the smaller is the observed performance, the greater are the benefits resulting from performing a new task and the smaller are the costs. More generally, there exists a value $p = p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$ at which the junior is indifferent between performing the same task again and performing a new task.

Finally, suppose that the junior observes a p just above $\frac{1}{\alpha}$. Then a similar argument holds. Again, there are two possibilities. First, a performance just above $\frac{1}{\alpha}$ can result from a junior with ability just above $\frac{1}{\alpha}$ performing an easy task. Ideally, the junior would like to perform a difficult task. In this situation performing a new task would increase the probability that the junior performs a difficult task in the second stage, increasing the junior's utility. The gains of option $X = 2$ are that with a probability of γ the new task is difficult and the additional utility derived from option $X = 2$ is given by the difference between curve C and curve B at the point $a = \frac{1}{\alpha} + \varepsilon$. The figure immediately shows that the gains are infinitesimally small. Second, a performance just above $\frac{1}{\alpha}$, can result from a junior with an ability just above $\sqrt{\frac{1}{\alpha}}$ performing a difficult task. Ideally this junior performs a difficult task. Performing a new task increases the probability that the new task is easy, decreasing the junior's utility. The costs of performing a new task are that with a probability of $(1 - \gamma)$ the new task is easy and the utility decreases by E. Again, the junior trades-off the costs of performing a new task and the benefits, when making a choice between $X = 1$ and $X = 2$. If performance is just above $\frac{1}{\alpha}$, the costs exceed the benefits. If the observed performance is $p = 1$, then the left-hand side of equation (3.2) is positive. This implies that if $p = 1$, then the junior prefers option $X = 2$. More generally, there exists a value of $p = p_H \in \left(\frac{1}{\alpha}, 1\right)$ at which the junior is indifferent between performing the same task again and performing a new task. The following lemma summarizes the above discussion.

Lemma 3.2 *Suppose the junior can choose between performing the same task again and performing a new task. Then, the junior chooses to perform the same task again if $p = 0$ or $p \in [p_L, p_H]$ and he chooses to perform a new task if $p \in (0, p_L)$ or if $p \in (p_H, 1]$.*

Until now we have focused on the choice between performing a new task and performing the same task again. The junior, however, can also decide not to perform a task. The utility a junior derives from not performing the task equals 0. A junior who observes a sufficiently low performance, will choose not to perform the task. For these juniors, the costs of performing the task exceed the expected benefits of performing the task. Depending on the costs of performing the task, two situations can be distinguished. Let $c = \overline{c}$ be the cost for which the junior is indifferent between $X = 0$, $X = 1$ and $X = 2$ if he observes $p = p_L$. If the costs are sufficiently small $(c < \overline{c})$, the junior chooses to stop performing the task if $p < p_c^L$, where p_c^L solves

$$\widehat{\gamma}\left(\gamma\alpha p_c^L + (1-\gamma)\sqrt{p_c^L}\right) + (1-\widehat{\gamma})\left(\gamma\alpha\left(p_c^L\right)^2 + (1-\gamma)\,p_c^L\right) - c = 0$$

and if the cost are sufficiently high $(c \geq \overline{c})$, the junior decides to stop performing the task if $p < p_c^H$, where p_c^H solves

$$\widehat{\gamma}\alpha p_c^H + (1-\widehat{\gamma})\,p_c^H - c = 0$$

Figure 3.2 and Proposition 3.2 summarize the above discussion.

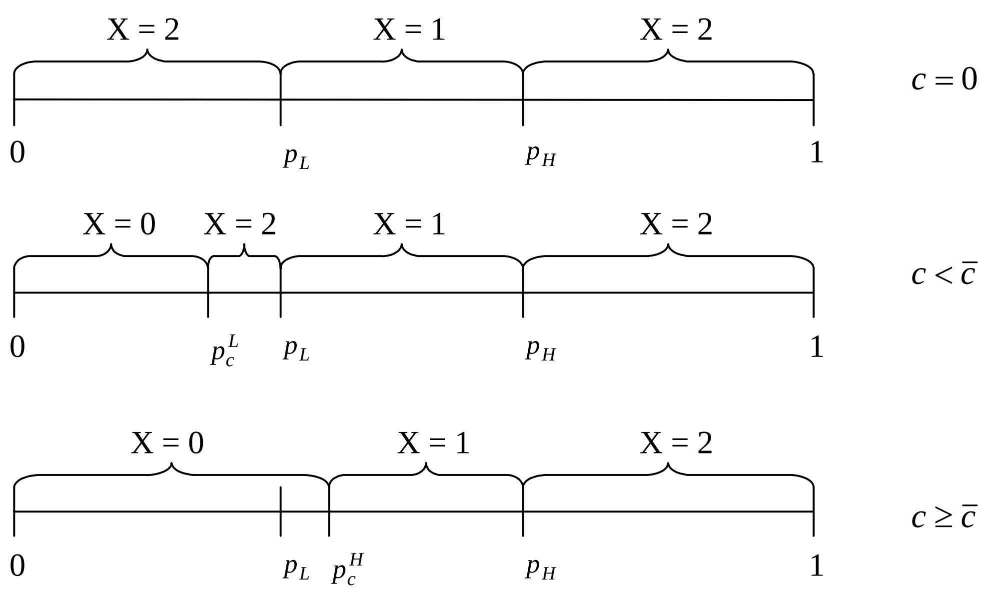

Figure 3.2

Proposition 3.2 *Suppose that the costs are sufficiently small ($c < \overline{c}$), then (i) a junior who observes $p < p_c^L$ chooses to stop performing a task (ii) a junior who observes $p \in \left[p_c^L, p_L\right)$ or $p \in (p_H, 1]$ chooses to perform a new task, and (iii) a junior who observes $p \in [p_L, p_H]$ chooses to perform the same task again. Suppose that the costs are sufficiently large ($c \geq \overline{c}$), then (i) a junior who observes $p < p_c^H$ chooses to stop performing the task, (ii) a junior who observes $p \in \left[p_c^H, p_H\right]$ chooses to perform the same task again, and (iii) a junior who observes $p \in (p_H, 1]$ chooses to perform a new task.*

An implication of taking a decision based on observed performance, is that the junior sometimes takes the wrong decision. The junior can make two types of mistakes. First, a highly talented junior who has performed a difficult task may decide to perform a new task after observing his performance. Take, for example, a junior with an ability equal to a' and a performance of $p' > p_H$ after performing a difficult task. Then, according to Proposition 3.2, the junior, who has no information about his ability and the difficulty of the performed task, decides to perform a new task. However, if the junior, after performing the task, were to learn his ability and the difficulty of the task, he would decide to continue with the same task.[7] Second, a talented junior who has performed a difficult task may decide to stop performing a task if performing a task is sufficiently costly. Take, for example, a junior with ability $\widehat{a} > \frac{1}{\alpha}$ and a performance of $\widehat{p} < p_c^H$ after performing a difficult task. Furthermore, suppose that $c > \overline{c}$. Then, according to Proposition 3.2, the junior decides to stop performing the task. If the junior, however, were to learn his ability and the difficulty of the task, he would decide to continue with the task. Hence, sometimes a junior takes the wrong decision because he lacks information about his ability and about the difficulty of the task. Both types of mistakes are costly for an organization. The organization sometimes can prevent a junior from making these mistakes by appointing a senior employee who acts as the junior's mentor.

[7] The same type of mistake is made by a low ability junior. Take, for example, a junior with an ability equal to a'' and a performance of $p'' < p_L$ after performing an easy task. Then, the junior decides to perform a new task. However, if the junior after performing the task were to learn his ability and the difficulty of the task, he would decide to continue with the same task.

3.5 Extension: The role of a mentor

The role of a mentor in an organization is to help "the younger individual learn to navigate in the adult world and the world of work" (Kram, 1985 p.2). A senior employee has more experience and therefore is better able to discern easy tasks from difficult tasks. Besides, she is better able to assess the junior's ability. The information a senior employee has at her disposal is valuable for the junior employee to improve current and future decisions. Therefore, appointing a mentor who provides this information to the junior employee may prevent juniors from taken mistaken decisions. As Clutterbuck (1985) points out "most staff turnover occurs during the first six months with a new employer and a major cause is inability to adjust rapidly enough. Assigning a mentor to a new arrival helps overcome the counter-productive problems of culture shock and the uncertainty most people feel as they find their feet in the new environment."

We extend the model by introducing a mentor. The mentor is fully informed. He knows the difficulty of the task ($d \in \{0, 1\}$) and he observes the junior's ability. The role of the mentor, in stage 0, is twofold. First, the mentor assigns no task ($t = n$), assigns an easy task ($t = 0$) or assigns a difficult task($t = 1$). Second, if $t \in \{0, 1\}$, the mentor sends a message about the difficulty of the task $m \in \{0, 1\}$, $m = 0$ denoting "task is easy" and $m = 1$ denoting "task is difficult". After the junior has received m, he decides whether or not to perform the assigned task. If he performs the assigned task he learns his performance $p_1 \in [0, 1]$. In the second stage, the junior decides whether to (i) stop performing the task ($X = 0$), (ii) continue performing the same task ($X = 1$), or (iii) perform a new task ($X = 2$). The preferences of the junior are represented by (3.1).

In the present model the message is costless for the mentor. It is well-known in cheap-talk games that if the preferences of the principal and the agent are perfectly aligned, then communication between the principal and the agent can be perfect (Crawford and Sobel, 1982). So, if the mentor has the same preferences as the junior, introducing a fully informed mentor makes it possible for the junior to achieve the first-best outcome in both stages. The mentor can perfectly match the difficulty of the task and the junior's ability. So, the introduction of a mentor prevents a highly talented junior from performing an easy task. Besides, it avoids that a low ability junior performs a task.

In many settings, however, the preferences of the mentor and the junior are not perfectly aligned. A reason may be that the mentor does not incur the costs of performing a task. Therefore, she does not care about these costs. Then, the mentor's utility is given by

$$U^M = d\alpha p + (1-d)\,p$$

The mentor wants a junior with an ability smaller than $\frac{1}{\alpha}$ to perform an easy task, and she wants a junior with an ability larger than $\frac{1}{\alpha}$ to perform a difficult task. Notice that the mentor always wants the junior to perform a task. Henceforth, we assume that the mentor always assigns a task in stage 0. This implies that a junior with $a \in [0, c]$ is assigned a task, while he prefers to perform no task.

First, let us consider the case that the strategy of the mentor is

$$\begin{cases} t = 0 \text{ and } m = 0 \text{ if } a < \frac{1}{\alpha} \\ t = 1 \text{ and } m = 1 \text{ if } a \geq \frac{1}{\alpha} \end{cases}$$

What is the junior's response to this strategy? The junior only observes the mentor's message. Suppose that he observes $m = 1$. Then, the junior knows that the assigned task is difficult and that his ability is larger or equal to $\frac{1}{\alpha}$. As a junior with an ability greater than $\frac{1}{\alpha}$ wants to perform a difficult task, his best response is to perform the assigned task. Now suppose the junior observes $m = 0$. The mentor's message tells the junior that the assigned task is easy and that his ability is smaller than $\frac{1}{\alpha}$. A junior with $a \in [0, c]$ prefers to perform no task and a junior with $a \in \left[c, \frac{1}{\alpha}\right]$ prefers to perform an easy task. As the junior does not observe his ability, his decision to perform the assigned task depends on c. The higher are the costs of performing the task, the greater is the proportion of juniors who prefer not to perform the task. More precisely, performing the task yields $\frac{1}{2}\frac{1}{\alpha} - c + E\left[U_2 \mid m = 0\right]$ (where $E\left[U_2 \mid m = 0\right] = \frac{1}{2}\frac{1}{\alpha} - c + \frac{1}{2}\alpha c^2$). Not performing the task yields zero. Then, if $c \leq c_L = \frac{2-\sqrt{2}}{\alpha}$, it is a best response for the junior to perform the task. Hence, if $c \leq c_L$, the junior performs the assigned task.

After performing the task, the junior learns his performance. As the message reveals the difficulty of the task, the junior can determine his ability from the observed performance. This implies that in the second stage he can take a fully informed decision. Hence, in the second stage, the junior stops performing the task if $a < c$ and he continues with the task otherwise. The strategy of the junior, if $c \leq c_L$, can be summarized as follows: In the first stage the junior performs the assigned task. In the second stage he performs no task if $a < c$ and he performs the same task otherwise.

Finally, we have to show that given the strategy of the junior, the mentor's strategy is a best response. Notice that there exists only a conflict of interest between the mentor and a junior with $a < c$. The mentor wants all juniors to perform a task, while a junior with $a < c$ decides not to perform a task in the second stage. The question that arises is: Can the mentor prevent a junior with $a < c$ from not performing the task in stage 2 by assigning him an easy task but by claiming the task is difficult? As long as the costs are sufficiently small, the answer is in the negative. A junior who observes a performance smaller than $\left(\frac{1}{\alpha}\right)^2$ knows, independent of the mentor's message, that the performed task was easy. The strategy of the mentor tells us that a junior with $a < \frac{1}{\alpha}$ performs an easy task yielding a performance in the range $\left[0, \frac{1}{\alpha}\right)$ and a junior with $a \geq \frac{1}{\alpha}$ performs a difficult task yielding a performance in the range $\left[\left(\frac{1}{\alpha}\right)^2, 1\right]$. This implies that a performance of $\left[0, \left(\frac{1}{\alpha}\right)^2\right)$ can only correspond to a junior who has performed an easy task. So, the mentor cannot influence the decision of a junior with ability $a < c < \left(\frac{1}{\alpha}\right)^2$ by lying about the difficulty of the task. Hence, if $c < \left(\frac{1}{\alpha}\right)^2$, the mentor has no incentive to deviate from his strategy. The following Proposition summarizes the conditions under which the mentor always sends a truthful message.

Proposition 3.3 *Suppose that the costs are sufficiently small ($c \leq c_L$ and $c < \left(\frac{1}{\alpha}\right)^2$). Then a partially separating equilibrium exists in which the mentor in stage* 0 *assigns an easy task and sends $m = 0$ if $a < \frac{1}{\alpha}$ and she assigns a difficult task and* *sends* $m = 1$ *if* $a \geq \frac{1}{\alpha}$. *In stage* 1, *the junior performs the assigned task. In stage* 2, *the junior decides to stop performing the task if* $a < c$ *and he performs the task again otherwise.*

As the preferences of the mentor and the junior are not perfectly aligned, some juniors do not obtain the first best outcome. A junior with an ability smaller than c will perform a task in the first stage, although performing a task is too costly for him. Nevertheless, having a mentor with different preferences over the costs of performing a task, yields a higher expected utility to the junior than having no mentor at all. The reason is that the mentor can match difficulty of the task to the junior's ability. Therefore, highly talented juniors will never perform an easy task and less talented juniors will never perform a difficult task.

Suppose that $c_L < c < \left(\frac{1}{\alpha}\right)^2$.[8] Then if the mentor were to reveal the true difficulty of the task, the junior would not perform the task if $m = 0$ ($E[U \mid m = 0] < 0$). Obviously, in this situation, the mentor has an incentive to lie about the difficulty of the task to some juniors. In this way he can prevent these juniors from not performing the task in the first stage. Let us consider the following strategy of the mentor[9]

$$\begin{cases} t = 0 \text{ and } m = 1 \text{ if } 0 \leq a < c \\ t = 0 \text{ and } m = 0 \text{ if } c \leq a < \frac{1}{\alpha} \\ t = 1 \text{ and } m = 1 \text{ if } \frac{1}{\alpha} \leq a \leq 1 \end{cases}$$

Notice that the mentor still assigns an easy task to a junior with $a < \frac{1}{\alpha}$ and assigns a difficult task to a junior with $a \geq \frac{1}{\alpha}$. The difference with respect to sending a truthful message is that the mentor now sometimes has an incentive to lie about the

[8] We assume that $\alpha < \frac{1}{2-\sqrt{2}}$, implying that $c_L < \left(\frac{1}{\alpha}\right)^2$. Similar results hold if $\alpha > \frac{1}{2-\sqrt{2}}$.

[9] There are several variants on this strategy. What is important is that by lying the mentor can prevent a junior with $0 \leq a < c$ from learning his ability after observing $m = 0$. A variant of this strategy is (i) always send $m = 1$ and (ii) $t = 0$ if $a < \frac{1}{\alpha}$ and $t = 1$ if $a \geq \frac{1}{\alpha}$. The message contains no information about the junior's ability. We have assumed that without mentor, a junior performs the task if he has no information about his ability and the difficulty of the task (Assumption 3.3). Then with mentor the junior will also perform the task if he has no information about his ability and the difficulty of the task. The reason is that the mentor takes care of a better match between difficulty of the task and the junior's ability. Hence, if the junior performs the task in the first stage without a mentor then he also performs the task with a mentor.

difficulty of the task. To prevent low-ability juniors from not performing a task in the first stage, the mentor sends the message that the assigned task is difficult. In this way a low-ability junior does not learn about his ability until after observing his performance on the task.

What is the junior's best response to the mentor's strategy? Suppose the junior observes $m = 0$, then he knows that his ability lies between c and $\frac{1}{\alpha}$ and that the assigned task is easy. The best response of the junior is to perform the assigned task. Now suppose the junior observes $m = 1$. There exist two possibilities: (i) the assigned task is difficult and the junior's ability is larger than $\frac{1}{\alpha}$ or (ii) the assigned task is easy and the junior's ability is smaller than c. Suppose that the costs are such that $E[U \mid m = 1] > 0$. This implies that the best response to $m = 1$ is to perform the assigned task.

After performing the task, the junior observes his performance and determines his ability. In the second stage, the junior stops performing the task if $a < c$ and continues with the same task otherwise. We have already shown that, if $c < \left(\frac{1}{\alpha}\right)^2$, a junior with ability $a < c$ can determine his ability although the mentor lies about the difficulty of the task. The reason is that a performance smaller than $\left(\frac{1}{\alpha}\right)^2$ can only correspond to a junior performing an easy task.

Next suppose that $c \geq \left(\frac{1}{\alpha}\right)^2$. Then a junior who observes a performance between $\frac{1}{\alpha}$ and c cannot determine his ability, because he is uncertain about the difficulty of the task. Figure 3.3 illustrates this situation. The relationship between observed performance and ability is given by the lines AA and BB. The relationship consists of two parts; a junior with an ability between 0 and $\frac{1}{\alpha}$ is assigned an easy task (AA) and a junior with an ability between $\frac{1}{\alpha}$ and 1 is assigned a difficult task (BB).

The junior only observes his performance and the mentor's message. Depending on the observed performance we can distinguish three cases. First, suppose the junior observes a performance larger than c. Then the mentor's message reveals the difficulty of the task and the junior can determine his ability; $a = p$ if the task is easy and $a = \sqrt{p}$ if the task is difficult. Second, suppose the junior observes a performance smaller than $\left(\frac{1}{\alpha}\right)^2$. Then, the junior knows that the performed task was easy and that $a = p$. In both cases the decision for the second period is given in section 3.4.1. Third, suppose the junior observes a performance between $\left(\frac{1}{\alpha}\right)^2$ and c. Then the mentor's message reveals no information about the difficulty of the task and the junior is unable to determine his ability. In this situation the decision for the second period is given in Proposition 3.2.

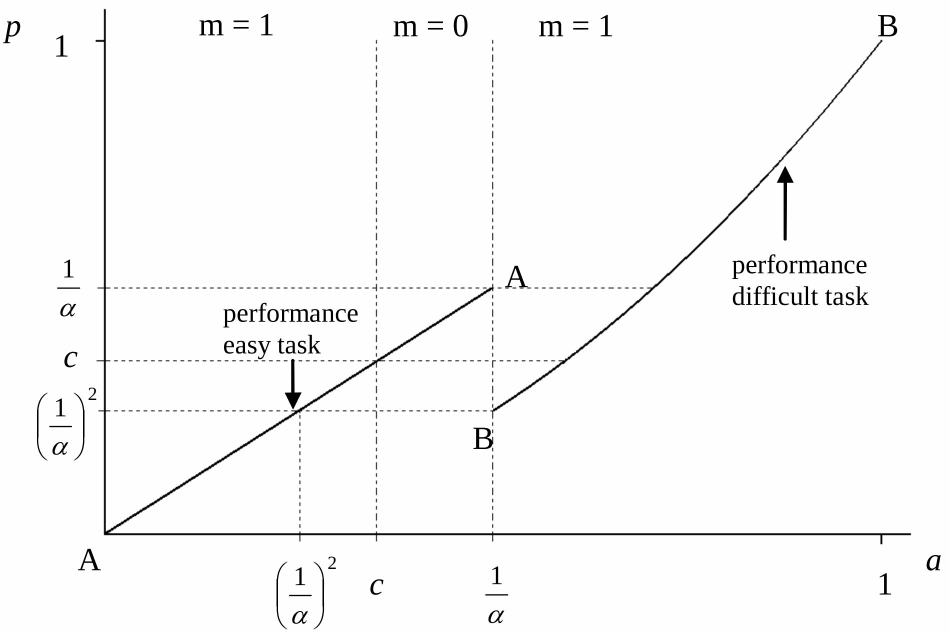

Figure 3.3

Depending on the costs of performing a task, two cases can be distinguished: (i) $p_c^H \leq \left(\frac{1}{\alpha}\right)^2 < c$ and (ii) $\left(\frac{1}{\alpha}\right)^2 < p_c^H < c$ (see Proposition 3.2).[10] First, suppose that costs are such that $p_c^H \leq \left(\frac{1}{\alpha}\right)^2 < c$. Then the strategy of the junior is: (i) stop performing the task if $p < \left(\frac{1}{\alpha}\right)^2$ and (ii) continue with the same task otherwise. The following Proposition summarizes the above discussion.

[10]We have assumed that $c > \overline{c}$, implying that the junior's decision for the second stage is: (i) a junior who observes $p < p_c^H$ chooses to stop performing the task, (ii) a junior who observes $p \in \left[p_c^H, p_H\right]$ chooses to perform the same task again, and (iii) a junior who observes $p \in (p_H, 1]$ chooses to perform a new task.

Proposition 3.4 *Suppose that the costs are intermediate ($c > c_L$ and $p_c^H \leq \left(\frac{1}{\alpha}\right)^2 < c$). Then the mentor in stage* 0 *(i) assigns an easy task and sends $m = 1$ if $0 \leq a < c$, (ii) assigns an easy task and sends $m = 0$ if $c \leq a < \frac{1}{\alpha}$, and (iii) assigns a difficult task and sends $m = 1$ if $\frac{1}{\alpha} \leq a \leq 1$. In stage 1, the junior performs the assigned task. In stage 2, the junior stops performing the task if $p < \left(\frac{1}{\alpha}\right)^2$ and he performs the task again otherwise.*

The benefit to the mentor of lying about the difficulty of the task is twofold. First, the mentor prevents the junior from not performing the assigned task in stage 1. Second, the mentor prevents a junior with an ability between $\left(\frac{1}{\alpha}\right)^2$and c from not performing the task in the second stage. As the mentor lies about the difficulty of the task a junior with ability between $\left(\frac{1}{\alpha}\right)^2$and c is unable to determine his ability and decides to continue with the task. Sofar, lying involves no costs for the mentor.

Second, suppose that $\left(\frac{1}{\alpha}\right)^2 < p_c^H < c$. Furthermore suppose that the junior observes a performance $\left(\frac{1}{\alpha}\right)^2 < p < p_c^H$ on a difficult task. Then, after observing his performance, the junior, who does not know the difficulty of the task, chooses to stop performing the task (see Proposition 3.2). Both a junior with $\left(\frac{1}{\alpha}\right)^2 < a < p_c^H$ performing an easy task and a junior with $\frac{1}{\alpha} < a < \sqrt{p_c^H}$ performing a difficult task decide to stop performing the task. Because of the conflict of interest between the mentor and the junior, the mentor is unable to communicate the difficulty of the task to talented juniors performing a difficult task. Consequently, talented juniors decide to stop performing the task. This is costly for the organization and for the mentor.

To prevent talented juniors from not performing a task, the mentor has to think of a way to communicate the junior's ability to him. One way, is to have a junior with $\frac{1}{\alpha} < a < \sqrt{p_c^H}$ perform an easy task in the first stage. Then after observing his performance on the task, the junior learns that his ability lies between $\frac{1}{\alpha}$ and $\sqrt{p_c^H}$ and in the second stage, the junior decides to perform a new task. As the junior, the mentor prefers the junior to perform a difficult task. Hence, the junior will ask the mentor to assign a new difficult task to him. The following Proposition summarizes the equilibrium.

Proposition 3.5 *Suppose that the costs are sufficiently high ($c > c_L$ and $\left(\frac{1}{\alpha}\right)^2 < p_c^H < c$). Then an equilibrium exists in which the mentor (i) assigns an easy task if $a < \sqrt{p_c^H}$ and assigns a difficult task otherwise, and (ii) sends $m = 1$ if $a < c$, sends $m = 0$ if $c < a < \sqrt{p_c^H}$, and sends $m = 1$ if $a > \sqrt{p_c^H}$. In stage 1, the junior performs the task. In stage 2, the junior decides to (i) stop performing the task if $p < p_c^H$, (ii) perform a new task if $\frac{1}{\alpha} < p < p_c^H$ and $m = 0$ and asks mentor to assign him a new task, and (iii) perform the same task again otherwise.*

The Proposition shows that the mentor has an incentive to assign too often an easy task. The intuition is that the mentor is unable to communicate the difficulty of the task to the junior. To avoid that a talented junior gets discouraged after observing his performance on a difficult task, the mentor assigns an easy task to him. In this way the mentor prevents a talented junior from quitting a task.

3.6 Conclusion

We have developed a model that describes the self-assessment of a junior employee after observing performance on a task. In this model, the junior has no information about his ability, but he can use his performance on a task to make an inference. The problem is that performance not only depends on the junior's ability, but also on the unknown difficulty of the task. We have shown that, in line with Kruger (1999), a junior who has performed a difficult task underestimates his ability and a junior who has performed an easy task overestimates his ability. An implication is that a wrong self-assessment may result in a mistaken future decision. Sometimes a talented junior after observing his performance on a difficult task may decide to stop performing the task.

