Essays on Intrinsic Motivation, Identity and Incentives in Public Organizations. A Behavioral Economics Perspective.

by

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To my parents, Pilar and Esteban. They have never stopped fighting in favour of my happiness and the happiness of my brothers.

To Tíscar. Life with your love is an amazing adventure.

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Chapter 1

Introduction

Standard incentive theory assumes that choices of an agent depend only on his own monetary payoff. Thus, agents are considered selfish payoff maximizers who act in their own material interest. Consequently, a principal who plans to change agents' behavior can do that just by changing monetary payoffs because no other variable play a role in agents' behavior. This is what incentive theory calls price effect and, for decades, economic theorists have considered it the only tool capable of changing economic agents' choices.

But in the last few decades a new field of the economic theory, called behavioral economics, have stormed into the scene[1]. The focus of research in behavioral economics is on individual choice and motives underlying that choice. Behavioral economics is organized around experimental findings that suggest inadequacies of standard economic theories. Much of the behavioral economics builds on experimental evidence in which a new variable that it is neglected by standard economic theory is shown to "matter".

In their seminal work Güth et al. (1982) showed that responders in ultimatum bargaining game experiments[2], routinely reject small offers and therefore do not

[1] See for instance Bowles (1998), Rabin (1998), Camerer et al. (2004) and DellaVigna (2009).

[2] The ultimatum bargaining game consists in two players that bargains anonimously to divide a fixed amount between them. Proposer offers a division of the pie. Responder decides whether to

maximize their selfish monetary payoff as standard models of economics predict.

This result has been confirmed by a large number experiments using the ultimatum bargaining game in different contexts.[3] Seeking for an explanation, behavioral economists started to develop theoretical models introducing new variables used to parameterize deviations from these standard models[4]. Thus is how the branch of *Social Preferences* emerged within behavioral economics.

Literature on social preferences tries to explain and measure the impact of non-selfish motives on competition, cooperation and incentives. In particular, behavioral economics has been approached to the study of incentives trying to find out the psychological foundations which shape them, (Fehr and Falk (2002)). This dissertation aims to be a step forward in this approach. In this thesis work two innovations from the standard models of principal-agent are proposed. *Identity* (chapter 2) and *Intrinsic Motivation* (chapter 3) are incorporated into the standard models of principal agent and their effects studied in a dynamic setting. These two innovations are therefore a contribution to developing richer models *'[. . .] that may become part of the 'behavioral contract theory'."* [Fehr et al. (2007), p. 152.].

Chapter 2 and chapter 3 give rise to new interesting and possibly relevant new hypotheses that can be tested empirically. The behavioral assumptions incorporated into the models of chapter 2 and chapter 3 are also other interesting issues that should be object of empirical testing. Chapter 4 is a pilot inquiry on incentives, intrinsic motivation and crowding effects[5] being an attempt to test empirically some

accept it or to reject it. If accepted both player gets their agreed upon shares. If rejected players receive nothing.

[3] See Camerer (2003)

[4] See Rabin (1993), Fehr and Schmidt (1999) and Bolton and Ockenfelds (2000).

[5] By crowding effects, the literature on intrinsic motivation means the interplay between intrinsic motivation and extrinsic incentives. Extrinsic incentives may hurt intrinsic motivation (crowding-out) or may improve intrinsic motivation (crowding-in). For a review see Bowles and Polanía-Reyes (2012).

of the behavioral assumptions and new hypotheses coming from chapter 3, using qualitative methods[6] and semi-structured interviews *à-la-Bewley*[7].

1.1 Identity and Incentives in Public Organizations

Organizations that provide collective goods pursue goals and objectives, which are not necessarily monetary profitable. Usually the motivation of the employees who work within these organizations goes beyond the expected monetary gain. In general terms, people who work in the provision of collective goods sector have a self-view as pro-social agents. They share organizational goals and objectives and thus they cohere with managers and policy makers in what Wilson (1989) called *mission*.

> A "mission" is a single culture that is widely and enthusiastically shared by the members of the organization. Wilson (1989, p. 99)

> Bureaucrats have preferences. Among them is the desire to do the job. That desire may spring entirely out of a sense of duty, or it may arise out of a willingness to conform to the expectations of fellow workers and superiors even when there is no immediate financial advantage in doing so. Wilson (1989, p. 156).

If motivations beyond the monetary contribute in drawing the way of public workers' behavior, then non-monetary incentives should be incorporated to motivate them. In many of the most productive firms there have been attempts to substitute monetary incentives with the culture of mission, Wilson (1989).

> In business where one might suppose that money incentives are the whole story, great efforts have been made by the most productive firms to supple-

[6] See Corbin and Strauss (2008).

[7] See Bewley (1999, 2002).

ment those incentives with a sense of mission based on a shared organizational culture. Wilson (1989, 157).

Then, mission preferences and other non-monetary or non-economic workers' motivations might lead them to high quality work, high degree of implication, effort culture, and identification with the organization's objectives.

In line with Wilson (1989) approach, Kreps (1990) led a new branch of the literature on organizational theory named *Corporate Culture*. In his seminal work, Kreps (1990), treats the corporate culture as a principle that helps to identify the firm's rule of behavior. The rule helps setting a good reputation that may be used to generate confidence to potential future trading partners. In Kreps (1990) view, culture *"[...] gives hierarchical inferiors an idea ex-ante how the organization will react to circumstances as they arise; in strong sense, it gives identity to the organization."*.

Other relevant works from Corporate Culture literature[8] also have approached the question of how a good culture, shared by all the members of an organization, may be a powerful motivator different from the monetary rewards.

Akerlof and Kranton (2005) consider this sharing-goals behavior of agents as *Identity*. In their words, identity, is *"a way to motivate employees, different than incentives from monetary compensation"* and also believe that *"[...] a change in identity is the ideal motivator if, [...] the effort of a worker is either hard to observe or hard to reward"*.

Identity in economics of organizations and public workers' motivation is an issue in the recent economic literature [9]. Identity may alter the economic behavior of workers' because it acts as a workers' internal non-material motivator. Thus, in the

[8] Barney (1986), Schein (1986), Crémer (1993), Lazear (1995), Tirole (1996), Carrillo and Gromb (1999), Carrillo and Gromb (2007), Hermalin (2001) and, Rob and Zemsky (2002)

[9] The effects of identity on economic decisions have been analyzed also by Sen (1985), Wilson (1989), Akerlof and Kranton (2005), Akerlof and Kranton (2008), Besley and Ghatak (2005), Ghatak and Mueller (2011), Prendergast (2007) and Prendergast (2008).

provision of collective goods where workers' self-view as pro-social agents plays an important role, the design of optimal incentives may differ from the private sector where the weight of economic motives is higher.

Identity is related with person's self-image: how people think about they and the others should behave[10]. In an organization, identity is the extent to which agents share organizational goals and objectives. At public organizational level, identity is a measure of how accurately workers identify themselves with the organization mission or goal of providing social valuable goods. Identity is the internalization of a culture by all the members of an organization and culture can be seen as the organizational goal or mission.

In this thesis the concept of culture is integrated within identity. Identity means that workers' share organizational goals. Culture is interpreted as a situation in which identity becomes a stable behavior rule for all the members of the organization: 'to behave pro-socially exerting high effort at workplace', for instance. Thus identity can lead all the members of an organization to exert high effort with the goal of producing and providing to the society with the highest possible amount of socially valuable goods and services at the highest possible quality.

The economic literature has analyzed the role of workers' identity and its consequences within firms. But economics has not explained how this identity affects to organizational outcomes and decisions when the organization (principal) may alter workers' (agents) identity. There is a lack of research that incorporates the process of changing identity principal-agent games. Akerlof and Kranton (2005), for instance, point out the possibility of changing agents identity as a way that allows organizations to get economic benefits. But they, neither formalize this process nor incorporate it into their model.

[10] See Sen (1985), Akerlof and Kranton (2005) and Akerlof and Kranton (2008).

Trying to move a step forward from the literature, a model in which workers' identity may be altered as a result of *socialization* is proposed in this work. Socialization is the process through which organizations can change workers' identity. As a result of socialization, workers' goals and organization's goals get aligned. By contrast, conflict will be the process that lead workers to completely disagree with organizational goals. Socialization can be launched by organization's managers carrying out certain investments and actions which promote a sense of mission, shared culture, or common objectives through and among workers.

In this thesis the effects of workers' identity in the economics of organizations are analyzed. Chapter 2 presents a principal-agent model in which the possibility to influence public workers' (agents) identity with the use of incentives is introduced. We assume that including some motivational investments in contracts, public organizations may affect positively their employees' identity.

1.2 Intrinsic Motivation and Incentives in Health Care Organizations

Doctors working in public health systems are usually intrinsically motivated agents who get satisfaction from the very act of doing their work. As it is shown in Bowles and Polanía-Reyes (2012), there are motives such as altruism, reciprocity, intrinsic pleasure in helping others and ethical commitments, inducing people to help others more than a self-interested profit-maximizer individual would be willing to do. Teachers, doctors, firefighters, policemen and social workers are other good examples of such intrinsically motivated workers[11]. We use the term "intrinsic motivation" to refer to doing something because it is inherently interesting or enjoyable like in Deci and Ryan (1985) and Deci and Ryan (2000a). In health care, intrinsic motivation

[11] See for example Benabou and Tirole (2003), Besley and Ghatak (2005) and Ghatak and Mueller (2011).

refers to doctors' willingness to exert effort performing in medical activities that are of non-material interest like research, teaching, further education, health prevention activities or clinical management.

A new branch of contract theory investigates optimal contracts and incentives when agents are intrinsically motivated and when incentives beyond the money work[12]. Dewatripont et al. (1999a) explore the effects of implicit incentives in the form of career concerns. Murdock (2002) shows that in presence of implicit contracts, the firm can commit to implement some financially non-profitable projects with positive intrinsic value for the agent because doing that, agents will respond putting high effort to generate more projects and increasing the expected returns of the firm.

Another body of the literature analyzes the effects of having motivated agents in public organizations or in private organizations that serve collective goods[13]. Wilson (1989) explains how in the collective goods provision agencies, incentives are supplemented with a sense of mission based on a shared organizational culture. In Ghatak and Mueller (2011) organizations can reduce incentive payments when they contract intrinsically motivated agents. Thus, an organization that adopts the *non-for-profit* status will attract motivated workers and will benefit from paying agents lower efficiency wages. Dewatripont et al. (1999b) show that specialization and professionalization of organizations raises the incentives of agents and create a sense of mission. They point out that *"this paradigm can be fruitfully expanded, for example to a dynamic perspective where effort choices are repeated and where the evolution of mission design can be analyzed (p. 216)"*. The above literature incorporates intrinsic motivation and the importance of the non-monetary incentives in principal-agent

[12] See Delfgaauw and Dur (2008), Dewatripont et al. (1999a), Murdock (2002) and Prendergast (2008).

[13] See Besley and Ghatak (2005), Francoise (2000), Francoise (2003) and Prendergast (2007).

models. However, all these works have neglected the well established fact that incentives affect intrinsic motivation.

Psychologists[14] and behavioural economists[15], argue that under some specific conditions incentives crowd-out intrinsic motivation of agents. The *crowding-out* effect is one of the most important anomalies in economics, and acts in a manner opposite to the fundamental economic 'law' that raising monetary incentives increases supply[16]. Bowles and Polanía-Reyes (2012) classify the mechanisms accounting for crowding out. Our framework deals with three of these mechanisms: the informative value of incentives about principal's intentions or type, the compromise of agents' self determination or control aversion, and the agents' preferences updating process.

However *crowding-in* can also occur, as shown in Bowles and Polanía-Reyes (2012) and Deci and Ryan (2000a). In sixteen out of the fifty experiments surveyed in Bowles and Polanía-Reyes (2012) they found evidence of crowding-in showing that well designed fines, subsidies, and the like, make incentives and intrinsic motivation complements rather than substitutes.

In this thesis, however, it is assumed that principals in health care are primarily focused on health benefits. They focus heavily upon improving certain health performance measures that are easily observable by the electorate: for instance reducing the amount of time spent on waiting lists, increasing the number of operations conducted for common pathologies, increasing the infrastructure, buying new technology assets, reducing costs and saving resources, and enlarging the range of services supplied. In contrast, physicians' goals are focused toward patients, a subset of all tax-payers, and also they have other interests in clinical and medical research, teaching and further education that taken together form what is called the doctors' "mission".

[14] See DeCharms (1968), Deci (1971), Deci and Ryan (1985) and Deci et al. (1999).

[15] See Benabou and Tirole (2003), Bowles (2008), Frey (1997) and Frey and Jegen (2001)

[16] See Benabou and Tirole (2003), Benabou and Tirole (2006), Bowles (2008), Bowles and Polanía-Reyes (2012), Frey and Jegen (2001) and Gneezy et al. (2011) for a review on Crowding-out effect.

One key fact of the approach presented in chapter 3 is that incentives may make the action of providing health a less convincing signal of a doctors' intrinsic motivation resulting in observers interpreting some generous acts, as merely self-interested. This may crowd out doctors intrinsic motivation and they could shift from an ethical to a payoff maximizing frame, as in Benabou and Tirole (2006) and Bowles and Polanía-Reyes (2012).

The contribution of the approach proposed in the thesis is threefold: first, following Dewatripont et al. (1999a) research program, a dynamical principal-agent model with intrinsically motivated agents and repeated effort and incentives choices is presented, to analyze the evolution of optimal contracts; second, crowding effects are incorporated in this dynamic model; and third, the proposed dynamical setting allows to endogenize changes in doctors' preferences in response to the principal actions and therefore to evaluate how optimal contracts evolve and affect the outcomes of the game.

1.3 Intrinsic Motivation, Crowding Effects and Incentives in the Field: a Case of Study in the *Servicio Navarro de Salud-Osasunbidea* (SNS-O)

As stated above in this chapter, recent theoretical and empirical literature in economics has shown that economic agents act beyond the self-interest and have other motivations than the pure monetary. Contrary to the standard economic model starred by the *homo economicus*, a vast experimental, empirical and theoretical literature on *Behavioral Economics*[17] has shown that motives like social preferences

[17] For a depth review see Camerer (2003), Camerer et al. (2004), Fehr and Falk (2002) and Frey (1997).

[18], intrinsic motivation[19], or corporate culture (identity, social norms, values and ethics)[20] among others, play a key role in the economic decisions of economic agents.

However, mainstream contract theory and the theory of incentives have neglected the role of such motivations[21]. The study of contract incompleteness and optimal incentives has based on the standard economic assumptions of economic behavior. Thus economic theory on adverse selection and moral hazard in organizations has generated a wide range of results many of which failed in their predictions in contexts where motivations beyond the maximization of the economic profits emerge[22].

It is well established that social organizations[23] pursue goals and objectives which are not necessarily profitable in monetary terms (Wilson (1989)). Moreover, usually the motivation of agents who work for these organizations goes beyond the expected monetary gain. They are social agents, intrinsically motivated for work and with a strong self view as pro-social agents. They enjoy from simply doing the work and view themselves as a part of a whole system that seeks to maximize the social welfare providing education, health care, public services and so on. Thus monetary incentives implemented in accordance with the standard economic theory might not work properly because agents' behavior is also shaped by other motives in addition to the monetary and material ones.

However, despite the huge amount of theoretical and experimental work, the lack

[18] See for instance Benabou and Tirole (2006), Bowles (1998) and Fehr et al. (2007).

[19] See Benabou and Tirole (2003), Bowles and Polanía-Reyes (2012), Deci and Ryan (2000a), Deci and Ryan (1985) and Frey and Jegen (2001).

[20] See Akerlof and Kranton (2005), Carrillo and Gromb (1999), Crémer (1993), Hermalin (2001), Kreps (1990), Lazear (1995), Rob and Zemsky (2002), Schein (1986) and Sen (1985).

[21] Dixit (2002).

[22] See for instance Fehr et al. (2007), Ghatak and Mueller (2011), LeGrand (2006) and Prendergast (2007).

[23] We will refer as social organizations to those organizations which are state or publicly owned and whose goal is to provide a collective good like health, education, social services, civil safety, emergency services.

of empirical and field research and also the lack of natural experiments leave *behavioral economics* unbalanced in its approach to the Economics of Organizations and Incentives. There are some contributions that approach the topic empirically[24]; but, as a discipline, there is a lack of empirical support of the new theoretical predictions, and also of the experimental findings. Our work is aimed at throwing some light in this empirical test of theoretical implications on the topic. Specifically, we aim to test the theoretical implications drawn from chapters 2 and 3 of this thesis which are summarized in Berdud et al. (2014a,b). Given the inherent difficulty to obtain data about intrinsic motivation, identity and related concepts, we relied upon *Qualitative Research* methods.

The chapter 4 of this thesis is aimed at seeking empirical evidence from the field, useful to improve existing theories on the topic and/or develop new theory on *Behavioral Economics* and *Behavioral Contract Theory*. More precisely, the objective is twofold: first, we aim to find evidence in the field about intrinsic motivation and second, we aim to find evidence about how these motivations affect agents' decisions and attitudes towards work through crowding effects.

Research is framed into health care organizations where, presumably, agents (physicians) are intrinsically motivated to work in the provision of health. More precisely, the hypotheses that we are seeking to test are the following: (1) Doctors are intrinsically motivated agents, (2) Economic incentives and control and command policies may crowd out doctors' intrinsic motivation and (3) There are other incentives that may crowd in agents intrinsic motivation.

Finding confirmatory evidence on the above hypotheses may help us to inform decision makers about the optimal design of incentives, regulations and policies which will lead to better outcomes. Paraphrasing the words of Gnezzy and List (2013) *"Once we understand what people value and why, we can develop effective incentives*

[24] See Stern (2004), Batifoulier et al. (2009) or Kolstad (2013)

and use them to [. . .], motivate employees" (doctors). We forecast that in the case of health these better outcomes could lead to an improvement in the efficiency and the effectiveness with which health services are provided and to improvement in the quality of health services.

Chapter 2

Identity, Incentives and Motivational Capital in Public Organizations

2.1 Introduction

As mentioned in the previous chapter, identity has become an issue in the recent economic literature o economics of organizations and public workers' motivation. Identity may alter the economic behavior of workers' because it acts as an internal non-material motivatorof workers. Thus, in the provision of collective goods sector where workers' self-view as pro-social agents plays an important role, the design of optimal incentives may differ from the private sector where the weight of economic motives is higher.

At public organizational level, identity is a measure of how accurately workers identify themselves with the organization mission or goal of providing social valuable goods. In the present chapter identity means that workers share organizational goals. Thus identity can lead all the members of an organization to exert high effort in order to produce socially valuable goods and services.

The economic literature has analyzed the role of workers' identity and its consequences within firms. But economics has not explained how this identity affects to organizational outcomes and decisions when the organization (principal) may alter

workers' (agents) identity. There is a lack of research that incorporates the process of changing identity principal-agent games. In Akerlof and Kranton (2005), for instance, they point out the possibility of changing agents identity as a way that allows organizations to get economic benefits. But authors, neither formalize this process nor incorporate it into their model.

In the game proposed in this chapter workers' identity may be altered as a result of *socialization*. Socialization is the process through which organizations can change workers' identity. As a result of socialization, workers' and organization's goals and objectives get aligned.

Socialization can be launched by organization's managers carrying out certain investments and actions which promote a sense of mission, shared culture, or common objectives through and among workers. This approach allows us to measure what Akerlof and Kranton (2005) call as *motivational capital*. That is, the current value of the stream of the expected costs saved by the organization when the principal invests a given amount of resources to improve workers' identity. Using the value of motivational capital, we can establish the conditions under which firms and organizations might benefit from investing in motivational capital.

In the following sections of this chaper the effects of workers' identity in the economics of organizations are analyzed, under the frame of a principal-agent relationship, with the aim to answer the following questions: Can workers' identity be considered another productive asset of public organizations? If so, how should public organizations' managers design incentive schemes in order to benefit from this *Motivational Capital*? Then, could identity be the key to avoid shirking in public organizations?