Having a talented junior leave the organization is costly. To prevent this from happening, the organization can appoint a better informed senior employee who acts as the junior's mentor. The benefit of a mentor, if the preferences of the mentor and the junior are perfectly aligned, is that the junior can achieve the first-best outcome. The reason is that a fully informed mentor can perfectly match the junior's ability and the difficulty of the performed task. If the preferences of the mentor and the junior are not perfectly aligned, then sometimes the mentor does not have an incentive to reveal the correct information to the junior. An implication is that if performing a task is sufficiently costly, some talented juniors may decide to stop performing the task after observing performance on a difficult task. The reason is that the mentor is unable to communicate the difficulty of the task to some talented juniors and based on the observed performance these juniors decide to stop performing the task. To prevent talented juniors from not performing a task, the mentor assigns an easy task to these juniors. After observing performance on the easy task, the junior learns his ability and decides to continue performing a task.

3.A Appendix

3.A.1 Appendix A

In this appendix we show two things. First, we show that the average ability reported by juniors performing a difficult task is smaller than the average ability of juniors in the model. In the main text we have determined that the average ability reported by juniors performing a difficult task equals $a^e_{t1} = \int_0^1 a^e_p \cdot g(p)\, dp = \int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot \frac{1}{2\sqrt{p}} \right) dp$ if the junior does not know the difficulty of the task. If the junior were to know that the performed task is difficult, then using assumption 3.1 he can determine $a = \sqrt{p}$. The average ability reported by juniors equals $a^e_{d=1} = \int_0^1 \left(\sqrt{p} \cdot \frac{1}{2\sqrt{p}} \right) dp = \frac{1}{2}$. We will have shown that the average ability reported by juniors performing a difficult task is smaller than the average ability of juniors in the model if $\int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot \frac{1}{2\sqrt{p}} \right) dp < \int_0^1 \left(\sqrt{p} \cdot \frac{1}{2\sqrt{p}} \right) dp$. It is straightforward to show that $\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} < \sqrt{p}$ for all p, implying that $\int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot \frac{1}{2\sqrt{p}} \right) dp < \int_0^1 \left(\sqrt{p} \cdot \frac{1}{2\sqrt{p}} \right) dp$ for all p.

Second, we show that the average ability reported by juniors performing an easy task is greater than the average ability of juniors in the model. In the main text we have determined that the average ability reported by juniors performing an easy task equals $a^e_{t2} = \int_0^1 a^e_p \cdot f(p)\, dp = \int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot 1 \right) dp$ if the junior does not know the difficulty of the task. If the junior were to know that the performed task is easy, then using assumption 3.2 he can determine $a = p$. The average ability reported by juniors equals $a^e_{d=0} = \int_0^1 (p \cdot 1)\, dp = \frac{1}{2}$. We will have shown that the average ability reported by juniors performing an easy task is greater than the average ability of juniors in the model if $\int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot 1\right) dp < \int_0^1 (p \cdot 1)\, dp$. It is straightforward to show that $\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} > p$ for all p, implying that $\int_0^1 \left(\frac{(2p(1-\gamma)+\gamma)\sqrt{p}}{2\sqrt{p}(1-\gamma)+\gamma} \cdot 1\right) dp < \int_0^1 (p \cdot 1)\, dp$ for all p. ■

3.A.2 Appendix B

In this Appendix, we provide a proof for Lemma 3.1. Lemma 3.1 consists of two parts. First it states that equation 3.2 has three roots. Second, it states that $p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$ and that $p_H \in \left(\frac{1}{\alpha}, 1\right)$.
To determine that equation (3.2) has three roots, first we fill $\widehat{\gamma} = \frac{\gamma}{2\sqrt{p}(1-\gamma)+\gamma}$ into equation (3.2) and rewrite it in the following way

$$\begin{aligned} \frac{2\sqrt{p}\,(1-\gamma)}{2\sqrt{p}\,(1-\gamma)+\gamma}\gamma\left(\alpha p^2 - p\right) - \frac{\gamma}{2\sqrt{p}\,(1-\gamma)+\gamma}(1-\gamma)\left(\alpha p - \sqrt{p}\right) &= 0 \\ \frac{(1-\gamma)\,\gamma\sqrt{p}}{2\sqrt{p}\,(1-\gamma)+\gamma}\left(2\alpha p^2 - 2p - \alpha\sqrt{p} + 1\right) &= 0 \end{aligned}$$

Now, we can determine that the first root of the equation is $p = 0$. Next, to prove that $2\alpha p^2 - 2p - \alpha\sqrt{p} + 1 = 0$ has two roots, we take three steps. First, we determine that $r = 2\alpha p^2 - 2p - \alpha\sqrt{p} + 1$ has a local minimum at p^*. Taking the first derivative with respect to p we can determine the optimum $p = p^*$, where p^* solves $4\alpha p^* - 2 - \frac{\alpha}{2\sqrt{p^*}} = 0$. The second derivative tells us that the optimum is a minimum, $\frac{d^2 r}{dp^2} = 4\alpha + \frac{\alpha}{4p\sqrt{p}} > 0$. Second, we have to show that the minimum is negative. Filling $p = \frac{1}{\alpha}$ into r gives $r = 2\alpha\left(\frac{1}{\alpha}\right)^2 - 2\left(\frac{1}{\alpha}\right) - \alpha\sqrt{\frac{1}{\alpha}} + 1 < 0$ $(\alpha > 1)$, implying that the minimum has to be negative. Third, we have to show that r is positive for small values of p and for high values of p. Filling $p = 0$ and $p = 1$ into r gives $r > 0$ for $p = 0$ and for $p = 1$. Summarizing $2\alpha p^2 - 2p - \alpha\sqrt{p} + 1 = 0$ has two roots. Let the roots be p_L and p_H.
Second, we have to show that $p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$ and that $p_H \in \left(\frac{1}{\alpha}, 1\right)$. The second part we have already proven. We have shown that if $p = \frac{1}{\alpha}$ then $r < 0$ and that if $p = 1$,

then $r > 0$. Hence, $p_H \in \left(\frac{1}{\alpha}, 1\right)$. What remains to be proven is that $p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$. Filling $p = \left(\frac{1}{\alpha}\right)^2$ into r gives $r = 2\alpha\left(\frac{1}{\alpha}\right)^4 - 2\left(\frac{1}{\alpha}\right)^2 - \alpha\frac{1}{\alpha} + 1 < 0$ $(\alpha > 1)$. We have already shown that if $p = 0$, then $r > 0$. Hence, $p_L \in \left(0, \left(\frac{1}{\alpha}\right)^2\right)$. ■

Part II

Retention Contracts

Chapter 4

Disciplining and Screening Top Executives

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4.1 Introduction

The literature on CEO turnover often rests on an important assumption: bad performance means a bad CEO. As a consequence, the problem a board of directors faces seems relatively simple: in case of bad performance, the CEO should be replaced.[1] It is, however, a recurrent finding that substantially worse performance hardly leads to an increase in the chances of dismissal.[2] To explain this tenuous relation between weak performance and turnover, boards are often characterized as "indolent" and as "ineffective rubber stampers" of top management's decisions.[3] Such characterizations typically invoke descriptions of cases and interviews with top management and board members. We do not doubt the validity and accuracy of these case descriptions. Rather, we want to argue that they point to a reality in which even

[1] The assumption usually remains implicit by using phrases like "dismising a CEO after poor performance" and "firing an incompetent CEO" interchangeably, see e.g., Borokhovich et al. (1996, p. 340), and Weisbach (1988, p. 431). In other parts of the literature, the gist seems to be that dismissal following bad performance is an unproblematic implication, see, e.g., Warner et al. (1988) and Kaplan (1994).

[2] See, e.g., Brickley's (2003) discussion of the empirical research on turnover and performance.

[3] See Tirole (2006) for a survey of complaints.

well-intended board members face thorny dilemmas rather than a simple problem due to the need to balance the attainment of various goals and the availability of scant information. As we will show, one important implication is that the inference from bad performance to bad CEO becomes questionable. Also, the relationship between bad performance and dismissal becomes tenuous.

Mace (1971) provides a classic account of what the relationship between a board of directors and top executives is about in reality.[4] Directors lack time, knowledge and information to have an active involvement in decision-making.[5] As a result, the board performs two functions. First, a board "serves as some sort of discipline" (p. 13). When making decisions, top executives take into account what they feel the board would consider acceptable actions, solutions and explanations. The second function a board performs is to decide whether to retain or replace a top executive. However, it is a very difficult task for a board to find out whether the top executive is doing a good job. The board often does not know the problems the company is facing, nor the possible actions it can take or the results it may expect, and by and large it depends on the company for information on these matters. Moreover, directors seem to dislike upsetting amiable relations with the top executives. As a result, the board only decides to replace an executive if bad (financial) performance has been apparent for a considerable time (pp. 27–33).

Performance related pay is also used to direct executives' attention and effort. There is no denying that incentive pay may work well. There is, however, some evidence that observed incentive pay schemes do not provide a strong relationship between firm performance and pay[6]. In a recent study, Dittmann and Maug (forthcoming, p. 1) conclude that the "standard principal agent model typically used in the literature cannot rationalize observed contracts". One of the reasons may be

[4]Mace (1971) is based on interviews with executives and directors of American companies. Lorsch and MacIver (1989), basing themselves on interviews held with directors of American companies in the second half of the 1980s, and Stiles and Taylor (2001), using interviews with directors of British companies conducted in the late 1990s, report findings that are by and large consistent with those of Mace (1971).

[5]Directors refers to outside directors. Mace (1971, pp. 125-127) argues that inside directors depend too much on the CEO to perform a critical role.

[6]See, e.g., Jensen and Murphy (1990) for a well known example of this. For a contrary view, see Hall and Liebman (1998).

that, in the words of Bebchuk and Fried (2003, p. 72), "managerial power and rent extraction ... have an important influence on the design of compensation packages". This would imply that incentive pay is not a remedy to an agency problem, but part of the problem itself.

In this chapter we focus on the use of retention strategies as a means to discipline and screen executives in an environment in which the board has limited information about the outcomes of executives' actions. Our analysis sheds light on observed empire building; on the tenuous relationship between performance and dismissal; and casts doubt on the assumption that bad performance results from bad CEOs.

It has become one of the mainstays of the literature on corporate governance that executives will turn into empire builders if not reined in by some tight form of governance. Excessive growth or excessive investment are two forms empire building may take on. It is invariably argued that the construction of such empires reflects executives' hunger for status, power and prestige, see, e.g., Marshall (1932), Baumol (1959), Marris (1964), Williamson (1974), and Jensen (1986). Empire building, then, stems from differences in preferences between board and executives in conjunction with lack of observability, a typical moral hazard problem. Marris (1964, p. 102) adds that there is a further reason for growth: "When a man takes decisions leading to successful expansion,...he has demonstrated his powers as a manager and deserves his reward. So personal ability also becomes judged by achieved growth". Such signalling can be useful to a board possessing only limited information on an executive's ability. How, then, does a board deal with a possible conflict between soliciting information and thwarting empire building? What is the nature of possible retention strategies? How do they differ in the way they trade-off the attainment of the goals of the board?

To answer these questions, we use a simple two-period model, in which on behalf of a board, in each period an executive designs a 'project' and decides whether or not to implement it. A project can be anything that is meant to have a substantial impact on the company, e.g., restructuring, diversification, acquisition. The quality of the project depends on the competence of the executive and on exogenous circumstances. The executive knows his competence, but the board does not. When making the implementation decision, the executive observes the exogenous circumstances, but the board does not. The board observes the implementation decision. It learns the quality of the project only when it is implemented and then only with a probability. Once the executive has made the implementation decision in the first period, the board can choose between keeping the executive and replacing him.

An important feature of our model is that a competent executive is more likely to implement a project than a less competent one. The reason is that on average a competent executive designs better projects, i.e. projects that are profitable in more adverse circumstances. Activism signals competence. The implication of this feature is that activism can be used as a screening device. As a result, the board sometimes wants a competent executive to implement projects that are not desirable per se. Moreover, the board wants incompetent executives sometimes to abstain from implementing desirable projects. The consequence is that the relationship between bad performance and low quality executive is weakened.

Having established the screening function of the implementation decision, we then show that an executive's desire to keep his job (because of prestige, power, remuneration etc.) may lead him to exploit this function, and to distort the implementation decision.[7] The executive may partially base the implementation decision on the consequences this decision has for his career. The more the executive is moved by prestige and power, the more he is willing to distort the implementation decision—to build an empire. That is, by using the implementation decision as a screening device, the board *creates* a moral-hazard problem. The board may reduce this problem by dismissing an executive who has been found to have implemented too bad a project. However, the signalling function of the implementation decision implies that undesirable projects are implemented by competent executives in particular. As a result, a board will find it difficult to knowingly dismiss a competent executive and replace him by one of unknown quality. To overcome this problem, a board may have to stick to a norm or rule. If this is the case, dismissals stemming

[7] Prendergast and Stole (1996) show that a manager will initially exaggerate his information to appear talented, but ultimately becomes unwilling to respond to new information. See also Suurmond, Swank and Visser (2004) for the consequences of reputational concerns on decision making.

from bad performance will often be considered regrettable yet inevitable.

The board should also decide what to do when it does not learn the quality of an implemented project. Again, it is on the horns of a dilemma. On the one hand, it could stick to a 'no news is good news' norm, meaning that the executive is retained in the absence of definite information on the value of the implemented project. This would increase the probability that in period 2 a project will be designed by a competent executive (after all, competent executives are more likely to implement than incompetent ones). But it would also strengthen the incentive for the executive in period 1 to distort the project implementation decision. In case the board were to follow a 'no news is bad news' norm, implying the executive has to leave in the absence of information, the reverse holds. We show that a 'no news is good news' norm is preferable, ceteris paribus, if an executive does not care too much about power, if the likelihood that a replacement is highly competent is small, and if the difference in competence between executives is large.

An important insight of our analysis, then, is that boards in order to address the two main tasks they face, may have to stick to a norm to overcome a time inconsistency problem.[8] In particular, under some conditions the board wants to commit itself to a retention norm that may induce it to dismiss an executive who is likely to be competent. Ex ante such a norm may be optimal as it discourages executives to distort the implementation decision too much to signal competence. Though perhaps surprising from a theoretical point of view, our result seems empirically relevant. Consider Van der Hoeven, the former CEO of Ahold. In the ten years he had been at the helm at Ahold, the company quickly expands through a corporate acquisition strategy. As a result, Ahold had been hailed as the best Dutch company for 5 consecutive years by 2002, notably for its "consistent growth and strategy". Van der Hoeven himself had been elected manager of the year in 2001 and 2002, praised for his "strategic insight and entrepreneurship".[9] He had to resign in the wake of the bookkeeping fraud at Ahold's daughter US Foodservices in 2003. Further judicial

[8] Lorsch and MacIver (1989) discuss how board room norms determine the effectiveness with which boards can perform their tasks.

[9] See *Management Team*, issues 17 of 2001 and 2002. This Dutch magazine publishes the results of a questionnaire held among 400 Dutch managers.

inquiries later showed that Ahold's stake in companies in Sweden, Argentina, and Chile had been exaggerated with a view to inflating revenues and profits. Similarly, Bernard Ebbers, the former CEO of MCI Worldcom, received awards for his leadership from, among others, Business Week, Financial World, Wired and Time Magazine in the late 1990s and in 2000. As Van der Hoeven, he had grown the business by going on a buying spree. He was dismissed in 2002 following serious concerns about the company's finances and accounting practices. It could be argued that fraudulent practices and judicial probes led to their dismissal, not a negative decision of the board following observed bad results. However, the fraudulent practices were meant to paint too rosy a picture of the situation either company found itself in. This suggests that both executives were aware that had the real results of their corporate acquisition activities become known dismissal by the board would have been likely.

The trade-off between disciplining and screening is also felt in the relationship that exists between a parliament and a minister. The "inevitable-yet-regrettable" feeling that comes with the tension inherent in knowingly dismissing a competent agent is well expressed by the *Financial Times* when commenting on the dismissal of the then British Foreign Secretary Lord Carrington in 1982. The Argentinian invasion of the disputed Falkland Islands had made clear that his attempt at a diplomatic solution to the Falkland crisis had failed. The newspaper commented that "[t]he resignation of Lord Carrington is deeply regrettable – as regrettable as the events which left him with no other honourable course. He has been a notable Foreign Secretary, and has earned the highest regard internationally"[10], and "[i]n the public eye he was perhaps the most successful British Foreign Minister since the war."[11,12]

[10] See Lexis Nexis, 'After Lord Carrington' in *The Financial Times*, April 6, 1982, p.14.

[11] See Lexis Nexis, 'The Resignation of Lord Carrington' in *The Financial Times*, April 6, 1982, p.15.

[12] The South-Korean Hwang Woo-Suk, who was "heralded as the world's leading stem-cell researcher" and was a "national hero" may well have fallen prone to the same pressure to show his ability. He falsified data used in a Science publication in 2005. He was forced to resign in December 2005 (The Economist (2005, 2006))

4.2 Related literature

Our analysis contributes to the literature on boards of directors. In their survey article, Hermalin and Weisbach (2003, p. 8) observe that "the empirical literature on boards in public corporations is fairly well developed, while theory is still in its infancy". Stiles and Taylor (2001), when surveying the literature on boards, reach the same conclusion as to the dearth of theory. The paper most closely related to ours is Hermalin (2005). He models how a board selects a candidate for an executive position, forms an impression of the executive's ability, and decides whether to retain or replace him. Two important differences with this chapter should be mentioned. First, Hermalin focuses on a single role of the board, screening executives' abilities. Second, the impression of the executive's ability is based on, say, presentations and interactions in board meetings, but not on observed organizational performance. As a result, the board does not have to reconcile conflicting goals. Graziano and Luporini (2003) model the same selection and retention-dismissal decision. As a board may erroneously hire an incompetent executive at the selection stage, it may be hesitant in the evaluation stage to dismiss the executive as this would signal its own lack of competence and possibly trigger its own replacement due to a takeover. We come back to some other related literature in the conclusion.

In this chapter, the board uses a retention contract to deal with the moral hazard problem of the executive, analogous to the electorate using its re-election strategy to discipline politicians in political agency models. As far as we know, it is the first time that this analogy is exploited in the literature on corporate governance. As in the political agency literature, the contracts we consider are implicit, and are not enforced by some third party. They constitute expectations that are shared among the principal (board, electorate, or parliament) and the agent (executive, parliament or minister) about the situations in which an incumbent agent is retained or dismissed.[13] Much of our analysis amounts to the determination of the optimal implicit contract. As noted above, such contracts could be considered norms. We

[13] See e.g. Persson and Tabellini (2000). Barro (1973) and Ferejohn (1986) were the first to argue that the power to replace agents disciplines agents who are inclined to use office as a means of pursuing their own goals.

argue that this (implicit contract) approach is also useful to understand certain aspects of the relationship between a board of directors and its top executives. After all, just as it is hard to gauge the contribution of, say, a minister of foreign affairs to the well-being of a country it is also hard to pin down a top executive's contribution to the long-term profitability or survival of his organization. What is typically much easier to observe is whether a minister or top executive has become active: whether an agreement has been signed, a re-organization started, or a strategy implemented. Furthermore, just as a parliament does not write an explicit contract specifying when a minister will be dismissed, a typical board does not stipulate in a contract what triggers the ousting of an executive.

The remainder of this chapter is organized as follows. Section 4.3 introduces the model. In Section 4.4 and 4.5, we establish the trade-off the board faces between disciplining and selecting executives. Section 4.6 discusses how the board shapes the behaviour of the executive, given that it retains the executive when it does not observe the value generated by an implemented project. Section 4.7 discusses how the board shapes the behaviour of the executive, given that it dismisses the executive when it does not observe the consequences of an implemented project. In Section 4.8, we identify the conditions under which the board wants to retain or dismiss the executive when it does not observe the consequences of an implemented project. Section 4.9 concludes.

4.3 The model

We consider a two-period principal-agent model. There is a pool of agents ('executives'), a fraction ρ of which is 'competent', while the other executives are 'incompetent'. At the beginning of period $t = 1$, an executive is randomly drawn from this pool and becomes the incumbent. At the end of period $t = 1$, the principal ('board') can dismiss the incumbent. If he is dismissed, an executive is randomly drawn from the pool of executives[14] and enters office in period $t = 2$. If the incumbent is not

[14] We assume that a dismissed period 1 incumbent has no chance of becoming the period 2 incumbent.

dismissed, he will also hold office in period $t = 2$.

Once the incumbent has been determined for period $t \in \{1, 2\}$, he designs a project, X_t. We view the value created by this project, V_t, as the addition to the organization's long term value, relative to business as usual. It depends on (i) the incumbent's competence, and (ii) the state of the world ('market circumstances'), μ_t. The random variable μ_t is uniformly distribution over $[-h, h]$. The executive knows his competence, and observes μ_t. Once he knows the value of the project, he can either decide to implement the project ('change'), $X_t = 1$, or to maintain the status quo ('business as usual'), $X_t = 0$. An implemented project designed by an incompetent executive yields a value $V_t = V_{IC}(\mu_t) = p + \mu_t$, while an implemented project designed by a competent executive yields $V_t = V_C(\mu_t) = p + f + \mu_t$. Of course, $f > 0$, implying that on average, or for given market circumstances, a competent executive designs a better project than an incompetent one. We assume $V_C(\mu_t = -h) = p + f - h < 0$. As we will see, this implies that market circumstances may be so averse that even a competent executive should maintain the status quo. Similarly, we assume $V_{IC}(\mu_t = h) = p + h > 0$, implying that market circumstances may be favourable enough such that an incompetent executive should implement the project.

Assumption 4.1 $V_C(\mu_t = -h) < 0 < V_{IC}(\mu_t = h)$.

Information

As mentioned, we assume that the incumbent knows his competence, and that when making the decision on X_t, he also knows μ_t. The board has limited information on which it can base its decision to retain or dismiss the incumbent. It knows the prior probability that a randomly drawn executive is competent, ρ, but it does not know his actual level of competence.[15] It may learn about an incumbent's level of competence on the basis of the actions the incumbent takes in period one. The board observes the decision on X_t, but does not always observe whether the executive has

[15] What is essential in our model is that the incumbent is better informed about his level of competence and the market circumstances than the board.

made a good decision. Specifically, we assume that (1) if $X_t = 0$, the board does not learn what would have been V_t; (2) if $X_t = 1$, the board learns V_t with probability γ; and (3) if $X_t = 1$, with probability $1-\gamma$ the board remains ignorant about V_t.

Preferences

We model the board as a unitary actor. Its per period payoff is X_tV_t, and its goal is to maximize the total (two-period) payoff by using its retention contract. The possible retention strategies are discussed in the following sections. The executive in our model represents a top executive of an organization. He derives utility from holding office—power, prestige, visibility, remuneration etc.—to which we refer as benefits from holding office, λ. Besides caring about these benefits, the executive also cares to some degree about the value of the implemented project. We assume that an executive's per period payoff equals

$$\begin{cases} X_tV_t + \lambda & \text{if in office in period } t \\ X_tV_t & \text{otherwise} \end{cases} \tag{4.1}$$

The goal of the incumbent in period $t = 1$ is to maximize his total (two-period) payoff using his implementation decision and given the retention strategy of the board; the goal of the incumbent in period $t = 2$ is to maximize period 2 payoff. To minimize notation, preferences are represented by (4.1). Implicit in (4.1) is that an executive who is dismissed in period 1 and an executive who is not dismissed in period 1 care to the same extent about the value created in period 2. This is often unrealistic. However, one can argue that the period 1 incumbent cares to some extent about the value created in period 2, even if he has been dismissed. This may result from identification with the organization one has been leading. Of course, the degree of identification with an organization varies from person to person and from organization to organization.[16]

Following the principal-agent literature, we assume that first the principal sets the terms of the contract and next the agent determines his optimal behaviour given

[16] Our results do not change qualitatively if we were to assume that an executive does not care about the organization if he has been dismissed.

those terms. In our case, the board determines under what conditions an executive is retained or dismissed (the implicit contract), and then the executive decides what projects to implement.

Timing

Period 1

- Nature determines the type of incumbent, draws μ_1, and reveals type and μ_1 to the incumbent, but not to the board.
- The incumbent takes a decision on the project, $X_1 \in \{0, 1\}$.
- The board observes the decision on X_1. If $X_1 = 1$, then with probability γ the board observes V_1.
- The board chooses either to keep the incumbent or to replace him.

Period 2

- If the incumbent was replaced in period 1, nature draws a type and reveals it to the new incumbent, but not to the board.
- Nature draws μ_2 and reveals it to the incumbent, but not to the board.
- The incumbent takes a decision on the project, $X_2 \in \{0, 1\}$.

4.4 The need for selection

Suppose that the board does not select an executive on the basis of first-period outcomes. Thus, no matter what, the board keeps the first-period incumbent.[17] In that case, strategic considerations stemming from the desire to hold office play no role. A project is implemented in period t if and only if its value is positive. Given the executive's ability, the per period payoff is maximized. Suppose the incumbent is competent. Then, $X_t = 1$ is chosen if and only if $V_C(\mu_t) \geq 0$. Given the executive's

[17] Alternatively, the principal could always dismiss the agent.

ability, the per period payoff is maximal. Suppose the executive is competent. He chooses to implement the project if and only if $V_C(\mu_t) \geq 0$, or if $\mu_t \geq -p - f$. This implementation decision yields a per period payoff to the board equal to

$$\Pi_C = \Pr\left(V_C(\mu_t) \geq 0\right) E\left(V_C(\mu_t) \left| V_C(\mu_t) \geq 0\right.\right) = \frac{1}{4h}(p+h+f)^2$$

Similarly, an incompetent executive implements a project if $\mu_t \geq -p$, yielding a per period profit equal to $\Pi_{IC} = \frac{1}{4h}(p+h)^2$. Clearly, this implies that a board prefers a competent executive to an incompetent one. We have now arrived at the drawback of always keeping the executive. Since a competent executive implements a project in market circumstances in which an incompetent would refrain from doing so, project implementation (activism) is a signal of competence. Maintaining the status quo (passivity) is a signal of incompetence. The board could increase its expected second period payoff by dismissing an executive who has maintained the status quo.

Define $\Pi_\rho := \rho\Pi_C + (1-\rho)\Pi_{IC}$. This is the expected project payoff if an executive of unknown or 'average' quality were to hold office. We will assume that an incompetent executive who holds office cares so much about being retained that he does not ask to be replaced by an executive of unknown quality. This means that $[\lambda + \Pi_{IC}] > [\Pi_\rho]$, where here and throughout the chapter second-period payoffs are given in square brackets. If this inequality were not to hold, the board could simply have asked the incumbent as to his competence level and would have obtained an honest answer.

Assumption 4.2 *The benefits of holding office are sufficiently high, $\lambda > \Pi_\rho - \Pi_{IC}$, such that the board does not believe the executive's claim as to his competence.*

4.5 Selection induces moral hazard

The previous section shows that when the board always keeps the executive, a competent executive is more likely to implement a project than an incompetent one

($\mu_C < \mu_{IC}$). As a result, executive activism signals competence. In this section we assume that the board selects the second-period incumbent on the basis of the first-period outcome. In line with the signalling function of the implementation decision, activism is rewarded by retention, whereas an inactive executive is sent home. We show that this influences the behaviour of the incumbent in period 1. Activism gives way to 'empire building'.

Consider a competent executive who has observed μ_1 in period $t = 1$.[18] He will implement the project (rather than reject it) if and only if $V_C(\mu_1) + \lambda + [\Pi_C + \lambda] \geq \lambda + [\Pi_\rho]$. This inequality determines a cut-off value $V_C^*(\lambda)$ such that the project is implemented if and only if

$$V_C(\mu_1) \geq V_C^*(\lambda) := -(\Pi_C - \Pi_\rho) - \lambda \qquad (4.2)$$

Note that because $\Pi_\rho < \Pi_C$, we have $V_C^*(\lambda) < 0$. Equation (4.2) says therefore that in period 1 a competent executive is willing to make a loss on a project in order to gain more in the second period. These gains are twofold: benefits from office, λ, and a foregone drop in project payoff $\Pi_C - \Pi_\rho$.

Similarly, an incompetent executive implements the project if $V_{IC}(\mu_1) + \lambda + [\Pi_{IC} + \lambda] \geq \lambda + [\Pi_\rho]$. This determines a cut-off value $V_{IC}^*(\lambda)$ such that the project is implemented if and only if

$$V_{IC}(\mu_1) \geq V_{IC}^*(\lambda) := (\Pi_\rho - \Pi_{IC}) - \lambda \qquad (4.3)$$

Because of Assumption 4.2, $V_{IC}^*(\lambda) < 0$. A comparison of (4.2) and (4.3) shows that a competent executive implements projects for lower values of V_1. Furthermore, for a given value of μ_1, $V_C(\mu_1) > V_{IC}(\mu_1)$. Implementation is therefore more likely with a competent than with an incompetent executive.

To highlight the signalling function of the implementation decisions suppose that even if $\lambda = 0$ an incumbent is able to signal his competence only through his implementation decision. Equations (4.2) and (4.3) imply that the board would have

[18] Of course, as the game ends after period 2, the second-period incumbent chooses $X_2 = 1$ if and only if the expected project payoff is positive.

wanted both a competent and an incompetent executive to deviate from the implementation decision that maximizes per period payoff. This can be seen from the first part on the right hand side of (4.2) and (4.3): $V_C^*(0) = -(\Pi_C - \Pi_\rho) < 0$ and $V_{IC}^*(0) = (\Pi_\rho - \Pi_{IC}) > 0$. A competent executive may decide to implement a bad project, while an incompetent executive may decide not to implement a good project. Such deviations from the first-best implementation decision are the price the board is willing to pay for gaining information about the executive's competence. These deviations should therefore not be considered distortions. They perform a signalling function. The only parts of (4.2) and (4.3) that are distortions from the board's point of view stem from the executive's benefits from holding office concerns, λ.

Figure 4.1 illustrates our analysis so far. Panels A and B show the range of values of V_1 for which the project is implemented or the status quo is maintained by a competent executive in case $\lambda = 0$ and $\lambda > 0$, respectively. Panels C and D show the same for an incompetent executive. The desire to hold office widens the range of parameters for which $X_1 = 1$. The board does not want (i) a competent executive to choose $X_1 = 1$ if $V_1 \in [V_C^*(\lambda), V_C^*(0))$; nor (ii) an incompetent executive to choose $X_1 = 1$ if $V_1 \in [V_{IC}^*(\lambda), V_{IC}^*(0))$.

In comparison with *always* keeping the executive, the benefit of keeping the executive *only if* he has implemented a project is an increase in expected payoff in the second period. This stems from the signalling function of the first-period implementation decision. In practice, the quality of executives improves. The downside of keeping the executive only if he has implemented a project, however, is that he distorts the implementation decision. Selecting on the basis of outcomes leads to a moral hazard problem. In practice, executives become empire builders (see, e.g., Baumol (1959), Williamson (1974), and Jensen (1986)).

It is also clear from Figure 4.1, parts B and D, that the implementation of value-destroying projects may result from both competent and incompetent executives. The tie between bad performance and incompetent management is broken because the board faces two tasks, both disciplining and screening.

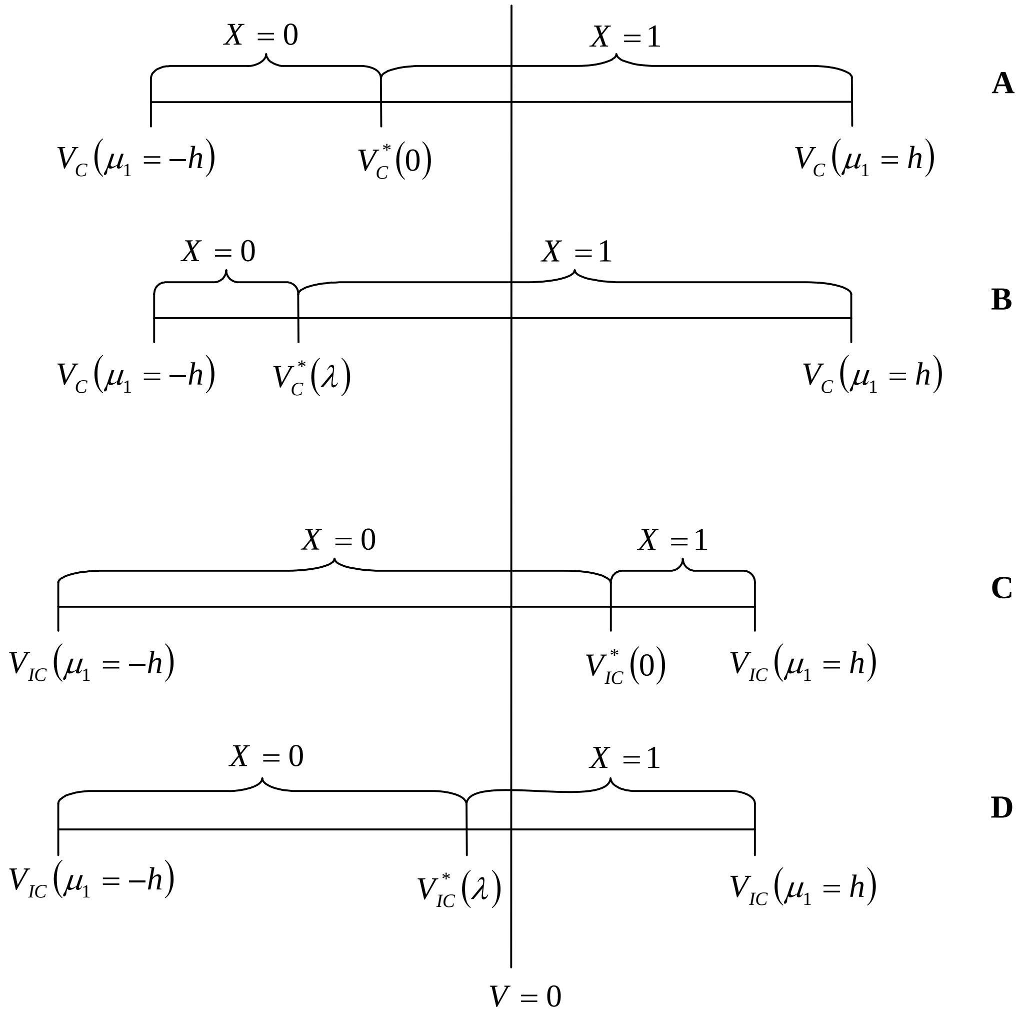

Figure 4.1

So far we have focused on two extreme possible strategies for the board. However, as the board occasionally observes the project value, V_1, it may condition its decision to keep the executive not merely on a project being implemented, but also on information on the project value. By keeping the executive only if the value of the project exceeds a threshold value, $V_1 > a$, the board may discipline[19] the executive, that is, reduce the executive's incentive to distort the implementation decision. What remains to be decided is what to do in case the project is implemented, but the project's value remains unknown. In the next section, we assume

[19] This is the expression used by Mace (1971), see the introduction.

the retention contract 'no news is good news': the board keeps the executive if it observes implementation but does not observe the project value. In Section 4.7, we assume 'no news is bad news'. The executive is replaced if the board does not observe the project value. A remark on terminology is in order. We use *threshold value* when discussing the board's retention contract, and *cutoff value* when discussing the executive's implementation strategy.

4.6 Retention contract 1: 'No news is good news'

Under retention contract 1 the board

- dismisses the executive in case no project has been implemented,
- dismisses the executive in case a project has been implemented, and observes $V_1 \leq a$,
- keeps the executive in case a project has been implemented, and does not observe V_1
- keeps the executive in case a project has been implemented, and observes $V_1 > a$.

Our main concern is the determination of the threshold value a that is optimal from the board's point of view. The choice of a determines the degree to which an executive is disciplined and also the likelihood that a competent executive is selected for the second period.

To see how the board's choice of a may affect the executive's implementation decision in period 1, consider panels B and D in Figure 4.1. Suppose that the board chooses $a \in [V_C^* (\lambda), V_{IC}^* (\lambda))$. Then, in case the incumbent is competent, his decision on X_1 may be affected by a. If the board observes $V_1 \leq a$, $X_1 = 1$ leads to dismissal. Hence, compared to the situation of the previous section, in which $X_1 = 1$ always leads to keeping the executive, the incentive to choose $X_1 = 1$ is weakened. If the executive in office in period 1 is incompetent, $a \in [V_C^* (\lambda), V_{IC}^* (\lambda))$ does not affect his implementation decision, as a is non–binding. Now suppose that the board chooses $a \geq V_{IC}^*(\lambda)$. Then, a is binding for both a competent and an incompetent executive. Relative to (4.2) and (4.3), the incentive to choose $X_1 = 1$ is weakened.

The upshot is that the board's choice of a amounts to choosing between two alternatives. First, by choosing $a \in [V_C^*(\lambda), V_{IC}^*(\lambda))$, the board chooses to discipline competent executives, taking for granted that if an incompetent executive is in office, the implementation decision will be distorted, see (4.3). Second, by choosing $a \geq V_{IC}^*(\lambda)$, the board affects the implementation decision of either type of executive. We now first derive how the choice of a influences the behaviour of either type of executive in isolation.

4.6.1 Case 1: disciplining a competent executive

Ideally, the board wants a competent incumbent to choose $X_1 = 1$ if and only if $V_1 > V_C^*(0)$. However, a competent executive chooses $X_1 = 1$ if $V_1 \geq V_C^*(\lambda)$, see (4.2). By using a threshold value a in his retention contract, the board can discipline the executive. We say that an executive is 'fully disciplined' if he no longer distorts the implementation decision at all, while an executive is said to be 'partially disciplined' if the distortion is merely reduced. Let $\widehat{V}_C$ denote the cut-off value used by a competent incumbent if the board sets a sufficiently large. Notice that to have an effect on a competent executive's implementation decision, the board should set $a \geq \widehat{V}_C$. Thus, assume $a \geq \widehat{V}_C$. Now suppose that a competent executive observes $V_C(\mu_1) < a$. He will implement the project if $V_C(\mu_1) + \lambda + [(1-\gamma)(\Pi_C + \lambda) + \gamma(\Pi_\rho)] \geq \lambda + [\Pi_\rho]$. Hence, the executive implements the project if

$$V_C(\mu_1) \geq \widehat{V}_C(\lambda) := -(1-\gamma)(\Pi_C - \Pi_\rho) - (1-\gamma)\lambda \tag{4.4}$$

Four remarks are in order. First, for $V_1 \in \left[\widehat{V}_C(\lambda), a\right]$ the executive chooses implementation in the hope that the board does not observe the project outcome, so that he keeps office. Second, the board can change the value of a without affecting the cutoff value used by the executive as long as it sets the threshold value a

such that $a \geq \widehat{V}_C(\lambda)$. Third, a comparison between (4.2) and (4.4) shows that $V_C^*(\lambda) < \widehat{V}_C(\lambda)$. Hence, the executive is at least partially disciplined. Fourth, for $\lambda < \lambda^* := \frac{\gamma}{1-\gamma}(\Pi_C - \Pi_\rho)$, the cutoff value would satisfy $V_C^*(0) < \widehat{V}_C(\lambda)$. This means that if the competent executive cares little about holding office, the effect of setting a threshold may be too strong: the beneficial screening function of the implementation decision is hampered. But this also implies that for $\lambda < \lambda^*$, the board can induce the executive to use $V_C^*(0)$ as his threshold value by setting $a = V_C^*(0)$. This effectively stops the executive from distorting the implementation decision.

Lemma 4.1 *Suppose the retention contract 'no news is good news'. If $\lambda < \lambda^*$ holds, then $a = V_C^*(0)$ is the unique threshold value that guarantees that a competent executive is fully disciplined. If instead $\lambda \geq \lambda^*$ holds, then the board can only partially discipline a competent executive, by setting $a \geq \widehat{V}_C(\lambda)$. The cut-off value used by the disciplined executive is*

$$\widehat{V}_C = \begin{cases} V_C^*(0) & \text{if } \lambda < \lambda^* \\ \widehat{V}_C(\lambda) = -(1-\gamma)(\Pi_C - \Pi_\rho) - (1-\gamma)\lambda & \text{if } \lambda \geq \lambda^* \end{cases} \tag{4.5}$$

with $\widehat{V}_C \in (V_C^*(\lambda), V_C^*(0)]$.[20]

4.6.2 Case 2: disciplining an incompetent executive

We now turn to the possibility that the board sets the threshold value a such that the behaviour of an incompetent executive is affected, $a \geq V_{IC}^*(\lambda)$.

Lemma 4.2 *Suppose the retention contract 'no news is good news'. It is not possible to fully discipline an incompetent executive. An incompetent executive can be partially disciplined by setting $a \geq \widehat{V}_{IC}(\lambda) = (1-\gamma)(\Pi_\rho - \Pi_{IC}) - (1-\gamma)\lambda$. Then, the board induces an incompetent executive to choose $X_1 = 1$ if and only if $V_1 \geq \widehat{V}_{IC}(\lambda)$, where $\widehat{V}_{IC}(\lambda) \in (V_{IC}^*(\lambda), V_{IC}^*(0))$.*

[20] If $\lambda < \lambda^*$, the disciplined executive implements the project if and only if $V_1 > V_C^*(0)$. Hence, to be precise, the cut-off value should be $\lim_{\varepsilon \downarrow 0} V_C^*(\varepsilon)$.

Proof. Suppose a is such that the incompetent executive's implementation strategy is affected (i.e., $a > V_{IC}^{*}(\lambda)$). Clearly, for $V_{IC}(\mu_1) \geq a$, the project will be implemented. For $V_{IC}(\mu_1) < a$, implementation yields $V_{IC}(\mu_1)+\lambda+[\gamma\Pi_\rho + (1-\gamma)(\Pi_{IC}+\lambda)]$, while maintaining the status quo yields $\lambda + [\Pi_\rho]$. It is now straightforward to check that $X_1 = 1$ is preferred to $X_1 = 0$ if $V_{IC}(\mu_1) \geq \widehat{V}_{IC}(\lambda) = (1-\gamma)(\Pi_\rho - \Pi_{IC}) - (1-\gamma)\lambda$, where $V_{IC}^{*}(\lambda) < \widehat{V}_{IC}(\lambda) < V_{IC}^{*}(0)$. As a result, disciplining is partial, not full. ■

Lemma 4.2 states that the board can only partially discipline an incompetent executive. To understand why the board cannot fully discipline an incompetent executive, suppose that the threshold value set by the board equals $a = V_{IC}^{*}(0)$ and that the executive observes μ_1 such that $V_{IC}(\mu_1) = V_{IC}^{*}(0)$, and $\lambda > 0$. Recall that $V_{IC}^{*}(0)$ is the cut-off value the executive uses if he does *not* care about the benefits from office, and if implementation is *sufficient* for re-appointment. In the current situation, the executive *does* care about holding office, and implementation is merely *necessary* for re-appointment. As a result of $\lambda > 0$, the executive now strictly prefers implementation to maintaining the status quo from a benefits point of view. Now take the project value point of view. If implementation is sufficient to be retained, an incompetent incumbent has to maintain the status quo to ensure that he is replaced by someone of ‘average’ quality such that expected payoff goes up in the second period. However, with retention contract 1, implementation no longer guarantees retention. Therefore, the benefits of dismissal (a higher expected period two payoff) can now be combined with implementation of a profitable project in period 1 (recall that $V_{IC}^{*}(0) > 0$). As a result, the executive now strictly prefers implementation to maintaining the status quo. As the executive prefers $X = 1$ to $X = 0$ both from a project and a career point of view when $V_{IC}(\mu_1) = V_{IC}^{*}(0)$, he cannot be fully disciplined.

4.6.3 Choice of threshold value a

Above we have analysed the effect of a threshold value a on the behaviour of each type of incumbent in isolation. We now analyse how the choice of a influences the board's utility. To do so, we look both at the effect of the choice of a on the discipline exerted in the first period and on the likelihood that a competent executive is selected for the second period.

Proposition 4.1 *Suppose the retention contract 'no news is good news'. The board has two options. It either disciplines a competent executive as much as possible (be it fully or partially) by setting* $a = \widehat{V}_C$. *Or it disciplines both types of executive by setting* $a \in [\widehat{V}_{IC}(\lambda), V_{IC}(\mu_1 = h)]$.

The Proposition follows, to a large extent, from Lemma 4.1 and Lemma 4.2. Therefore, we only provide an informal proof of the Proposition. To grasp the basic ideas behind Proposition 4.1 consider Figure 4.2.

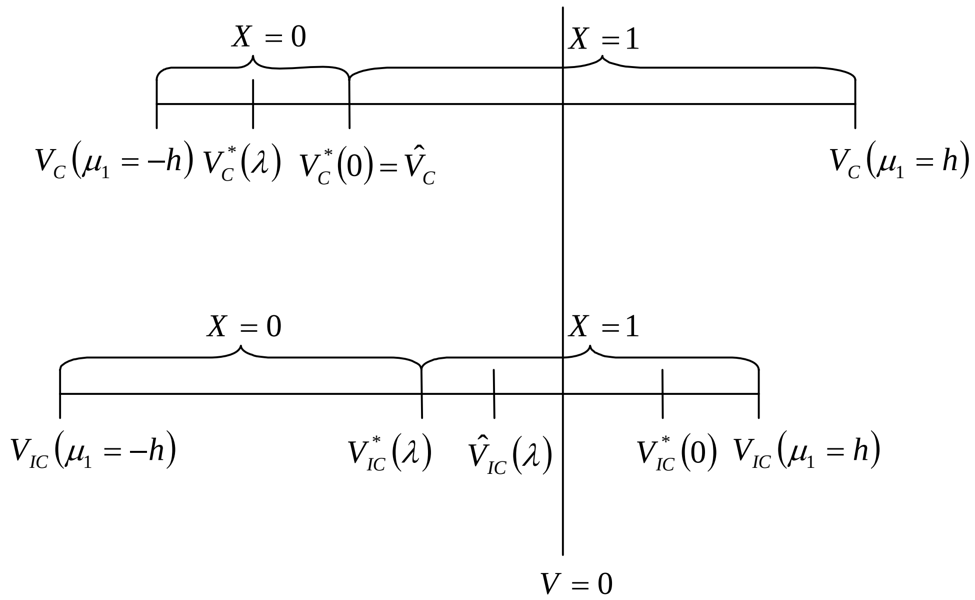

Figure 4.2

Figure 4.2 describes a situation where $\widehat{V}_C < V_{IC}^*(\lambda)$.[21] Suppose that the board sets $a < V_{IC}^*(\lambda)$. The implication is that the board sets a so as to influence the

[21] If $V_{IC}^*(\lambda) \leq \widehat{V}_C$, then the board's dominant strategy is to discipline also the incompetent executive. In this case setting $a = \widehat{V}_C$ also affects the behavior of an incompetent executive. Hence, disciplining only a competent executive is not an option.

behaviour of a competent executive, taking for granted that an incompetent executive's implementation decision is based on $V_{IC}^*(\lambda)$. In Section 4.5 we have argued that, given that the board does not know the executive's ability, ideally it wants a competent executive to choose implementation only if $V_1 > V_C^*(0)$. Lemma 4.1 states that if $\lambda < \lambda^*$, the board can reach this goal by setting $a = V_C^*(0)$: a competent incumbent can be fully disciplined. If instead $\lambda \geq \lambda^*$, the board can only partially discipline a competent executive, $\widehat{V}_C(\lambda) < V_C^*(0)$, by setting $a \geq \widehat{V}_C(\lambda)$. Has the board an incentive to set $a > \widehat{V}_C(\lambda)$, rather than $a = \widehat{V}_C(\lambda)$? The answer is in the negative. When the board observes that $V_1 \in \left[\widehat{V}_C(\lambda), V_{IC}^*(\lambda)\right)$, it knows the incumbent is competent. The incumbent executive should be kept.

Now suppose that the board sets $a \geq \widehat{V}_{IC}(\lambda)$. Then, the board disciplines an incompetent executive, and since $\widehat{V}_C < \widehat{V}_{IC}(\lambda)$, it also disciplines a competent executive. Thus, by choosing $a \geq \widehat{V}_{IC}(\lambda)$, the board maximally uses the disciplining possibilities within the 'no news is good news' contract. Notice that if the board observes a value $V_1 \in [\widehat{V}_C, \widehat{V}_{IC}(\lambda))$, it is aware that the executive is competent, but nevertheless dismisses him. The price of a contract that disciplines an incompetent executive is that the possibilities for selecting a competent executive are not fully exploited. At which value should the board set a? Recall from Section 4.5 that ideally the board wants an incompetent executive to choose implementation if $V_{IC}(\mu_1) \geq V_{IC}^*(0)$. However, as Lemma 4.2 states, within the 'no news is good news' contract the board cannot fully discipline an incompetent executive. The best it can do is to partially discipline an incompetent executive by setting $a \geq \widehat{V}_{IC}(\lambda)$. Does the board have an incentive to set $a > \widehat{V}_{IC}(\lambda)$, rather than $a = \widehat{V}_{IC}(\lambda)$? For $a \in \left[\widehat{V}_{IC}(\lambda), V_{IC}(\mu_1 = h)\right]$, the value of a has no effect on the implementation decision of either type of executive, nor on selection. The board should not set $a > V_{IC}(\mu_1 = h)$, as $V_1 > V_{IC}(\mu_1 = h)$ is clear evidence that the executive is competent.

The upshot is as follows. Recall that equating project implementation and retention induces the executive to become overly active. The board can use information on the value of implemented projects that occasionally becomes available to condition its retention decision. The contract 'no news is good news' offers two options for a board to guide the behaviour of an executive. First, the board can focus on disciplining a competent executive only ($a = \widehat{V}_C$). We refer to this option as the *selection option*, as this option maximally exploits the selection possibilities. Second, the board can focus on disciplining an incompetent executive and thereby also on disciplining a competent executive ($a = \widehat{V}_{IC}(\lambda)$). We refer to this option as the *disciplining option*. The benefit of the selection option is a higher probability that in period two the incumbent will be competent. This probability is directly related to the length of the interval $\left[\widehat{V}_C, V_{IC}^*(\lambda)\right]$, see Figure 4.2. The benefit of the disciplining option is that an incompetent executive distorts the implementation decision less. This benefit depends positively on the length of the interval $\left[V_{IC}^*(\lambda), \widehat{V}_{IC}(\lambda)\right]$.

One important question remains: Which option does the board choose? Proposition 4.2 describes how the answer to this question depends on the parameters of the model.

Proposition 4.2 *Suppose $\widehat{V}_C < V_{IC}^*(\lambda)$. Then, an increase in λ or γ, or a decrease in $\Pi_C - \Pi_{IC}$ or ρ, widens the range of parameters for which the board chooses the disciplining option, rather than the selection option. If instead $V_{IC}^*(\lambda) \leq \widehat{V}_C$, the board's dominant strategy is to choose the disciplining option by setting $a = \widehat{V}_{IC}(\lambda)$.*

Proof. Appendix ■

Clearly, if $V_{IC}^*(\lambda) \leq \widehat{V}_C$, then the board chooses the disciplining option. The reason is that in that case, if the board were to choose $a = \widehat{V}_C$, it would also affect an incompetent executive's behaviour. Therefore, disciplining a competent executive only, the selection option, is not a real option. Another way of looking at this result is that, as discussed earlier, the benefit of the selection option is directly related to the length of the interval $[a, V_{IC}^*(\lambda)]$. Obviously, if $V_{IC}^*(\lambda) \leq a$, then there is no benefit of the selection option.