2.2 The Model

We want to analyze the optimality of contracts in a principal agent model in which the principal may provoke changes in agents' identity through incentives and *identity investments*. We want to capture in the model whether the possibility of changing agents' identity may influence optimal incentive contracts. In the present section we define the game and solve it. Then we make comparative statics to draw some results.

2.2.1 Players' Preferences and Utilities.

There are two players in the game: the agent $\mathcal{A}$ and the principal $\mathcal{P}$[1]. We assume that $\mathcal{A}$ can develop identity. We also restrict the analysis to linear contracts.

We model a finite period $t = 0, 1, ..., T, ...$ principal-agent dynamical game where the agents' effort is private information. Agents' behaviour is affected by identity. We incorporate identity into $\mathcal{A}$'s utility function. Identity is a non-monetary source of motivation that affects agents' preferences. Identity also can be altered or changed by principal's choices.

Principal

In our model there is a performance measure q_t that $\mathcal{P}$ wants to optimize in each $t = 0, 1, 2, \ldots, T, \ldots$. Performance q_t is a function of $\mathcal{A}$s' effort $e_t \in \{\underline{e}, \overline{e}\}$. Assume that $q_t \in \{\overline{q}, \underline{q}\}$ where $\overline{q} > \underline{q}$; interpret $\overline{q}$ as $\mathcal{P}$'s target on performance level and $\underline{q}$ as a fail in this target. Let $p(q_t = \overline{q}|e_t) = \theta_i$ be the probability of high performance conditional to $\mathcal{A}$'s effort choice. We use $i = 0, 1$ to label low and high effort: 0 means low effort $\underline{e}$ and 1 means high effort $\overline{e}$. Then $p(q_t = \overline{q}|e_t = \overline{e}) = \theta_1$ will be

[1] Often we use she and he to refer to the agent and the principal respectively, as conventionally the principal agent literature does.

the probability of high performance when the agent decides to exert high effort, and $p(q_t = \overline{q}|e_t = \underline{e}) = \theta_0$ the probability of high performance when the agent decides to exert low effort. Alternatively $p(q_t = \underline{q}|e_t = 1) = 1 - \theta_1$ and $p(q_t = \underline{q}|e_t = \underline{e}) = 1 - \theta_0$ will be the probabilities of low performance when effort is high and low, respectively. We assume that performance q_t is an informative but noisy signal of e_t which means that $\theta_1 > \theta_0$.

The principal may use monetary incentives –"carrots and sticks"– or non-monetary incentives –"identity investments"– to maximize q_t or performance. We assume that, regardless agents shirk or not, $\mathcal{P}$ always expects higher profit from high performance level. Formally,

$$\theta_i\big(R_t(\overline{q}_t) - \overline{w}_t^{s_0}\big) > (1 - \theta_i)\big(R_t(\underline{q}_t) - \underline{w}_t^{s_0}\big) \text{ where } s_0 = \{0, S\} \text{ and } i = \{0, 1\}.$$

Despite q_t is a target outcome for $\mathcal{P}$ it is not necessarily the only one for $\mathcal{A}$. This condition of disconnection may be the reason for using incentives in order to achieve high performance.

Let $R_t(q_t)$ be a function which assigns a monetary value to the performance level[2]. $R_t(q_t)$ is positively correlated with the achieved social welfare, the total amount of the collective good or service delivered, and the sort of measures which are salient and observable by the electorate, tax payers and political advisors to evaluate the public supply of collective goods.

Let $E[R_t(q_t)|\theta_i]$ be the expected material rewards for $\mathcal{P}$. Rewards depend on performance q_t. Performance is conditional to θ_i. Let $w_t(q_t)$ be the monetary payments offered by $\mathcal{P}$ to $\mathcal{A}$. Payments are contingent to performance. Let $E[w_t(q_t)|\theta_i]$ be the

[2] Usually for the firm this monetary value is determined by the market price and the quantity sold. But in the case of the public provision of collective goods the absence of markets and market prices makes hard to measure the monetary value of q_t. We can interpret this function as one which calculate the opportunity cost of public supplying rather than market supplying

expected monetary payment that $\mathcal{P}$ offers to $\mathcal{A}$ which is also an expected monetary cost for $\mathcal{P}$. Let s_0 be the total amount of resources invested to promote and change $\mathcal{A}$'s identity. Like any other investment, we assume that $\mathcal{P}$ faces an initial investment cost of $C_0 = \{0, S\}$ at $t = 0$. If $\mathcal{P}$ decides to make *identity investments* $s_0 = S$, he will face the future depreciation cost of such investments in the following periods. We capture this depreciation cost stream with the cost function $C_t(s_0)$.

All the above describes $\mathcal{P}$'s expected profit function Π_t for each period t that can be written as,

$$\Pi_t = E[R_t(q_t)|\theta_i, \upsilon_t] - E[w_t(q_t)|\theta_i, \upsilon_t] - C_t(s_0) \tag{2.1}$$

In equation 2.1 the cost function $C_t(s_0)$ takes the value $C_0(S) = S$ in $t = 0$ and an depreciation cost $C_t(S) = \gamma S$ for every $t \geqslant 1$ at constant depreciation rate γ.

Agent

We represent the $\mathcal{A}$'s preferences with the following expected utility function.

$$\mathcal{U}_t = \underbrace{E[u_t(w_t(q_t))|\theta_i]}_{\text{Expected utility from income}} - \underbrace{\psi_t(e_t, \overbrace{\upsilon_t(s_0)}^{\text{Identity}})}_{\text{Disutility from effort}} \tag{2.2}$$

The first term on the right hand side of the above utility function, $E[u_t(w_t(q_t))|\theta_i]$, is the expected utility from money. The agent is risk averse, $u' > 0$ and $u'' < 0$, and the parameter θ_i is the probability of high or low performance.

The second term on the right hand side of the expected utility function represents the disutility from effort $\psi_t(e_t, \upsilon_t(s_0))$. The disutility from effort depends positively on effort and negatively on $\upsilon_t(s_0)$ which is a function representing $\mathcal{A}$'s identity. The properties of the disutility from effort are summed up in the following set of assumptions.

A1: *The function* $\psi_t(e_t, \upsilon_t(s_0))$ *is continuous in the interval* $[\underline{\upsilon}, \overline{\upsilon}]$.

A2: *The function* $\psi_t(e_t, \upsilon_t(s_0))$ *is strictly decreasing in its second argument when* $e_t = \overline{e}$. *That is,* $\frac{\partial \psi_t(\overline{e}, \upsilon_t)}{\partial \upsilon_t}|_{e_t=\overline{e}} < 0$.

A3: *When* $e_t = \underline{e}$, *then* $\psi_t(\underline{e}, \upsilon_t) = 0$; $\forall \upsilon_t \in [\underline{\upsilon}, \overline{\upsilon}]$.

A4: *The function* $\psi_t(e_t, \upsilon_t(s_0))$ *is upper and lower bounded. Is lower bounded when* $\psi_t(\underline{e}, \upsilon_t) = 0 \ \forall \upsilon_t$, *and* $\psi_t(\overline{e}, \overline{\upsilon}) = 0$. *The function is upper bounded when* $\psi_t(\overline{e}, \underline{\upsilon}) = \Psi$, *with* $\Psi \in \mathbb{R}_+$.

The above assumptions ensure that, when identity converge to its upper *(lower)* bound, then $\mathcal{A}$'s disutility from doing high effort converges to zero *(Ψ)*. That is, the agent does not suffer disutility from exerting high effort when she develops identity. Contrary, when she has no identity, $\mathcal{A}$ experiences the maximum disutility from effort and she only can diminish this disutility making low effort.

Agent's Identity: Information

At the first period of the game, $\mathcal{P}$ learns $\mathcal{A}$s' identity probability distribution $F_0(\upsilon_0)$[3]. $\mathcal{P}$'s action over s_0 affects the $\mathcal{A}$'s identity. Then, conditional to his identity investment choice $s_0 = \{0, S\}$, $\mathcal{P}$ have to update the $\mathcal{A}$s' identity distribution $F_t(\upsilon_t|s_0)$ in the subsequent periods of the game $t = 1, ..., T, ...$ where $t \in \mathbb{N}$.

2.2.2 The Game

The game is a repeated game with two players: the agent $\mathcal{A}$, and the principal $\mathcal{P}$. We consider a recontracting game in which every period both players have to play again:

[3] We consider a continuum of types of $\mathcal{A}$, $\upsilon_t \in [\underline{\upsilon}, \overline{\upsilon}]$ There is a possibility of switching $\mathcal{A}$s' type or identity making an investment in the starting period of the game. For a precise description of the time evolution of the conditional distribution of types see the mathematical appendix.

$\mathcal{P}$ must offer a new contract and $\mathcal{A}$'s has to accept or reject the contract and choose effort level. We analyze this repeated principal agent game with moral hazard, where the choices made by the $\mathcal{P}$ affects $\mathcal{A}$'s identity. Reciprocally these changes in identity and motivation affect the contracts offered by $\mathcal{P}$ in the next period.

Timing

Each period the game consists of three stages: stage 0, stage 1, and stage 2. The sequence of these stages in $t = 0, 1, 2, ...$ is graphically shown in figure 2.1.

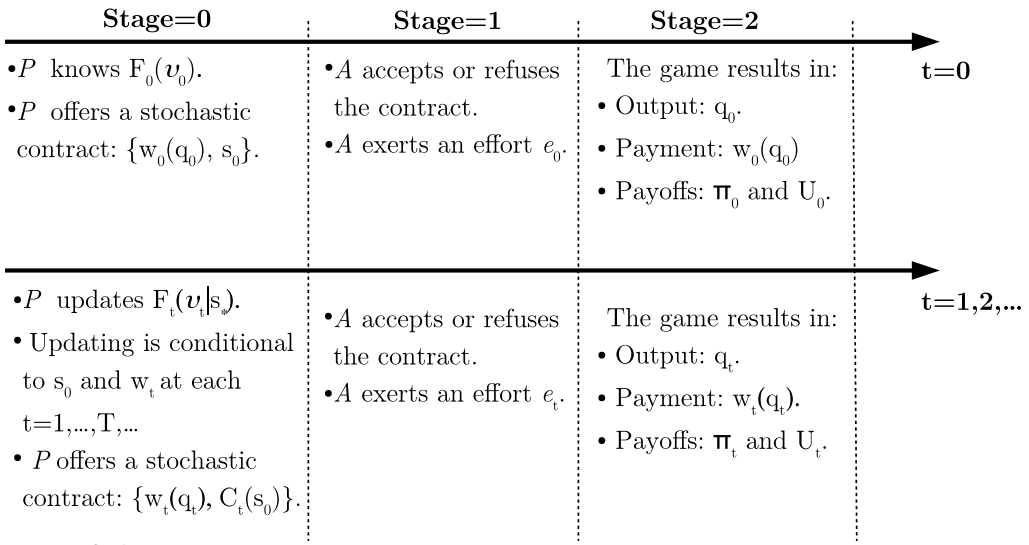

FIGURE 2.1: The timing of the game in two separate sequences, $t = 0$ and $t = 1, 2, ...$

The sequence of stages within each period $t = 0, 1, 2, ...$ is as described below:

(0): The principal $\mathcal{P}$ learns the distribution of $\mathcal{A}$s' identity $F_0(\upsilon_0)$ in $t = 0$ or updates $\mathcal{A}$s' identity distribution $F_t(\upsilon_t|s_0)$ in $t = 1, 2, ...$ taking into account his choice of $s_0 \in \{0, S\}$ in $t = 0$. Then, $\mathcal{P}$ offers a contract conditional to the expected value of $\mathcal{A}$'s identity. The contract consists in a dupla of stochastic contingent payments $w_0(q_0) = \{\underline{w}, \overline{w}\}$ and the decision to invest or not in socialization $s_0 \in \{0, S\}$ in $t = 0$: $\{w_0(q_0), s_0\}$. In $t = 1, 2, \ldots$ a contract consists in a dupla of stochastic

contingent payments $w_t(q_t) = \{\underline{w}, \overline{w}\}$ and the commitment of bearing the cost of depreciation of the $s_0 \in \{0, S\}$ investment, $C_t(s_0) = \gamma s_0$. We refer to this contract with $\{w_t(q_t), C_t(s_0)\}$.[4]

(1): $\mathcal{A}$ accepts or refuses the contract. If she accepts, then choose an action over effort $e_0 \in \{\underline{e}, \overline{e}\}$. Contrary, if she refuses then she gets her reservation utility $\overline{U}$.

(2): Finally, output is realized $q_t \in \{\underline{q}, \overline{q}\}$. Stochastic contingent payment is realized $w_t(q_t) = \{\underline{w}, \overline{w}\}$ and payoffs π_t and U_t are realized.

Identity and Socialization

Agents only differ in their identity. For all of them, their skills and qualification for work is the same. They are equally productive in the production of q_t. Therefore, $\mathcal{P}$ only deals with *moral hazard* because the differences in identity do not involve any difference in agents' ability for the production of q. $\mathcal{A}$'s identity distribution is assumed to be known by $\mathcal{P}$.

Contracts and incentives offered by the principal may influence agent's identity. Agent's identity can take a value within some closed interval $\upsilon \in [\underline{\upsilon}, \overline{\upsilon}]$, with $\underline{\upsilon} < \overline{\upsilon}$ and $\upsilon \in \mathbb{R}^+$. In the model higher identity means lower disutility from effort. Thus, we can anticipate that an agent with higher identity needs less monetary incentives to exert high effort. However, the only use of monetary incentives by the principal will involve a higher amount of money offered to $\mathcal{A}$ period after period. This is so because the agent will experience more disutility from effort as mean as she looses his identity.

What we want to capture with the socialization process[5] is $\mathcal{P}$'s ability to influence

[4] The inclusion of the depreciation cost in every period into the contract, can be interpreted as an instrument used by $\mathcal{P}$ to signal the nature of the incentives offered by him to exert effort from agents: socialization incentives or pure economic transaction incentives.

[5] See Adler and Borys (1996)

and change agents' identity carrying out investments in the organization which signal support and awareness toward agents or workers. Activities, meetings and events organized by the organization to set its employees organizational minded, participation of workers in organization's decisions, to agree organizational objectives jointly with workers, setting organization's internal rules of behavior through democratic processes, the design of workteams of employees to represent organization in exhibitons, congresses or conferences, training programs and further education to employees, housing facilities, employees' children schooling facilities, high school or university scholarships to employees' children or the priority to hire employees' relatives might be some good examples of such investments. Thus, influencing $\mathcal{A}$s' identity with such investments, $\mathcal{P}$ leads them to share the organization's goals and also to be involved with organization. Then, if $\mathcal{P}$ chooses to invest $s_0 = S$ he will switch $\mathcal{A}$s' identity to a higher level and agents will experience less disutility from effort. But if he decides not to invest, $s_0 = 0$, then agents will switch to lower identity, they will be lead to conflict and in such situation they will experience high disutility from exerting effort at workplace.

To make this more understandable think in the following opposed situations: in the firm X workers are treated kindly by management, supported in their needs not only at work but also at home and in general. Also they are supported in their personal, professional, intellectual, or human development, and encouraged to be participative, responsible, collaborative and proactive in leading organization to achieve their goals. In the firm Y workers are monitored, controlled at their workplace, left out of every decision process whithin the firm, uninformed of organization's goals and pushed to achieve the desired performance only with the use of monetary bonuses or punishments. Then it will be normal to expect that in the firm X, all its members work harder, more efficiently, more motivated to achieve high standards of quality in

production, and more implicated with customers, dealers and suppliers than in the firm Y, independently of they are remunerated with the same, even less, amount of money.

Solving Principal's Problem

In the game $\mathcal{A}$ and $\mathcal{P}$ have to renegotiate contracts period after period. This assumption turns the game into a dynamic *re-contracting* game. Then the game is able to be solved implementing the spot contract in each period. In order to make the vector of the spot contracts as the long term optimal solution we have to assume that the only way to agree upon a contract is playing the repeated game at every period $t = 0, 1, ..., T, ...$ as a new game.

Then we can write the $\mathcal{P}$'s problem as follows,

$$Max_{\{w_t(q_t),s_0\}} \quad \alpha_t \cdot \Big[E[R_t(q_t)|\theta_0] - E[w_t(q_t)|\theta_0]\Big]$$

$$+ \Big[(1-\alpha_t) \cdot \Big[E[R_t(q_t)|\theta_1] - E[w_t(q_t)|\theta_1]\Big]\Big] - C_t(s_0) \tag{2.3}$$

Subject to:

$$E[u_t(w_t(q_t)|\theta_1)] - \psi_t(\overline{e}, \upsilon_t) \geqslant E[u_t(w_t(q_t)|\theta_0)] - \psi_t(\underline{e}, \upsilon_t) \qquad \text{(ICC)} \tag{2.4}$$

$$E[u_t(w_t(q_t)|\theta_1)] - \psi_t(\overline{e}, \upsilon_t) \geqslant \overline{U} \qquad \text{(PC)} \tag{2.5}$$

$$u_t(\underline{w}) \geqslant 0 \iff w_t(\underline{q}) \geqslant 0 \iff h(u_t(\underline{w})) \geqslant 0 \qquad \text{(LLC)} \tag{2.6}$$

(2.3) is the objective function for the principal. $\mathcal{P}$ does not know each agent identity. He only knows agents' identity distribution. Using this information, he offers a contract that satisfies the incentive compatibility of agents with average level of identity $E_t[\upsilon_t|s_0] = \upsilon_t^{avg}$. Then, only agents with identity above the average level will exert high effort and the rest shirk. (2.3) is weighted by $P_t(\upsilon_t < \upsilon^{avg}|s_0) = \alpha_t$

and $P_t(\upsilon_t \geqslant \upsilon^{avg}|s_0) = (1-\alpha_t)$ to capture this feature of the game. The first is the probability that the identity of the $\mathcal{A}$ is lower than the average level, and the second is the probability that the agent identity is higher or equal to the average level, both conditional to $\mathcal{P}$'s decision $s_0 = \{0, S\}$.

(2.4) is $\mathcal{A}$'s *incentive compatibility constraint* (ICC), and ensures that the agent will prefer to exert high effort. (2.5) is the $\mathcal{A}$'s *participation constraint* (PC), and ensures that the agent will prefer to participate and accept the contract. Finally, (2.6) is a *limited liability constraint* (LLC), and ensures that the low payment never falls below zero level.

$\mathcal{P}$'s problem is solved for each t. The solution for each period t consist in a payment function $w(q) : q \longrightarrow w$

$$w(q) = \begin{cases} \overline{w} & \text{if} \quad q = \overline{q} \\ \underline{w} & \text{if} \quad q = \underline{q} \end{cases}$$

where $\overline{w} > \underline{w}$.[6] In the next section we will analyze the conditions under which to offer socialization incentives and invest in changing $\mathcal{A}$s' identity is optimal for $\mathcal{P}$. From now on advance we just show the pair of payments which solves the spot contracting problem. Let $h : u \longrightarrow w$ be the inverse function of the utility function,

$$h(u) = \begin{cases} \overline{w} & \text{if} \quad u = \overline{u} \\ \underline{w} & \text{if} \quad u = \underline{u} \end{cases}$$

Applying the variable change $w = h(u(w(q))) = (u(w(q)))^{-1}$ we have the following payments,

$$\overline{w}_t = h(u_t(\overline{w})) = \left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, \upsilon_t(s_0))\right)^{-1} \tag{2.7}$$

$$\underline{w}_t = h(u_t(\underline{w})) = \left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, \upsilon_t(s_0))\right)^{-1}. \tag{2.8}$$

[6] The calculation of these contingent payments is formally shown in the mathematical appendix, section A.2

As it can be seen, identity lowers $\overline{w}$ and raises $\underline{w}$. To establish a more precise a relation between identity and incentive payments it is necessary to analyze how identity and the disutility from effort interacts each with the other. Also it is necessary to analyze how socialization affects workers' identity and how these changes affects future stochastic contingent payments. Once these interactions are established we can calculate the principal's expected costs and profits and then analyze the possible outcomes of the game.