Now suppose that $\widehat{V}_C < V_{IC}^*(\lambda)$, so that the board really can choose between the selection and disciplining option. To determine how a change in the parameters affects the board's choice as to the two options, we compare the effects of such a change on the lengths of the intervals $\left[\widehat{V}_C, V_{IC}^*(\lambda)\right]$ and $\left[V_{IC}^*(\lambda), \widehat{V}_{IC}(\lambda)\right]$. We focus on the situation where $\lambda \geq \lambda^*$ (and so $\widehat{V}_C = \widehat{V}_C(\lambda)$[22]). It is easy to show that

$$\begin{aligned} V_{IC}^*(\lambda) - \widehat{V}_C &= \Pi_C - \Pi_{IC} - \gamma(\Pi_C - \Pi_\rho) - \gamma\lambda \\ &= (1 - \gamma(1-\rho))(\Pi_C - \Pi_{IC}) - \gamma\lambda \end{aligned} \tag{4.6}$$

and

$$\begin{aligned} \widehat{V}_{IC}(\lambda) - V_{IC}^*(\lambda) &= -\gamma(\Pi_\rho - \Pi_{IC}) + \gamma\lambda \\ &= -\gamma\rho(\Pi_C - \Pi_{IC}) + \gamma\lambda \end{aligned} \tag{4.7}$$

The larger is the value of (4.6), the more attractive is the selection option. In contrast, the larger is the value of (4.7), the more attractive is the disciplining option.[23]

An increase in benefits from holding office λ decreases the value the board attaches to the selection option, see (4.6), and increases the value of the disciplining option, see (4.7). The reason for this result is clear. As explained in Section 4.5, the executive's desire to hold office is the reason the board wants to discipline in the first place.

In our model, the board wants a competent, rather than an incompetent, executive to design a project. It is therefore hardly surprising that an increase in $\Pi_C - \Pi_{IC}$ widens the range of parameters for which the board chooses the selection option. It is worth noting that an increase in $\Pi_C - \Pi_{IC}$ decreases (4.7). The reason is that an increase in $\Pi_C - \Pi_{IC}$ raises the cost of distorting the implementation decision for the executive. As a result, the need for disciplining the executive diminishes.

An increase in γ implies that the probability that the board learns the project outcome increases. Important for the effect of γ on the choice between the selection and disciplining option is that the possibility of observing V is a prerequisite for disciplining executives. It is therefore quite intuitive that a rise in γ increases the attractiveness of the disciplining option. This is borne out by the fact that the value

[22] The analysis of the case $\lambda < \lambda^*$ with $\widehat{V}_C = V_C^*(0)$ is analogous.

[23] Recall from Assumption 4.2 that $\lambda > \Pi_\rho - \Pi_{IC}$, and so the expression in (4.7) is strictly positive.

of the disciplining option, (4.7), increases in γ. By the same token, the value of the selection option, (4.6), goes down as a higher likelihood of the project value being observed reduces a competent executive's eagerness to implement.

The parameter ρ denotes the probability that an executive is competent. The direct effect of an increase in ρ is a smaller loss stemming from not disciplining incompetent executives. This is why an increase in ρ widens the range of parameters for which the board chooses the selection option ((4.6) goes up in ρ, while (4.7) goes down).

4.7 Retention contract 2: 'No news is bad news'

Under retention contract 2 the board

- dismisses the executive in case no project has been implemented,
- dismisses the executive in case a project has been implemented, and observes $V_1 < a$,
- dismisses the executive in case a project has been implemented, and does not observe V_1
- keeps the executive in case a project has been implemented, and observes $V_1 \geq a$.

Notice that the main difference between contracts 1 and 2 resides in the board's decision in case it does not observe the value of an implemented project. With contract 1, the executive is kept in office. This makes sense from a selection perspective. After all, a competent executive is more likely to implement a project than an incompetent one. It has the disadvantage of inducing the incumbent to distort the implementation decision as he hopes a project of low value will go unnoticed. Retention contract 2 dashes any such hopes. By dismissing the incumbent in case activism does not lead to any visible results, it becomes easy to discipline the incumbent. However, it still is the case that a competent executive is more likely to implement a project than an incompetent one. The consequence is that in the absence of visible results, the board is more likely to send home a competent than an incompetent executive.

Consider the executive's behaviour if the board retains him if and only if he implements a project and the project's payoff becomes visible. Suppose the incumbent is competent. He implements a project of value $V_C(\mu_1)$ if and only if $V_C(\mu_1) + \lambda + [\gamma(\Pi_C + \lambda) + (1-\gamma)\Pi_\rho] > \lambda + [\Pi_\rho]$ or if

$$V_C(\mu_1) \geq \widetilde{V}_C(\lambda) := -\gamma(\Pi_C - \Pi_\rho) - \gamma\lambda \tag{4.8}$$

An incompetent incumbent implements a project if and only if

$$V_{IC}(\mu_1) \geq \widetilde{V}_{IC}(\lambda) := \gamma(\Pi_\rho - \Pi_{IC}) - \gamma\lambda \tag{4.9}$$

Note that $\widetilde{V}_C(\lambda) < \widetilde{V}_{IC}(\lambda)$. As in the previous section, a competent incumbent opts for $X_1 = 1$ for more values of V_1 and therefore of μ_1 than an incompetent incumbent. It is useful to compare (4.8) and (4.9) with (4.2) and (4.3), respectively. Recall that the latter equations describe the cut-off values in case project implementation (activism) is sufficient for re-appointment. With $\lambda = 0$, (4.8) and (4.9) denote the optimal implementation decisions from the board's point of view, given that the executive is dismissed if outcomes are not observed. Clearly, as a competent incumbent is sent home with probability $1-\gamma$ if he implements a project, the board is now less willing to accept a first-period loss. Analogously, the board is now less willing to forego a profitable project in period one to find out that the incumbent is incompetent: with probability $1-\gamma$ the incumbent would have been replaced anyway. This comparison shows that 'no news is bad news' allows for a lower degree of screening than 'no news is good news'. The advantage of the retention contract 'no news is bad news' is that it gives weaker incentives to executives to distort the implementation decision ($\gamma\lambda$ in (4.8) and (4.9) instead of λ in (4.2) and (4.3)).

If the board uses the 'no news is bad news' retention contract, it can fully discipline a competent executive, independent of the degree to which an executive derives benefits from holding office.

Lemma 4.3 *Suppose 'no news is bad news'. The board can fully discipline a competent executive by setting* $a = \widetilde{V}_C(0)$*. A competent executive then uses the cut-off value* $\widetilde{V}_C(0)$*.*

Proof. Consider a project with $V_C(\mu_1) < \widetilde{V}_C(0)$. Implementation leads to a project loss (as $\widetilde{V}_C(0) < 0$, see Eq (4.8)), and dismissal in period 1. Maintaining the status quo is better as the project loss is foregone. Now suppose $V_C(\mu_1) \geq \widetilde{V}_C(0)$. Implementation yields $V_C(\mu_1) + \lambda + [\gamma(\Pi_C + \lambda) + (1-\gamma)\Pi_\rho]$ whereas maintaining the status quo yields $\lambda + [\Pi_\rho]$. Implementation is best as $V_C(\mu_1) \geq -\gamma(\Pi_C - \Pi_\rho) - \gamma\lambda = \widetilde{V}_C(0) - \gamma\lambda$ holds. ■

Now consider the case that the board wants to discipline an incompetent executive, $a \in \left(\widetilde{V}_{IC}(\lambda), V_{IC}(\mu_1 = h)\right]$. It can at most partially discipline an incompetent executive. As with retention contract 1, if it decides to discipline an incompetent executive, it also disciplines a competent executive.

Lemma 4.4 *Suppose 'no news is bad news'. If the board decides to discipline an incompetent executive, its (weakly) dominant strategy is to set* $a = 0$*, thereby inducing both types of executive to implement only profitable projects in period 1.*

The intuition for this result is as follows. By setting $a \in \left[\widetilde{V}_{IC}(\lambda), 0\right)$, the board induces either type of executive to implement a project only if $V_1 \geq a$. By setting $a \in [0, V_{IC}(\mu_1 = h)]$, it induces either type of executive to implement only profitable projects, $V_1 \geq 0$. As in either case both types of executives use the same implementation strategy, a change in a leaves the likelihood of selecting a competent executive unaffected. The best the board can do is to induce either type of executive to implement only profitable projects. This can be guaranteed by setting $a = 0$.[24]

Whether the board wants to discipline the competent executive only (the selection option) or both types of executive (the disciplining option) is described in the next proposition.

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[24]To be precise, the board can choose any $a \in [0, V_{IC}(\mu_1 = h)]$, whence $a = 0$ being a weakly dominant strategy, see Lemma 4.4. In what follows we will ignore the other weakly dominant strategies $a \in (0, V_{IC}(\mu_1 = h)]$.

Proposition 4.3 *Suppose 'no news is bad news'. If* $\lambda < \Pi_C - \Pi_{IC}$*, the board has two options. It either chooses the selection option by setting* $a = \widetilde{V}_C(0)$*, or it chooses the disciplining option by setting* $a = 0$*. An increase in* λ*, or a decrease in* $\Pi_C - \Pi_{IC}$ *or* ρ *widens the range of parameters for which the board chooses the disciplining option. The parameter* γ *does not affect the choice of option. If instead* $\lambda \geq \Pi_C - \Pi_{IC}$*, the board's dominant strategy is to choose the disciplining option by setting* $a = 0$*.*

Proof. Appendix ■

As under the retention contract 'no news is good news', the board's choice of a under 'no news is bad news' is a choice between putting emphasis on disciplining or selecting. For instance, an increase in benefits λ strengthens executives' incentives to distort the implementation decision. Therefore, an increase in λ makes the disciplining option more important (choose $a = 0$). In contrast, the higher is $\Pi_C - \Pi_{IC}$, the more important it is that a competent executive keeps office. Consequently, the higher is $\Pi_C - \Pi_{IC}$, the more the board would like to emphasize the selection function of the retention contract (choose $a = \widetilde{V}_C(0)$).

Qualitatively, Proposition 4.3 only differs from Proposition 4.2 in the effects of γ. The reason is that under the retention contract 'no news is good news' an increase in γ facilitates disciplining an incumbent. However, under 'no news is bad news', the board can always discipline the incumbent. Consequently, under the latter retention contract, γ does not influence the choice between the two options concerning a.

4.8 The two retention contracts compared

Boards of directors perform two main functions. They influence what top executives consider acceptable actions, and they screen incumbents with a view to retaining competent ones and dismissing incompetent ones. We have argued that *within* a retention contract or norm the board faces a trade-off between increasing the likelihood of selecting a competent executive on the one hand, and weakening executives' incentives to distort the implementation decision on the other hand. Essentially the same trade-off exists when comparing the effectiveness of the two retention norms.

The main difference between the two norms is the board's reaction to an executive who has implemented an important project the outcomes of which are not known yet. From a narrow selection point of view, the board's adequate reaction is to keep the executive. As shown in Section 4.3, it is more likely that a project is implemented by an executive who is competent than incompetent. Thus, a benefit of 'no news is good news' is that in case of no news the executive is retained. This improves the expected quality of projects implemented in the second period. However, from a disciplining perspective, the board benefits from announcing and sticking to a 'no news is bad news' norm, as it reduces an executive's incentive to distort the implementation decision.

It is now easy to determine which type of retention norm performs better depending on the value of λ. For small values of λ, executives hardly have incentives to distort the implementation decision. The implication is that for small values of λ the retention contract 'no news is bad news' is relatively unattractive. It scores badly on selecting, while the benefits of disciplining are small. More generally, one can show that if λ is smaller than a certain threshold $\lambda < \lambda_L$, then the board prefers 'no news is good news' to 'no news is bad news'. The opposite holds for very high values of λ. Lemma 4.1 and 4.2 show that with 'no news is good news' and very high values of λ, both competent and incompetent executives virtually always implement the project in period 1. Clearly, disciplining is then desired. By choosing 'no news is bad news' with $a = 0$ the board assures that only profitable projects are implemented. One can show that if λ is sufficiently high $\lambda > \lambda_H$, then the board prefers 'no news is bad news' to 'no news is good news'.

For moderate values of λ, the relative performance of the two retention norms is less clear. All parameters play a role. Numerical analysis suggests that a rise in $\Pi_C - \Pi_{IC}$ always makes 'no news is good news' a more attractive choice. This difference in profit is the reason for having a selection procedure before period two. It is therefore quite intuitive that an increase in this difference makes the retention contract focusing on selection relatively more attractive. An increase in γ, the likelihood with which the value of the project becomes known before the board decides on retention, also makes the choice for 'no news is good news' more appealing.

The reason is that an increase in γ lowers the cost (distortion of the implementation decision) of the 'no news is good news' retention contract.

Apart from how the parameters of the model affect the choice between the two retention contracts, another feature of the retention contracts is worth emphasizing. In the introduction, we have discussed examples of top executives who were acknowledged as competent, but who were nevertheless dismissed. Our model provides an explanation. First consider the 'no news is good news' retention contract. Suppose that within this contract the board chooses the disciplining option, affecting the implementation decision of either type of executive. Then, as argued in Section 4.6, a competent executive chooses implementation for a wider range of parameters than an incompetent executive. Consequently, when the board observes that the project outcome falls in this range, it can infer that the executive is competent. Nevertheless, it will dismiss him. The reason is that following a strict retention contract weakens executives' incentives to distort the implementation decision. Occasionally dismissing competent executives is the price the board has to pay for discipline. Under the 'no news is bad news' retention contract a similar phenomenon exists. Again, a competent executive chooses implementation for a wider range of parameters than an incompetent one. This result is independent of the choice of the board between only disciplining the competent executive and disciplining either type of executive. Hence, implementation signals competence. Therefore, dismissing, rather than retaining, an executive when a project has been implemented but outcomes remain unobserved makes it quite probable that the dismissed executive is competent.

4.9 Conclusion

Boards of directors have limited information that can be used to discipline and screen the top executives of their companies. In this chapter we have analysed a simple model that shows the dilemmas that result. The desire to screen executives to improve the future wellbeing of the organization induces executives to become overly active to show their credentials. The board can counter this tendency by dismissing an executive whose projects are proven to destroy value. Besides, it can decide to replace the incumbent if it knows that a project has been implemented, but its results remain as yet unobserved. Either decision will reduce the temptation to implement loss-generating projects. But unfortunately, if it decides to dismiss the incumbent on either ground, the board can deduce that the expected quality of the incoming executive will be lower than that of the incumbent who is forced to leave. We have shown under what circumstances one retention contract is preferred over another.

Mace (1971) noticed that only in case of repeatedly observed bad performance is an executive ousted. One way of interpreting this finding is that, by and large, the parameter values in the real world are such that boards prefer a "no news is good news" retention norm. After all, if executives identify themselves with the wellbeing of their company, or if it is very hard to find a capable executive that could replace the current one, "no news is good news" is the more adequate norm. There may be other reasons for the pattern observed by Mace. First, note that if the board follows this norm, it does not face a dilemma in case the benefits of a project are still unknown: the incumbent stays and this is best from a screening perspective. For a board that does not want to upset amiable relations with the executive, this norm—granting the executive the benefit of the doubt—may well be preferred to "no news is bad news". Second, a board that uses a "no news is bad news" contract may induce executives to focus on projects and investments that generate visible results quickly. This short-termism may pose a threat to the long-term viability of the organization. We did not discuss this possibility, but it should not be hard to integrate it into the current set-up. Third, in our modelling approach we see the executive as the agent, and the board as its principal, albeit a badly informed one. Hermalin and Weisbach (1998) argue that it may be better to replace this approach by one in which an executive influences the composition of the board and negotiates about its pay. The better the executive performed in the past, the more leeway he will have. Bebchuk and Fried (2003) argue that a managerial power approach to the relation between a board and an executive should complement the standard principal-agent approach. Again, board members who are selected by the top executive and who enjoy substantial pay and prestige because of their position are unlikely to "rock the boat" and come into action unless some egregious and obvious problem cannot be denied any longer. Future research that aims at integrating retention strategies as used in the current chapter and a bargaining or managerial power approach seems to be a worthwhile undertaking.

4.A Appendix

Proof of Proposition 4.2: Proposition 4.2 consists of two parts. First, it defines a parameter space ($V_{IC}^{*}(\lambda) \leq \widehat{V}_C$) for which the principal's dominant strategy is to discipline an agent irrespective of his type and a parameter space ($V_{IC}^{*}(\lambda) > \widehat{V}_C$) for which the principal sometimes chooses the selection option and sometimes the disciplining option. Second, for $V_{IC}^{*}(\lambda) > \widehat{V}_C$, the proposition gives the comparative statics results. In the main text the conditions on the parameter space are derived. So, what remains to be proven are the comparative statics results.
To derive the comparative statics results if $V_{IC}^{*}(\lambda) > \widehat{V}_C$, we distinguish two cases. First, if $\lambda < \lambda^{*} = \frac{\gamma}{1-\gamma}(\Pi_C - \Pi_\rho)$, the principal can fully discipline the competent agent. Second, if $\lambda \geq \lambda^{*}$, the principal can only partially discipline the competent agent.

Comparative statics results for $\lambda < \lambda^{*}$

To derive the comparative statics results for $\lambda < \lambda^{*}$, we take two steps. First, we determine the principal's expected utility if she chooses the selection option. Next, we determine the principal's expected utility if she chooses the disciplining option.
Suppose the principal chooses the selection option and sets $a = V_C^{*}(0)$, implying that a competent agent implements the project iff $V_1 > V_C^{*}(0)$ and an incompetent agent implements the project iff $V_1 \geq V_{IC}^{*}(\lambda)$. Then the principal's expected utility equals

$$\begin{aligned}&\Pi_\rho - \frac{1}{4h}\left(\rho\left(V_C^{*}(0)\right)^2 + (1-\rho)\left(V_{IC}^{*}(\lambda)\right)^2\right)\\&+\left[\Pi_\rho + \frac{\rho(1-\rho)}{2h}\left(f + V_{IC}^{*}(\lambda) - V_C^{*}(0)\right)(\Pi_C - \Pi_{IC})\right]\end{aligned}$$

Filling in $V_{IC}^{*}(\lambda)$ (see (4.3)) and $V_C^{*}(0)$ (see (4.2) with $\lambda = 0$) and rewriting gives

$$\begin{aligned}&\Pi_\rho - \frac{1-\rho}{4h}\left(\rho(\Pi_C - \Pi_{IC})^2 + \lambda^2 - 2\rho(\Pi_C - \Pi_{IC})\lambda\right)\\&+\left[\Pi_\rho + \frac{\rho(1-\rho)}{2h}\left(f + (\Pi_C - \Pi_{IC}) - \lambda\right)(\Pi_C - \Pi_{IC})\right]\end{aligned} \tag{4.10}$$

Now suppose the principal chooses the disciplining option and sets $a \in \left[\widehat{V}_{IC}(\lambda), V_{IC}(\mu_1 = h)\right]$, implying that a competent agent implements the project iff $V_1 \geq \widehat{V}_C(\lambda)$ and an incompetent agent implements the project iff $V_1 \geq \widehat{V}_{IC}(\lambda)$. Then the expected utility to the principal equals

$$\Pi_\rho - \frac{1}{4h}\left(\rho\left(\widehat{V}_C(\lambda)\right)^2 + (1-\rho)\left(\widehat{V}_{IC}(\lambda)\right)^2\right)$$
$$+\left[\Pi_\rho + \frac{\rho(1-\rho)}{2h}\left(f + (1-\gamma)\left(\widehat{V}_{IC}(\lambda) - \widehat{V}_C(\lambda)\right)\right)(\Pi_C - \Pi_{IC})\right]$$

Filling in $\widehat{V}_{IC}(\lambda)$ (see lemma 4.2) and $\widehat{V}_C(\lambda)$ (see (4.5) and rewriting gives

$$\Pi_\rho - \frac{(1-\gamma)^2}{4h}\left(\rho(1-\rho)(\Pi_C - \Pi_{IC})^2 + \lambda^2\right)$$
$$+\left[\Pi_\rho + \frac{\rho(1-\rho)}{2h}\left(f + (1-\gamma)^2(\Pi_C - \Pi_{IC})\right)(\Pi_C - \Pi_{IC})\right] \quad (4.11)$$

Now the choice between the selection option and the disciplining option amounts to a comparison between (4.10) and (4.11). The principal chooses the selection option if

$$(\gamma(2-\gamma) - \rho)\lambda^2 - \rho(1-\rho)\gamma(2-\gamma)(\Pi_C - \Pi_{IC})^2 < 0 \quad (4.12)$$

Notice that inequality (4.12) always holds if

$$\gamma(2-\gamma) - \rho \leq 0 \quad (4.13)$$

Thus if (4.13) holds, the principal always chooses the selection option. Given $\gamma(2-\gamma) - \rho > 0$, then the principal chooses the selection option iff

$$\lambda < \overline{\lambda}_1 = (\Pi_C - \Pi_{IC})\sqrt{\frac{\rho(1-\rho)\gamma(2-\gamma)}{(\gamma(2-\gamma) - \rho)}} \quad (4.14)$$

where $\overline{\lambda}_1$ is the value of λ at which the principal is indifferent between disciplining only the competent agent and disciplining either type of agent.

We are now ready to determine the effect of λ, f, ρ and γ on the choice between the selection option and the disciplining option.

- An increase in λ widens the range of parameters for which the principal chooses to discipline either type of agent. This result follows directly from (4.14).

- The higher is the parameter f, the less attractive is the disciplining option. An increase in f, has a positive effect on $\overline{\lambda}_1$

$$\frac{\partial \overline{\lambda}_1}{\partial f} = \frac{\partial (\Pi_C - \Pi_{IC})}{\partial f} \sqrt{\frac{\rho (1-\rho) \gamma (2-\gamma)}{(\gamma (2-\gamma) - \rho)}}$$

where $\frac{\partial (\Pi_C - \Pi_{IC})}{\partial f} = 2 (h + p + f) > 0$.

- The higher is the parameter ρ, the less attractive is the disciplining option. First, note that an increase in ρ widens the range for which the principal always chooses selection ($\frac{\partial}{\partial \rho} (\gamma (2-\gamma) - \rho) = -1 < 0$). Second, if $\gamma (2-\gamma) - \rho > 0$, an increase in ρ, has a positive effect on $\overline{\lambda}_1$.

$$\frac{\partial \overline{\lambda}_1}{\partial \rho} = \frac{(\Pi_C - \Pi_{IC}) \gamma (2-\gamma) ((1-2\rho) (\gamma (2-\gamma) - \rho) + \rho (1-\rho))}{2 (\rho (1-\rho) \gamma (2-\gamma))^{\frac{1}{2}} (\gamma (2-\gamma) - \rho)^{\frac{3}{2}}} > 0$$

To prove that $\frac{\partial \overline{\lambda}_1}{\partial \rho} > 0$, we must show that $(1-2\rho) (\gamma (2-\gamma) - \rho) + \rho (1-\rho) > 0$. Define $t = (1-2\rho) (\gamma (2-\gamma) - \rho) + \rho (1-\rho)$. We can prove that $t > 0$ by showing that the lowest possible value of t is positive. The proof consists of two steps. First, we can show that $\frac{\partial t}{\partial \rho} = -(2-\gamma) 2\gamma + \rho < 0$. Recall that $\rho < \gamma (2-\gamma)$. Hence, by taking $\rho = \lim_{\varepsilon \downarrow 0} (\gamma (2-\gamma) - \varepsilon) = \gamma (2-\gamma)$ we obtain the lowest value of t. Let $t^{\min}$ be this value of t. Then $t^{\min} = \gamma (6 - 9\gamma + 4\gamma^2 - \gamma^3)$. The sign of $t^{\min}$ depends on the sign of $t' = (6 - 9\gamma + 4\gamma^2 - \gamma^3)$. Taking the derivative with respect to γ we get $\frac{\partial t'}{\partial \gamma} = 9 + 8\gamma - 3\gamma^2 < 0$, where $0 < \gamma < 1$. Hence, by taking $\gamma = \lim_{\varepsilon \downarrow 0} (1 - \varepsilon) = 1$ we find that in the limit the minimum value of t' equals 0. This implies that in the limit the lowest possible value of t is zero. Hence, we can conclude that $\frac{\partial \overline{\lambda}_1}{\partial \rho} > 0$.

- The higher is the parameter γ, the more attractive is the disciplining option. First, note that an increase in γ, narrows the range of parameters for which the principal always chooses selection ($\frac{\partial}{\partial \gamma} (\gamma (2-\gamma) - \rho) = 2 (1-\gamma) > 0$).

Second, if $\gamma(2-\gamma)-\rho>0$ an increase in γ has a negative effect on $\overline{\lambda}_1$.

$$\frac{\partial\overline{\lambda}_1}{\partial\gamma}=\frac{-(1-\gamma)(1-\rho)\rho^2(\Pi_C-\Pi_{IC})}{(\gamma(2-\gamma)\rho(1-\rho))^{\frac{1}{2}}(\gamma(2-\gamma)-\rho)^{\frac{3}{2}}}<0$$

Comparative statics results for $\lambda\geq\lambda^*$

To derive the comparative static results for $\lambda\geq\lambda^*$, we again have to compare the principal's expect utility if she chooses the selection option and the principal's expected utility if she chooses the disciplining option. In the previous case we have already determined the expected utility if the principal chooses the disciplining option. So, let us now determine the principal's expected utility if she chooses the selection option. This means that (i) the principal sets $a=\widehat{V}_C(\lambda)$, (ii) a competent agent implements the project iff $V_1\geq\widehat{V}_C(\lambda)$, and (iii) an incompetent agent implements the project iff $V_1\geq V_{IC}^*(\lambda)$. The principal's expected utility then equals

$$\Pi_\rho-\frac{1}{4h}\left(\rho\left(\widehat{V}_C(\lambda)\right)^2+(1-\rho)\left(V_{IC}^*(\lambda)\right)^2\right)+$$
$$\left[\Pi_\rho+\frac{\rho(1-\rho)}{2h}\left(f+V_{IC}^*(\lambda)-\widehat{V}_C(\lambda)\right)(\Pi_C-\Pi_{IC})\right]$$

Filling in the values of $\widehat{V}_C(\lambda)$ (see (5)) and $V_{IC}^*(\lambda)$ (see (4)) and rewriting gives

$$\Pi_\rho-\frac{1}{4h}\left(\rho\left(-(1-\gamma)(1-\rho)(\Pi_C-\Pi_{IC})-(1-\gamma)\lambda\right)^2+(1-\rho)\left(\rho(\Pi_C-\Pi_{IC})-\lambda\right)^2\right)$$
$$+\left[\Pi_\rho+\frac{\rho(1-\rho)}{2h}\left(f+(1-\gamma(1-\rho))(\Pi_C-\Pi_{IC})-\gamma\lambda\right)(\Pi_C-\Pi_{IC})\right] \tag{4.15}$$

The choice between the selection option and the disciplining option amounts to comparing (4.15) and (4.11). The principal chooses the selection option if

$$\lambda<\overline{\lambda}_2=\frac{(\Pi_C-\Pi_{IC})}{2-\gamma}\left(\rho(1-\gamma)+\sqrt{\rho\left(2(1-\gamma)(2-\gamma)+\rho\right)}\right) \tag{4.16}$$

We can now determine the effect of λ, f, ρ and γ on the choice between selection and disciplining.