$\mathcal{P}$ can not perfectly discriminate agents attending their identity. $\mathcal{P}$ only knows the distribution of identity. Then, he updates such distribution at every period taking into account his own past behavior and knowing how the socialization process works. After updating $\mathcal{A}$s' identity distribution, $\mathcal{P}$ is able to offer a new contract based on the expected identity of agents[7]. Thus, at every period of the game, $\mathcal{P}$ must offer a new pair of expected payments adjusted to agents' expected identity,

$$\overline{w}_t(E[\upsilon_t|s_0]) = \left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, E[\upsilon_t|s_0])\right)^{-1} \tag{2.9}$$

$$\underline{w}_t(E[\upsilon_t|s_0]) = \left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, E[\upsilon_t|s_0])\right)^{-1}. \tag{2.10}$$

We write the Expected Cost Function for $\mathcal{P}$ at each t,

$$EC_t = \alpha_t \cdot \left[\theta_0\overline{w}_t(E[\upsilon_t|s_0]) + (1-\theta_0)\underline{w}_t(E[\upsilon_t|s_0])\right]$$

$$+ (1-\alpha_t) \cdot \left[\theta_1\overline{w}_t(E[\upsilon_t|s_0]) + (1-\theta_1)\underline{w}_t(E[\upsilon_t|s_0])\right] + C_t(s_0) \tag{2.11}$$

Let us use the superscript $s_0 \in \{0, S\}$ in $EC_t^{s_0}$, in order to differentiate the expected cost function when $\mathcal{P}$ invests in identity $s_0 = S$, from the no-investment case $s_0 = 0$. Then we have EC_t^S and EC_t^0.

[7] This solution is suboptimal compared with the first best solution where effort level and identity are perfectly observable. Also is more far away from the first best solution than the second best solution in which only the effort is unobservable but identity doesn't play any role.

$$EC_t^0 = \alpha_t \cdot \left[\theta_0 \overline{w}_t(E[\upsilon_t|0]) + (1-\theta_0)\underline{w}_t(E[\upsilon_t|0])\right]$$

$$+ (1-\alpha_t) \cdot \left[\theta_1 \overline{w}_t(E[\upsilon_t|0]) + (1-\theta_1)\underline{w}_t(E[\upsilon_t|0])\right] \tag{2.12}$$

$$EC_t^S = \alpha_t \cdot \left[\theta_0 \overline{w}_t(E[\upsilon_t|S]) + (1-\theta_0)\underline{w}_t(E[\upsilon_t|S])\right]$$

$$+ (1-\alpha_t) \cdot \left[\theta_1 \overline{w}_t(E[\upsilon_t|S]) + (1-\theta_1)\underline{w}_t(E[\upsilon_t|S])\right] + C_t(S) \tag{2.13}$$

Now we introduce into the analysis the earnings of $\mathcal{P}$ expressed by the function $R_t(q_t)$. We take the earnings in expected terms due $\mathcal{A}$'s identity hetereogeneity captured by the conditional distribution function $F_t(\upsilon_t|s_0)$, and also due to the stochastic effort-peformance relation captured with $\theta_i \in [0,1]$ probabilities. We can express the expected earnings of $\mathcal{P}$ as follows,

$$E[R_t(q_t)|\theta_i, \upsilon_t] = \alpha_t \cdot E[R_t(q_t)|\theta_0] + (1-\alpha_t) \cdot E[R_t(q_t)|\theta_1] =$$

$$\Big[\alpha_t \cdot \left[\theta_0 R_t(\bar{q}) + (1-\theta_0)R_t(\underline{q})\right]\Big] + \Big[(1-\alpha_t) \cdot \left[\theta_1 R_t(\bar{q}) + (1-\theta_1)R_t(\underline{q})\right]\Big]$$

We also write the *Expected Revenue Function* conditional to $\mathcal{P}$'s action,

$$ER_t^0 = \Big[\alpha_t \cdot \left[\theta_0 R_t(\bar{q}) + (1-\theta_0)R_t(\underline{q})\right]\Big] + \Big[(1-\alpha_t) \cdot \left[\theta_1 R_t(\bar{q}) + (1-\theta_1)R_t(\underline{q})\right]\Big]$$

$$ER_t^S = \Big[\alpha_t \cdot \left[\theta_0 R_t(\bar{q}) + (1-\theta_0)R_t(\underline{q})\right]\Big] + \Big[(1-\alpha_t) \cdot \left[\theta_1 R_t(\bar{q}) + (1-\theta_1)R_t(\underline{q})\right]\Big]$$

Finally we write the *Expected Profits Function*, also conditional to $\mathcal{P}$'s choice over s_0,

$$E\Pi_t^0 = ER_t^0 - EC_t^0 = \alpha_t \cdot \Big[\theta_0\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|0])\big) + (1-\theta_0)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|0])\big)\Big]$$

$$+ (1-\alpha_t) \cdot \Big[\theta_1\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|0])\big) + (1-\theta_1)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|0])\big)\Big] \tag{2.14}$$

$$E\Pi_t^S = ER_t^S - EC_t^S = \alpha_t \cdot \Big[\theta_0\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|S])\big) + (1-\theta_0)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|S])\big)\Big] - C_t(s_0)$$

$$+ (1-\alpha_t) \cdot \Big[\theta_1\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|S])\big) + (1-\theta_1)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|S])\big)\Big] + C_t(S) \quad (2.15)$$

Identity can be considered another productive asset of the organization that we call *Motivational Capital*. Confronting $\mathcal{P}$'s expected profits from using socialization incentives Π_t^S, with his expected profits from using monetary incentives Π_t^0, in every period $t = 0, 1, 2, \ldots$, we can measure the return of investing in motivational capital. This return is calculated as the present value of the stream of the differences in expected profits obtained by the principal. Formally,

$$CNV^{mk} = \sum_{t=0}^{T} \delta^t \left[E\Pi_t^S - E\Pi_t^0\right] \quad (2.16)$$

Where, $\delta^t = \left(\frac{1}{1+r}\right)^t$ is the discount factor, and r is the discount rate. We say that the principal has incentives to invest in motivational capital when $CNV^{mk} \geqslant 0$ and we say that, there is no incentive to invest in motivational capital when $CNV^{mk} < 0$.

2.3 Results

To obtain results first we calculate the spot contract's cost, the organization profits and agents utilities for every $t = 0, 1, ..., T, ...$ Then we confront the case in which $\mathcal{P}$ chooses to use socialization incentives to change $\mathcal{A}$s' identity $s_0 = S$ with the case in which $\mathcal{P}$ chooses to use only monetary incentives $s_0 = 0$. Finally we present some results drawn from comparative statics in the last subsection. We also discuss on some conclusions.

2.3.1 Identity Incentives and Socialization: Investment in Motivational Capital

Consider the case in which the principal chooses to use identity incentives $s_0 = S$. In this case the principal tries to benefit from investing in motivational capital. The spot payments at every t are,

$$\overline{w}_t^S(E_t[\upsilon_t|S]) = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|S])\right) \tag{2.17}$$

$$\underline{w}_t^S(E_t[\upsilon_t|S]) = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|S])\right) \tag{2.18}$$

At $t = 0$ payments will be,

$$\overline{w}_t(E_0[\upsilon_0]) = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_0(\overline{e}, E_0[\upsilon_0])\right) \tag{2.19}$$

$$\underline{w}_t(E_0[\upsilon_0]) = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_0(\overline{e}, E_0[\upsilon_0])\right) \tag{2.20}$$

Payments at $t = 0$ are equal independently of using socialization incentives $s_0 = S$ or pure monetary incentives $s_0 = 0$. This is so because at the starting period of the game the socialization effect can not have occurred yet. For the case of $s_0 = S$ we will write the spot expected profit function for the principal as follows,

$$E\Pi_t^S = ER_t^S - EC_t^S = \alpha_t \cdot \Big[\theta_0\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|S])\big) + (1-\theta_0)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|S])\big)\Big]$$

$$+(1-\alpha_t)\cdot\Big[\theta_1\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|S])\big) + (1-\theta_1)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|S])\big)\Big] - C_t(S) \tag{2.21}$$

Now we calculate either, the spot expected utility $\mathcal{U}_t^S$ for an $\mathcal{A}^h$ who have an identity $\upsilon_t^h > \upsilon_t^{avg}$ and chooses $e_t = \overline{e}$ and also the spot expected utility for an $\mathcal{A}^l$ who have an identity $\upsilon_t^l \leqslant \upsilon_t^{avg}$ and chooses $e_t = \underline{e}$.

$$\mathcal{U}_t^{S,h} = \theta_1 \left(\overline{U} + \tfrac{(1-\theta_0)}{\Delta\theta} \psi_t\big(\overline{e}, E_t[\upsilon_t|S]\big) \right)$$

$$+ (1-\theta_1) \left(\overline{U} - \frac{\theta_0}{\Delta\theta} \psi_t\big(\overline{e}, E_t[\upsilon_t|S]\big) \right) - \psi_t\big(\overline{e}, \upsilon_t^h(S)\big) \quad \text{and,} \tag{2.22}$$

$$\mathcal{U}_t^{S,l} = \theta_0 \left(\overline{U} + \tfrac{(1-\theta_0)}{\Delta\theta} \psi_t\big(\overline{e}, E_t[\upsilon_t|S]\big) \right)$$

$$+ (1-\theta_0) \left(\overline{U} - \frac{\theta_0}{\Delta\theta} \psi_t\big(\overline{e}, E_t[\upsilon_t|S]\big) \right) - \psi_t\big(\underline{e}, \upsilon_t^l(S)\big) \tag{2.23}$$

Finally, we compute the present value of the sum of spot profits and the sum of the spot utilities, and also the expression which measures the present value of the total surplus TS^S when $\mathcal{P}$ action is $s_0 = S$.

$$\Gamma^S = \sum_{t=0}^{T} \delta^t \Pi_t^S = \sum_{t=0}^{T} \delta^t \Big[ER_t^S - EC_t^S \Big] \tag{2.24}$$

$$\Lambda^S = \sum_{t=0}^{T} \delta^t \Big[\alpha_t \cdot \mathcal{U}_t^{S,l} + (1-\alpha_t) \cdot \mathcal{U}_t^{S,h} \Big] \tag{2.25}$$

$$TS^S = [\Lambda_t^S + \Gamma^S] \tag{2.26}$$

2.3.2 Agents in Conflict: No-investment in Motivational Capital

In this section we analyze the no investment case or $s_0 = 0$. In this case $\mathcal{P}$ does not invest any amount of resources to promote $\mathcal{A}$'s identity. The mere use of monetary incentives to control $\mathcal{A}$s' behavior will put agents into conflict toward organization. For this case spot payments are,

$$\overline{w}_t^0(E_t[\upsilon_t|0]) = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|0])\right) \tag{2.27}$$

$$\underline{w}_t^0(E_t[\upsilon_t|0]) = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|0])\right) \tag{2.28}$$

Payments in $t = 0$ are exactly the same as those described in the previous subsection. taking the expected costs, EC_t^0 into account we can calculate the spot expected profit Π_t^0 for $\mathcal{P}$.

$$E\Pi_t^0 = ER_t^0 - EC_t^0 = \alpha_t \cdot \Big[\theta_0\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|0])\big) + (1-\theta_0)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|0])\big)\Big]$$

$$+ (1-\alpha_t) \cdot \Big[\theta_1\big(R_t(\bar{q}) - \overline{w}_t(E[\upsilon_t|0])\big) + (1-\theta_1)\big(R_t(\underline{q}) - \underline{w}_t(E[\upsilon_t|0])\big)\Big] \tag{2.29}$$

Then we also can calculate the spot expected utility $\mathcal{U}_t^0$ for an $\mathcal{A}^h$ agent who have an identity $\upsilon_t^h > \upsilon_t^{avg}$ and chooses $e_t = \overline{e}$, and for an agent $\mathcal{A}^l$ who have an identity $\upsilon_t^l \leqslant \upsilon_t^{avg}$ and chooses $e_t = \underline{e}$.

$$\mathcal{U}_t^{0,h} = \theta_1\left(\overline{U} + \tfrac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|0])\right)$$

$$+ (1-\theta_1)\left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, E_t[\upsilon_t|0])\right) - \psi_t(\overline{e}, \upsilon_t(0)) \quad \text{and,} \tag{2.30}$$

$$\mathcal{U}_t^{0,l} = \theta_0\left(\overline{U} + \tfrac{(1-\theta_0)}{\Delta\theta}\psi_t\big(\overline{e}, E_t[\upsilon_t|0]\big)\right)$$

$$+ (1-\theta_0)\left(\overline{U} - \frac{\theta_0}{\Delta\theta}\psi_t\big(\overline{e}, E_t[\upsilon_t|0]\big)\right) - \psi_t\big(\underline{e}, \upsilon_t^l(0)\big) \tag{2.31}$$

Also for this case we complete the results showing the present value of the sum of spot profits and the sum of the spot utilities, and also the expresion which measures the present value of the social welfare TS^0 under the incentive policy $s_0 = 0$.

$$\Gamma^0 = \sum_{t=0}^{T} \delta^t E_t \Pi_t^0 = \sum_{t=0}^{T} \delta^t \left(ER_t^0 - EC_t^0 \right) \tag{2.32}$$

$$\Lambda^0 = \sum_{t=0}^{T} \delta^t \Big[\alpha_t \cdot \mathcal{U}_t^{0,l} + (1 - \alpha_t)) \cdot \mathcal{U}_t^{0,h} \Big] \tag{2.33}$$

$$TS^0 = \left[\Lambda_t^0 + \Gamma_t^0 \right] \tag{2.34}$$

2.3.3 Comparative statics

Our model shows that an agent with identity whithin the firm or public organization is willing to work hard at a high effort for a lower overall pay. This lower incentive requirement to foster high effort from agents represents a cost advantage of achieving high performance to the organization. When this cost advantage is high enough, it can be worthwhile for $\mathcal{P}$ to undertake a costly program to promote agents' identity.

Comparative statics of our model establish under which conditions agents' identity lead the organization to find profitable to invest in promoting identity among workers. If inculcating identity is low-cost, if output and agents' effort are weakly correlated (effort is hard to observe an hard to reward), if agents are especially risk averse or if high effort is critical to the organization's output, then the use of an identity incentive scheme will be more profitable and more likely to be used.

Identity and Motivational Capital

One very first result that it is straightforward to set, comes from the comparison between the current value of the sum of spot profits for $\mathcal{P}$ when he takes S action and when he takes 0 action. That is, firstly calculating the *Current Net Value* of the $\mathcal{A}$'s motivational capital (CNV^{mk}), and then checking if it is positive or negative.This first result is formally shown in proposition 1.

Proposition 1. *Let T the number of periods of the game. Let $K < T$ be number of periods large enough to allow socialization or conflict entirely happen. For a δ large enough and if $\theta_1 \overline{w}_K^0 + (1-\theta_1)\underline{w}_K^0 > \gamma S + h(\overline{U})$ there exists a threshold t^* such that,*

$$CNV^{mk} = \Gamma^S - \Gamma^0 = 0 \tag{2.35}$$

from which the following is concluded:

i. If $t^* \leqslant T$ then $CNV^{mk} \geqslant 0$ and $\mathcal{P}$ finds profitable to invest in motivational capital and choose the $s_0 = S$ strategy.

ii. If $t^* > T$ then $CNV^{mk} < 0$ and $\mathcal{P}$ finds profitable not to invest in motivational capital and choose the $s_0 = 0$ strategy.

Figure 2 illustrate results of proposition 1. Figure 2.2 shows jointly as a function of time t, $\mathcal{P}$'s $E\Pi_t^{s_0}$, $ER_t^{s_0}$ and $EC_t^{s_0}$ in either case, when $\mathcal{P}$ choose $s_0 = 0$ or$s_0 = S$. A comparison between $E\Pi_t^S$ and $E\Pi_t^0$ and the discounted sum of the difference between these two functions CNV_t^{mk} are shown.

The graph (d) down, on the right side of the figure 2.2 shows the value of the CNV^{mk} as a function of time t. Two cases are shown in the graph: socialization incentives $s_0 = S$ and pure monetary incentives $s_0 = 0$. The t^* threshold determines the critical point that states the optimal strategy for $\mathcal{P}$.

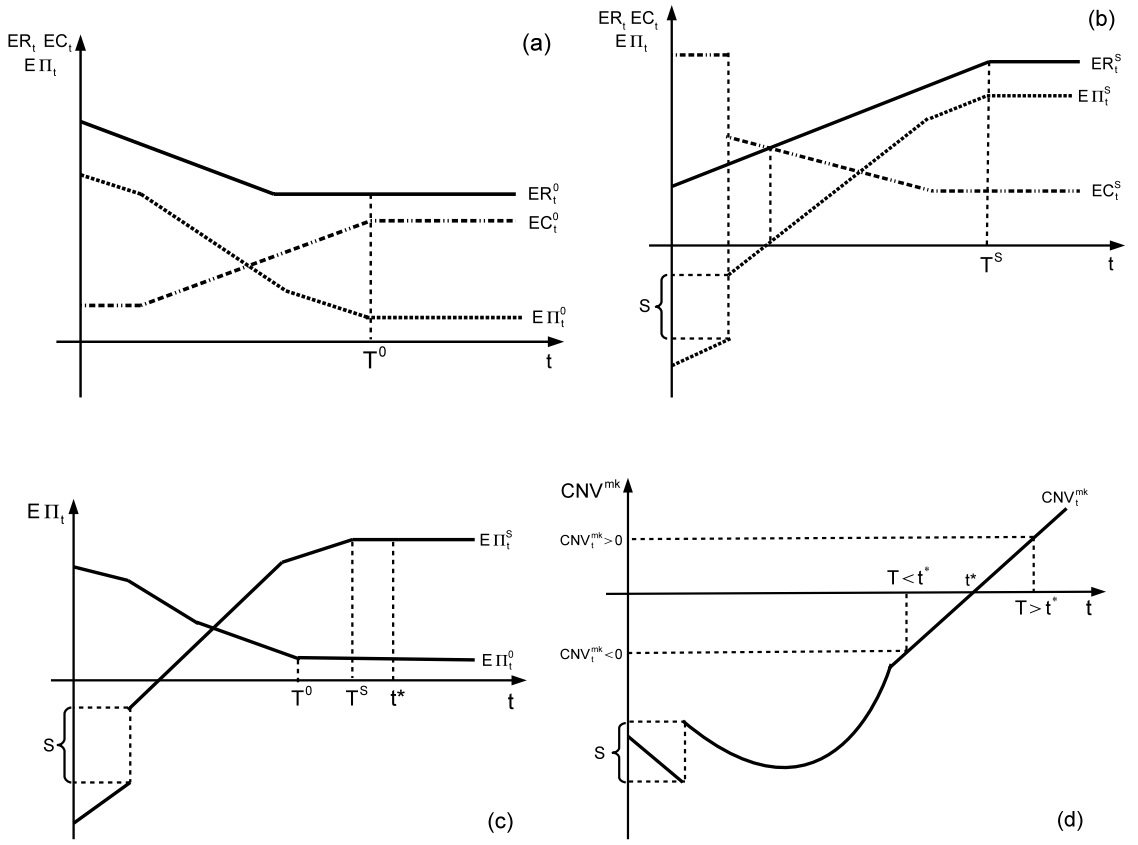

FIGURE 2.2: In the figure, first graph (a) shows the time evolution of ER_t^0, EC_t^0 and $E\Pi_t^0$ in the case of pure monetary incentives $s_0 = 0$. T^0 represents the period in which the socialization process is completed and all the agents present an identity $\upsilon_{T^S} = \overline{\upsilon}$. Second graph (b) shows the time evolution of ER_t^S, EC_t^S and $E\Pi_t^S$ in the case of identity incentives $s_0 = S$. T^S represents the period in which the conflict process is completed and all the agents present an identity $\upsilon_{T^0} = \underline{\upsilon}$. Third graph (c) confront the time evolution of $\mathcal{P}$'s expected profits in each case, $s_0 = 0$, and $s_0 = S$. Finally, d) shows the time evolution of the current net value of the motivational capital CNV_t^{mk}, where the profitability threshold labelled with t^*, is the cutoff between CNV_t^{mk} function and x-axis.

The motivational capital profitability threshold t^* is key for $\mathcal{P}$ in order to choose the optimal action. This threshold depends on several variables. The relations given between these variables and the motivational capital profitability threshold is what determines $\mathcal{P}$'s optimal decision in this contracting game. We will focus on the analysis of these relations in order to draw conditions under which one or another strategy, $s_0 \in \{0, S\}$ is optimal.

Now let us compare the total surplus of each strategy $s_0 \in \{0, S\}$ of $\mathcal{P}$, to analyze the cases in which all the members whithin an organisation are better off. The following proposition shows that the social optimum coincides with the optimal choice of $\mathcal{P}$. This is so, because incentive compatibility constraint (2.4) and participation constraint (2.5) ensure that for every choice $s_0 \in \{0, S\}$ of $\mathcal{P}$, and every $t = 0, 1, \ldots, T$ the expected utility required by $\mathcal{A}$ to exert high effort is the same. The only difference consists in the source from which $\mathcal{A}$ gets the utility. Depending on the $\mathcal{P}$'s choice over $s_0 \in 0, S$, $\mathcal{A}$ get utility from the economic incentive and identity with different weights although the total expected utility remains constant. Proposition 2 establishes, when a given strategy profile is socially optimun.

Proposition 2. *Let* $CNV^{mk} = TS^S - TS^0 = \sum_{t=0}^{T} \delta^t \left[EC_t^0 - EC_t^S\right]$. *Let* $\left(s_0, e_t\left(v_t^{l,h}\right)\right)$ *be the strategy profile that solves the game.*

i. If $CNV^{mk} \geqslant 0$, *then* $(S, \overline{e}^h, \underline{e}^l)$ *is a Pareto-Efficient strategy profile and Pareto-Dominates any other possible strategy profile:* $(S, \underline{e}^h, \underline{e}^l)$, $(0, \overline{e}^h, \underline{e}^l)$ *or* $(0, \underline{e}^h, \underline{e}^l)$.

ii. If $CNV^{mk} < 0$, *then* $(0, \overline{e}^h, \underline{e}^l)$ *is a Pareto Efficient strategy profile and Pareto Dominates any other possible strategy profile:* $(S, \overline{e}^h, \underline{e}^l)$, $(S, \underline{e}^h, \underline{e}^l)$ *or* $(0, \underline{e}^h, \underline{e}^l)$.

Proposition 2 then shows that in case of $CNV^{mk} \geqslant 0$ investing in motivational capital results optimal for the principal. High effort will be optimal for the agent whose identity is higher than average $\overline{e}^h$. The agent whose identity is low will shirk $\underline{e}^l$.Then, $(S, \overline{e}^h, \underline{e}^l)$ is the equilibrium strategy profile for the game and there is no chances to improve any of the players without necessarily worsening at least one of the others. Analogously, if $CNV^{mk} < 0$, then using pure monetary rewards is optimal for the principal. High effort choice will be optimal for the agent whose identity is high $\overline{e}^h$. The agent whose identity is low will shirk $\underline{e}^l$. Then, $(0, \overline{e})$ is the

equilibrium strategy profile for the game, there is no chances to improve any player of the game without necessarily worsening at least one of the others.

The Role of the Depreciation Rate of Motivational Investment.

Profitability threshold t^* and time depreciation of the motivational investment that the principal must face to run a socialization incentives program γ, provide another interesting insight. Once the entire socialization effect or conflict effect has happened, principal finds crucial to balance two opposite effects: the higher profits from having agents with high identity in contrast with the additional costs he must face to run a socialization incentive policy. The first effect establish that $\theta_1(\overline{R}-\overline{w}_t^0)+(1-\theta_1)(\underline{R}-\underline{w}_t^0) < \theta_1(\overline{R}-\overline{w}_t^S)+(1-\theta_1)(\underline{R}-\underline{w}_t^S)$.

But, to lead agents' identity towards $\upsilon_t = \overline{\upsilon}$, $\mathcal{P}$ must face the consequent depreciation cost of using socialization incentives $C_t(S) = \gamma S$, in $t = 1, 2, \ldots$. Then depreciation cost rate γ becomes a key parameter to study the profitability of investing in motivational capital. As γ takes values closer to one, t^* becomes larger and is less likely for the principal to find profitable to invest in motivational capital.

In other words, in a context in which a principal $\mathcal{P}$, who have to reinvest a sufficiently high amount of resources $C_t(S) = \gamma S$ in $t = 1, 2, \ldots$, would not find that investment profitable because it would never be compensated by the savings generated from lower incentive requirements. To illustrate this case, assume that there is a maximum depreciation rate γ^+ above of which the *Current Net Value* of motivational capital never will reach a positive value. Then, investing in motivational capital will not be profitable at all. Proposition 3 summarize this result.

Proposition 3. *Let $K < T$ be number of periods large enough to allow socialization or conflict entirely happens. Where $\upsilon_K = \overline{\upsilon}$ if $s_0 = S$ and $\upsilon_K = \underline{\upsilon}$ if $s_0 = 0$. Taking*

S as constant, if $\gamma \geqslant \frac{\theta_1 \overline{w}_K^0 + (1-\theta_1)\underline{w}_K^0 - h(\overline{U})}{S}$, then $CNV^{mk} < 0$ for all $t = 1, 2, ...$ and $\mathcal{P}$ never will find profitable to invest in motivational capital.

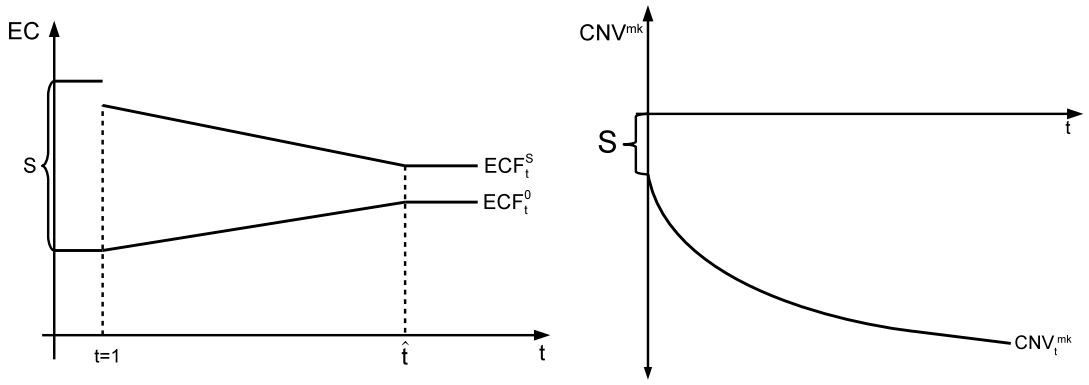

FIGURE 2.3: Negative Current Net Value of the Motivational Capital, $CNV^{mk} < 0$ due to high cost of depreciation γS.

Intuitively proposition 3 states that, there is no reason to spend resources to change workers' identity, neither in the short run nor in the long run, whenever $\mathcal{A}$s' identity is not large enough to cause an advantage in payments which offset the cost of promoting identity $\big(E[w_t^0 - w_t^S|\theta_i, \alpha_t] < C_t(S)\big)$. This case have sense for organizations and jobs in which workers have to perform in bad work environment, doing nasty, exhausting and/or boring tasks, the work implicitly involves conflict of interests between the members of organization and is costly to change their identity.

However, we are more interested in the case in which identity is large enough to overcome the cost of generating it $E[w_t^0 - w_t^S|\theta_i, \alpha_t] > \gamma S$ at some time period $t' \in \{0, 1, \dots\}$. In this case $\mathcal{P}$'s expected savings from identity when is strictly increasing and bounded. Taken together with the assumption of a constant depreciation cost, γS we have that the optimality of investing in motivational capital becomes a matter of time. The time that the organization has to wait in order to get profits from identity changes, $CNV^{mk} > 0$, will be a function of the depreciation rate value γ. Proposition 4 shows such a relation.

Proposition 4. *Let $j = \{A, B\}$ be two alternative actuations to foster agents' identity with γ_A and γ_B associated depreciation costs such that $\gamma_A < \gamma_B$. Let $t = t'_j$, $t'_j \in \{0, 1, \dots\}$ be the time periods in which the change in agents' identity reach a value such that $E\left[w^0_{t'_j} - w^S_{t'_j} | \theta_i, \alpha_t\right] \geqslant \gamma_j S$. Let $t = t^*_j$, $t^*_j \in \{0, 1, \dots\}$ be the number of time periods in which $CNV^{mk}_j = 0$. Then $t'_A < t'_B$ and $t^*_A < t^*_B$.*

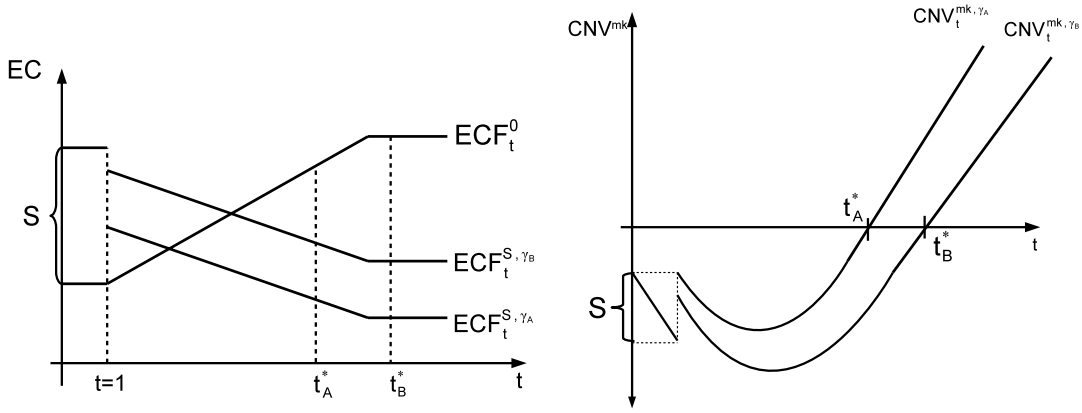

FIGURE 2.4: Current Net Value of Motivational Capital with two different depreciation rates γ_A and γ_B such that $\gamma_A < \gamma_B$.

Figure 2.4 illustrates the result of the proposition 4. In situations in which investing in motivational capital is profitable. Then, those actuations or investments with higher depreciation costs will require a higher number of periods in order to generate positive returns. In other words, when changing agents' identity requires more resources (obstinate agents, distrustful agents,...), investing in motivational capital will be less likely to be optimal. Organizations with high rotation rate of employees is a particular case of this result.

Effort Effectiveness and Motivational Capital

The parameter $\theta_i \in [0, 1]$ measures $\mathcal{A}$'s effort effectiveness, where $i = 0, 1$ serve to distinguish low effort action and high effort action respectively. θ_i measures the prob-

ability of achieving high performance conditional on $\mathcal{A}$'s effort choice. We say that θ_i is informative if $\theta_1 > \theta_0$. As mean as the value of θ_0 approaches to θ_1, $\mathcal{P}$ must offer higher incentives to force $\mathcal{A}$ to exert high effort. This is what literature in economics of information calls *agent's rent extraction power*. In words, to make shirking costly enough in order to incentivize $\mathcal{A}$ to high effort will result more expensive as mean as performance is more noisy signal of effort.

Then pure monetary incentives results too expensive when the signal used to link payments to effort is hard to observe and hard to reward. In such cases, $\mathcal{P}$ will find optimal to invest in motivational capital $s_0 = S$ more likely. Although investing in motivational capital is costly $C_t(S)$, $\mathcal{P}$ will reduce payment costs because workers with identity do not need monetary incentives to exert high effort (at least not as high as those of the workers without identity). If θ_0 implies higher monetary incentives, then potential savings from implementing $s_0 = S$ strategy will be very high and the current net value, CNV^{mk} becomes positive earlier.

Proposition 5. *Higher values of θ_0 implies higher values of CNV_t^{mk} for every $t = 0, 1, \ldots, T, \ldots$. Then, investing in motivational capital is more profitable for $\mathcal{P}$, when performance is a more random signal about $\mathcal{A}$'s effort level.*

Proposition 5 shows that as higher is the probability of achieving high performance when the effort is low, $p(q = \overline{q}|e = \underline{e}) = \theta_0$, then more profitable will be for $\mathcal{P}$ to invest in motivational capital $s_0 = S$[8].

Figure 2.5 shows how the high payment grow towards infinity and the low payment falls up to 0 (LLC) as θ_0 approaches to θ_1. However, having agents with identity implies that no incentive payments are needed to elicit them to exert high effort and

[8] This result is consistent with what Akerlof and Kranton (2005) state about identity as motivating for work. *[...] a change in identity is the ideal motivator if, [...] the effort of a worker is either hard to observe or hard to reward.*(p. 10)

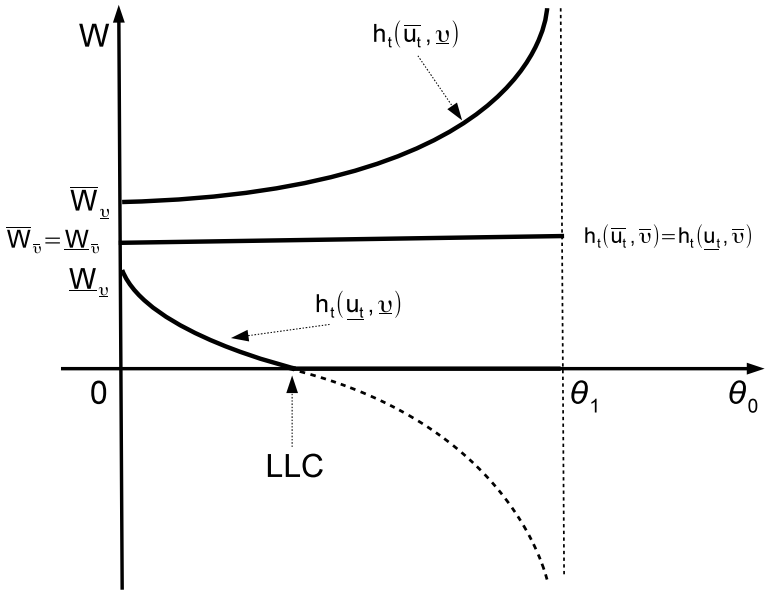

FIGURE 2.5: Information and motivational capital. As figure shows, values of θ_0 closer to θ_1 makes motivational investments more profitable for $\mathcal{P}$. A worse signal of effort increases $\mathcal{A}$'s rent extraction power so much that the expected savings from having workers with identity exceed the costs of investing in otivatonal capital. With $\upsilon_t = \underline{\upsilon}$ the low payment $h(\underline{u}_t, \underline{\upsilon})$ goes to 0 (LLC) when θ_0 approaches θ_1 and the high payment $h(\overline{u}_t, \underline{\upsilon})$ goes to infinity. However, if $\upsilon_t = \overline{\upsilon}$ the payment remains constat independently of the value of θ_0.

then, the savings from having workers with identity will be so large that compensate the cost of socialization investments.

Agents' Risk Aversion and Motivational Capital

In the model, agents are risk-averse with respect to their monetary earnings. They perceive utility from incentives which consists in contingent payments $w_t(q_t)$. But agents also experience utility from identity. As mean as agent's identity increases, fewer incentives are required in order to encourage him to exert high effort. Less variation in payments indicates that $\mathcal{A}$ must be compensated with a lower risk premium. Then, as $\mathcal{A}$s' identity increases, incentives fall and this constitutes another cost-saving source for the organization.

Proposition 6 formally states that investing in motivational capital is more profitable in the presence of risk-averse $\mathcal{A}$.

Proposition 6. *Let $\mathcal{A}_1$ and $\mathcal{A}_2$ be a pair of agents with υ_1 and υ_2 identity respectively. If agents are risk-averse and $\upsilon_1 < \upsilon_2$, then incentives will be lower in the case of $\mathcal{A}_2$ than in the case of $\mathcal{A}_1$. Therefore $t_1^* > t_2^*$ and $\mathcal{P}$ will find more profitable to invest in motivational capital when agents are more risk averse.*

The intuition behind this result is that incentives must be greater in order to encourage high effort from agents without identity. Lower identity enlarge the different between low $\underline{w}$ and high $\overline{w}$ incentive payments. Given that $\mathcal{A}$ is risk averse, the risk premium that $\mathcal{P}$ should offer to reach the certainty equivalent will result higher. Analogously, agents with identity will require fewer incentives to exert high effort. Consequently, an agent with high identity has to bear a lower variance over payments and has to be compensated with a lower risk premium. Thus identity generates savings for $\mathcal{P}$.

2.4 Conclusion

We introduce the notion of identity in a model of principal agent with moral hazard. Also we incorporate the principal's ability to change agents' identity. We conclude the conditions under which spending resources in changing agents' identity is profitable for organizations. These conditions are the length of the contracts offered, the total cost of investing in changing agents' identity for the principal, the informative value of the signal used to observe and incentivize effort, and the degree of agents' risk aversion.

An initial investment in motivational capital using non-monetary incentives though costly at inception, will result more effective to control public organizations expenditure. Then, Governments, political advisors and public organizations should take

this into account and incorporate these findings to the policy design. For instance, from the proposition 1 a planner could conclude that monetary incentives are the best way to achieve a specifical goal in the short term. However for the long term goal proposition 1 establishes, that an investment in *motivational capital* to foster agents' identity is the most profitable action for the organization.

Finally, wherever the principal in the public organization is politically designated, their time horizon will be the legislative time period and then it is more likely that they are focused in the short term goals. Thus, they will have a willingness to choose pure monetary rewards as incentive schemes, despite in the long term the best choice is the investment in *motivational capital* given that workers' contracts are much longer that legislative piece of time. Anyway these conclusions are interesting future research questions which, should be tested and studied in depth in the future.

Chapter 3

Motivational Capital and Incentives in Health Care Organizations

3.1 Introduction

The present chapter investigates the principal-agent relationship between managers and doctors as in McGuire (2000), where the divergence in objectives between the principal's performance measures and the physicians' mission is a source of conflict.

It is assumed that principals in health care are primarily focused on health benefits. They focus heavily upon improving certain health performance measures that are easily observable by the electorate: for instance reducing the amount of time spent on waiting lists, increasing the number of operations conducted for common pathologies, increasing the infrastructure, buying new technology assets, reducing costs and saving resources, and enlarging the range of services supplied. In contrast, physicians' goals are focused toward patients, a subset of all tax-payers, and also have other interests in clinical and medical research, teaching and further education that, taken together, form what is called the doctors' "mission".

One key fact of the approach proposed in this chapter is that incentives may make the action of providing health a less convincing signal of doctors' intrinsic motivation, resulting in observers interpreting some generous acts as merely self-interested. This

may crowd out doctors intrinsic motivation and they could shift from an ethical to a payoff maximizing frame, as shown Benabou and Tirole (2006) and Bowles and Polanía-Reyes (2012).

The contribution of the present approach is threefold: first, following Dewatripont et al. (1999a) research program, we present a dynamical principal-agent model with intrinsically motivated agents and repeated effort and incentives choices to analyze the evolution of optimal contracts; second, crowding effects are incorporated into this dynamic model; and third, the proposed dynamical setting allows us to endogenize changes in doctors' preferences in response to the principal actions and therefore to evaluate how optimal contracts evolve and affect the outcomes of the game.

In the model, health managers have two options to motivate doctors: motivational investments and monetary incentives. We use the term *motivational investments* to refer to the resources devoted to well designed mechanisms, beyond the monetary incentives, oriented towards maintaining, recovering or enhancing doctors' intrinsic motivation through a crowding-in effect. However, the use of pure monetary incentives may discourage doctors through a crowding-out effect, leading them to behave as payoff maximizers.