- An increase in λ widens the range of parameters for which the principal chooses to discipline either type of agent, rather than only disciplining a competent agent. This result follows directly from (4.16).

- The higher is f, the less attractive is the disciplining option. An increase in f, has a positive effect on $\overline{\lambda}_2$.

$$\frac{\partial \overline{\lambda}_2}{\partial f} = \frac{\partial \left(\Pi_C - \Pi_{IC}\right)}{\partial f} \frac{\left(\rho \left(1-\gamma\right) + \sqrt{\rho \left(2 \left(1-\gamma\right) \left(2-\gamma\right) + \rho\right)}\right)}{2-\gamma}$$

where $\frac{\partial(\Pi_C - \Pi_{IC})}{\partial f} = 2\left(h + p + f\right) > 0$.

- The higher is ρ, the less attractive is the disciplining option. An increase in ρ, has a positive effect on $\overline{\lambda}_2$.

$$\frac{\partial \overline{\lambda}_2}{\partial \rho} = \frac{\left(\Pi_C - \Pi_{IC}\right)}{2-\gamma} \left(\left(1-\gamma\right) + \frac{1}{2} \frac{2\left(\rho + \left(1-\gamma\right)\left(2-\gamma\right)\right)}{\sqrt{\rho\left(2\left(1-\gamma\right)\left(2-\gamma\right)+\rho\right)}} \right) > 0$$

- The higher is γ, the more attractive is the disciplining option. An increase in γ has a negative effect on $\overline{\lambda}_2$.

$$\frac{\partial \overline{\lambda}_2}{\partial \gamma} = \frac{\left(\Pi_C - \Pi_{IC}\right)}{\left(2-\gamma\right)^2} \left(-\rho + \frac{-\left(2-\gamma-\rho\right)\rho}{\sqrt{\rho\left(2\left(1-\gamma\right)\left(2-\gamma\right)+\rho\right)}} \right) < 0$$

■

Proof of proposition 4.3: Proposition 4.3 consists of two parts. First, it defines a parameter space ($\lambda < \Pi_C - \Pi_{IC}$) for which the principal's dominant strategy is to discipline either type of agent and a parameter space ($\lambda \geq \Pi_C - \Pi_{IC}$) for which the principal can choose between the selection option and the disciplining option. Second, for $\lambda < \Pi_C - \Pi_{IC}$, the proposition gives the comparative statics results. First, we derive the conditions on the parameter space. If $\widetilde{V}_C(0) \geq \widetilde{V}_{IC}(\lambda)$ (that is $\lambda \geq (\Pi_C - \Pi_{IC})$), setting $a = \widetilde{V}_C(0)$ also affects an incompetent agent's behavior. In this situation disciplining only a competent agent is not a real option. Therefore, the principal's dominant strategy is to discipline either type of agent by setting $a \in [0, V_{IC}(\mu_1 = h)]$. If $\lambda < (\Pi_C - \Pi_{IC})$, then the principal can choose to discipline only the competent agent or she can discipline either type of agent. What remains to be proven are the comparative statics results in the last situation.

To derive the comparative statics results we take two steps. First, we determine the expected utility if the principal chooses the selection option. Second, we determine the principals expected utility if she chooses to discipline either type of agent.

Suppose the principal chooses the selection option and sets $a = \widetilde{V}_C(0)$, implying that a competent agent implements the project iff $V_1 \geq \widetilde{V}_C(0)$ and an incompetent agent implements the project iff $V_1 \geq \widetilde{V}_{IC}(\lambda)$. Then the principal's expected utility equals

$$\Pi_\rho - \frac{1}{4h}\left(\rho\left(\widetilde{V}_C(0)\right)^2 + (1-\rho)\left(\widetilde{V}_{IC}(\lambda)\right)^2\right)$$
$$+\left[\Pi_\rho + \frac{\gamma\rho(1-\rho)}{2h}\left(f + \widetilde{V}_{IC}(\lambda) - \widetilde{V}_C(0)\right)(\Pi_C - \Pi_{IC})\right]$$

Filling in $\widetilde{V}_{IC}(\lambda)$ (see (4.9)) and $\widetilde{V}_C(0)$ (see (4.8) with $\lambda = 0$) and rewriting gives the following expression

$$\Pi_\rho - \frac{(1-\rho)\gamma^2}{4h}\left(\rho(\Pi_C - \Pi_{IC})^2 + \lambda^2 - 2\rho(\Pi_C - \Pi_{IC})\lambda\right)$$
$$+\left[\Pi_\rho + \frac{\gamma^2\rho(1-\rho)}{2h}(f + (\Pi_C - \Pi_{IC}) - \lambda)(\Pi_C - \Pi_{IC})\right] \tag{4.17}$$

Now suppose the principal chooses the selection option and sets $a \in [0, V_{IC}(\mu_1 = h)]$, implying that an agent implements the project iff $V_1 \geq 0$. Then the principal's expected utility equals

$$\Pi_\rho + \left[\Pi_\rho + \frac{\gamma\rho(1-\rho)}{2h} f(\Pi_C - \Pi_{IC})\right] \tag{4.18}$$

Now the choice between the selection option and the disciplining option can be analyzed by comparing (4.17) and (4.18). The principal prefers the selection option to the disciplining option if

$$\begin{aligned}\lambda^2 &< \rho\left(\Pi_C - \Pi_{IC}\right)^2 \\ \lambda &< \overline{\lambda}_3 = \sqrt{\rho}\left(\Pi_C - \Pi_{IC}\right) \qquad (4.19)\end{aligned}$$

where $\overline{\lambda}_3$ is the value of λ for which the principal is indifferent between the selection option and the disciplining option.

Now we can determine how the parameters λ, f, ρ and γ affect the choice between selection and disciplining.

- An increase in λ, widens the range of parameters for which the principal chooses to discipline either type of agent. This result follows directly from (4.19).

- An increase in f, narrows the range of parameters for which the principal chooses to discipline either type of agent. An increase in f has a positive effect on $\overline{\lambda}_3$
$$\frac{\partial\overline{\lambda}_3}{\partial f} = \frac{\partial\left(\Pi_C - \Pi_{IC}\right)}{\partial f}\sqrt{\rho}$$
where $\frac{\partial(\Pi_C - \Pi_{IC})}{\partial f} > 0$.

- The higher is ρ, the smaller is the range for which the principal chooses to discipline either type of agent and the larger is the range for which the principal chooses to discipline only the competent agent. An increase in ρ has a positive effect on $\overline{\lambda}_3$
$$\frac{\partial\overline{\lambda}_3}{\partial \rho} = \frac{\left(\Pi_C - \Pi_{IC}\right)}{2\sqrt{\rho}} > 0$$

- The parameter γ has no effect on the choice between disciplining the competent agent only or disciplining either type of agent. An increase in γ has no effect on $\overline{\lambda}_3$ ($\frac{\partial\overline{\lambda}_3}{\partial\gamma} = 0$).

■

Chapter 5

Does Electoral Competition create Incentives for Political Parties to collect Information about the Pros and Cons of Alternative Policies?

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5.1 Introduction

In most democratic societies, policy decisions are delegated to elected politicians: in practice democracy is representative rather than direct. A well-known rationale for representative democracy is that direct democracy leads to a serious free-rider problem as to the collection of information. The reason is simple. The analysis of the full consequences of policy alternatives is complicated and costly. When in communities with many citizens decisions are made through referenda, individuals lack incentives to examine policy consequences. The cost of collecting information almost always exceeds the benefit, because the probability that one's vote is decisive is negligible. A problem with this rationale for representative democracy is that it takes for granted that representatives do collect information.

In this chapter we examine whether or not electoral competition induces political parties or candidates to collect information about policy consequences. To this end, we employ a simple spatial voting model, in which two parties compete for office. The elections revolve around a single issue. As to this issue, there are three options, say, cut spending, maintain spending and increase spending. Partly, voters' preferences over the three alternatives are exogenous. However, voters may change preferences over policies when new information about their pros and cons becomes available. Because of "rational ignorance", voters do not search for information that bears on the pros and cons of policy options. Before elections are held, parties may collect information. Collecting information is costly. After the two parties have had the opportunity to find information, they simultaneously select a party platform (one of the policy alternatives). Next, the parties campaign. In the campaign, parties can try to make a case for their platform. Arguments in favor of one's own platform or arguments against the platform of the opponent, if found, can be supplied in the campaign. After the campaign, elections are held. The winning party takes office and implements its program.

We derive two main results. Our first result is not very surprising. Whether or not parties collect information depends on the cost of information. If this cost is sufficiently low, each party searches for both arguments in favor and arguments against policy alternatives. If this cost is sufficiently high, neither party collects information. In the intermediate case an equilibrium exists, in which one party searches for arguments in one direction, say increase spending, whereas the other party searches for arguments in the other direction.

Our second result is more interesting. In the equilibrium in which one party searches for arguments in favor of one alternative, while the other party searches for arguments in favor of another alternative, divergence of platforms may occur. One party either chooses "increase spending" or "status quo", depending on the information it has found, while the other party either chooses "decrease spending" or "status quo". It is worth emphasizing that this result is obtained under the assumption that parties primarily care about winning the elections.

This chapter is closely related to the literature on pre-election politics. In this literature, the essential policy decisions are made before the elections (Persson and Tabellini, 2000). An important result is that electoral competition between two parties or candidates leads to convergence of platforms (Downs, 1957). Calvert (1985) argues that this result is robust by pointing out that if parties care about policy outcomes (rather than about winning elections) they also tend to choose the same policy platform.[1] We show that endogenizing information may affect the convergent result.

This chapter also builds on Dewatripont and Tirole (1999), henceforth DT. DT consider a situation in which a decision maker is uncertain about the pros and cons of alternative policies. They argue that it could be efficient for an organization to let advocates of specific interests collect information about the pros and cons of alternative policy options. The reason is that stakes in the decision process create strong incentives for agents to collect information. An important difference between DT and this chapter is that, in this chapter agents are driven by electoral motives, whereas in DT agents are driven by monetary rewards.

This chapter is organized as follows. The next section discusses the model. Section 5.3 describes the equilibria. Section 5.4 concludes.

5.2 The model

We consider a society inhabited by a continuum of voters. Each voter i has quadratic preferences over policy, X. There are three alternative policies: $X \in \{-1, 0, 1\}$. Voter i's preferences are represented by

$$U_i = -\left[X - \left(X_i^d + \theta\right)\right]^2 \tag{5.1}$$

[1]Alesina and Rosenthal (1995) argue that the convergent result is not as robust as Calvert suggests. A basic assumption underlying Calvert's result is that parties can make credible commitments to carry out announced campaign promises after being elected. If parties are unable to make precommitments, even a small amount of policy preferences breaks down the convergent outcome. Alesina (1988) shows that complete or partial convergence can only occur if the interaction between parties is modelled as an infinitely repeated game.

where X_i^d denotes the voter's type and θ is a stochastic term. This term consists of two parts:

$$\theta = \theta_A + \theta_B$$

where θ_A is equal to $-z$ or 0 with equal probability, and θ_B is equal to z or 0 with equal probability. In (5.1), $X_i^d + \theta$ denotes voter i's bliss point. The stochastic term θ reflects that voters are uncertain about policy consequences. A straightforward interpretation of θ_A is that there might be arguments for restrictive policy ($X = -1$). Likewise, θ_B captures that there might be arguments for intensifying policy ($X = 1$). We assume that θ_A and θ_B contain hard information that can be conveyed to voters. The position of the median voter is given by $X_m^d = 0$.

Two parties, denoted by L and R, compete for office. Before the elections, each party can learn the values of the stochastic terms. For each party, there are four alternatives. First, at a cost C_2 ($j = L, R$) party J learns both θ_A and θ_B, $L_J = AB$. Second and third, at a cost $C_1 < C_2$, party J learns either θ_A ($L_J = A$) or θ_B ($L_J = B$). Finally, party J can decide to learn nothing ($L_J = 0$).

After the parties have had the opportunities to learn the stochastic terms, they simultaneously select their party platforms, $X_J = \{-1, 0, 1\}$. We assume that parties select X_J with a view to win the election. Formally, party J selects X_J so as to maximize π_J, where π_J is the probability that party J wins the election. Parties care about policy outcomes in case policy outcomes do not affect their chances of winning the elections. In that case, party L prefers $X = -1$ to $X = 0$ and $X = 0$ to $X = 1$, while party R prefers $X = 1$ to $X = 0$ and $X = 0$ to $X = -1$. Parties have thus lexicographic preferences: policy outcomes matter only if they do not affect parties' chances of winning the elections. We assume that party platforms are binding. If elected, party J implements the platform it has announced. The preferences of party J are represented by

$$U_J = \lambda \pi_J - C$$

where λ denotes the value of holding office.

Before the elections, the parties campaign. In the campaign, parties try to make a case for their platform. Depending on what parties have learned about the stochastic terms, they can supply arguments in favor of their own platform or supply arguments against the platform of their opponent. We assume that information about the stochastic terms can be concealed, but cannot be forged. After the campaign elections are held, in which voters choose between the two parties. In our model, preferences are single-peaked. It is well-known that in such a model the choice of the median voter is decisive. From now on, we will treat our model as a game with three players, Party L, party R and the median voter, voter M.

5.3 Equilibrium

This section presents the equilibria of our game. Each equilibrium identifies the strategy of each party, i.e. it describes a party's decision about the information it collects, the platform it selects and the information it supplies in the campaign. Moreover, an equilibrium describes how the median voter updates his beliefs about the stochastic terms, and for which party he votes. In equilibrium, the strategies of the parties and the median voter are optimal responses to each other, and beliefs are updated according to Bayes' Rule.

On the basis of the cost of information collection and the value of z, three equilibria in pure strategies and one equilibrium in mixed strategies can be distinguished. Proposition 5.1 gives the conditions under which an equilibrium exists in which both parties investigate both stochastic terms.

Proposition 5.1 *Suppose $C_2 < \frac{1}{4}\lambda$ and $z > \frac{1}{2}$. Then, an equilibrium exists in which $L_L = L_R = AB$; the following platforms are chosen: $X_L = X_R = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_L = X_R = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_L = X_R = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_L = X_R = 0$ if $\theta_A = -z$ and $\theta_B = z$. If found, parties supply information about the pros and cons of policy alternatives.*

Proof. The proof of this proposition and other propositions can be found in the Appendix. ■

Proposition 5.1 states that if the cost of collecting full information is low and z is sufficiently large, then parties are willing to incur the cost of learning the full consequences of alternative policies. Moreover, under those conditions parties choose the same platforms. The intuition behind Proposition 5.1 is straightforward. If z is sufficiently large, information about the pros and cons of policies may convince the median voter that $X = 0$ is not optimal. Being better informed about policy consequences may thus be the key to office. If a party finds arguments in favor or against a policy, supplying this information to voters weakly dominates not supplying this information. Weakly, because the other party may supply the same information. Under the conditions stated in Proposition 5.1, parties and voters are eventually fully informed. It is therefore not surprising that, as in conventional spatial voting models, party platforms fully converge.

In the case that the cost of collecting full information is sufficiently high, parties will only collect partial information if the cost of collecting partial information is low and z is sufficiently large. The conditions under which this equilibrium holds, are discussed in Proposition 5.2.

Proposition 5.2 *Suppose* $\frac{1}{4}\lambda + C_1 < C_2 < \frac{1}{2}\lambda$, $C_1 < \frac{1}{4}\lambda$ *and* $z > \frac{1}{2}$*. Then, an equilibrium exists in which* $L_L = A$ *and* $L_R = B$*; the following platforms are chosen: party* L *chooses* $X_L = 0$ *if* $\theta_A = 0$ *and* $X_L = -1$ *if* $\theta_A = -z$ *and party* R *chooses* $X_R = 0$ *if* $\theta_B = 0$ *and* $X_R = 1$ *if* $\theta_B = z$*. If found, party* L *supplies information about the pros of* $X = -1$ *and party* R *supplies information about the pros of* $X = 1$*.*

Proposition 5.2 describes an equilibrium in which party L searches for arguments in favor of restrictive policy (θ_A) and party R searches for arguments in favor of intensifying policy (θ_B). In this case parties have asymmetric information, party L learns θ_A and party R learns θ_B. The choice of platforms depends on the information parties find. Party L chooses "decrease spending" if it finds arguments in favor of this policy alternative and else it chooses "status quo". Party R, on the other hand, chooses "increase spending" if it finds arguments in favor of this policy alternative and else it chooses "status quo". Full convergence of political platforms only occurs if neither one of the parties finds arguments in favor of the policy alternative it has investigated.

Finally, if collecting information is too costly, parties decide to learn nothing. Proposition 5.3 shows under which conditions both parties decide to learn nothing. As in conventional spatial-voting models, the choice of platforms depends only on the position of the median voter. It is not surprising that both parties choose the platform $X = 0$. Parties also decide not to search for information if z is small enough.

Proposition 5.3 *Suppose collecting information is too costly ($C_1 > \frac{1}{4}\lambda$) or $z < \frac{1}{2}$. Then, an equilibrium exists in which parties decide not to collect information ($L_L = L_R = 0$). The following platforms are chosen: $X_L = X_R = 0$.*

In Propositions 5.1, 5.2 and 5.3 we have seen under which conditions political parties collect full information, partial information or no information. There is one equilibrium that we have not discussed yet. Suppose that the costs of collecting information are $\frac{1}{4}\lambda < C_2 < \frac{1}{4}\lambda + C_1$ and $C_1 < \frac{1}{4}\lambda$, then an equilibrium in pure strategies does not exist. There exists an equilibrium in which parties randomize between collecting full information, collecting partial information and collecting no information. This equilibrium is described in Proposition 5.4.

Proposition 5.4 *Suppose $\frac{1}{4}\lambda < C_2 < \frac{1}{4}\lambda + C_1$, $C_1 < \frac{1}{4}\lambda$ and $z > \frac{1}{2}$. Then, an equilibrium in mixed strategies exists. Party L (R) chooses $L_L = AB$ ($L_R = AB$) with probability $\frac{\frac{1}{4}\lambda - C_1}{\frac{1}{4}\lambda}$, $L_L = A$ ($L_R = B$) with probability $\frac{C_2 - \frac{1}{4}\lambda}{\frac{1}{4}\lambda}$ and $L_L = 0$ ($L_R = 0$) with probability $\frac{C_1 - C_2 + \frac{1}{4}\lambda}{\frac{1}{4}\lambda}$. The choice of platforms depends on the information parties have collected. There are nine possible outcomes.*

To understand proposition 5.4 let us first consider the payoff matrix parties face in the first stage.

	$L_R = AB$	$L_R = B$	$L_R = 0$
$L_L = AB$	$\frac{1}{2}\lambda - C_2, \frac{1}{2}\lambda - C_2$	$\frac{3}{4}\lambda - C_2, \frac{1}{4}\lambda - C_1$	$\frac{3}{4}\lambda - C_2, \frac{1}{4}\lambda$
$L_L = A$	$\frac{1}{4}\lambda - C_1, \frac{3}{4}\lambda - C_2$	$\frac{1}{2}\lambda - C_1, \frac{1}{2}\lambda - C_1$	$\frac{3}{4}\lambda - C_1, \frac{1}{4}\lambda$
$L_L = 0$	$\frac{1}{4}\lambda, \frac{3}{4}\lambda - C_2$	$\frac{1}{4}\lambda, \frac{3}{4}\lambda - C_1$	$\frac{1}{2}\lambda, \frac{1}{2}\lambda$

Proposition 5.4 states that there does not exist an equilibrium in pure strategies if $\frac{1}{4}\lambda < C_2 < \frac{1}{4}\lambda + C_1$, $C_1 < \frac{1}{4}\lambda$ and $z > \frac{1}{2}$. The reason is that parties always have an incentive to deviate. Suppose that party L collects full information, then party R prefers to collect no information. But, given that party R collects no information, party L achieves a higher payoff by collecting partial information. And, given that party L collects partial information, party R prefers to collect full information.

In equilibrium both parties randomize between collecting full information, partial information and no information. The intuition behind this equilibrium is that collecting full information is costly. Therefore parties only want to collect full information if the other party is collecting partial information. In the other cases parties prefer to collect either partial information or no information. Because parties decide simultaneously how much information to collect, they are uncertain about the amount of information the other party is going to collect. Therefore collecting full information, collecting partial information and collecting no information can all be a best response. Parties play each of the three actions with positive probability.

Proposition 5.4 presents the probabilities of collecting full information, partial information and no information. The probabilities depend on the value of holding office (λ) and on the costs of collecting information. First we consider the effect of a change in λ on the probability of collecting full, partial or no information. The parameter λ has a positive effect on the probability of collecting full information. So, political parties have a stronger incentive to collect full information if the value of office (λ) increases. The intuition is that as λ increases, winning the elections becomes more important to parties. And, by collecting full information, parties can increase the probability of winning the elections. Besides the effect on the probability of collecting full information, changing λ also affects the probability of collecting partial information and the probability of collecting no information. The parameter λ has a negative effect on the probability of collecting partial information and a positive effect on the probability of collecting no information. These findings can be explained by the positive effect of λ on the probability of collecting full information. We have already seen that given that one party collects full information, the other party is best off collecting no information. This means that if the probability of collecting full information increases as λ increases, the probability of collecting no information also increases. In a similar way we can explain that the probability of collecting partial information decreases as λ increases.

Next, let us consider the effect of a change in the cost of information on the probability of collecting full information. The probability of collecting full information only depends on the cost of collecting partial information. As the cost of collecting partial information increases, the probability of collecting full information decreases. The reason is that as the cost of collecting partial information increases, collecting partial information becomes more costly resulting in a weaker incentive to collect partial information. We have already shown that collecting full information is only a best response if the other party collects partial information. This means that a weaker incentive to collect partial information reduces the probability of collecting full information. Surprising is that the probability of collecting full information does not depend on the cost of collecting full information. The reason is that two opposite effects play a role. On the one hand, parties have a weaker incentive to collect full information if the cost of collecting full information increases. On the other hand, the cost of collecting full information has a positive effect on the probability of collecting partial information. And, collecting partial information is a best response, given that the other party collects no information. In a similar way we can explain the effect of a change in the cost of information on the probability of collecting partial information and on the probability of collecting no information

5.4 Conclusion

In this chapter we have analyzed under which conditions electoral competition induces political parties to collect information. We have considered a model of electoral competition in which parties are allowed to collect information before elections take place. In the electoral campaign, parties can use the information, if found, to make a case for their platform. With respect to the preferences of parties we have assumed that parties care only about winning the elections.

We have shown that whether or not parties collect information depends on the cost of information. More surprisingly, we find that endogenizing information may lead to divergence of policy platforms.

5.A Appendix

In this appendix, we show under which conditions parties collect full information, partial information or decide to learn nothing. Parties face nine feasible outcomes. We treat each outcome separately.

Case 1. Suppose $L_L = L_R = AB$. Each party has full information about the alternative policies. If $z > \frac{1}{2}$, party L and R choose $X_L = X_R = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_L = X_R = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_L = X_R = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_L = X_R = 0$ if $\theta_A = -z$ and $\theta_B = z$. The payoffs of both parties equal $\frac{1}{2}\lambda - C_2$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoffs of both parties equal $\frac{1}{2}\lambda - C_2$.

Case 2. Suppose $L_L = AB$ and $L_R = B$. Then party L learns θ_A and θ_B and party R only learns θ_B. If $z > \frac{1}{2}$, party L chooses $X_L = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_L = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_L = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_L = 0$ if $\theta_A = -z$ and $\theta_B = z$. Party R chooses $X_R = 1$ if $\theta_B = z$ and $X_R = 0$ if $\theta_B = 0$. If party R learns that $\theta_B = z$, $X = 0$ and $X = 1$ yield the same expected probability of winning the elections. Because of the lexicographic preference relation of parties, party R prefers $X = 1$. If $\theta_B = 0$, $X = 0$ and $X = -1$ yield the same probability of winning. In this case party R prefers $X = 0$. The payoff of party L equals $\frac{3}{4}\lambda - C_2$ and the payoff of party R equals $\frac{1}{4}\lambda - C_1$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoff of party L equals $\frac{1}{2}\lambda - C_2$ and the payoff of party R equals $\frac{1}{2}\lambda - C_1$.

Case 3. Suppose $L_L = AB$ and $L_R = 0$. Then only party L learns θ_A and θ_B and party R learns nothing. If $z > \frac{1}{2}$, party L chooses $X_L = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_L = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_L = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_L = 0$ if $\theta_A = -z$ and $\theta_B = z$. Party R chooses $X_R = 0$. The payoff of party L equals $\frac{3}{4}\lambda - C_2$ and the payoff of party R equals $\frac{1}{4}\lambda$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoff of party L equals $\frac{1}{2}\lambda - C_2$ and the payoff of party R equals $\frac{1}{2}\lambda$.