We discuss the conditions under which spending resources on motivational capital is optimal for the health organization's manager. Our results show that in the long run, investing in motivational capital will be more efficient than using monetary incentives. We will also prove that when doctors are risk-averse, it is more profitable for the health manager to invest in motivational capital.

3.2 The Model

There are two players in the game: a doctor $\mathcal{A}$ (agent) and a health manager $\mathcal{P}$ (principal)[1]. We assume that $\mathcal{A}$ is intrinsically motivated. We also restrict the analysis to linear contracts.

The game is played for a finite number of periods $t = 0, 1, ..., T, ...$ There is a health performance measure $q_t \in \mathbb{R}$ that $\mathcal{P}$ wants to maximize. Define q_t as the amount of services produced by the health organization in the period $t = 0, 1, 2, \ldots, T, \ldots$ as in Siciliani (2009) or the number of QALYs[2].For all t let $R_t(q_t)$ be a function $R_t : \mathbb{R} \longrightarrow \mathbb{R}_+$ which assigns a monetary value to every q_t.

Performance q_t is a function of doctor's effort $e_t \in \{\underline{e}, \overline{e}\}$. Assume that $q_t \in \{\overline{q}, \underline{q}\}$ in which $\overline{q} > \underline{q}$. Take $\overline{q}$ as $\mathcal{P}$'s target for performance level and $\underline{q}$ as a failure to reach this target performance level. Let $p(q_t = \overline{q}|e_t) = \theta_i$ be the conditional probability of high performance given $\mathcal{A}$'s effort choice $i = 0, 1$ in which 0 indicates low effort $\underline{e}$ and 1 indicates high effort $\overline{e}$. The probability distribution of q_t conditioned to e_t is given by: $p(q_t = \overline{q}|e_t = \overline{e}) = \theta_1$; $p(q_t = \underline{q}|e_t = \overline{e}) = 1 - \theta_1$ and, $p(q_t = \overline{q}|e_t = \underline{e}) = \theta_0$; $p(q_t = \underline{q}|e_t = \underline{e}) = 1 - \theta_0$. We assume that $\theta_1 > \theta_0$, which indicates that q_t is an informative signal of e_t.

We denote the health expected revenue conditional to q_t with $E[R_t(q_t)|\theta_i]$; $\overline{R}$ and $\underline{R}$ will stand for $R_t(\overline{q})$ and $R_t(\underline{q})$, respectively.

Let $w_t = w(q_t)$ be the contingent monetary reward offered by $\mathcal{P}$: $w(\overline{q}_t) = \overline{w}_t$ and $w(\underline{q}_t) = \underline{w}_t$, where $\overline{w}_t > \underline{w}_t$. $E[w(q_t)|\theta_i]$ will then be the expected monetary cost for the health organization, or $\mathcal{P}$. Let $s_0 \in \{0, S\}$ be the total initial investment in motivational capital. This investment generates a cost stream $C_t(s_0)$ that takes the

[1] We use she and he to refer to the agent and the principal respectively, is conventional whithin the principal agent literature.

[2] QALY stands for Quality Adjusted Live Years. For an estimation of the monetary value of a QALY see **?**.

value $C_0(S) = S$ or $C_0(0) = 0$ in $t = 0$ and gives the depreciation cost $C_t(S) = \gamma S$ for every $t \geqslant 1$ at a constant depreciation rate of $\gamma \in [0, 1)$. We assume, as in Murdock (2002), that by having motivated doctors, $\mathcal{P}$ should expect discounted future profits higher than the current cost of motivational incentives. $\mathcal{P}$'s problem is to maximise the expected profit function.

$$E[\pi_t|\theta_i] = E[R_t(q_t)|\theta_i] - E[w_t(q_t)|\theta_i] - C_t(s_0)$$

We represent $\mathcal{A}$'s preferences with the following overall expected utility function.

$$E[U_t|\theta_i] = E[u_t(w_t)|\theta_i] - \psi_t(e_t) + \phi_t\big(w_t, s_0\big)$$

The first term on the right hand side of the above expression $u_t(w_t)$, represents $\mathcal{A}$'s utility from monetary incentives which *"...complement the remuneration provided by the employer of the physician (p. 1)"*, as in de Pouvourville (2012). We assume that $\mathcal{A}$ is risk-averse and that this utility function from monetary rewards satisfies the Inada conditions[3].

The middle term $\psi_t(e_t)$ is the cost from effort in utility terms that depends positively upon effort: $\psi_t(\underline{e}) = 0$ and $\psi_t(\overline{e}) = \Psi$. Thus, $\psi_t(e_t) \in \{0, \Psi\}$ where $\psi_t(\overline{e}) = \{\Psi \in \mathbb{R} | \Psi > 1\}$.

The last term is $\phi_t(w_t, s_0) \in [0, \Phi]$, in which $\phi_t : \mathbb{R}^2_+ \longrightarrow \mathbb{R}_+$ captures $\mathcal{A}$'s intrinsic motivation. Intrinsic motivation depends negatively on incentives w_t. This captures the crowding-out effect of incentives. Intrinsic motivation depends positively on $\mathcal{P}$'s investment in motivational capital s_0.

The incentives offered by $\mathcal{P}$ may affect the intrinsic motivation of $\mathcal{A}$ through crowding effects. The properties of this intrinsic motivation function and of crowding

[3] Inada conditions: $\mathrm{d}u_t(w_t)/\mathrm{d}w_t > 0$, $\mathrm{d}^2u_t(w_t)/\mathrm{d}w_t^2 < 0$, $u_t(0) = 0$, $\lim_{t\to\infty}\Big[\mathrm{d}u_t(w_t)/\mathrm{d}w_t\Big] = 0$ and $\lim_{t\to 0}\Big[\mathrm{d}u_t(w_t)/\mathrm{d}w_t\Big] = \infty$.

effects are summed up in the following assumptions:

A1: For any fixed value of $w_t(q_t) = \tilde{w}_t$ such that $\tilde{w}_t \in [0, \infty) \times [0, \infty)$ we have $\phi_t(\tilde{w}_t, S) - \phi_t(\tilde{w}_t, 0) > 0$.

A2: Intrinsic motivation depends negatively upon incentives:

$$\partial \phi_t(w_t, s_0)/\partial w_t < 0.$$

A3: Crowding in: in the case that $\mathcal{P}$ chooses $s_0 = S$, ϕ_t increases over time:

$$\mathrm{d}\phi_t\left(w_t, S\right)/\mathrm{d}t > 0$$

A4: Crowding out: in case of $\mathcal{P}$ chooses $s_0 = 0$, ϕ_t decreases over time;

$$\mathrm{d}\phi_t\left(w_t, 0\right)/\mathrm{d}t < 0$$

Assumption A1 shows a fixed crowding effect. Assumption A2 states that in presence of intrinsic motivation, agents enjoy a higher reward from it if they perform at high effort norm. Assumption A3 tells that intrinsic motivation is negatively correlated with incentives (crowding out). Assumption A4 captures a crowding-in effect: when $\mathcal{P}$ chooses the $s_0 = S$, $\mathcal{A}$'s intrinsic motivation will increase period after period. Assumption A5 captures a crowding-out effect: when $\mathcal{P}$ chooses a $s_0 = 0$, $\mathcal{A}$'s intrinsic motivation will diminish period after period.

Physicians may have different degrees of intrinsic motivation at $t = 0$. The model captures this heterogeneity with a probability distribution function, $F_0(\phi_0)$ that is defined over the value of the intrinsic motivation at $t = 0$. For any $\phi^* \in [0, \Phi]$ the distribution function calculates the probability $F_0(\phi^*) = Prob(\phi_0 \leqslant \phi^*)$. In the game, $\mathcal{P}$ knows $F_0(\phi_0)$. His offer at $t = 0$ affects $\mathcal{A}$'s intrinsic motivation through crowding effects. We model crowding effects as time displacements of the

distribution function conditional to $s_0 \in \{0, S\}$ and w_t (for example, $F_t(\phi_t|w_t, s_0)$). Thus, for any $\phi_t = \phi^* \in [0, \Phi]$, the conditional distribution calculates the probability $F_t(\phi_t|w_t, s_0) = Prob(\phi_t \leqslant \phi^*)$.

Figure 3.1 shows how crowding effects affect the intrinsic motivation probability distribution function. At $t = 0$, $\mathcal{P}$ knows a given distribution function $F_0(\phi_0)$. His choice of incentives in $t = 0$ affects agents intrinsic motivation switching the distribution function at $t = 1, 2, \ldots, T, \ldots$.

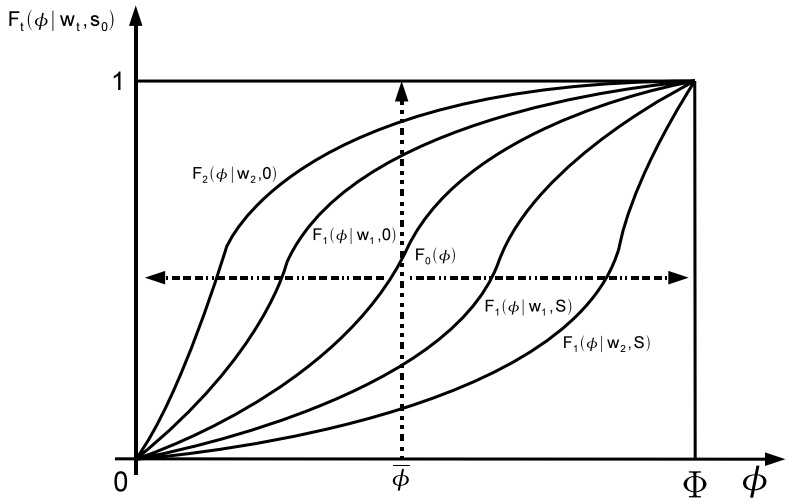

FIGURE 3.1: **Stochastic Dominance.** The figure shows how crowding effects affect the intrinsic motivation probability distribution function in response to principal's choice of incentive policy: motivational investments $s_0 = S$, or pure monetary incentives $s_0 = 0$. Motivational investments $s_0 = S$ cause crowding-in switching the distribution function to the right period after period. Pure monetary incentives $s_0 = 0$ cause crowding-out switching the distribution function to the left period after period. Stochastic dominance ensures that no curve cross each together

As shown in the figure, if $\mathcal{P}$ chooses $s_0 = 0$, then the distribution function will shift to the left period after period. In other words, if incentives are only monetary, then doctors will concentrate around lower values of intrinsic motivation $\phi_t = 0$. In

contrast, if incentives are motivational $s_0 = S$, then doctors will concentrate around higher values of intrinsic motivation $\phi_t = \Phi$. In this latter case, the distribution function shifts period after period to the right in figure 1.

We assume stochastic dominance in distribution function time shifts. This property involves, as shown in figure 1, that $\mathcal{P}$'s choices of incentives affect every $\mathcal{A}$ intrinsic motivation in the same way. As a result, stochastic dominance assumes that probability distributions do not intersect on another[4].

The game is a repeated dynamic re-contracting game. In each period of the game both players have to make new choices: $\mathcal{P}$ must offer a new contract after updating his beliefs about $\mathcal{A}$, and $\mathcal{A}$ has to choose a new effort level. The choices made by $\mathcal{P}$ affect $\mathcal{A}$'s intrinsic motivation, and changes in $\mathcal{A}$'s motivation affect the contract and equilibrium payments offered by $\mathcal{P}$ in the next period.

Each period of the game consists of three stages: stage 0, stage 1, and stage 2. The timing of the within-period in each $t = 0, 1 \ldots, T, \ldots$ is:

(0) The principal $\mathcal{P}$ knows the distribution of doctors' intrinsic motivation $F_0(\phi_0)$ at $t = 0$ or updates $F_t(\phi_t|s_0, w_t)$ given w_t and s_0 at $t = 1, 2, \ldots, T, \ldots$. He then offers a contract to $\mathcal{A}$. This contract consists of a pair of stochastic contingent payments $w_0(q_0) = \{\underline{w}, \overline{w}\}$ and the choice to invest or not invest in motivational capital s_0: $\{w(q_0), s_0\}$ at $t = 0$ and $\{w(q_t), s_0\}$ at $t = 1, 2, \ldots, T, \ldots$.

(1) $\mathcal{A}$ accepts or refuses the contract. If she accepts, then she chooses an action $e_t \in \{\underline{e}, \overline{e}\}$ at each $t = 0, 1, 2, \ldots, T, \ldots$. If she refuses then she gets her reservation utility $\overline{U}$.

(2) Finally, output is realised $q_t \in \{\underline{q}_t, \overline{q}_t\}$, payment is realised $w(q_t) = \{\underline{w}_t, \overline{w}_t\}$ and payoffs π_t and U_t are realized in each $t = 0, 1, 2, \ldots, T, \ldots$.

Figure 3.2 shows the sequence of these stages in $t = 0, 1, 2, \ldots, T, \ldots$.

[4] For a more formal description of this property, see the mathematical appendix.

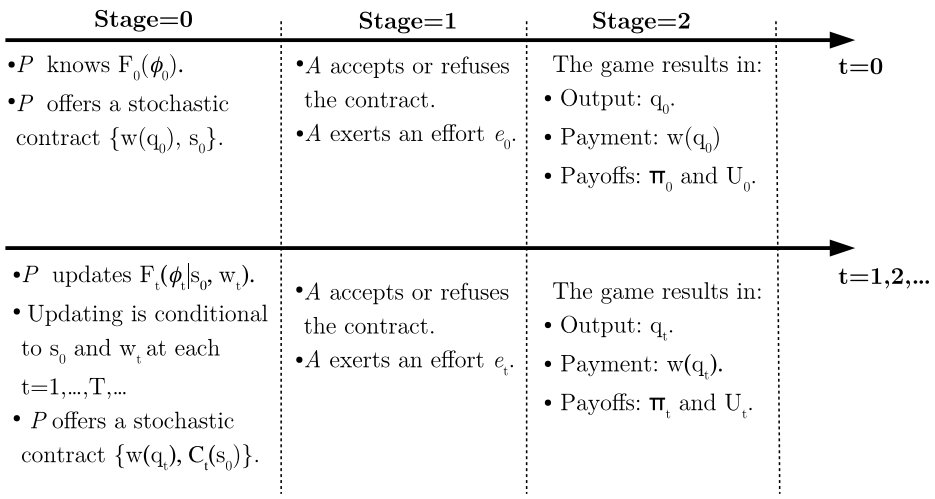

FIGURE 3.2: **Timing.** The figure describes the stages of the game within each period, differentiating the starting period of the game $t = 0$, where no crowding effect has had place, from subsequent periods $t = 1, 2, \ldots$ where $\mathcal{P}$'s actions affects $\mathcal{A}$s' intrinsic motivation through crowding effects

Before solving the game, let us assume that $\mathcal{P}$ and $\mathcal{A}$ can not sign long term contracts at $t = 0$. As a result, they have to agree upon the rewards at every period t. Once $\mathcal{P}$ has chosen $s_0 = S$ in $t = 0$ he bears the depreciation cost $C_t(s_0) = \gamma S$. We also assume that there is no contract renegotiation in the short term. In this game, the only way to agree upon a contract is to play the repeated game at every period $t = 0, 1, \ldots, T, \ldots$ as a new game.

We can therefore write $\mathcal{P}$'s problem as follows,

$$Max_{\{w_t(q_t),s_0\}}\alpha_t\Big(E[R_t(q_t)|\theta_0] - E[w_t(q_t)|\theta_0]\Big)$$

$$+ (1-\alpha_t)\Big(E[R_t(q_t)|\theta_1] - E[w_t(q_t)|\theta_1]\Big) - C_t(s_0) \tag{3.1}$$

Subject to

$$E[u_t(w_t)|\theta_1)] - \psi_t(\overline{e}) + \overline{e}\cdot\phi_t\Big(w_t, s_0\Big) \geqslant$$

$$E[u_t(w_t)|\theta_0)] - \psi_t(\underline{e}) + \underline{e} \cdot \phi_t\Big(w_t, s_0\Big) \qquad \text{(ICC)} \qquad (3.2)$$

$$E[u_t(w_t)|\theta_1)] - \psi_t(\overline{e}) + \overline{e} \cdot \phi_t\Big(w_t, s_0\Big) \geqslant \overline{U} \qquad \text{(PC)} \qquad (3.3)$$

$$u_t(\underline{w}) \geqslant 0 \qquad \text{(LLC)} \qquad (3.4)$$

Where $P_t(\phi_t < \overline{\phi}|s_0) = \alpha_t$ is the probability of having a doctor with an intrinsic motivation lower than the average conditional to $\mathcal{P}$'s choice of s_0, and $P_t(\phi_t \geqslant \overline{\phi}|s_0) = 1 - \alpha_t$ is the probability of having a doctor with an intrinsic motivation higher or equal than the average conditional to $\mathcal{P}$'s choice of s_0. The objective function of $\mathcal{P}$ is weighted by α_t and $1 - \alpha_t$ because $\mathcal{P}$ does not know the intrinsic motivation of each $\mathcal{A}$. Therefore, he will offer a contract sufficient to incentivize the agent with average level of intrinsic motivation. Thus, those agents who are less intrinsically motivated than the average $\phi_t < \overline{\phi}_t$ will shirk, and those who are equal or more intrinsically motivated than the average $\phi_t \geqslant \overline{\phi}_t$ will exert high effort[5]. Condition (3.2) is $\mathcal{A}$'s *incentive compatibility constraint* (ICC) and ensures that the agent will prefer to exert high effort. (3.3) is the $\mathcal{A}$'s *participation constraint* (PC) and ensures that the agent will prefer to participate and accept the contract. Finally, (3.4) is a *limited liability constraint* (LLC) and ensures that the low utility payment will never fall below zero.

The solution to the above problem for each t is a pair of contingent payments $\{\overline{w}, \underline{w}\}$ associated with $\overline{q}$ and $\underline{q}$, respectively. Let us show how we calculate the equilibrium of the game.

For notational simplicity we will write $u_t(\overline{w}) = \overline{u}$ and $u_t(\underline{w}) = \underline{u}$. Let $h : u(w) \longmapsto w$ be the inverse of the utility function $h(u(w)) = (u(w))^{-1} = w$; then $\overline{w} = h(\overline{u})$ and $\underline{w} = h(\underline{u})$. Finally $\Delta\theta = (\theta_1 - \theta_0)$; and reservation utility is denoted by $\overline{U}$.

[5] When crowding-out (crowding-in) effect entirely happens, all agents' intrinsic motivation will reach $\phi_t = 0$ ($\phi_t = \Phi$).Then, all agents will exert high effort because $\phi_t = \overline{\phi}_t = 0$ ($\phi_t = \overline{\phi}_t = \Phi$). As a consequence $\mathcal{P}$'s benefit function will be $E\Pi_t = \theta_1 \cdot [R_t(\overline{q}_t) - w_t(\overline{q}_t)] - (1-\theta_1) \cdot [R_t(\underline{q}_t) - w_t(\underline{q}_t)] - C_t(s_0)$.

We rewrite $\mathcal{P}$'s problem as follows:

$$Max_{\{w_t(q_t),s_0\}}\ \alpha_t \cdot \Big(\theta_0\left(\overline{R}-h(\overline{u})\right)-(1-\theta_0)\left(\underline{R}-h(\underline{u})\right)\Big)$$

$$+(1-\alpha_t)\cdot\Big(\theta_1\left(\overline{R}-h(\overline{u})\right)-(1-\theta_1)\left(\underline{R}-h(\underline{u})\right)\Big)-C_t(s_0) \tag{3.5}$$

Subject to

$$\theta_1\overline{u}+(1-\theta_1)\underline{u}-\Psi+\phi_t \geqslant \theta_0\overline{u}+(1-\theta_0)\underline{u}+\phi_t \text{ (ICC)} \tag{3.6}$$

$$\theta_1\overline{u}+(1-\theta_1)\underline{u}-\Psi+\phi_t \geqslant \overline{U} \text{ (PC)} \tag{3.7}$$

$$\underline{u} \geqslant 0 \text{ (LLC)} \tag{3.8}$$

Letting λ and μ be the non-negative Khun-Tucker multipliers associated respectively to (ICC) and (PC) constraints. First-order conditions of this problem lead to:

$$\left(1/u'(\overline{w})\right)=\mu+\lambda\cdot\left(\Delta\theta/\theta_1\right) \tag{3.9}$$

$$\left(1/u'(\underline{w})\right)=\mu-\lambda\cdot\left(\Delta\theta/(1-\theta_1)\right) \tag{3.10}$$

The equations (3.9) and (3.10) (jointly with (3.6) and (3.7)) form a system of four equations with four variables $(\overline{w},\underline{w},\mu,\lambda)$. Multiplying (3.9) by θ_1 and (3.10) by $(1-\theta_1)$ and adding those two modified equations, we obtain;

$$\mu=\Big(\theta_1/u'(\overline{w})\Big)+\Big(1-\theta_1)/u'(\underline{w})\Big)>0 \tag{3.11}$$

Therefore, $\mu>0$ and the participation constraint (3.9) is binding. Using (3.11) and (3.9), we also obtain,

$$\lambda=\Big((1-\theta_1)\cdot\theta_1/\Delta\theta\Big)\cdot\Big(\left(1/u'(\overline{w})\right)-\left(1/u'(\underline{w})\right)\Big)>0 \tag{3.12}$$

Therefore, $\lambda > 0$ and the incentive compatibility constraint (3.6) is also binding. Thus, we can immediately obtain the values of $\overline{u}$ and $\underline{u}$ by solving a system with two equations and two unknowns. The result is shown below:

$$\overline{u}_t = \overline{U} - \phi_t\left(w_t, s_0\right) + \Big((1-\theta_0)/\Delta\theta\Big)\Psi$$

$$\underline{u}_t = \overline{U} - \phi_t\left(w_t, s_0\right) - \Big(\theta_0/\Delta\theta\Big)\Psi.$$

Applying the variable change $w_t(q_t) = h(u_t(w_t)) = (u_t(w_t))^{-1}$, we have the following payments,

$$\overline{w}_t = h(\overline{u}_t) = \left(\overline{U} - \phi_t\left(w_t, s_0\right) + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right)^{-1}$$

$$\underline{w}_t = h(\underline{u}_t) = \left(\overline{U} - \phi_t\left(w_t, s_0\right) - \Big(\theta_0/\Delta\theta\Big)\Psi\right)^{-1}.$$

Thus, at every period of the game, $\mathcal{P}$ must offer to $\mathcal{A}$ the following expected payments,

$$\overline{w}_t = \left(\overline{U} - E[\phi_t|w_t, s_0] + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right)^{-1} \tag{3.13}$$

$$\underline{w}_t = \left(\overline{U} - E[\phi_t|w_t, s_0] - \Big(\theta_0/\Delta\theta\Big)\Psi\right)^{-1}. \tag{3.14}$$

Using (3.13) and (3.14) $\mathcal{P}$'s Expected Cost function $EC_t^{s_0}$, Expected Revenue function $ER_t^{s_0}$ and Expected Profit function $E\Pi_t^{s_0}$ are calculated for every t as follows,

$$EC_t = \alpha_t \cdot \Big(\theta_0\overline{w}_t + (1-\theta_0)\underline{w}_t\Big) + (1-\alpha_t)\Big(\theta_1\overline{w}_t + (1-\theta_1)\underline{w}_t\Big) + C_t(s_0) \tag{3.15}$$

$$ER_t = \alpha_t \cdot \Big(\theta_0\overline{R}_t + (1-\theta_0)\cdot\underline{R}_t\Big) + (1-\alpha_t)\Big(\theta_1\overline{R}_t + (1-\theta_1)\underline{R}_t\Big) + C_t(s_0) \tag{3.16}$$

$$E\Pi_t = ER_t - EC_t \tag{3.17}$$

Let us use the superscript $s_0 \in \{0, S\}$ in $EC_t^{s_0}$ and $w_t^{s_0}$ to differentiate the expected cost function and expected payments when $\mathcal{P}$ invests in motivational capital

$s_0 = S$ from the no investment case $s_0 = 0$. We then write conditional to $s_0 \in \{0, S\}$ two Expected Cost functions, two Expected Revenue functions and two Expected Profit functions.

$$EC_t^0 = \alpha_t \cdot \Big(\theta_0 \overline{w}_t + (1-\theta_0)\underline{w}_t\Big) + (1-\alpha_t)\Big(\theta_1 \overline{w}_t + (1-\theta_1)\underline{w}_t\Big) \tag{3.18}$$

$$EC_t^S = \alpha_t \cdot \Big(\theta_0 \overline{w}_t + (1-\theta_0)\underline{w}_t\Big) + (1-\alpha_t)\Big(\theta_1 \overline{w}_t + (1-\theta_1)\underline{w}_t\Big) + C_t(S) \tag{3.19}$$

$$ER_t^0 = \alpha_t \cdot \Big(\theta_0 \overline{R}_t + (1-\theta_0)\underline{R}_t\Big) + (1-\alpha_t) \cdot \Big(\theta_1 \overline{R}_t + (1-\theta_1)\underline{R}_t\Big) \tag{3.20}$$

$$ER_t^S = \alpha_t \cdot \Big(\theta_0 \overline{R}_t + (1-\theta_0)\underline{R}_t\Big) + (1-\alpha_t) \cdot \Big(\theta_1 \overline{R}_t + (1-\theta_1)\underline{R}_t\Big) + C_t(S) \tag{3.21}$$

$$\begin{aligned} E\Pi_t^0 = ER_t^0 - EC_t^0 = \alpha_t \cdot \Big(\theta_0 \left(\overline{R}_t - \overline{w}_t\right) + (1-\theta_0)\left(\underline{R}_t - \underline{w}_t\right)\Big) \\ + (1-\alpha_t)\Big(\theta_1 \left(\overline{R}_t - \overline{w}_t\right) + (1-\theta_1)\left(\underline{R}_t - \underline{w}_t\right)\Big) \end{aligned} \tag{3.22}$$

$$\begin{aligned} E\Pi_t^S = ER_t^S - EC_t^S = \alpha_t \cdot \Big(\theta_0 \left(\overline{R}_t - \overline{w}_t\right) + (1-\theta_0)\left(\underline{R}_t - \underline{w}_t\right)\Big) \\ + (1-\alpha_t) \cdot \Big(\theta_1 \left(\overline{R}_t - \overline{w}_t\right) + (1-\theta_1)\left(\underline{R}_t - \underline{w}_t\right)\Big) - C_t(S) \end{aligned} \tag{3.23}$$

As we have said in Section II, doctors' intrinsic motivation can be considered another productive asset or capital of the health organization called *Motivational Capital*. The current net value (CNV^{mk}) of the return of an investment in motivational capital is:

$$CNV^{mk} = \sum_{t=0}^{T} \delta^t \left[E\Pi_t^S - E\Pi_t^0\right] \tag{3.24}$$

in which, $\delta^t = \big(1/(1+r)\big)^t$ is the discount factor, and r is the discount rate. We say that the principal has incentives to invest in motivational capital when $CNV^{mk} \geqslant 0$ and we say that, there is no incentive to invest in motivational capital when $CNV^{mk} < 0$.

3.3 Results

We solve the principal's problem under two alternative scenarios: when $\mathcal{P}$ chooses $s_0 = S$ and when he chooses $s_0 = 0$. We calculate the solution for each case to show necessary and sufficient conditions for investing in motivational capital.

3.3.1 Motivational Incentives: Crowding In

First, we solve the model for the case in which the health manager chooses $s_0 = S$. In this case, $\mathcal{A}$'s spot utilities and spot payments in each t are:

$$\overline{u}_t^S = \overline{U} - \phi_t\left(w_t, S\right) + \big((1-\theta_0)/\Delta\theta\big)\Psi \tag{3.25}$$

$$\underline{u}_t^S = \overline{U} - \phi_t\left(w_t, S\right) - \big(\theta_0/\Delta\theta\big)\Psi \tag{3.26}$$

$$\overline{w}_t^S = \Big(\overline{U} - E_t[\phi_t|w_t, S] + \big((1-\theta_0)/\Delta\theta\big)\Psi\Big)^{-1} \tag{3.27}$$

$$\underline{w}_t^S = \Big(\overline{U} - E_t[\phi_t|w_t, S] - \big(\theta_0/\Delta\theta\big)\Psi\Big)^{-1}. \tag{3.28}$$

Using (3.25) and (3.26) we calculate $\mathcal{A}$'s expected utility $E_t[\mathcal{U}_t^S|\theta_i, \phi_t]$ for every period $t = 0, 1, 2, \ldots, T$. We differentiate two cases, $\mathcal{A}^h$ or when agents have an intrinsic motivation above the average $\phi_t^h \geqslant \overline{\phi}_t$ on the one hand, and $\mathcal{A}^l$ or when agents who have an intrinsic motivation below the average $\phi_l^h < \overline{\phi}_t$ on the other hand.

$$E\mathcal{U}_t^{S,h} = E_t[\mathcal{U}_t^{S,h}|\theta_1, \phi_t^h] = \Big(\theta_1\overline{u}_t^S + (1-\theta_1)\underline{u}_t^S\Big) - \Psi + \phi_t^{h_k}(w_t, S) \tag{3.29}$$

$$E\mathcal{U}_t^{S,l} = E_t[\mathcal{U}_t^{S,l}|\theta_0, \phi_t^l] = \Big(\theta_0\overline{u}_t^S + (1-\theta_0)\underline{u}_t^S\Big) + \phi_t^{l_j}(w_t, S) \tag{3.30}$$

Where $\phi_t^{h_i}(w_t, S)$ is the amount of intrinsic motivation of k-est agent whose intrinsinc motivation is above the average and $\phi_t^{l_j}(w_t, S)$ is the amount of intrinsic motivation of j-est agent whose intrinsinc motivation is below the average.

Finally, using (3.23), (3.29) and (3.30), we calculate the current value of the sum of all periods expected profits (Γ^S), the sum of the all periods expected utilities (Λ^S) and the current value of the total surplus (TS^S) when the action of $\mathcal{P}$ is $s_0 = S$.

$$\Gamma^S = \sum_{t=0}^{T} \delta^t E\Pi_t^S$$

$$\Lambda^S = \sum_{t=0}^{T} \delta^t \Big[\alpha_t \cdot E\mathcal{U}_t^{S,l} + (1-\alpha_t) \cdot E\mathcal{U}_t^{S,h}\Big]$$

$$TS^S = \Lambda^S + \Gamma^S \tag{3.31}$$

3.3.2 Motivational Incentives: Crowding Out

The second case is $s_0 = 0$, when $\mathcal{P}$ uses pure monetary rewards and causes the crowding out of intrinsic motivation. In this case, $\mathcal{A}$'s spot utilities and spot payments in each t are:

$$\overline{u}_t^0 = \overline{U} - \phi_t\left(w_t, 0\right) + \big((1-\theta_0)/\Delta\theta\big)\Psi \tag{3.32}$$

$$\underline{u}_t^0 = \overline{U} - \phi_t\left(w_t, 0\right) - \big(\theta_0/\Delta\theta\big)\Psi \tag{3.33}$$

$$\overline{w}_t^0 = \Big(\overline{U} - E_t[\phi_t|w_t, 0] + \big((1-\theta_0)/\Delta\theta\big)\Psi\Big)^{-1} \tag{3.34}$$

$$\underline{w}_t^0 = \Big(\overline{U} - E_t[\phi_t|w_t, 0] - \big(\theta_0/\Delta\theta\big)\Psi\Big)^{-1}. \tag{3.35}$$

Using (3.32) and (3.33) we calculate $\mathcal{A}$'s expected utility $E_t[\mathcal{U}_t^0|\theta_i, \phi_t]$ for every period $t = 0, 1, 2, \ldots, T$. We differentiate two cases, $\mathcal{A}^h$ or when agents have an intrinsic motivation above the average $\phi_t^h \geqslant \overline{\phi}_t$ on the one hand, and $\mathcal{A}^l$ or when agents who have an intrinsic motivation below the average $\phi_l^h < \overline{\phi}_t$ on the other hand.

$$E\mathcal{U}_t^{0,h} = E_t[\mathcal{U}_t^{0,h}|\theta_1, \phi_t^h] = \Big(\theta_1\overline{u}_t^0 + (1-\theta_1)\underline{u}_t^0\Big) - \Psi + \phi_t^{h_k}(w_t, 0) \tag{3.36}$$

$$E\mathcal{U}_t^{0,l} = E_t[\mathcal{U}_t^{0,l}|\theta_0, \phi_t^l] = \left(\theta_0 \overline{u}_t^0 + (1-\theta_0)\underline{u}_t^0\right) + \phi_t^{l_j}(w_t, 0) \tag{3.37}$$

Where $\phi_t^{h_k}(w_t, 0)$ is the amount of intrinsic motivation of k-est agent whose intrinsinc motivation is above the average and $\phi_t^{l_j}(w_t, 0)$ is the amount of intrinsic motivation of j-est agent whose intrinsinc motivation is below the average.

Finally, using (3.22), (3.36) and (3.37), we calculate the current value of the sum of all periods expected profits (Γ^S), the sum of the all periods expected utilities (Λ^0) and the current value of the total surplus (TS^0) when the action of $\mathcal{P}$ is $s_0 = 0$.

$$\Gamma^0 = \sum_{t=0}^{T} \delta^t E\Pi_t^0$$

$$\Lambda^0 = \sum_{t=0}^{T} \delta^t \left[\alpha t \cdot E\mathcal{U}_t^{0,l} + (1-\alpha_t) \cdot E\mathcal{U}_t^{0,h}\right]$$

$$TS^0 = \Lambda^0 + \Gamma^0 \tag{3.38}$$

3.3.3 Comparative Statics

A health manager who is considering to invest in doctors motivation anticipates that to benefit from this, even in the long run, the additional profits of having intrinsically motivated agents must overcome the addtional costs of motivate them somewhere in time.

Our model shows that an intrinsically motivated doctor is willing to work for lower overall pay. Thus $\mathcal{P}$'s benefits will be increasing when he decides to motivate doctors $s_0 = S$ and decreasing when he decides not to motivate doctors. Therefore, motivational capital profitability requires that the following condition holds once the crowding effects have entirely happened.

$$\underline{w}_t^0 - \underline{w}_t^S + \theta_1(\Delta w^0 - \Delta w^S) > \gamma S \tag{3.39}$$

Changes in each parameter of the model will affect the profitability of such the investment on *Motivational Capital*. Then to study how these parameters affects the benefits of investing in motivation will be a key question to find the conditions under which a health manager may benefit from motivational capital. in the nexte sections we analyze different cases.

Motivational Capital and Optimal Contracts

We want to establish a decision rule for $\mathcal{P}$. He will take an action over $s_0 = \{0, S\}$ depending upon the total present profit that he can extract from each. Our analysis of $\mathcal{P}$'s behaviour then begins with a comparison of the different values of the contracts that he gets in with each decision. Let T be the number of periods that the game is going to be played. We then have:

$$\Gamma^S - \Gamma^0 = \sum_{t=0}^{T} \delta^t \left[E\Pi_t^S - E\Pi_t^0 \right]$$

Looking at the above expression, the decision rule for $\mathcal{P}$ will be to choose $s_0 = 0$ (pure monetary reward incentives) when $\Pi^S - \Pi^0 < 0$ and to choose $s_0 = S$ when $\Pi^S - \Pi^0 > 0$.

As we can see, the above expression equals the expression (3.24), which reflects the current net value of an investment made by $\mathcal{P}$ to generate motivation CNV^{mk}. $\mathcal{P}$ will then choose $s_0 = S$ in the case that $CNV^{mk} > 0$ and will choose $s_0 = 0$ in the case that $CNV^{mk} \leqslant 0$.

We then establish the following result:

Proposition 7. *Let T be the number of periods that the game will be played. Let $L^0 < T$ and $L^S < T$ be the minimun number of time periods enough to allow crowding effects entirely happen for $s_0 = 0$ and $s_0 = S$ respectively. If $\left[\underline{w}_t^0 - \underline{w}_t^S + \theta_1(\Delta w^0 - \Delta w^S)\right] >$*

γS with $\Delta w_t^0 = \overline{w}_t^0 - \underline{w}_t^0$ and $\Delta w_t^S = \overline{w}_t^S - \underline{w}_t^S$, then there exists a threshold t^* such that:

$$CNV^{mk} = \Gamma^S - \Gamma^0 = \sum_{t=0}^{t*} \delta^t \left[E\Pi_t^S - E\Pi_t^0 \right] = 0$$

and for which

i. If $t^* < T$ then $CNV^{mk} > 0$ and $\mathcal{P}$ finds it profitable to invest in motivational capital and choose the $s_0 = S$ strategy.

ii. If $t^* \geqslant T$ then $CNV^{mk} \leqslant 0$ and $\mathcal{P}$ finds it profitable to not invest in motivational capital and chooses the $s_0 = 0$ strategy.

Figure 3.3 illustrates the result using a particular case. The left side shows $\mathcal{P}$'s expected profit functions for $s_0 = 0$ and $s_0 = S$. The right side shows the value of the CNV^{mk} as a function of time t. The t^* threshold determines the critical point which determnes the best strategy for $\mathcal{P}$.

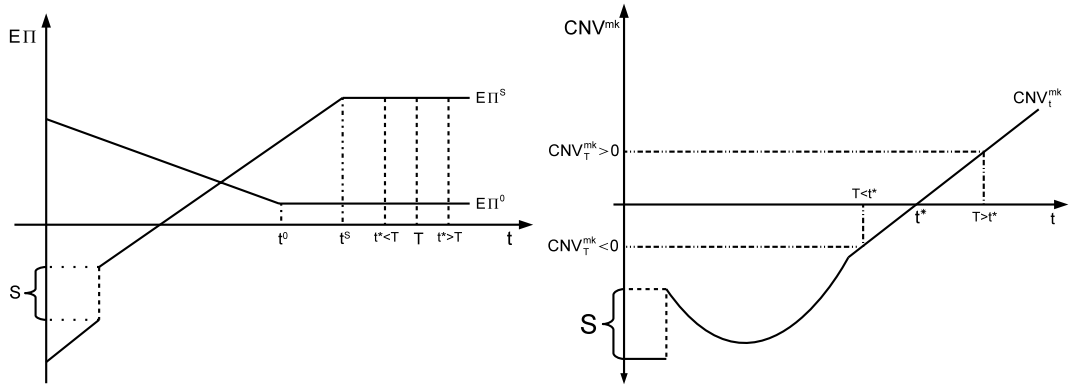

FIGURE 3.3: **Current Net Value of Motivational Capital.** The graph shows together the expected profit functions $E\Pi_t^S$ and $E\Pi_t^0$, joint with the current net value of motivational capital CNV^{mk}. In t^0 and t^S the crowding effects ofb $s_0 = 0$ and $s_0 = S$ are completed. The motivational investments profitability threshold t^* shows the point at which the CNV^{mk} becomes positive and therefore investing in motivational capital $s_0 = S$ is the best choice for $\mathcal{P}$

CNV^{mk} depends on $\mathcal{P}$'s time preference, which is captured in the model by the parameter δ. Lower values indicate that the health manager puts more weight on the present. Impatience therefore makes $s_0 = S$ less attractive.

Remark. *A lower value of δ means that the health manager is more focused on the short term. This implies that t^* will be larger, consequently making any investment of resources in motivational capital (i.e., implementing the $s_0 = S$ strategy) less attractive to him.*

This simple observation leads to an important discussion: the need for politically independent managerial positions in health. The political cycle forces politicians and consequently managers in health, to set short-term goals. They have a low δ because they put a lot of weight in the profits earned during the legislature. In contrast, doctors are career professionals who have long- term goals in health provision. As a result, politicians usually prefer to implement control and command policies and monetary incentives rather than implementing motivational incentives or investing in motivational capital (both of which are initially costly).

Depreciation Cost and Motivational Capital

A high depreciation cost γ may make investments in motivational capital no optimal at all.