Case 4. Suppose $L_L = A$ and $L_R = AB$. Then party L only learns θ_A and party R learns θ_A and θ_B. If $z > \frac{1}{2}$, party R chooses $X_R = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_R = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_R = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_R = 0$ if $\theta_A = -z$ and

$\theta_B = z$. Party L chooses $X_L = -1$ if $\theta_A = -z$ and $X_L = 0$ if $\theta_A = 0$. The payoff of party R equals $\frac{3}{4}\lambda - C_2$ and the payoff of party L equals $\frac{1}{4}\lambda - C_1$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoff of party R equals $\frac{1}{2}\lambda - C_2$ and the payoff of party L equals $\frac{1}{2}\lambda - C_1$.

Case 5. Suppose $L_L = 0$ and $L_R = AB$. Then only party R learns θ_A and θ_B and party L learns nothing. If $z > \frac{1}{2}$, party R chooses $X_R = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_R = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_R = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_R = 0$ if $\theta_A = -z$ and $\theta_B = z$. Party L chooses $X_L = 0$. The payoff of party R equals $\frac{3}{4}\lambda - C_2$ and the payoff of party L equals $\frac{1}{4}\lambda$. If $z < \frac{1}{2}$, parties choose $X_L = X_R = 0$. The payoff of party R equals $\frac{1}{2}\lambda - C_2$ and the payoff of party L equals $\frac{1}{2}\lambda$.

Case 6. Suppose $L_L = A$ and $L_R = B$. Then party L learns θ_A and party R learns θ_B. If $z > \frac{1}{2}$, party L chooses $X_L = -1$ if $\theta_A = -z$ and $X_L = 0$ if $\theta_A = 0$. Party R chooses $X_R = 1$ if $\theta_B = z$ and $X_R = 0$ if $\theta_B = 0$. The payoffs of both parties equal $\frac{1}{2}\lambda - C_1$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoffs of both parties equal $\frac{1}{2}\lambda - C_1$.

Case 7. Suppose $L_L = A$ and $L_R = 0$. Then party L learns θ_A and party R learns nothing. If $z > \frac{1}{2}$, party L chooses $X_L = -1$ if $\theta_A = -z$ and $X_L = 0$ if $\theta_A = 0$. Party R chooses $X_R = 0$. The payoff of party L equals $\frac{3}{4}\lambda - C_1$ and the payoff of party R equals $\frac{1}{4}\lambda$. If $z < \frac{1}{2}$, the parties choose $X_L = X_R = 0$. The payoff of party L equals $\frac{1}{2}\lambda - C_1$ and the payoff of party R equals $\frac{1}{2}\lambda$.

Case 8. Suppose $L_L = 0$ and $L_R = B$. Then party L learns nothing and party R learns θ_B. If $z > \frac{1}{2}$, party R chooses $X_R = 1$ if $\theta_B = z$ and $X_R = 0$ if $\theta_B = 0$. Party L chooses $X_L = 0$. The payoff of party R equals $\frac{3}{4}\lambda - C_1$ and the payoff of party L equals $\frac{1}{4}\lambda$. If $z < \frac{1}{2}$, parties choose $X_L = X_R = 0$. The payoff of party R equals $\frac{1}{2}\lambda - C_1$ and the payoff of party L equals $\frac{1}{2}\lambda$.

Case 9. Suppose $L_L = L_R = 0$. Then parties choose $X_L = X_R = 0$. The payoffs of both parties equal $\frac{1}{2}\lambda$.

For $z > \frac{1}{2}$ we have summarized the cases in a payoff matrix.

	$L_R = AB$	$L_R = B$	$L_R = 0$
$L_L = AB$	$\frac{1}{2}\lambda - C_2, \frac{1}{2}\lambda - C_2$	$\frac{3}{4}\lambda - C_2, \frac{1}{4}\lambda - C_1$	$\frac{3}{4}\lambda - C_2, \frac{1}{4}\lambda$
$L_L = A$	$\frac{1}{4}\lambda - C_1, \frac{3}{4}\lambda - C_2$	$\frac{1}{2}\lambda - C_1, \frac{1}{2}\lambda - C_1$	$\frac{3}{4}\lambda - C_1, \frac{1}{4}\lambda$
$L_L = 0$	$\frac{1}{4}\lambda, \frac{3}{4}\lambda - C_2$	$\frac{1}{4}\lambda, \frac{3}{4}\lambda - C_1$	$\frac{1}{2}\lambda, \frac{1}{2}\lambda$

Proof of Proposition 5.1

Suppose $z > \frac{1}{2}$ and $C_2 < \frac{1}{4}\lambda$. Then investigating both parts of the stochastic term strictly dominates not investigating the stochastic term. The strategy investigate both parts also dominates the strategy investigate only one part of the stochastic term ($C_2 < \frac{1}{4}\lambda + C_1$). This means that independent of the choice of party L, party R always chooses to investigate both parts if $C_2 < \frac{1}{4}\lambda$. The same is true for party L.

If $z > \frac{1}{2}$, both parties collect full information if $C_2 < \frac{1}{4}\lambda$. The following platforms are chosen: $X_L = X_R = 0$ if $\theta_A = 0$ and $\theta_B = 0$, $X_L = X_R = -1$ if $\theta_A = -z$ and $\theta_B = 0$, $X_L = X_R = 1$ if $\theta_A = 0$ and $\theta_B = z$ and $X_L = X_R = 0$ if $\theta_A = -z$ and $\theta_B = z$. ■

Proof of Proposition 5.2

Suppose $z > \frac{1}{2}$, $\frac{1}{4}\lambda + C_1 < C_2 < \frac{1}{2}\lambda$ and $C_1 < \frac{1}{4}\lambda$. Then investigating both parts is too costly. Neither one of the parties will collect full information. The strategy investigate both parts of the stochastic term is dominated by the strategy investigate only one part. We can restrict our attention to the last four cases (case 6, 7, 8 and 9). If $C_1 < \frac{1}{4}\lambda$, the strategy investigate one part of the stochastic term strictly dominates the strategy not investigate the stochastic term. Given that party L investigates θ_A, party R will investigate θ_B if $\frac{1}{2}\lambda - C_1 > \frac{1}{4}\lambda$ ($C_1 < \frac{1}{4}\lambda$). Given that party L does not investigate θ_A, party R will investigate θ_B if $\frac{3}{4}\lambda - C_1 > \frac{1}{2}\lambda$ ($C_1 < \frac{1}{4}\lambda$). The same can be done to determine the optimal strategy of party L.

If $z > \frac{1}{2}$, parties investigate one part of the stochastic term if $C_1 < \frac{1}{4}\lambda$ and $\frac{1}{4}\lambda + C_1 < C_2 < \frac{1}{2}\lambda$. The following platforms are chosen: party L chooses $X_L = -1$ if $\theta_A = -z$ and $X_L = 0$ if $\theta_A = 0$ and party R chooses $X_R = 1$ if $\theta_B = z$ and $X_R = 0$ if $\theta_B = 0$. ■

Proof of Proposition 5.3

Suppose $z > \frac{1}{2}$ and $C_1 > \frac{1}{4}\lambda$. Then both parties decide to learn nothing. Both parties choose the platform which lies closest to the median voter, $X_L = X_R = 0$. Also if $z < \frac{1}{2}$, parties decide not to collect information. If $z < \frac{1}{2}$, investigating the stochastic term is strictly dominated by not investigating the stochastic term $(\frac{1}{2}\lambda - C_1 < \frac{1}{2}\lambda)$. ■

Proof of Proposition 5.4

Suppose $z > \frac{1}{2}$, $\frac{1}{4}\lambda < C_2 < \frac{1}{4}\lambda + C_1$ and $C_1 < \frac{1}{4}\lambda$. Then there is no equilibrium in pure strategies. To find an equilibrium in mixed strategies we define α as the probability that $L_R = AB$, β as the probability that $L_R = B$ and $\gamma = 1 - \alpha - \beta$ as the probability that $L_R = 0$. The payoff to party L, of choosing respectively $L_L = AB$, $L_L = A$ and $L_L = 0$, is:

$$\begin{aligned}
\Pi(AB) &= \left(\frac{1}{2}\lambda - C_2\right)\alpha + \left(\frac{3}{4}\lambda - C_2\right)\beta + \left(\frac{3}{4}\lambda - C_2\right)(1-\alpha-\beta) \\
&= \frac{3}{4}\lambda - C_2 - \frac{1}{4}\lambda\alpha \\
\Pi(A) &= \left(\frac{1}{4}\lambda - C_1\right)\alpha + \left(\frac{1}{2}\lambda - C_1\right)\beta + \left(\frac{3}{4}\lambda - C_1\right)(1-\alpha-\beta) \\
&= \frac{3}{4}\lambda - C_1 - \frac{1}{2}\lambda\alpha - \frac{1}{4}\lambda\beta \\
\Pi(0) &= \frac{1}{4}\lambda\alpha + \frac{1}{4}\beta - \frac{1}{2}(1-\alpha-\beta) \\
&= \frac{1}{2}\lambda - \frac{1}{4}\lambda\alpha - \frac{1}{4}\lambda\beta
\end{aligned}$$

For a mixed strategy to be an equilibrium we must have that party L is indifferent between $L_L = AB$, $L_L = A$ and $L_L = 0$. This occurs if:

$$\begin{aligned}
\alpha &= \frac{\frac{1}{4}\lambda - C_1}{\frac{1}{4}\lambda} \\
\beta &= \frac{C_2 - \frac{1}{4}\lambda}{\frac{1}{4}\lambda} \\
\gamma &= \frac{\frac{1}{4}\lambda + C_1 - C_2}{\frac{1}{4}\lambda}
\end{aligned}$$

Due to symmetry we find the same probabilities for party L. Party L (R) chooses $L_L = AB$ $(L_R = AB)$ with probability $\frac{\frac{1}{4}\lambda - C_1}{\frac{1}{4}\lambda}$, $L_L = A$ $(L_R = B)$ with probability $\frac{C_2 - \frac{1}{4}\lambda}{\frac{1}{4}\lambda}$ and $L_L = 0$ $(L_R = 0)$ with probability $\frac{C_1 - C_2 + \frac{1}{4}\lambda}{\frac{1}{4}\lambda}$. The choice of platforms depends on the information parties have collected in the first stage. All nine cases have a positive probability of occurring. The probabilities of collecting full information, collecting partial information and collecting no information lie between 0 and 1 if the following conditions hold:

$$
\begin{aligned}
0 &< \alpha < 1 \text{ if } 0 < C_1 < \frac{1}{4}\lambda \\
0 &< \beta < 1 \text{ if } \frac{1}{4}\lambda < C_2 < \frac{1}{2}\lambda \\
0 &< \gamma < 1 \text{ if } C_1 < C_2 < \frac{1}{4}\lambda + C_1
\end{aligned}
$$

If one of the conditions is not satisfied, parties choose one of three equilibria in pure strategies discussed in Propositions 5.1, 5.2 and 5.3. Suppose $C_1 > \frac{1}{4}\lambda$. Then both parties decide to learn nothing, because it gives the highest payoff. This equilibrium is discussed in Proposition 5.3. Suppose that $C_1 < \frac{1}{4}\lambda$ and $C_2 > \frac{1}{4}\lambda + C_1$. Then both parties collect partial information. This equilibrium is discussed in Proposition 5.2. Finally, suppose that $C_1 < \frac{1}{4}\lambda$ and $C_2 < \frac{1}{4}\lambda$. Then both parties will collect full information (Proposition 5.1). ■

Chapter 6

Polarization, Information Collection and Electoral Control*

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6.1 Introduction

In the economics literature, polarization of preferences of political parties generally leads to sub-optimal outcomes. The reason is twofold. First, polarization introduces uncertainty, because it usually implies that (economic) outcomes will depend on electoral outcomes. It is well-known that when voters are risk-averse, they prefer a certain outcome X to a gamble for which the expected outcome is X (Myerson, 1995, Persson and Tabellini, 2000, chapter 5). Second, polarization of preferences prevents information revelation. Schultz (1996, 1999) shows that polarization may induce the incumbent party to bias its policies to increase its chances of re-election. An important feature of his model is that parties have better information on how the economy works than voters.

This chapter shows that besides costs, there is a benefit of polarization of preferences: it encourages political parties to make a case for their policies. As a conse-

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quence, in a polarized political system, the incentives of parties to collect information are stronger than in a political system in which parties are purely office motivated. When the cost of acquiring information is high relative to the rents from office, voters prefer a polarized political system to a system with office motivated parties. To make our point, we employ a principal-agent model in which two parties compete for office. We examine two cases: the case that the sole aim of parties is holding office, and the case that parties are ideologically driven.[2] In our model, the electorate wants parties to perform two tasks. The first task is acquiring information. The idea is that the electorate wants parties to make a case for their policy. Each party can search for two pieces of information: an argument that justifies intensifying policy and an argument that justifies restricting policy. Both the incumbent party and the opposition party can collect information.[3] It is also possible that one party searches for one piece of information and the other party searches for the other piece of information. The second task is making a decision about policy. The incumbent party performs this task. We examine to what extent alternative voting rules induce political parties to pursue the voters' interests.

We derive several results. First, in case the parties are office motivated, voting rules should focus on information collection. The reason is that since the incumbent party is not concerned with policy, it always selects the policy voters want. The problem is to encourage parties to collect information. One could interpret this result as a variation on the median voter theorem. As to the determination of policies, office motivated parties tend to act in accordance with the wishes of a majority of voters. Second, a voting rule that encourages the opposition party to collect information may be at least as good as a voting rule that stimulates the incumbent party to

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[2] The reason for analyzing office motivated parties and policy motivated parties separately is to highlight the forces at work. We are aware that these are extreme cases. Combining them is straightforward, but tedious.

An other extension of the model is to allow for different types of politicians, for example, allowing for office motivated parties and policy motivated parties. In this set-up, elections can be seen as a mechanism used by the voter to select the type of politician that provides the largest utility to the electorate.

[3] In principal-agent models of politics, the opposition party usually does not play an active role. In the words of Ferejohn (1986, p. 14): "The importance of challengers lies entirely in their availability".

collect information. The intuition of this result is that charging the opposition with the task of collecting information increases the value of office (the incumbent party enjoys the rents from office, while the opposition party incurs the cost of effort). This second result is similar to one of the main results of tournament theory that a bigger spread of payoffs leads to higher effort levels (Lazear and Rosen, 1981). Our second result suggests that the role of the opposition party in a democracy might be much bigger than "being available".

Our next two results are related to the case that parties are policy motivated. We show that policy motivated parties need to be given weaker incentives to collect information than office motivated parties. The main reason is that information about policy consequences may warrant particular policies. For instance, a party that is biased towards selecting restrictive policy will search for arguments that support restrictive policy. An implication of this result is that in a polarized party system, as to information collection there is a natural division of tasks. One party collects information about the pros of restrictive policy; the other party collects information about the pros of intensifying policy. Finally, when parties are policy motivated, the voter cannot always induce the incumbent party to select a policy in her interest. At most, the voters can induce the incumbent party sometimes to select the policy that is optimal from her point of view. The reason is that a policy motivated party desires office because of the influence it wields in determining policy. If this influence is not present, the party will simply select its optimal policy, taking for granted that it will be sent away. How often the incumbent party should be allowed to select its own optimal policy depends on the costs of collecting information.

This article builds on the literature on electoral competition in two-party systems. On the basis of the way voters are modeled, two strands in this literature can be distinguished. First, in spatial models of elections, each voter compares the platforms of the political parties, and votes for the party whose platform yields highest expected utility. This literature gives the conditions under which in a two-party system the platforms of parties converge (see for a survey of this literature Mueller, 2003, chapter 11 and 12), or diverge (Wittman, 1977, Calvert, 1985, Alesina, 1988). Second, in principal-agent models of politics, voters are modeled as a principal who has to keep an officeholder, the agent, in check. The relationship between voters and the officeholder is modeled as an implicit contract (or voting rule). This contract stipulates the conditions under which the office holder stays in office or is replaced by another one. This literature also has provided several insights. For example, Ferejohn (1986) shows how voters can control moral hazard on the part of the incumbent. Persson, Roland and Tabellini (1997) use a principal-agent model to analyze the pros and cons of alternative political institutions.

An attractive feature of the literature using spatial models of politics is its empirical relevance. For example, Alesina and Rosenthal (1989) provide evidence that U.S. macroeconomic data are consistent with the predictions of a model in which parties cater to the interests of their core constituencies. Another attractive feature of spatial models is their focus on competition: both the incumbent and the opposition party play a role. A nice feature of principal-agent models is that they build on the basic idea of representative democracy that there might be huge benefits of delegating authority over policy to a relatively small number of representatives. However, a serious problem resulting from delegating authority is abuse of power. Elections may discipline officeholders, because voters can send them away if they do a poor job or keep them when they do a good job. Another attractive feature of principal-agent models is that they can do justice to the complexity of the policy-decision process. As a rule, the consequences of policy decisions are difficult to foresee. It is in the voters' interest that the officeholder makes *informed* decisions. Voters want political parties to collect information and to act upon this information. Principal-agent models are suitable for analyzing whether or not voters can encourage political parties to collect information. By (1) allowing for polarization; (2) giving a role to the opposition party; and (3) giving parties multiple tasks, this chapter tries to combine the attractive features of the two strands in the literature on electoral competition in two-party systems.

As mentioned before, this chapter is closely related to Schultz (1996,1999) who shows that polarization of preferences prevents information revelation and may lead to Pareto inferior equilibria. An important difference between our model and the ones studied by Schultz is that in Schultz it is assumed that parties have better information about how the economy works, while in our model the distribution of information is endogenous. In fact, we show that polarization of preferences may be the reason why political parties are better informed than voters. Thus, in Schultz asymmetric information and polarization lead to manipulation of information, while in this chapter polarization induces parties to collect information. As a consequence, in our model polarized preferences may lead to Pareto superior equilibria.

This chapter is also closely related to Dewatripont and Tirole (1999). They show that using two competing agents defending their own special interest improves the quality of decision-making compared to using a single agent. They thus provide a rationale for advocacy.[4] Following Dewatripont and Tirole, we assume that information is hard, i.e. once found, information can costlessly be verified. As a consequence, information cannot be forged or manipulated. We are aware that much of the information supplied by political parties is not hard. Often, it is very difficult for the voter to distinguish relevant from irrelevant information. However, we do believe that at elections voters want political parties to make a case for their policies. Our assumption of hard information reflects that it is easier for a party to convince voters when it has actual information than when it has forged information.[5]

This chapter is organized as follows. The next section discusses the model. Section 6.3 and 6.4 describe the equilibria of the model. In Section 6.3 we consider parties that are purely office motivated and in Section 6.4 we consider purely policy motivated parties. Section 6.5 concludes.

6.2 The model

We consider an infinitely repeated game. In each period t, a political party has to make a decision about a public project, X_t. There are three alternatives: $X_t = -1$, $X_t = 0$ and $X_t = 1$. One could interpret $X_t = -1$ as restricting policy, $X_t = 0$ as

[4] Ossokina and Swank (2004) also show that voters may benefit from advocacy. Their model revolves around uncertainty about the median voter's preferences.

[5] Swank and Visser (2003) show that if information is soft, it is hard for voters to encourage office motivated politicians to collect information (see also Dur and Swank (2005), and Beniers and Swank (2004) for the question how alternative types of information influence agents' incentives to collect information).

maintaining status quo, and $X_t = 1$ as intensifying policy. In each period, there are three players: party L, party R and a representative (middle of the road) voter, to which we refer as 'the voter'. The voter's preferences are represented by

$$-E\sum_{t=0}^{\infty}\delta^t\left(X_t-\theta_t\right)^2 \tag{6.1}$$

where E is the expectations operator, δ is the discount factor ($0<\delta<1$), and θ_t is a stochastic term. The term θ_t consists of two parts: $\theta_t = \theta_{A,t} + \theta_{B,t}$, with $\theta_{A,t} \in \{-1, 0\}$, $\Pr(\theta_{A,t} = -1) = \Pr\left(\theta_{A,t} = 0\right) = \frac{1}{2}$ and $\theta_{B,t} \in \{0, 1\}$, $\Pr(\theta_{B,t} = 0) = \Pr\left(\theta_{B,t} = 1\right) = \frac{1}{2}$. The terms $\theta_{A,t}$ and $\theta_{B,t}$ are independent of each other and independent of their previous values. The idea behind the stochastic term is that the consequences of policy are uncertain. Under full information, the voter would prefer $X_t = 1$ if $\theta_t = 1$, $X_t = 0$ if $\theta_t = 0$ and $X_t = -1$ if $\theta_t = -1$. However, the voter does not know $\theta_{A,t}$ and $\theta_{B,t}$. Without further information about the stochastic terms, the voter prefers $X_t = 0$. Notice that the voter wants policy to be based on θ_t.

In each period, policy is selected by the party which won the last elections. Before the governing party selects policy, the two parties may collect information about policy consequences. At cost C_2, a party learns both $\theta_{A,t}$ and $\theta_{B,t}$. At cost C_1, a party can learn the value of either $\theta_{A,t}$ or $\theta_{B,t}$. In a policy debate, information about policy consequences, if collected, can be communicated. We assume that if a party learns that $\theta_{A,t} = -1$ or $\theta_{B,t} = 1$, it can convey this information to the other party and the voter. For example, if a party puts forward an argument for intensifying policy ($\theta_{B,t} = 1$), this reveals that that party has collected information about $\theta_{B,t}$. However, if a party collects information about, say, $\theta_{B,t}$ and learns that $\theta_{B,t} = 0$, it cannot show that it has collected information. The basic idea about the information structure is that with some probability arguments in favor ($\theta_{B,t} = 1$) or against ($\theta_{A,t} = -1$) intensifying policy exist. Costs have to be made to find arguments. If a party puts forward an argument, then it is clear that the party tried to find an argument. If a party does not put forward an argument, then one cannot infer that the party did collect information. It is possible that $\theta_{A,t} = 0$

and/or $\theta_{B,t} = 0$.

As to the objectives of the parties, we make two assumptions. First, we assume that parties receive rents from holding office. In the next section, the preferences of party L are represented by

$$U_L = E \sum_{t=0}^{\infty} \delta^t \left(d_t \lambda - C_{t,L} \right) \tag{6.2}$$

where d_t is a variable taking the value one if party L is in office in period t and taking the value zero otherwise, λ denotes the value of holding office, and $C_{t,L} \in \{0, C_1, C_2\}$. Analogously, the preferences of party R are represented by

$$U_R = E \sum_{t=0}^{\infty} \delta^t \left((1 - d_t) \lambda - C_{t,R} \right) \tag{6.3}$$

where $C_{t,R} \in \{0, C_1, C_2\}$. Next, we assume that parties have ideological preferences. In Section 6.4, the preferences of party L are given by

$$U_L = E \sum_{t=0}^{\infty} \delta^t \left[-(X_t - (-1 + \theta_t))^2 - C_{t,L} \right] \tag{6.4}$$

and the preferences of party R are given by

$$U_R = E \sum_{t=0}^{\infty} \delta^t \left[-(X_t - (1 + \theta_t))^2 - C_{t,R} \right] \tag{6.5}$$

Equation (6.4) reflects that, without further information about θ_t, party L prefers $X_t = -1$. Only if party L learns that $\theta_t = 1$, it prefers $X_t = 0$. Without information about θ_t, party R prefers $X_t = 1$. Only if $\theta_t = -1$, party R prefers $X_t = 0$. Equations (6.4) and (6.5) capture the main idea behind models with partisan politicians (Hibbs, 1977, Wittman, 1977, Alesina, 1988), in which political parties differ in their ideological preferences.

At the end of each period, the voter decides whether or not to re-elect the incumbent party. We assume that the voter applies a simple retrospective voting rule. This rule conditions re-election of the incumbent on outcomes in the current period.

When voting, the voter observes the policy selected by the incumbent party, and whether or not parties have found arguments in favor of restricting policy ($\theta_{A,t} = -1$) or intensifying policy ($\theta_{B,t} = 1$). The voting rule is meant to motivate the parties to collect information and to motivate the incumbent party to select the policy that maximizes equation (6.1).

Let us summarize the timing in each period. (1) The party that won the elections in period $t-1$ takes office. (2) Nature chooses $\theta_{A,t}$ and $\theta_{B,t}$. (3) Each party decides whether to learn the value of either $\theta_{A,t}$ or $\theta_{B,t}$, to learn both values or none of them. (4) The parties reveal the information they collected. (5) The incumbent party selects policy. (6) Elections are held.

6.3 Office motivated parties

In this section we identify the conditions under which the voter can induce political parties to pursue her interest in case parties are purely office motivated. From the voter's point of view, the first best situation is attained if (i) information about both $\theta_{A,t}$ and $\theta_{B,t}$ is collected, and, (ii) given the available information, X_t maximizes (6.1). With office motivated parties, the incumbent party has never an incentive to select a policy that does not accord with the voter's interest. For this reason, in this section we assume that the incumbent always selects the policy that maximizes (6.1), given the available information about θ_t. The problem that remains is the design of a voting rule that gives incentives to the parties to collect full information.

The idea behind any voting rule is that good behavior must be rewarded and bad behavior must be punished. Clearly, collecting full information is good, and not collecting information is bad. The main problem is that the voter does not always observe whether or not a party really collected information. A party can only show that it collected information if it found arguments in favor and/or against intensifying policy.

With office motivated parties, voting rules can be distinguished on the basis of two features. The first feature is the party on which the rule focuses. For example, if a rule focuses on the incumbent party, that rule stipulates what the incumbent party should do to get re-elected. The second feature of the voting rule concerns the question of how demanding the voting rule is.

We first consider a voting rule that focuses only on the incumbent party and is highly demanding. After that, we will discuss voting rules that demand less of the incumbent party or that focus (partially) on the opposition party:

Voting rule I: *Re-elect the incumbent party if and only if it showed that* $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$.

To examine the consequences of this voting rule, we identify the conditions under which it induces the incumbent to collect full information. Notice that if the incumbent party collects full information, the voter attains the first-best situation. A direct implication is that once we have shown that collecting full information is an optimal reply to voting rule I, we have identified an equilibrium of the game.