Proposition 8. *Let $t^0 < T$ and $t^S < T$ be the minimum number of periods enough to allow crowding effects entirely happen for $s_0 = 0$ and $s_0 = S$ respectively. Then, taking S as constant, if $\gamma \geqslant \frac{\left[\underline{w}_t^0 - \underline{w}_t^S + \theta_1(\Delta w^0 - \Delta w^S)\right]}{S}$, then $CNV^{mk} < 0$ for all $t = 1, 2, ...$ and $\mathcal{P}$ never will find profitable to invest in motivational capital.*

Proposition 8 states that when the depreciation cost is a higher fraction of the initial invested amount in motivational capital than the fraction that expected additional profits are over the same invested amount, then health manager never will

invest in motivational capital because he will not expect any profit from this, neither in the short nor in the long run.

Risk Aversion and Motivational Capital

In the model, agents are risk-averse and thereby receive contingent rewards linked to performance q_t. As $\mathcal{A}$'s intrinsic motivation increases, fewer incentives and less variation in payments are required in order to encourage him to exert high effort. Less variation in payments indicates that $\mathcal{A}$ can be compensated with a lower risk premium, and this constitutes another cost-saving source for the health organization.

Proposition 9 formally states that investing in motivational capital is more profitable in the presence of risk-averse $\mathcal{A}$:

Proposition 9. *Investing in motivational capital is more profitable for $\mathcal{P}$ in presence of risk-averse agents. Let $\mathcal{A}^1$ and $\mathcal{A}^2$ be a pair of agents with ϕ^1 and ϕ^2 intrinsic motivation respectively. If the agents are risk-averse and $\phi^1 < \phi^2$, then the risk premium will be lower in the case of $\mathcal{A}^2$ than in the case of $\mathcal{A}^1$. This additional advantage in costs shortens t^* and consequently CNV_t^{mk} will earlier become positive.*

The intuition behind this result is that incentives must be greater in order to encourage high effort from agents without much intrinsic motivation. However, these higher incentives raise the range between the low $\underline{w}$ and the high $\overline{w}$ payments. Given that $\mathcal{A}$ is risk averse, the risk premium that $\mathcal{P}$ should offer to make the incentive contract attractive for $\mathcal{A}$ will be higher. Analogously, intrinsically motivated agents required fewer incentives to exert high effort. Consequently, she has to bear a lower variance over payments and has to be compensated with a lower risk premium.

Doctors' Outside Options and Motivational Capital

When doctors have less options to employ out of the organization then, intuitively, we may expect that investments in motivational capital would become less attractive for the health manager. This is so because with less outside options ($\overline{U} = 0$), the low incentive payment $\underline{w}_t^{s_0}$ required to incentivize doctors' effort is equal to 0 due to limited liability constraint (8).

Proposition 10. *Investments in motivational capital will be less likely to be optimal to the principal (health manager) when* $\overline{U} = 0$ *and no outside options are available to agents (doctors).*

Proposition 10 states that in contexts with no outside options or with less likely ones, incentivize high effort from doctors is less costly. Then, health managers will find less attractive to invest in motivational capital and they will be more focused in using only monetary incentives.

Information and Motivational Capital

Information affects motivational capital. Higher values of θ_0, or closer to θ_1 may change the conditions under which investing in motivational capital is optimal. We study how a poor correlation between effort and performance affects the decision of investing in motivational capital.

Higher values of θ_0 increase incentive payments in expected terms. This is so, by twofold reason: first because a poorer (more random) signal of doctors' effort increases doctors' rent extraction power and, second, because doctors are risk averse. In this context a reduction in incentive payments coming from having more intrinsically motivated doctors, result in a higher expected savings. Therefore, as mean as performance becomes more random signal of effort, the profitability of investing in motivational increase.

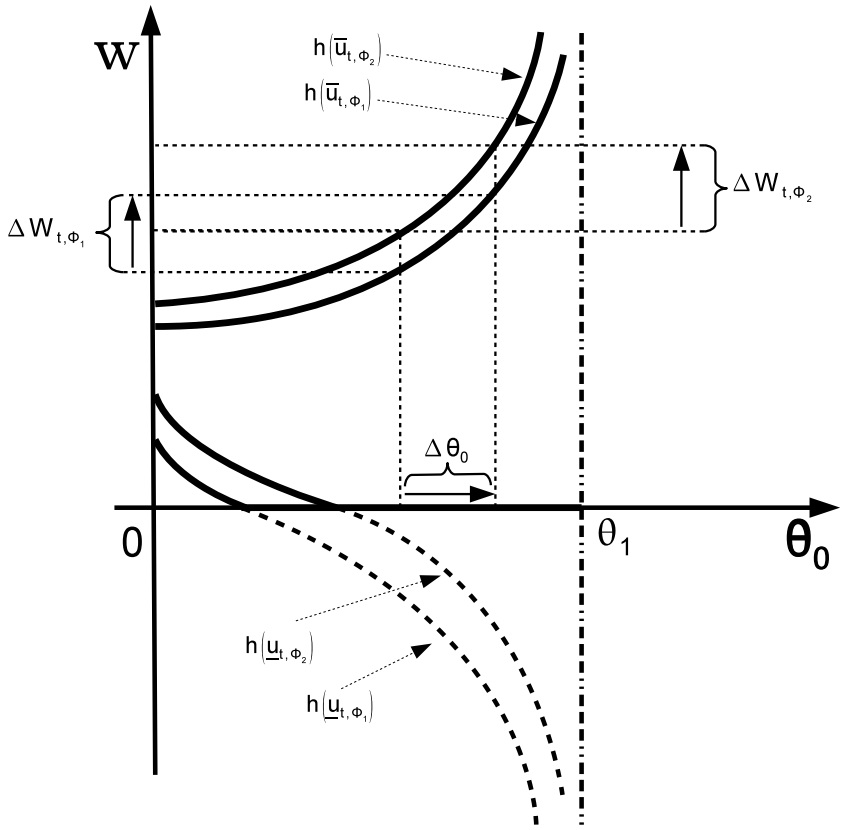

FIGURE 3.4: **Information and intrinsic motivation.** Four different curves appear in the figure. $h(\overline{u}_{t,\phi_1})$ and $h(\underline{u}_{t,\phi_1})$ show incentives for every value of θ_0 when the agent has ϕ_1 intrinsic motivation. $h(\overline{u}_{t,\phi_2})$ and $h(\underline{u}_{t,\phi_2})$ show incentives for every value of θ_0 when the agent has ϕ_2 intrinsic motivation. In the figure we represent the case in which $\phi_2 > \phi_1$.

Proposition 11. *Whenever the LLC condition is applied, higher values of θ_0, more close to θ_1 entail higher values of CNV^{mk}.*

Figure 3.4 illustrates proposition 11. The figure show how incentives respond to an increment on θ_0. As it can be seen in the figure, an increment of the same amount on θ_0 ($\Delta\theta_0$), generates an increment in incentive payment of lower magnitude when the agent is more intrinsically motivated ($\Delta\overline{w}_{t,\phi_1} > \Delta\overline{w}_{t,\phi_2}$). Then, investing in motivational capital is more profitable in cases in which performance is a more random signal of the agent's effort.

3.4 Conclusion

The following conclusions summarize the results of this work.

Results show that in the long run, to dedicate resources to crowd in doctors intrinsic motivation, although costly at inception, will result more efficient than the use of monetary incentives. However, if health care managers are focused on the short run (legislative period), then they will have a tendency to choose purely monetary rewards.

A health manager considering to invest or not in motivation will compute the present value of the expected returns of both alternatives. As long as health manager will have a lower discount factor more weight will put in the short run and less attractive will find to invest in doctors' motivation. This, strengthen the previous conclusion.

In the model investments in motivational capital entails depreciation costs. If the cost of depreciation is so large that the benefit from doctors intrinsic motivation can not compensate it, then an investment in doctors' motivation will not be optimal at all for health manager.

Doctors outside options affect positively to the optimality of making investments in motivational capital. Then, in public health, investments in motivational capital will be more attractive in those medical specialties which have better outside options in the private sector.

When doctors are risk-averse, investments in motivational capital are more likely to be profitable for the health manager. When doctors are intrinsically motivated they are paid with lower uncertainty to exert high effort and this result in a benefit for the health manager.

Whenever doctors own a large amount of private information or performance is a poor signal of effort, then investments in motivational capital are more prof-

itable.This case is particularly interesting because in health, outcomes are hard to measure and often the factors which determine them are not only doctors' effort. Furthermore, physicians are highly qualified professionals in areas of advanced and complex knowledge. As a consequence, they own a large amount of private information. Our results predict that health organizations are excellent candidates to benefit from motivational capital investments due to the informational features that characterize them.

Finally, other parameters and elements present in the model can offer information to determine when motivational investments will be optimal for health manager. The total surplus of contracts depend on the doctors' intrinsic motivation distribution function. The form of this distribution and how the crowding effects affect it, are crucial to determine the effects produced by incentives −economic or motivational− on the total welfare of all the members of the health organization. This is a field to explore in depth that we consider for further research.

Chapter 4

A Pilot Inquiry on Incentives and Intrinsic Motivation in Health Care: the Motivational Capital Explained by Doctors

4.1 Introduction

Despite the huge amount of theoretical and experimental work, the lack of empirical and field research and also the lack of natural experiments leave *behavioral economics* unbalanced in the approach to the Economics of Organizations and Incentives. The present chapter seeks to throw some light in this empirical test of theoretical implications on the topic. Given the inherent difficulty to obtain data about intrinsic motivation, identity and related concepts, we relied upon *Qualitative Research* methods using semi-structured interviews *à-la-Bewley*.

The objective of this chapter is twofold: first, we aim to find evidence in the field about intrinsic motivation and second, we aim to find evidence about how these motivations affect agents' decisions and attitudes towards work through crowding effects. We frame the research into health care organizations where, presumably, agents (physicians) are intrinsically motivated to work in the provision of health. More precisely, the hypotheses that we are seeking to test are the following: (1)

Doctors are intrinsically motivated agents, (2) Economic incentives and control and command policies may crowd out doctors' intrinsic motivation and (3) There are other incentives that may crowd in agents intrinsic motivation.

Finding confirmatory evidence on the above hypotheses may help us to inform decision makers about the optimal design of incentives, regulations and policies which will lead to better outcomes. Borrowing the words of Gneezy and List (2013) *"Once we understand what people value and why, we can develop effective incentives and use them to [...], motivate employees"* (doctors). We forecast that in the case of health this better outcomes could be an improvement in the efficiency and the effectiveness with which health services are provided and an improvement in the quality of health services.

4.2 Methods

4.2.1 Interviews

We performed in-depth semi-structured interviews *à-la-Bewley* Bewley (1999) to physicians at *Servicio Navarro de Salud-Osasunbidea* (SNS-O) (n=16). Interviews were undertaken over a sixteen-month period starting in February 2010. The questions addressed were open-ended and were written based on new theories coming from Behavioral Economics Literature: intrinsic motivation and crowding effects, identity, corporate culture and economics of information.

The place, date and time of the interview were always agreed with the interviewees. Fixing date process is very important in order to obtain high-quality data. Our main goal in dating always was to agree on a time when the interviewee would have enough time and no other commitments (professional, family duties, or other) waiting. We first started performing the interviews at the Department of Economics at Public University of Navarre. We met with the interviewee in a quiet, calm and

confortable room in order to create a wellcoming atmosphere that would facilitate the natural course of the interview. But soon we realized that moving to the respondents' workplace would be a better strategy. Thus, we performed the rest of interviews at doctors' workplace, usually in their personal offices. This strategy eased the dating process and resulted in a more natural and spontaneous behavior from doctors during the interviews. Anyway, in all cases, doctors themselves decided on location, time and day of the interview.

Doctors were invited to take part in the research through a formal invitation letter[1]. The letter briefly informed on the contents of the meeting although no details about the research goals were given to avoid biasing doctors' answers. Letter was sent jointly with a document of anonimity and confidentiality commitment[2]. We asked doctors openly talk and judge the health care and the health organization for which they were working and therefore we guaranteed anonimity in order to get sincere and honest reviews. We allowed doctors a great deal of freedom in answering to our questions. Doctors were keen on participating in the research and they were happy to have the opportunity to openly give their view about the state of the question. They gave their opinion in relation to the health care managers and their management practices. We believe that the main reason why they cooperated was the pleasure of talking to external academics about what they do day after day in their jobs. Most people like to talk about themselves. This is a fact from which is important to take advantage making interviews fun and interesting.

The duration of the interviews ranged from a minimun of 57 minutes to a maximun of 1 hour and 44 minutes. All interviews were performed by two of the authors (MB and JMC) and were recorded using a mp4 recorder/player[3]. Despite it is very

[1] Available from the authors upon request.

[2] Available from the authors upon request

[3] Samsung YP-T10

time consuming, we personally did the interviews because it is very important to take notes at the field. As long as the interviews progress, interviewees make gestures, show emotions or feelings through face expressions, change their voice tone and volume in relation with the question they are exposing and transmit changes in their mood. To capture all these details improves significatively the quality of data but requires the researchers presence in the interview in order to take notes. After the field work done at the moment of the interview, we transcribed the recorded audio to text document sentence by sentence. We typed all transcriptions as soon as possible after the interview. This allowed us to remember, with the help of all notes taken at field, all the details of the interview. This way we loss the minimun relevant information and keep as high as possible the quality of obtained data.

All interviewees were doctors working at SNS-O. Our selection criteria was to meet with highly qualified professionals, in high responsibility positions, and with long tenure within health care system. Consequently all but one were experienced senior staff, mostly men (fourteen out of sixteen), from a wide range of services. All but three were working at hospitals. The remaining were working or had worked to a private health care organization under public concertation, and in primary care centers.

4.2.2 Analysis

Analysis stacks the information within categories and codes Corbin and Strauss (2008). By category we mean *"the higher-level concepts under which analysts group other lower level concepts according to shared properties"*, Corbin and Strauss (2008). Categories represent the relevant phenomena that enables the analyst to group whithin them the data coming from the qualitative concepts or evidence from field. Categories are the dependent variables in the work. Categories are the outcomes produced and explained by qualitative data. We ordered the categories involved in

this work as follows: (i) Intrinsic Motivation, (i.a) Crowding out, (i.b) Crowding in, (ii) Identity, (ii.a) Socialization and (ii.b) Conflict.

Codes are labels used to concentrate and homogeneize interviewees' statements or quotes. In each code homogeneous statements are grouped and all of them refer to a concept which is related to a category. Each statement belonging to a given code is an observation. Taken together, all observations belonging to a given code determine the strength with which such a code serves as evidence for a given category.

Codes are of two types: deductive and inductive. Deductive codes are those which have been defined and labelled on the basis of existing theories and literature on the topic (category) that it is being analyzed. Think for instance in a code labeled as *autonomy*. *Self Determination Theory* (SDT) Deci and Ryan (1985), Deci and Ryan (2000a), Deci and Ryan (2000b) has established that autonomy (decision and action) acts as a fuel for intrinsic motivation. Thus, we use a code labelled *autonomy* to group under it all statements which allude to autonomy in relation to intrinsic motivation or other category. Analogously, when the code emerged spontaneously from respondents' statements, then we classify it as inductive code. For instance, doctors frequently say that economic incentives are effective only in the short run: *'[...] people adapt to extra money ['...]", "[...] internalize extra earnings [...]", "[...] game the system and want more and more [...]",...* Then, we label a code with the word "Short run" to group under it all the statements which deal with the short-term effectiveness of economic incentives.

Sometimes inductive codes are called *"In-vivo"* Birks and Mills (2011). This is so when we label a code with a word that is of widespread use by informants in the course of the research to refer to one specific fact or circumstance. For instance, doctors often use the expression *"Café para todos"* [4] to point out that some incentives

[4] For the remaining of the work, the traslation to English of such an expression, *coffee for all* will be used to refer to the mentioned code

implemented in the SNS neither discriminate, nor differenciate and, consequently, do not recognize doctors who work at high level effort, interest and quality from those who simply meet the minimun. Then, we label the code with the exact words used by respondents to caught and count all those statements and other ones with the same meaning.

A descriptive analysis and some quantification are shown within each category. We explore the number of times and the frequency by which a given code appears into the respondents' discourse, the number of respondents who refer to a given code in relation to a given category, or the observed pairwise correlation between codes in reference to a given category. Some tables, figures and diagrams showing quantification will be displayed to support results from the qualitative analysis. Some additonal analysis has been done and more conclusions drawn from the classification of all the statements into *Positive* or *Normative*.

We organized data using two kinds of documents: a set of commented transcriptions and a set of spreadsheets. In the first, we add notes at the margin of each transcription document. In each note we emphasize a quote from the transcription. We label the selected quote with codes. We relate those codes with categories to underline the connection between the informants' statements and categories. We point out the code and the category each quote belongs to. Figure 1 shows a piece of a commented transcription. These commented transcription documents are the first step in the data analysis.

Next, we transfer all these data from commented transcriptions to spreadsheets. A first spreadsheet contains an individual sheet per respondent. We sort quotes in rows, and categories and codes in columns. For every quote we proceed filling with 1 the cells corresponding with the codes and the category present in it and we fill with a 0 the remaining. This way we generate a 0-1 matrix for each respondent that allows us to quantify and collect information from interviews.

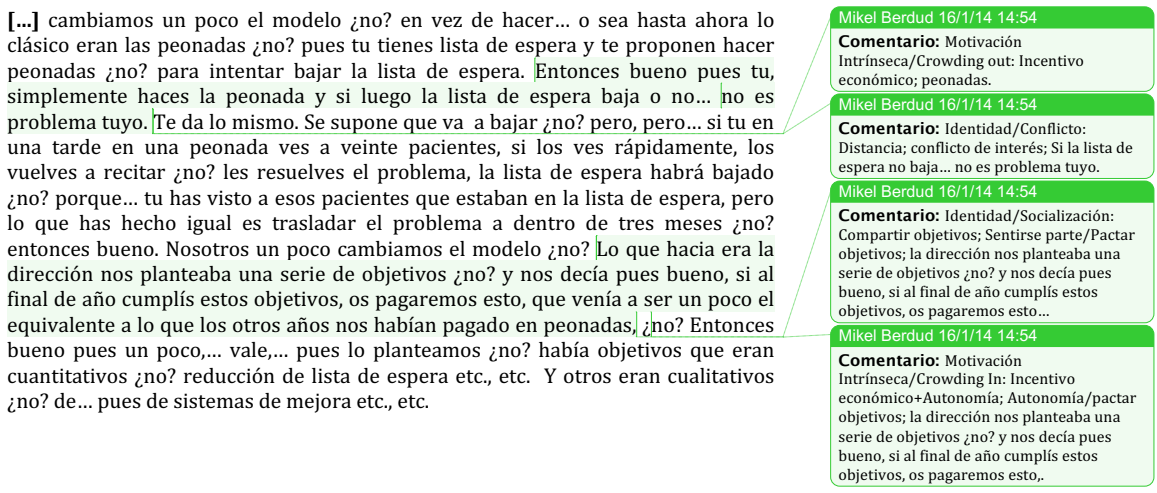

Figure 1: An example of a commented transcription document.

A second spreadsheet is built to analyze the data and the quantification provided by the first one. A single sheet is built for each category in which we develop a general 0-1 matrix for this category. This allows us to count the times that each code appears in the course of interviews related to a given category and also to set interconnections between codes counting the number of times that emerge jointly in reference to a given category. Using these inter-code relationships we establish a simple hierarchy between codes. Finally, we generate other sheet in which we do calculations with all the quantified data. For each category, we develop a series of tables showing the probability of appearance of a given category conditional to the positive or normative nature. This sheet also shows lists − one for each code − with the number of respondents who mention at least one time a given code in relation to a given category.

We define 37 codes which are briefly explained in the glossary (see annex). As we said before, we classify each quote as positive or normative. If of a respondent's statement is a descriptive answer about health organization, conditions at workplace, or the health care sector, we classify it as positive. Contrary, if the statement has

to do with the subjective view that respondent has about how the work, health organization and health care should be managed and organized, then we classify it as normative. If a code appears almost all times as normative in the interviewees discourses, then we interpret this as a signal showing which changes shold be implemented within the health care organizations from the point of view of the physicians. Analogously, if a given code appears almost all times as positive, then we interpret this as a signal of the actual state of the picture concerning health care organization at the moment in which the research was done.