Suppose that in each period, the incumbent collects full information. Does the incumbent have an incentive to deviate? It is easy to see that collecting partial information cannot be an optimal response to voting rule I. The reason is that collecting partial information is costly but never leads to re-election under voting rule I. In other words, collecting partial information is dominated by collecting no information. Therefore, if an incumbent deviates, it collects no information. If the incumbent collects no information, its payoff equals

$$\lambda + V_{t+1}^{NE} \tag{6.6}$$

where V_{t+1}^{NE} is the equilibrium continuation value for the incumbent if it is not re-elected. If the incumbent collects full information, then voting rule I implies that with probability $\frac{1}{4}$ it will be re-elected. Thus, collecting full information delivers a payoff equal to

$$\lambda - C_2 + \frac{1}{4}V_{t+1}^{EL} + \frac{3}{4}V_{t+1}^{NE} \tag{6.7}$$

where V_{t+1}^{EL} is the equilibrium continuation value for the incumbent if it is re-elected.

From (6.6) and (6.7) it immediately follows that the incumbent prefers collecting full information to collecting no information if

$$C_2 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) \tag{6.8}$$

In the Appendix we show that $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2+\delta}(\lambda - C_2)$. Lemma 6.1 summarizes our discussion about rule I.

Lemma 6.1 *Suppose voting rule I. Furthermore suppose that* $C_2 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$, *with* $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2+\delta}(\lambda - C_2)$. *Then, (i) the opposition party does not collect information; (ii) the incumbent party collects full information.*

Proof. The proof of this lemma and other lemmas can be found in the Appendix. ■

Basically Lemma 6.1 states that if parties care sufficiently about holding office, the cost of collecting information is sufficiently low, and parties are patient enough, then voting rule I leads to a first-best situation for the voter. Of course a high λ is not always good. For example, Dur (2002) shows that electoral concerns may induce parties not to repeal policies that hurt society.

Let us now consider a less demanding voting rule:

Voting rule II: *Re-elect the incumbent party if it showed that* $\theta_{A,t} = -1$ *and* $\theta_{B,t} = 1$, *or it showed that* $\theta_{A,t} = -1$, *or it showed that* $\theta_{B,t} = 1$.

Along the same lines as we derived (6.8), we can derive that under voting rule II the incumbent prefers collecting full information to collecting no information if

$$C_2 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) \tag{6.9}$$

with $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}(\lambda - C_2)$ (see the Appendix). Clearly condition (6.9) is weaker than condition (6.8). The reason is that if the incumbent party collects full information under voting rule II, it will be re-elected with probability $\frac{3}{4}$. Therefore, the expected benefits of collecting full information are higher under rule II than under rule I. Since showing partial information suffices for getting re-elected, voting rule II has the drawback that the incumbent party may be tempted to collect partial rather than full information.[6] If the incumbent party collects partial information in period t, its expected payoff equals

$$\lambda - C_1 + \frac{1}{2}V_{t+1}^{EL} + \frac{1}{2}V_{t+1}^{NE} \tag{6.10}$$

Collecting full information yields a higher expected payoff than collecting partial information if

$$C_2 - C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) \tag{6.11}$$

Equation (6.11) shows that the smaller is the difference between C_2 and C_1, the weaker is the incumbent's incentive to collect partial information. Lemma 6.2 describes the conditions under which voting rule II induces the incumbent party to collect full information.

Lemma 6.2 *Suppose voting rule II. Furthermore, suppose that* $C_2 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$ *and* $C_2 - C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$, *with* $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}\left(\lambda - C_2\right)$. *Then, (i) the opposition party does not collect information; (ii) the incumbent party collects full information.*

It is easy to see that both conditions (6.9) and (6.11) are weaker than (6.8). Hence, voting rule II leads to full information collection for a wider range of parameters than voting rule I. To put it differently, voting rule II (weakly) dominates voting rule I.

Voting rule I and II focus on the incumbent party. The same type of voting rules can be applied to the opposition party. Voting rule II applied to the opposition party can be formulated as[7]

Voting rule III: *Elect the opposition party if it showed that* $\theta_{A,t} = -1$ *and* $\theta_{B,t} = 1$, *or it showed that* $\theta_{A,t} = -1$, *or it showed that* $\theta_{B,t} = 1$.

[6] We assume that a political party that collects full information, searches for both pieces of information simultaneously. If political parties were allowed to collect information sequentially, voting rule II would induce the parties to stop searching for information, once they have found a piece of information.

[7] Voting rule I can also be rewritten for the opposition party. It is easy to show that such a rule is weakly dominated by voting rule III.

Clearly, under voting rule III, the incumbent party has no incentive to collect information. Lemma 6.3 presents the conditions under which voting rule III induces the opposition party to collect full information.

Lemma 6.3 *Suppose voting rule III. Furthermore suppose that* $C_2 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$ *and* $C_2 - C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$*, with* $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2+\delta}\left(\lambda + C_2\right)$*. Then, (i) the incumbent party does not collect information; (ii) the opposition party collects full information.*

Now we can compare voting rule II to voting rule III. Lemma 6.2 and 6.3 show that under voting rule III holding office is more attractive than under voting rule II, if $2C_2 > \delta\lambda$. The reason is that under voting rule III, the incumbent party enjoys the rents from holding office, while the opposition party incurs the cost of collecting information. Therefore, the value of holding office increases as the costs of collecting full information increase. In the case that voting rule II is applied, the opposite is true.

A comparison between the conditions in the Lemma 6.2 and 6.3 shows that voting rule III dominates voting rule II. Hence, the conditions in Lemma 6.3 are weaker than the conditions in Lemma 6.2. This means that the incentives to collect information are stronger if the opponent incurs the cost of information, while the incumbent enjoys the rents from office. We can compare this result to one of the main results in tournament theory. Lazear and Rosen (1981) show that giving a relatively high salary to an individual in a senior position, induces individuals in more junior positions to exert higher effort.

Finally, consider a voting rule which focuses on both the incumbent party and the opposition party.[8]

Voting rule IV: *Elect the opposition if and only if it showed that* $\theta_{B,t} = 1$*, while the incumbent did not show* $\theta_{A,t} = -1$*.*

[8] There are several variants on voting rule IV. For example, the voting rule can require that the opposition party must show that $\theta_{B,t} = 1$. Another variant is that the opposition party is elected unless the incumbent party shows that $\theta_{A,t} = -1$. It is straightforward to check that all such variants lead to the same type of conditions for full information collection.

Notice that under rule IV the incumbent is re-elected if both the incumbent and the opponent supply information. Consequently, under voting rule IV both the incumbent party and the opposition party must have an incentive to collect partial information. Let us first check under which conditions the incumbent party has no incentive to shirk. Collecting partial information yields an expected payoff equal to

$$\lambda - C_1 + \frac{3}{4} V_{t+1}^{EL} + \frac{1}{4} V_{t+1}^{NE}$$

Not collecting information yields an expected payoff equal to

$$\lambda + \frac{1}{2} V_{t+1}^{EL} + \frac{1}{2} V_{t+1}^{NE}$$

It is now easy to see that collecting partial information yields a higher payoff than collecting no information if

$$C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) \text{ with } V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}\lambda \tag{6.12}$$

An identical condition can be derived for the opposition party. Lemma 6.4 presents the conditions for which voting rule IV leads to full information collection.

Lemma 6.4 *Suppose voting rule IV. Furthermore suppose that* $C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$ *with* $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}\lambda$*. Then, (i) the incumbent party collects information about* $\theta_{A,t}$ *and (ii) the opposition party collects information about* $\theta_{B,t}$*.*

A comparison between Lemma 6.3 and 6.4 shows that without further information about C_1 and C_2, one cannot say whether or not voting rule III dominates voting rule IV. If C_2 is close to C_1, then rule III dominates rule IV. If instead C_2 is much higher than C_1, then one should avoid that one party has to collect all information. Consequently, rule IV dominates rule III. The following proposition summarizes the main results of this section.

Proposition 6.1 *Suppose parties are purely office motivated. Then, a voting rule that only induces the incumbent to collect information (voting rule I and II) is dominated by a voting rule that requires that the opposition collects information (voting* *rule III). If $C_1 \leq \frac{1}{3}C_2$, then the optimal voting rule induces both the incumbent and the opposition to collect partial information.*

So far, we have focused on voting rules which lead to full information collection. If the conditions are such that none of the voting rules leads to full information collection, then the voter prefers the incumbent party always to choose $X_t = 0$. To see why, suppose an equilibrium in which one of the parties collects information about $\theta_{A,t}$, but no party investigates $\theta_{B,t}$. Then, the parameters of the model are such that the voter weakly prefers $X_t = 0$, irrespective of the value of $\theta_{A,t}$. Therefore, if only one term is investigated, the voter does not want that the information about this term will affect policy. The implication is that from the voter's point of view, a voting rule that leads to no information collection is at least as good as a voting rule that leads to partial information collection. Hence, if the conditions for voting rules III and IV are violated, one optimal voting rule is re-elect the incumbent party if it chooses $X_t = 0$.

6.4 Policy motivated parties

This section describes the conditions under which the voter can induce political parties to pursue her interest in case parties are purely policy motivated [see eqs. (6.4) and (6.5)]. In contrast to office motivated parties, policy motivated parties have an incentive to select policies which do not always accord with the voter's interest. For this reason, a voting rule should not only give incentives to the parties to collect information, but should also give incentives to the incumbent party to select the policy which, given the available information, maximizes (6.1). An implication is that a voting rule should mainly focus on the incumbent party.

Before analyzing alternative voting rules in detail, we first present two more general results.

Lemma 6.5 *The voter (weakly) prefers a situation in which party L examines $\theta_{A,t}$ and party R examines $\theta_{B,t}$ to a situation in which the incumbent party examines both $\theta_{A,t}$ and $\theta_{B,t}$, and the other party examines nothing.*

The reason for Lemma (6.5) is that policy motivated parties may have an incentive to conceal information. Suppose, for instance, that the incumbent party examines both $\theta_{A,t}$ and $\theta_{B,t}$, and discovers that $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$. Furthermore suppose that party L is in office. Then, the incumbent party prefers $X_t = -1$ while the voter prefers $X_t = 0$. As a consequence, for a reasonable voting rule, party L has no incentive to reveal that $\theta_{B,t} = 1$. It is easy to verify that for any reasonable voting rule, neither party L nor party R has an incentive to conceal information if party L examines $\theta_{A,t}$ and party R examines $\theta_{B,t}$.

Lemma 6.6 *There does not exist a voting rule that induces (i) party L to investigate $\theta_{A,t}$, (ii) party R to investigate $\theta_{B,t}$, and (iii) the incumbent party to select the policy that maximizes the voter's payoff function given the available information.*

To understand Lemma 6.6, suppose that a voting rule exists that does lead to a first-best situation from the voter's point of view. Call this voting rule V. A direct implication of rule V is that the equilibrium continuation value of the game is independent of the election result. To put it differently, the payoff to a party is independent of whether or not it wins the next election. But then the incumbent party has no reason not to select its first-best policy.

An implication of Lemma 6.6 is that the incumbent must gain something from promoting the voter's interest. To put it in a more popular way, there should be something in it for the incumbent party. Thus, a voting rule must allow the incumbent to sometimes pursue its own interest. However, as we will show the voter should not be too generous. The voter might be better off if no decision is made and the status quo is retained in each period. Then, the voter achieves an expected utility of $-\frac{2}{4}$. Hence, the voter only has an incentive to delegate the policy decision to political parties, if it yields and expected utility larger than $-\frac{2}{4}$.

With policy motivated parties, voting rules can be distinguished on the basis of one feature, namely how demanding the voting rule is. In Lemma 6.6 we have already shown that the voter can never achieve a first-best situation. Below, we discuss some voting rules that permit the incumbent party sometimes to pursue its own interest. Let us first consider voting rule VI.

Voting rule VI: *Re-elect the incumbent party unless* $X_t \neq 0$ if $\theta_t = 0$.

Under voting rule VI the incumbent party is allowed to select its optimal policy if $\theta_t = -1$ or $\theta_t = 1$. However, the voter wants the incumbent party to select her optimal policy if $\theta_t = 0$. To examine how voting rule VI shapes the policy decision, suppose that party L is in office and that both parties collect information.[9] Clearly, unless $\theta_t = 0$, party L will select the policy which maximizes its current payoff, for there is no trade-off between current and future policy. Hence, party L chooses $X_t = -1$ if $\theta_t = -1$, and $X_t = 0$ if $\theta_t = 1$. If $\theta_t = 0$, then $X_t = -1$ yields an expected payoff to party L equal to $-C_1 + V_{t+1}^{NE}$, while $X_t = 0$ delivers $-C_1 + V_{t+1}^{EL} - 1$. Hence, when $\theta_t = 0$, party L chooses $X_t = 0$ if $V_{t+1}^{EL} - V_{t+1}^{NE} \geq 1$. Notice that if this condition holds, party L will always win the next election. If $V_{t+1}^{EL} - V_{t+1}^{NE} < 1$, then rule VI does not give incentives to party L to behave in accordance with the voter's interest.

Let us now identify the conditions under which party L investigates $\theta_{A,t}$ and party R investigates $\theta_{B,t}$. Suppose an equilibrium in which both parties investigate and select policy in accordance with voting rule VI. What are the incentives for party L to deviate? Investigating yields a payoff equal to $-\frac{3}{4} - C_1 + V_{t+1}^{EL}$, if $V_{t+1}^{EL} - V_{t+1}^{NE} \geq 1$. To derive the payoff to party L if it does not investigate $\theta_{A,t}$, we first have to determine which policy it would select in that case. Notice that if party L did not collect information, the voter would conclude that party L found $\theta_{A,t} = 0$. Suppose that $\theta_{B,t} = 1$. Then, it is optimal for party L to select $X_t = 0$. Now suppose that $\theta_{B,t} = 0$. Then, party L faces a trade-off between optimal policy in period t ($X_t = -1$) and losing the next election on the one hand and suboptimal policy in period t ($X_t = 0$) and winning the next election on the other hand. It is easy to verify that if party L is sufficiently concerned with the future ($V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1-\delta} > 2$),[10] then it chooses $X_t = 0$. In that case not investigating $\theta_{A,t}$ yields a payoff to party L equal to $-\frac{6}{4} + V_{t+1}^{EL}$. Hence, given that $V_{t+1}^{EL} - V_{t+1}^{NE} > 2$, party L prefers investigating to not investigating if $C_1 \leq \frac{3}{4}$. In case $V_{t+1}^{EL} - V_{t+1}^{NE} < 2$, then party L selects $X_t = -1$ if $\theta_{B,t} = 0$, and not investigating $\theta_{A,t}$ yields a payoff equal to $-\frac{1}{2} + \frac{1}{2}V_{t+1}^{EL} + \frac{1}{2}V_{t+1}^{NE}$. Consequently, party L prefers investigating to not investigating

[9] The analysis of the case that party R is in office is analogous.

[10] See the Appendix for the proof that $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1-\delta}$.

if $C_1 \leq \frac{1}{2}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) - \frac{1}{4}$.

We have now identified the conditions under which the incumbent party collects information. Let us now analyze under which conditions the opposition party, say party R, collects information. It is easy to verify that investigating $\theta_{B,t}$ yields an expected payoff to party R equal to $-\frac{7}{4} - C_1 + V_{t+1}^{NE}$, while not investigating yields $-\frac{10}{4} + V_{t+1}^{NE}$. Hence, party R investigates if $C_1 \leq \frac{3}{4}$.

Lemma 6.7 summarizes our discussion about voting rule VI.

Lemma 6.7 *Suppose voting rule VI. If $\frac{2}{3} < \delta < 1$ and $C_1 \leq \frac{3}{4}$, or $\frac{1}{2} < \delta < \frac{2}{3}$ and $C_1 \leq \frac{1}{2}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) - \frac{1}{4}$, with $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1-\delta}$, then (i) the incumbent party collects information about $\theta_{A,t}$ and (ii) the opposition party collects information about $\theta_{B,t}$, and (iii) the incumbent party implements $X_t = -1$ if $\theta_t = -1$, $X_t = 0$ if $\theta_t = 0$ and $X_t = 0$ if $\theta_t = 1$.*

Basically, Lemma 6.7 states that if the costs of collecting information are sufficiently low, and parties are sufficiently concerned with the future, then voting rule VI leads to full information collection, and party L (R) selects policy in accordance with the voter's interest unless $\theta_t = 1$ ($\theta_t = -1$). If the conditions presented in Lemma 6.7 are satisfied, then the voter's expected payoff equals $-\frac{1}{4}$ in each period.

Under voting rule VI, the incumbent party, say party L, is always re-elected if the conditions in Lemma 6.7 are satisfied. Also in the case that the incumbent party implements $X_t = 0$ if $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$, he is re-elected. A variant of this voting rule is a voting rule under which the opposition is elected if $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$. Let us consider this rule.

Voting rule VII: *Suppose party L is in office. Then re-elect the incumbent party if it implements the policy that maximizes the voter's utility given the available information unless $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$; if $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$, the opposition party is elected.*

If party R is in office, then re-elect the incumbent party if it implements the policy that maximizes the voter's utility given the available information unless $\theta_{A,t} = -1$ and $\theta_{B,t} = 0$; if $\theta_{A,t} = -1$ and $\theta_{B,t} = 0$, the opposition party is elected.

Along the same lines as we derived the conditions in Lemma 6.7, we can derive the conditions under which rule VII induces parties to investigate the full consequences of policy (see Appendix). These conditions are presented in Lemma 6.8.

Lemma 6.8 *Suppose voting rule VII. If* $\frac{2}{3} < \delta < 1$ *and* $C_1 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) - \frac{1}{4}$, *with* $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}$, *then (i) the incumbent party collects information about* $\theta_{A,t}$ *and (ii) the opposition party collects information about* $\theta_{B,t}$, *and (iii) the incumbent party implements* $X_t = -1$ *if* $\theta_t = -1$, $X_t = 0$ *if* $\theta_t = 0$ *and* $X_t = 0$ *if* $\theta_t = 1$.

A comparison between the conditions in Lemma 6.7 and Lemma 6.8 shows that voting rule VII dominates voting rule VI if $\delta > \frac{4}{5}$. This means that, if the future is very important, voting rule VII gives a stronger incentive to parties to collect information. The reason is that under voting rule VII the probability of being re-elected depends on the information the incumbent has collected. Under voting rule VI, on the other hand, the probability of being re-elected is independent of the information presented by the incumbent if $\delta > \frac{2}{3}$. Hence, under voting rule VII the incumbent has a stronger incentive to collect information. Also the opponent party has a stronger incentive to collect information. Under voting rule VI, the opponent only collects information to influence the choice of policy made by the incumbent party. Under voting rule VII collecting information has a second objective. By collecting information the opponent party can increase the probability of being in office next period and in this way be able to determine future policy.

Apart from voting rules VI and VII, there are several other voting rules that may give incentives to policy motivated parties. Like rule VI and VII, two similar voting rules yield an expected payoff to the voter equal to $-\frac{1}{4}$ in each period. We briefly discuss those rules.

Voting rule VIII: *Re-elect the incumbent party if it implements the policy that maximizes the voter's utility given the available information unless* $\theta_{A,t} = \theta_{B,t} = 0$; *if* $\theta_{A,t} = \theta_{B,t} = 0$, *the incumbent is always re-elected.*

A direct implication of voting rule VIII is that the incumbent party selects a policy which conflicts with the voter's preferences if $\theta_{A,t} = \theta_{B,t} = 0$. Rule VIII is clearly a variant of rule VI. For one event, the incumbent party may do what it wishes. Because voting rules VI and VIII are essentially the same, they work under the same conditions.

A variation on voting rule VIII is a voting rule according to which the opposition party is elected if $\theta_{A,t} = \theta_{B,t} = 0$. Call this voting rule IX. It is easy to show that voting rule IX is dominated by voting rule VIII. The reason is that under rule IX, the opposition party is elected if no information is presented. Hence, under rule IX the opposition has a weaker incentive to collect information than under rule VIII.

Until now we have considered voting rules that yield an expected payoff to the voter equal to $-\frac{1}{4}$. Next we want to determine what happens if the conditions in lemmas 6.7 and 6.8 are not satisfied. This means that either the future is less important or collecting information is too costly. We focus on the situation in which the future is less important.[11] In this situation the incumbent has a weaker incentive to implement the policy that maximizes voter's utility given the available information. Consequently, the voter has to allow the incumbent to pursue its own interest more often. Let us consider the following voting rule.

Voting rule X: *Re-elect the incumbent party if it implements* $X_t = -1$ if $\theta_{A,t} = -1$ and $X_t = 0$ if $\theta_{A,t} = 0$.

Voting rule X allows the incumbent to deviate in two cases, namely if $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$ and if $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$. Hence, voting rule X allows the incumbent party to ignore $\theta_{B,t} = 1$. Consequently, the opponent has no incentive to collect information. The reason is that collecting information has no effect for the opponent. Lemma 6.9 presents the results under which voting rule X induces the incumbent to follow the interests of the electorate.

Lemma 6.9 *Suppose voting rule X. Furthermore suppose that* $\frac{1}{3-C_1} < \delta < 1$ *and* $C_1 < 1$*. Then, (i) the incumbent party collects information about* $\theta_{A,t}$ *and (ii) the opposition party collects no information. With respect to policy, the incumbent party implements* $X_t = -1$ *if* $\theta_{A,t} = -1$ *and* $X_t = 0$ *if* $\theta_{A,t} = 0$.

[11] The case in which collecting information is too costly leads to similar results.

A comparison of Lemma 6.9 and the other lemmas in this section, shows that the conditions under which the incumbent pursues the interest of the electorate are weaker in lemma 6.9. However, we cannot conclude that voting rule X dominates the other rules. The reason is that the voter achieves a lower expected utility under voting rule X. If the conditions in Lemma 6.9 are satisfied, the voter achieves an expected utility of $-\frac{2}{4}$. This means that in order to make a less patient incumbent party pursue the interests of the electorate, the voter has to give up some utility.

We have already shown that if no policy decision is made, the payoff to the voter equals $-\frac{2}{4}$. This means that no policy decision leads to at least as good results as voting rules like rule X.[12]

The following proposition summarizes the main results of this section.

Proposition 6.2 *Suppose parties are purely policy motivated. Then, the voter can never achieve a first-best outcome. The voter can achieve an expected utility equal to $-\frac{1}{4}$, if parties care enough about the future ($\delta > \frac{1}{2}$). If $\delta > \frac{4}{5}$, then a voting rule in which the incumbent is not always re-elected (rule VII) dominates a voting rule that always re-elects the incumbent (rule VI). For $\frac{1}{2} < \delta < \frac{4}{5}$, the opposite is true. If the conditions of rule VI and VII are not satisfied, the voter is better off making the decision herself. This leads to an expected utility equal to $-\frac{2}{4}$.*

6.5 Concluding remarks

In this chapter we have analyzed to what extent voters can motivate political parties to collect information about policy consequences and to select good policies. We have designed a model in which the incumbent party determines policy. The consequences of policies are uncertain. To reduce this uncertainty both the incumbent and the opposition party can collect information. With respect to the preferences of parties we have distinguished two situations. Parties are either office motivated or policy

[12] There are several variants on voting rule X. These variants lead to an expected utility of at most $-\frac{2}{4}$. The intuition is that in order to have a less patient incumbent party pursue the voter's interest, the voter has to apply a less demanding voting rule as compared to the other voting rules in this section. A less demanding voting rule, yields a lower expected utility to the voter. A similar argument applies if collecting information is too costly.

motivated.

We have shown that office motivated parties choose policies that, given the available information, promote the interest of the representative voter. Information collection requires that parties sufficiently value office. One interesting result is that voting rules that focus on both the incumbent party and the opposition party perform at least as well as voting rules that exclusively focus on the incumbent party.

In case parties are policy motivated, the voter does not always need to induce parties to collect information. As parties derive utility from the implemented policy, they already have an incentive to collect information. The problem with policy motivated parties is that they tend to select sub-optimal policies. The voter must induce the incumbent party to implement the policy that maximizes her utility. An interesting result is that if parties are policy motivated, the voter can never achieve a first-best outcome. The incumbent must gain something from promoting the voter's interest.

We have argued that if parties are policy motivated, the voter never achieves a first-best outcome. In contrast, if parties are office motivated the voter can achieve a first-best outcome. It is too early to conclude from these results that a system with policy motivated parties is inferior to a system with office motivated parties. With office motivated parties, attaining the first best situation requires that the rents of holding office are large enough. This raises the question where do these rents come from? Possibly these rents are paid by the voter as in Persson, Roland and Tabellini (1997). Then, a system with policy motivated parties might be superior to a system with office motivated parties.

6.A Appendix

6.A.1 Appendix A: Present discounted value of office

In this appendix we determine the present discounted value of office. Suppose that in period 1 party L will be in office. With a probability of α, the incumbent is re-elected in each future period. Let V_{t+1}^{EL} be the equilibrium continuation value for the party if he is elected in period t and V_{t+1}^{NE} be the equilibrium continuation value for the party if he is sent home in period t. Let ρ_t be the probability that party L is in office in period t, then

$$\begin{aligned} \rho_{t+1} &= \alpha\rho_t + (1-\alpha)(1-\rho_t) \\ &= (2\alpha - 1)\rho_t + (1-\alpha) \end{aligned} \tag{6.13}$$

The general solution of this first-order difference equation is

$$\begin{aligned} \rho_t &= A(2\alpha-1)^t + \frac{(1-\alpha)}{1-(2\alpha-1)} \\ &= A(2\alpha-1)^t + \frac{1}{2} \end{aligned} \tag{6.14}$$

where A is an arbitrary constant. Recall that in period $t=1$, party L is in office, implying that for $t=1$, $\rho_1 = 1$. Now A directly follows from (6.14) $A = \frac{1}{2}\frac{1}{(2\alpha-1)}$. Hence the particular solution of (6.14) is

$$\rho_t = \frac{1}{2}(2\alpha-1)^{t-1} + \frac{1}{2}$$

It is now straightforward to calculate V_{t+1}^{EL}:

$$\begin{aligned} V_{t+1}^{EL} &= \sum_{t=1}^{\infty} \delta^t \left(\frac{1}{2}(2\alpha-1)^{t-1} + \frac{1}{2}\right)\left(U^I - U^O\right) \\ &= \frac{(1-\alpha\delta)\delta}{(1-\delta)(1-2\alpha\delta+\delta)}\left(U^I - U^O\right) \end{aligned}$$

where U^I is the utility a party receives if he holds office and U^O is the utility a party receives if he does not hold office.

Now suppose that in $t = 0$ party L is not re-elected. Then, in period $t+1$ party R will enter office, implying that $\rho_1 = 0$. From (6.14) it follows that $A = -\frac{1}{2}\frac{1}{(2\alpha-1)}$. Hence, the particular solution of (6.14) is

$$\rho_t = -\frac{1}{2}(2\alpha - 1)^{t-1} + \frac{1}{2}$$

We can now write the equilibrium continuation value if party L is not re-elected in period $t = 0$ as

$$\begin{aligned} V_{t+1}^{NE} &= \sum_{t=1}^{\infty} \delta^t \left(-\frac{1}{2}(2\alpha - 1)^{t-1} + \frac{1}{2}\right)\left(U^I - U^O\right) \\ &= \frac{(\delta - \alpha\delta)\,\delta}{(1-\delta)(1 - 2\alpha\delta + \delta)}\left(U^I - U^O\right) \end{aligned}$$

Hence,

$$V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1 - 2\alpha\delta + \delta}\left(U^I - U^O\right) \tag{6.15}$$

6.A.2 Appendix B: Proofs of lemmas

In this appendix we provide the proofs of the lemmas that are discussed in the chapter.

Proof of Lemma 6.1: A proof was provided in the text above the lemma. The present discounted value of office, $V_{t+1}^{EL} - V_{t+1}^{NE}$, can be determined making use of equation (6.15). Under voting rule I the incumbent party is re-elected if and only if he shows that $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$. Suppose that in equilibrium the party in office collects full information and the opponent collects no information. In equilibrium, the probability that the incumbent is elected equals $\alpha = \Pr(\theta_{A,t} = -1, \theta_{B,t} = 1) = \frac{1}{4}$. The utility a party gets if he holds office $\left(= U^I\right)$ equals $\lambda - C_2$ and the utility he gets if he is out of office equals 0. Substituting this into equation (6.15) gives $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2+\delta}(\lambda - C_2)$. ■

Proof of Lemma 6.2: A proof was provided in the text above the lemma. Again,

$V_{t+1}^{EL} - V_{t+1}^{NE}$ follows from (6.15). Under voting rule II the incumbent party is re-elected if he shows that $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$, or it showed that $\theta_{A,t} = -1$, or it showed that $\theta_{B,t} = 1$. Suppose that in equilibrium the party in office collects full information and the opponent collects no information. In equilibrium, the probability that the incumbent is elected equals $\alpha = \Pr(\theta_{A,t} = -1, \theta_{B,t} = 1) + \Pr(\theta_{A,t} = -1, \theta_{B,t} = 0) + \Pr(\theta_{A,t} = 0, \theta_{B,t} = 1) = \frac{3}{4}$. The utility a party achieves if he holds office $\left(= U^I\right)$ equals $\lambda - C_2$ and the utility he achieves if he is out of office equals 0. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}(\lambda - C_2)$. ■

Proof of Lemma 6.3: Along the same lines as we derived the conditions in lemma 6.2, we can derive the conditions in lemma 6.3. The main difference is that now the opponent has to decide whether or not to collect information. Under voting rule III, the opponent prefers collecting full information to collecting no information if $C_2 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$. He prefers to collect full information to collecting partial information if $C_2 - C_1 \leq \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$. The incumbent has no incentive to collect information. Next, we have to determine $V_{t+1}^{EL} - V_{t+1}^{NE}$. Under voting rule III the incumbent party is only re-elected if $\theta_{A,t} = 0$ and $\theta_{B,t} = 0$. Suppose that in equilibrium the opposition party collects full information and the incumbent party collects no information. In equilibrium, the probability that the incumbent is elected equals $\alpha = \Pr(\theta_{A,t} = 0, \theta_{B,t} = 0) = \frac{1}{4}$. The utility a party receives if he holds office $\left(= U^I\right)$ equals λ and the utility he receives if he is out of office $\left(= U^O\right)$ equals $-C_2$. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2+\delta}(\lambda + C_2)$. ■

Proof of Lemma 6.4: A proof was provided in the text above the lemma. The present discounted value of holding office, $V_{t+1}^{EL} - V_{t+1}^{NE}$, can be determined making use of (6.15). Under voting rule IV the incumbent party is re-elected if $\theta_{A,t} = 0$ and $\theta_{B,t} = 0$, $\theta_{A,t} = -1$ and $\theta_{B,t} = 0$ or $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$. Suppose that in equilibrium each party collects partial information. In equilibrium, the probability that the incumbent is elected equals $\alpha = \Pr(\theta_{A,t} = -1, \theta_{B,t} = 1) + \Pr(\theta_{A,t} = -1, \theta_{B,t} = 0) + \Pr(\theta_{A,t} = 0, \theta_{B,t} = 0) = \frac{3}{4}$. The utility a party receives if he holds office $\left(= U^I\right)$ equals $\lambda - C_1$ and the utility he receives if he is out of office $\left(= U^O\right)$ equals $-C_1$. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}\lambda$. ■

Proof of Lemma 6.7: A proof was provided in the text above the lemma. Again, $V_{t+1}^{EL} - V_{t+1}^{NE}$ can be determined making use of (6.15). Under voting rule VI the incumbent party is re-elected if he implements $X_t = 0$ if $\theta_t = 0$. Suppose that in equilibrium each party collects partial information and that $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$. Then, in equilibrium, the probability that the incumbent is re-elected equals $\alpha = 1$. The utility a party receives if he holds office $\left(= U^I\right)$ equals $-\frac{3}{4} - C_1$ and the utility he receives if he is out of office $\left(= U^O\right)$ equals $-\frac{7}{4} - C_1$. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1-\delta}$. ■

Proof of Lemma 6.8: Suppose voting rule VII. Furthermore suppose that in equilibrium each party collects partial information. First we determine which policy the incumbent party implements given the value of the stochastic term. The incumbent party implements $X_t = -1$ if $\theta_t = -1$ and $X_t = 0$ if $\theta_t = 1$. If $\theta_t = 0$, the incumbent implements $X_t = 0$ if and only if $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$, else he implements $X_t = -1$. Now, we can determine the expected payoff if the incumbent investigates $\theta_{A,t}$ and the opponent investigates $\theta_{B,t}$. If $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$, the expected payoff to the incumbent equals $-\frac{3}{4} - C_1 + \frac{3}{4}V_{t+1}^{EL} + \frac{1}{4}V_{t+1}^{NE}$ and the expected payoff to the opponent equals $-\frac{7}{4} - C_1 + \frac{1}{4}V_{t+1}^{EL} + \frac{3}{4}V_{t+1}^{NE}$.
To identify the conditions under which both parties collect partial information, we have to determine whether or not the incumbent has an incentive to deviate. Let us determine the expected payoff achieved by the incumbent if he does not collect information. In this case the incumbent implements $X_t = 0$ if $\theta_{B,t} = 1$. If $\theta_{B,t} = 0$, the incumbent implements $X_t = 0$ if and only if $V_{t+1}^{EL} - V_{t+1}^{NE} > 2$, else he implements $X_t = -1$. If $V_{t+1}^{EL} - V_{t+1}^{NE} > 2$, the expected payoff to the incumbent equals $-\frac{6}{4} + \frac{2}{4}V_{t+1}^{EL} + \frac{2}{4}V_{t+1}^{NE}$. If $V_{t+1}^{EL} - V_{t+1}^{NE} < 2$, the expected payoff to the incumbent equals $-\frac{2}{4} + V_{t+1}^{NE}$. Hence, the incumbent collects partial information if (i) $V_{t+1}^{EL} - V_{t+1}^{NE} > 2$ and $C_1 \leq \frac{3}{4} + \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$, and, (ii) $1 < V_{t+1}^{EL} - V_{t+1}^{NE} < 2$ and $C_1 \leq \frac{3}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right) - \frac{1}{4}$.
Next, we can determine whether or not the opponent has an incentive to deviate. Let us determine the expected payoff to the opponent if he does not collect information. Then the incumbent implements $X_t = 0$ if $\theta_{A,t} = 0$ and $X_t = -1$ if $\theta_{A,t} = -1$. The expected payoff to the opponent equals $-\frac{10}{4} + V_{t+1}^{NE}$. Hence, the opponent collects

partial information if and only if $C_1 \leq \frac{3}{4} + \frac{1}{4}\left(V_{t+1}^{EL} - V_{t+1}^{NE}\right)$.

Finally, we can determine the relative value of holding office. Suppose that in equilibrium each party collects partial information and that $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$. Then, in equilibrium, the probability that the incumbent is re-elected equals $\alpha = \Pr\left(\theta_{A,t} = -1, \theta_{B,t} = 1\right) + \Pr\left(\theta_{A,t} = -1, \theta_{B,t} = 0\right) + \Pr\left(\theta_{A,t} = 0, \theta_{B,t} = 0\right) = \frac{3}{4}$. The utility a party receives if he holds office $\left(= U^I\right)$ equals $-\frac{3}{4} - C_1$ and the utility he receives if he is out of office $\left(= U^O\right)$ equals $-\frac{7}{4} - C_1$. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta}$. Because $0 < \delta < 1$, the following always holds $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{2\delta}{2-\delta} < 2$. Therefore, we only need to consider the case in which $1 < V_{t+1}^{EL} - V_{t+1}^{NE} < 2$, say $\frac{2}{3} < \delta < 1$. ■

Proof of Lemma 6.9: Suppose voting rule X. Furthermore suppose that in equilibrium the incumbent investigates $\theta_{A,t}$ and the opponent does not collect information. First we determine which policy the incumbent party implements given the value of the stochastic term. The incumbent implements $X_t = 0$ if $\theta_{A,t} = 0$ and $X_t = -1$ if $\theta_{A,t} = -1$. The expected payoff to the incumbent equals $-\frac{2}{4} + V_{t+1}^{EL} - C_1$ and the expected payoff to the opponent equals $-\frac{10}{4} + V_{t+1}^{NE}$.

To identify the conditions under which the incumbent collects partial information, we have to determine whether or not the incumbent has an incentive to deviate. Let us determine the expected payoff achieved by the incumbent if he does not collect information. In this case the incumbent implements $X_t = 0$ if $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$, else he implements $X_t = -1$. The expected payoff to the incumbent if $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$ equals $-\frac{6}{4} + V_{t+1}^{EL}$. Hence, the incumbent collects partial information if $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$ and $C_1 \leq 1$.

Next we can determine whether or not the opponent has an incentive to deviate. Let us determine the expected payoff to the opponent if he collects partial information. In this case the incumbent implements $X_t = -1$ if $\theta_{A,t} = -1$ and $\theta_{B,t} = 0$, $X_t = -1$ if $\theta_{A,t} = -1$ and $\theta_{B,t} = 1$ and $X_t = 0$ if $\theta_{A,t} = 0$ and $\theta_{B,t} = 1$. If $\theta_{A,t} = 0$ and $\theta_{B,t} = 0$, the incumbent implements $X_t = 0$ if and only if $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$, else he implements $X_t = -1$. If $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$, the expected payoff to the opponent equals $-\frac{10}{4} + V_{t+1}^{NE} - C_1$.

Finally, we can determine the relative value of holding office. Suppose that in equilibrium the incumbent party collects full information and the opponent does not collect information and $V_{t+1}^{EL} - V_{t+1}^{NE} > 1$. Then, in equilibrium, the probability that the incumbent is re-elected equals $\alpha = 1$. The utility a party achieves if he holds office $\left(= U^I\right)$ equals $-\frac{2}{4} - C_1$ and the utility he gets if he is out of office $\left(= U^O\right)$ equals $-\frac{10}{4}$. Hence, $V_{t+1}^{EL} - V_{t+1}^{NE} = \frac{\delta}{1-\delta}(2 - C_1)$. ■

Chapter 7

Main Findings

In this thesis we have considered a variety of principal-agent problems. A key feature of each chapter has been the information asymmetry. In this chapter we summarize the main findings.

In chapter 2 we have developed a model that describes the interaction between a junior and a senior. The junior does not know his ability, but he can learn about his ability from the senior and from experience. In line with findings in the social psychology literature, we have shown that if communication is imperfect, then (i) the senior, on average, exaggerates the junior's ability, and (ii) overconfidence leading to too much activism is more likely than underconfidence leading to too much passivity.

In chapter 3 we have considered the benefits a junior may derive from having a mentor. Frequently the only information available to a junior employee to make a self-assessment is his performance. Performance, however, not only depends on the junior's ability, but also on the difficulty of the performed task. We have shown that a junior who has performed a difficult task underestimates his ability and a junior who has performed an easy task overestimates his ability. An implication is that some talented juniors decide to stop performing the task after observing performance on a difficult task. Appointing a better informed senior employee who acts as the juniors mentor can prevent talented juniors from leaving the organization. Furthermore, a mentor can prevent less talented juniors from performing a difficult task.

Chapter 4 has examined the relationship between the board of directors and top executives. Boards of directors face the twin task of disciplining and screening executives. To perform these tasks directors do not have detailed information about executives' behaviour, and only infrequently have information about the success or failure of initiated strategies, reorganizations, mergers etc. We have analysed the nature of (implicit) retention contracts boards use to discipline and screen executives. Consistent with empirical observation, we have shown that executives may become overly active to show their credentials; that the link between bad performance and dismissal is weak; and that boards occasionally dismiss competent executives.

In Chapter 5 and 6 we have analysed the relationship between voters and politicians. In chapter 5 we have shown that whether or not electoral competition induces political parties or candidates to collect information about policy consequences depends on the cost of information collection. Besides, we have shown that endogenizing information may lead to divergence of policy platforms. In chapter 6 we have identified the conditions under which voters can induce political parties to collect information and to select policies which are optimal from the representative voter's point of view. We have shown that it is easier to stimulate policy motivated parties to collect information than office motivated parties. However, in contrast to office motivated parties, policy motivated parties will sometimes select policies that conflict with the representative voter's interest.

Samenvatting (Summary in Dutch)

Elke dag nemen mensen talrijke beslissingen. Belangrijk voor het maken van keuzen is dat men weet wat de gevolgen van de verschillende mogelijkheden zijn. Het verzamelen van informatie over deze gevolgen is echter gecompliceerd en kostbaar. Daarom beschikken mensen soms niet over alle relevante informatie om een beslissing te nemen.

Dit proefschrift bespreekt en modelleert situaties waarin individuen niet over alle relevante informatie beschikken om een beslissing te nemen. We onderscheiden twee delen in het proefschrift. In het eerste deel kennen individuen hun eigen bekwaamheid niet. Om een beslissing te nemen moeten individuen een inschatting maken van hun bekwaamheid. We bespreken de gevolgen van het maken van een verkeerde inschatting. Het tweede deel bespreekt de interactie tussen de controlerende macht (bijvoorbeeld de raad van bestuur of de burger) en de uitvoerende macht (bijvoorbeeld de manager of de politicus). De manager neemt, namens de raad van bestuur, een beslissing. Omdat de preferenties van de manager en de raad van bestuur niet altijd overeenkomen, handelt een manager niet altijd in het belang van de raad van bestuur. We analyseren hoe de raad van bestuur ervoor kan zorgen dat de manager in het belang van de raad van bestuur handelt.

7.1 Zelfevaluatie

Er is een behoorlijke hoeveelheid bewijs dat individuen hun eigen bekwaamheid, gemiddeld genomen, te hoog inschatten op sommige domeinen. Bijvoorbeeld, de meerderheid van de autobestuurders in de VS vindt zichzelf beter dan de gemiddelde autobestuurder in de VS (Svenson, 1981). Als een individu echter wordt gevraagd naar zijn bekwaamheid in schaken dan schat een meerderheid van de individuen zichzelf als beneden gemiddeld in (Kruger, 1999).

Sociaal psychologen hebben laten zien dat de keuzen die individuen maken, beïnvloed worden door de perceptie die individuen hebben over hun bekwaamheid. Felson (1984) laat zien dat middelbare school jongens met een positief zelfbeeld over hun bekwaamheid betere resultaten behalen op school dan jongens met een negatiever zelfbeeld. Een mogelijke verklaring voor het tekort aan vrouwen in de wetenschap is dat vrouwen hun wetenschappelijke bekwaamheid onderschatten (Ehrlinger en Dunning, 2003).

Economen bestuderen hoe mensen keuzen maken. Gegeven dat de perceptie die een individu heeft over zijn bekwaamheid zo belangrijk is voor de keuzen die iemand maakt, is het nauwelijks verrassend dat economen geïnteresseerd zijn in dit onderwerp. Recentelijk zijn er meerdere economische artikels verschenen die de zelfevaluatie van bekwaamheid onderzoeken.[1] Een tekortkoming van deze studies is dat ze alleen overschatting verklaren. We kunnen echter niet ontkennen dat sommige mensen een zeer negatief zelfbeeld hebben. In hoofdstuk 2 en 3 proberen we een verklaring te vinden voor zowel overschatting als onderschatting. Het enige economische artikel waarin een negatief zelfbeeld theoretisch mogelijk is, is Santos-Pinto en Sobel (2005).

Hoofdstuk 2 bespreekt een model dat de zelfevaluatie van bekwaamheid beschrijft. In overeenstemming met de self-assessment theorie in sociale psychologie (Trope, 1979; Dunning, 1995; Taylor et al., 1995) willen individuen hun bekwaamheid leren om betere beslissingen in de toekomst te nemen. Individuen krijgen informatie over hun bekwaamheid door beoordelingen van anderen en door het uitvoeren van taken. We laten zien dat als communicatie niet perfect is (i) de be-

[1] Bijvoorbeeld, Benabou en Tirole (2004), Weinberg (2005) en Zabojnik (2004).

oordelingen van anderen te positief zijn, en (ii) overschatting waarschijnlijker is dan onderschatting.

Het model beschrijft de interactie tussen een senior medewerker en een junior medewerker. De senior medewerker heeft de neiging om te negatief te zijn over de bekwaamheid van een junior medewerker die net bekwaam is. Op deze manier probeert de senior ervoor te zorgen dat de junior zich niet teveel inspant. Voor dit type junior zijn de kosten van overschatting (teveel inspanning) groter dan de kosten van onderschatting (misplaatste passiviteit). Daarnaast heeft de senior medewerker de neiging om de bekwaamheid van een getalenteerde junior te overdrijven. De senior wil voorkomen dat dit type junior besluit om geen taak uit te voeren. Gemiddeld genomen overdrijft de senior medewerker de bekwaamheid van junior medewerkers. De reden is dat de kosten van onderschatting (misplaatste passiviteit) permanent zijn, terwijl de kosten van overschatting (teveel inspanning) tijdelijk zijn omdat individuen leren van het uitvoeren van een taak en deze informatie gebruiken om hun perceptie aan te passen.

In hoofdstuk 3 maken individuen een inschatting van hun bekwaamheid op basis van de behaalde prestaties bij het uitvoeren van een taak. Prestaties hangen af van de bekwaamheid van een individu en de onbekende moeilijkheidsgraad van de taak. In overeenstemming met Kruger (1999) laten we zien dat een individu (bijvoorbeeld een junior medewerker) die een moeilijke taak heeft uitgevoerd, gemiddeld genomen, zijn bekwaamheid onderschat, terwijl een individu die een makkelijke taak heeft uitgevoerd zijn bekwaamheid overschat. Het gevolg van het onderschatten van bekwaamheid na het uitvoeren van een moeilijke taak is dat een getalenteerde junior soms besluit om geen taak uit te voeren. Een organisatie kan voorkomen dat dit gebeurt door een senior medewerker aan te stellen die optreedt als de mentor van de junior. De senior medewerker heeft meer ervaring en is daarom beter in staat de bekwaamheid van een junior vast te stellen. Daarnaast is zij beter op de hoogte van de moeilijkheid van verschillende taken in de organisatie. Als de preferenties van de mentor en de junior overeenkomen zorgt de mentor ervoor dat het niveau van de taken en de bekwaamheid van een junior beter op elkaar worden afgestemd. Als de preferenties van de mentor en de junior niet overeenkomen, omdat de junior kosten moet maken om een taak uit te voeren en de mentor deze kosten niet hoeft te maken, dan heeft de mentor soms een prikkel om te liegen. De reden is dat een junior soms geen taak wil uitvoeren, omdat het uitvoeren van een taak te kostbaar is. De mentor, daarentegen, wil dat de junior altijd een taak uitvoert. Door te liegen voorkomt de mentor dat sommige junioren geen taak uitvoeren.

7.2 Retention contracts

Het delegeren van taken is noodzakelijk om meerdere redenen. In een organisatie, bijvoorbeeld, beschikt de raad van bestuur niet over voldoende tijd om beslissingen te nemen over de dagelijkse routine. Daarom delegeert de raad van bestuur (principaal) deze beslissingen aan een manager (agent). Een ander voorbeeld is de representatieve democratie. Burgers beschikken over zwakke prikkels om informatie te verzamelen over alle beleidsalternatieven. Daarom delegeren burgers politieke besluiten aan politici. In beide gevallen zijn de voordelen van het delegeren van beslissingen duidelijk. Echter, het delegeren van besluiten kan problematisch zijn als de agent niet dezelfde preferenties heeft als de principaal.

Het klassieke voorbeeld van principaal-agent problemen is het conflict tussen aandeelhouders en managers. De raad van bestuur beschikt over de macht om, namens de aandeelhouders, het bedrijf te runnen. De raad van bestuur beschikt echter niet over de tijd en informatie om besluiten te nemen. Daarom is de besluitvorming gedelegeerd aan de manager. De raad van bestuur heeft twee taken. In de eerste plaats moet de raad van bestuur een manager selecteren en aanstellen. In de tweede plaats moet de raad van bestuur managers controleren en vervangen als dit noodzakelijk is. Het probleem is dat de raad van bestuur beperkte informatie heeft om deze taken uit te voeren. Om ervoor te zorgen dat managers handelen in het belang van de raad van bestuur, is de raad van bestuur soms gedwongen om zich aan een norm te houden. In hoofdstuk 4, 5 en 6 bespreken we het gebruik van retention contracts als een middel om managers en politici te disciplineren en te screenen. Een retention contract specificeert onder welke condities een manager of een politicus herkozen wordt en onder welke condities hij vervangen wordt.

In hoofdstuk 4 bekijken we een omgeving waarin de raad van bestuur beschikt over beperkte informatie over de kwaliteit van projecten die managers hebben uitgevoerd. Elke periode moet een manager besluiten om een taak uit te voeren of niet. De kwaliteit van een project hangt af van de bekwaamheid van de manager en van exogene omstandigheden. De manager kent zijn eigen bekwaamheid en leert de exogene omstandigheden. Dit impliceert dat de manager volledig geïnformeerd is over de gevolgen van zijn beslissing. De raad van bestuur, daarentegen, observeert alleen of een project uitgevoerd is en soms leert zij de kwaliteit van het project. Een belangrijk element is dat competente managers betere projecten ontwikkelen dan incompetente managers. Daarom is het waarschijnlijker dat een competente manager een project uitvoert. Het feit dat een project geïmplementeerd is, is een teken van competentie. De raad van bestuur kan deze informatie gebruiken om managers te screenen. Een nadeel van het gebruiken van de implementatie beslissing om managers te screenen is dat managers een prikkel hebben om slechte projecten te implementeren om competentie te seinen. De raad van bestuur kan deze prikkel verkleinen door managers te ontslaan die te slechte projecten hebben uitgevoerd. Vanwege de seinfunctie van de implementatie beslissing is het waarschijnlijker dat de weggestuurde manager competent is. Het af en toe wegsturen van een competente manager is de prijs die de raad van bestuur moet betalen om managers te disciplineren.

Hoofdstuk 5 en 6 richten zich op de interactie tussen burgers en politici. Een reden voor burgers om bevoegdheden te delegeren aan politici is dat politici over betere informatie beschikken. Maar beschikken politici ook daadwerkelijk over betere informatie? In hoofdstuk 5 onderzoeken we of verkiezingen voldoende prikkels geven aan politici om informatie te zoeken. We bespreken een model met twee politieke partijen. Voordat verkiezingen plaatsvinden kunnen de partijen informatie verzamelen. Tijdens een verkiezingscampagne kunnen partijen de verzamelde informatie gebruiken om hun standpunten te verdedigen. Een welbekend theoretisch resultaat in de politieke economie is dat, als politieke partijen alleen maar geven om het winnen van verkiezingen, politieke partijen hetzelfde standpunt kiezen. In hoofdstuk 5 laten we zien dat, als partijen de mogelijkheid krijgen om informatie te verzamelen, politieke partijen soms gepolariseerde standpunten kiezen.

In hoofdstuk 6 moeten politieke partijen twee taken uitvoeren. In de eerste plaats kunnen zowel de regeringspartij als de oppositie partij informatie verzamelen. In de tweede plaats moet de regeringspartij een taak uitvoeren. We identificeren de voorwaarden waaronder burgers de politieke partijen kunnen aanzetten tot het verzamelen van informatie en tot het uitvoeren van het project dat optimaal is vanuit het oogpunt van de burger. We laten zien dat als politieke partijen alleen maar geven om macht, de burger een kiesregel moet gebruiken die partijen aanmoedigt om informatie te verzamelen. Daarbij geldt dat de oppositie soms sterkere prikkels heeft om informatie te verzamelen. Als politieke partijen alleen geven om beleid, dan moeten de partijen ook aangemoedigd worden om goed beleid te kiezen. Beleidsgerichte partijen hebben sterkere prikkels om informatie te verzamelen dan partijen die alleen geven om macht. Maar, in tegenstelling tot politieke partijen die alleen geven om macht, zullen beleidsgerichte partijen soms beleid kiezen dat in strijd is met de belangen van burgers.

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