We analyze data seeking evidence about physicians' intrinsic motivation and evidence of crowding effects: crowding-in and crowding-out. In the case of intrinsic motivation we want to find out if doctors are intrinsically motivated professionals. However, for crowding effects we are interested in setting which of the current policies, incentives or regulations implemented in the health care organization can be considered of being crowding-out or crowding-in. Analyzing informants' proposals and experiences we also try to suggest ideas and proposals of innovative and implementable crowding in incentives, policies and regulations.

4.3 Results

A total number of 594 statements concerning to intrinsic motivation and crowding effects were drawn from interviews. Figure 2 shows the distribution of all these statements by categories.

4.3.1 Intrinsic Motivation

All interviewed physicians reported directly or indirectly intrinsically motivated actions and/or behaviors. Figure 3 shows the distribution of the number of intrinsic motivation arguments mentioned by each interviewee.

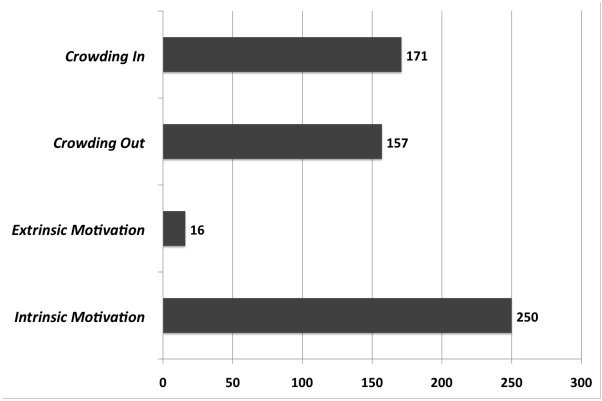

Figure 2: Crowding Out and economic incentives: distribution respondent by respondent.

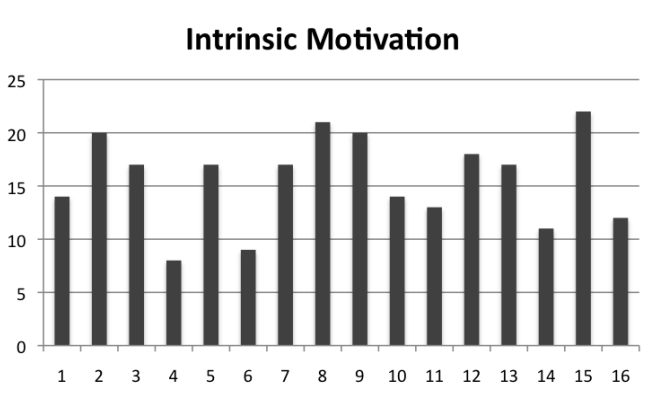

Figure 3: Number of intrinsic motivation statements distribution respondent by respondent.

Table 4.1 shows in the first column the codes which capture doctors' statements when they refer to intrinsic motivation. The second column shows the number of doctors who mention at least once statements referring to each code joint with the percentage between brackets. Third column shows the number and the percentage of statements belonging to each code.

All interviewees made statements showing their joy from practicing medicine. We capture all these statements into the code *like/enjoy*. Almost all doctors pointed out that *vocation* drove they to medical practice. *Humanity*, or being effective in alleviating human suffering was also pointed out as an inherent reward by almost all doctors. Other medical specific tasks also appeared frequently in interviews as

Table 4.1:

Are Physicians Intrinsically Motivated Professionals?

Code	Respondents 16 (%)	Statements 250 (%)
Like/Enjoy	16 (100,00%)	192 (76,80%)
Vocation	15 (93,75%)	48 (19,20%)
Humanity	15 (93,75%)	77 (30,80%)
Attractive profession	15 (93,75%)	91 (36,40%)
Service	13 (81,25%)	64 (25,60%)
Science	13 (81,25%)	61 (34,40%)
Technical knowledge	11 (68,75%)	27 (10,80%)
Further education	10 (62,50%)	26 (10,40%)
Recognition	10 (62,50%)	15 (6,00%)
Professional Development	9 (56,25%)	10 (4,00%)
Research	8 (50,00%)	21 (8,40%)
Challenge	8 (50,00%)	18 (7,20%)
Effort	8 (50,00%)	16 (6,40%)
Relatedness	7 (43,75%)	15 (6,00%)
Prestige	7 (43,75%)	10 (4,00%)
Passion	6 (37,50%)	12 (4,80%)
Empathy	6 (37,50%)	11 (4,40%)
Help	5 (31,25%)	12 (4,80%)
Pro-social	5 (31,25%)	7 (2,80%)
Dedication	5 (31,25%)	10 (4,00%)
Altruism	4 (25,00%)	6 (2,40%)
Teaching	4 (25,00%)	5 (2,00%)

The number of respondents who reported at least one statement of each code and the percentage of respondents who reported statements of each code. Also the number of statements within each code and their percentage of appearance relative to the total number of statements.

attractive for doctors: *service*, *science*, *research* or *help*. Finally, there are arguments caught by codes that are important although to a lesser extent. However, all of them share in common that physicians have inner motivations beyond the monetary which encourage them for work. From doctors' statements we conclude that they are intrinsically motivated agents who like the medical practice or enjoy just from working as physicians.

Like/enjoy group doctors' explanations which show their interest or joy towards the medical practice. All respondents mentioned at least one time a statement related with this code.

> *"...medical practice... is a practice in which... intellectual profits, affective profits are obtained quickly."*
>
> Respondent 1

> *"I find it very enjoyable to learn medicine and practice medicine when [...] working as a physician. You do the things that attract you and if you like windsurfing [...] you are cold but you don't feel it because you are doing windsurf. "*
>
> Respondent 13

Vocation is another inner motivation that doctors feel. Doctors perceive themselves as innerly and innately oriented to medical practice.

> *"within emergency, I am not looking for anyone to thank me anything, is my work and is what I want to do, then, I am happy just because I am doing it, what I have chosen."*
>
> Respondent 8

> *"I remember going into a hospital and it was a feeling... you feel that this is your place."*
>
> Respondent 15

Humanity is a key feature that characterizes doctors. Doctors report that they enjoy and/or are vocationally driven to improve humans welfare and health. Humans and their wellbeing are what almost all physicians feel to be a fundamental motivation who encourages good work and is beyond money. They have a sense of being public servants who contribute to people's welfare.

"I have experienced that people suffer much more with psychological things than with physical pain. Whereupon... I want to be physician to relieve suffering and given that the greatest suffering that there exist is the psychological suffering I dedicate myself to this."

Respondent 11

Service reflect the experienced joy from treating patients and helping them, is another reason of being intrinsically motivated behaviors drew from doctors explanations. We frequently found such reasons in their words.

"it is a global system ehm, so... that is... precisely the service... I understand it unseparable from teaching and from research, clinical... where you see the problems that you have read, that you have seen, you think about them and you research on them... is very attractive."

Respondent 14

Science and *research*, also seems to be key factors in the non-monetary motivations of doctors.

"I like also what I can do in research [...] this overeffort, what I do because I like it also, right? because actually this do not... that is, I do not gain anything, or little, from that [...] prestige or so if you want or open doors toward [...] new worlds, new perspectives"

Respondent 2

Doctors' reported evidence about intrinsic motivation can be classified into two families of codes: a first family having to do with psychological determinants that predispose doctors toward medical practice, and a second family including codes that encompass those tasks and features of the medical profession that doctors like most to perform. We treat the first family of codes as the main psychological and personal causes of doctors' intrinsic motivation toward medical practice, that is,

internal rewards that keep doctors motivated for work. On the other hand, we treat the second family as the means to display, apply and keep high that intrinsic motivation. In other words, the ways to perform in medical practice feeling joy from working at the field.

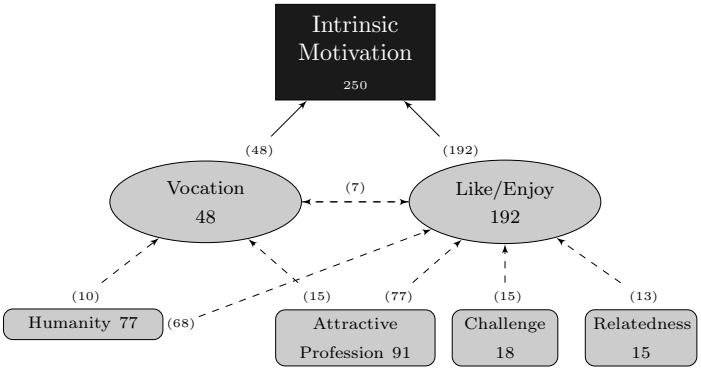

Figure 4: Numbers within nodes represent the number of quotes of the code. Numbers between brackets displayed in arrows represent the number of times that the codes connected by the arrow are quoted jointly. Dashed arrows connect codes. Continuous arrows connect the two main codes with the Intrinsic Motivation category.

Figure 4 displays the first family of codes and their interconnections. This family includes six codes classified into two levels. A first level containing *like/enjoy* and *vocation*, the two main codes which explain doctors' intrinsic motivation, and a second level containing the other four codes which are closely related with the main two: *humanity*, *attractive profession*, *relatedness*, and *challenge*. In the second family we include codes which encompass the specifical tasks and/or features liked to perform by doctors: *service*, *help*, *dedication*, *empathy*, *research*, *science*, *technical knowledge*, *professional development*, *further education* or *teaching*, among others.

Next we analyze the connections that these first family of codes (determinants) have with the second one. Attending to *like/enjoy*, some interesting relationships with other codes are drawn. We summarize the most significative ones in table 2.

As seen in table 4.2, there seems to be two main dimensions of the medical

Table 4.2: Intrinsic Motivation.

Which are the Determinants of Physicians' Intrinsic Motivation?

Code	Like/Enjoy (192)	Percentage
Science	58	30,21%
Service	54	28,12%
Further Education	26	13,54%
Technical knowledge	25	13,02%
Research	20	10,42%
Help/Empathy	18	9,37%

The number of times and the frequency with which Like/Enjoy code appear jointly with other codes referring to tasks and/or features of the medical practice.

practice which jointly form doctor's intrinsic motivation: the human centered or patient oriented part of the profession, and the technical knowledge or scientific advance oriented part of the profession. Figure 5 shows how these two dimensions relate with the different statements of interviewed doctors and the codes under these statements.

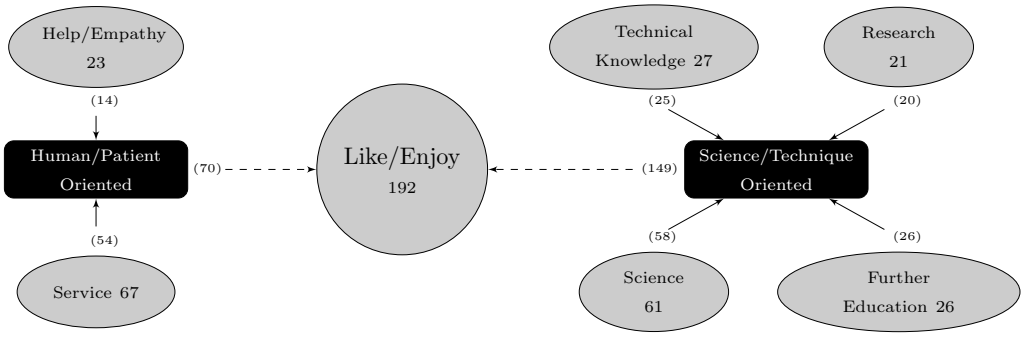

Figure 5: Codes are shown in the circle and ellipse nodes. Rectangle nodes show the dimensions of intrinsic motivation. Connected with such dimensions the figure shows the codes that emerge in each case. Numbers between brackets displayed within each node represent the number of quotes of each code. Numbers between brackets displayed in arrows represent the number of times that codes allude to each source and the number of times each source explain doctors' like/enjoy of medical practice.

Doctors reported they enjoy or like medical practice because they help people who suffer from illness and empathize with them.

"[. . .] doing something that you like... medicine actually has a part... of helping people who are... therefore has a portion of reward. "

Respondent 3

"Not only the technical or the scientific aspect of the profession of the medicine, but also the human relation. To check that things are going well with some patients and wrong or very wrong with others... to live such a, such a respect that life gives, right? the death, the birth, etcetera... eh... anyway, all the affective and emotional delights that may have... that may have the human relation."

Respondent 10

Doctors expressed also their joy by practicing medicine, specifically when they face *science* oriented medical activities and tasks like *research*, *further education* or *teaching*.

"[. . .] I think that medicine is extraordinary, there is a beast of a knowledge in a current moment, the divulgation is tremenduous, the advance... is of a such magnitude that... "

Respondent 9

"Like a personal challenge, because difficult things attract me more than easy things and, then I also like the professional challenge, of be able to advance and discover new things, I like that very much."

Respondent 6

Vocation, as explained before in this work, was also reported frequently by interviewees when speaking about the motives which lead them to become doctors. *Vocation* is a difusse concept that we use as a code because many times respondents speak about it using this word literally. However we try to overcome this vagueness of the vocation with other more precise concepts which jointly appear with it: *dedication*, *effort*, *service* and *help* among others. Table 3 shows codes (features and tasks) closely related with *vocation*.

Table 4.3: Intrinsic Motivation.

Which are the Determinants of Physicians' Intrinsic Motivation?

Code	Vocation (48)	Percentage
Service	12	25,00%
Help/Empathy	11	22,91%
Dedication	10	20,83%
Effort	7	14,58%
Pro-social/Altruism	7	14,58%

Codes closely related with vocation. Columns show the number of times and the frequency with which the codes appear jointly with vocation.

Table 4.3 shows that *vocation* is mainly determined by patient and/or human orientation. Despite some codes like *science* or *technical knowledge* also appear with vocation, we have omitted them because their frequency of appearance is very low. Therefore, vocation is a code mainly related with the human or patient oriented part of the medical practice.

Attitudes towards work and the willingness to work out of hours in favor of patients without any associated payment, are frequently reported statements which have to do with vocation. Doctors speak not only about their actions and ways to behave but also about their beliefs on how an ideal physician should behave and the sense of duty he should has.

> *"[. . .] Further, I do things out of my work hours. So well, that doesn't count [. . .]. I think that I work too much. And then, I swallow all the nasty things that I have. I mean, if all the patients fall into problems, I go to solve them, right? And yesterday, at the evening I was* (working) *until very late, and the day before until eleven at night, fighting with my things, which are my problems [...]"*
>
> Respondent 1

> *"the doctor should be empathetic, overall empathetic, empathetic. . . he must have a huge capacity to be empathetic, because you have to put your feet in the shoes of who is suffering, eh. . . and above of all, I think that you have to be a great communicator."'*

Summing up, we conclude that doctors are intrinsically motivated to practice medicine. They are professionals moved by intrinsic motives. Their professional rewarding system goes beyond the external and expected monetary gain. From their reporting we can also draw that they experience pleasure from practicing medicine. Interviews show that doctors chose medicine moved by a feeling of *vocation*.

Another interesting finding is that doctors intrinsic motivation seems to be determined by two separable dimensions: the patient or human oriented professional activity and the scientific or technique oriented professional activity. In the first dimension, tasks like service or patient care out of hours and features like help others or be empathetic with patients seems to be the most important ones. In the second dimension, research activities, teaching, further education or acquiring technical skills are the most important determinants.

Medical practice is subject to a great amount of responsibility which combines with the necessity to make decisions with celerity in order to avoid negative health consequences. Performing in tasks lik *service* or *research* produce effective results (*relatedness*) in saving lives, alleviate suffering, improve patients' quality of life and/or extend survival years of most severe pathologies. Doctors *help* patients and also be empathetic with patients and their relatives. They have a strong sense of duty toward performing at high *effort* level in their work. All of these ways to behave, emerged in the course of interviews, are shared by almost all interviewed doctors despite they will not be recognized with any explicit reward as a consequence.

4.3.2 Crowding Out

Evidence about the importance and the causes of the crowding-out effect was also found. Interviewees made 157 arguments pointing out crowding-out. Figure 6 shows

the distribution of the number of crowding out arguments mentioned by each interviewee.

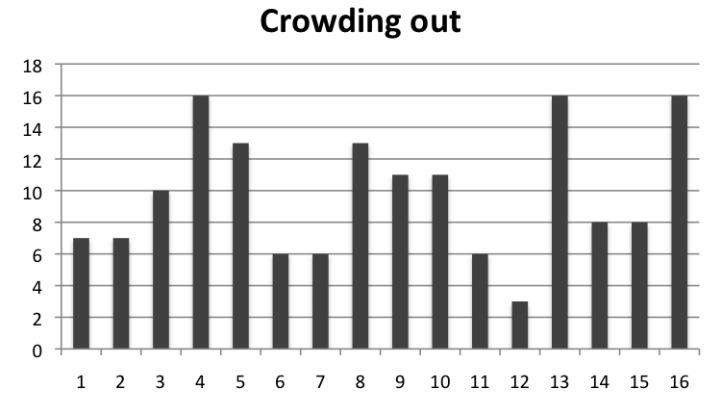

Figure 6: Crowding-out statements distribution respondent by respondent.

An observed regular fact that saturates[5] rapidly is the crowding out nature of the economic incentives. Despite respondents in their statements described multiple channels through which economic incentives may cause crowding out, the fact that money hurts doctors' intrinsic motivation was shared by all.

Table 4.4, shows the number and the percentage of doctos who reported at least once the codes shown in the first column. For instance, all doctors − sixteen or hundreed percent − reported that economic incentives cause crowding out. Other codes also shown in the table are: *task meaning change*, *lack of recognition*, *'coffee for all'*, *bureaucratization*, *'peonada'*[6] and *control*, among others. The third column shows the total number and the percentage of quotes related to each code. For instance, *lack of recognition* was quoted 68 times out of the 157 − a 28,48%. As we

[5] Saturation is a concept of widespread use in Qualitative Analysis Research literature Corbin and Strauss (2008). A code is saturated when it emerges repeatedly in almost all interviews, and always in the same explanatory or causal direction.

[6] The name with which an extra payment scheme implemented by SNS-O is commonly known. This payment scheme consists in a *Fee-For-Service* (FFS) payment that is offered to physicians for working out of hours. The goal of this FFS payment scheme is to reduce waiting lists under a previously determined threshold.

Table 4.4: Crowding out

Do Monetary Incentives and other Command and Control Policies Crowd out Physicians' Intrinsic Motivation?

Code	Respondents 16 (%)	Statements 157 (%)
Economic Incentives	16 (100%)	144 (91,72%)
Task Meaning Change	15 (93,75%)	68 (43,03%)
Lack of Recognition	14 (87,5%)	45 (28,48%)
'Coffee for All'	12 (75%)	31 (19,62%)
Bureaucratization	11 (68,75%)	31 (19,62%)
'Peonada' (FFS)	11 (68,75%)	23 (14,55%)
Control	11 (68,75%)	21 (13,29%)
Profesional career	9 (56,25%)	13 (8,23%)
Opportunistic Behavior	8 (50%)	21 (13,29%)
Market Transaction	8 (50%)	17 (10,75%)
Lack of Autonomy	7 (43,75%)	12 (7,59%)
Damage to prosocial image	5 (31,25%)	10 (6,32%)

The frequency with which respondents indicated the different codes that point out the existence of crowding out effect and its causes.

shall see, most codes shown in table 4 are closely related with *economic incentives* and the reasons by which *economic incentives* cause crowding-out.

Doctors expressed many statements referring to the crowding-out nature of economic incentives.

> *"[. . .] you get used that to develop a given task you need a given economic incentive... and it is likely to arrive to perverse situations... that I can tell you."*
>
> Respondent 4

> *Residents* (Physicians) *leave very early... they don't work extra hours or if they do, they call these hours overtime... when we did extra hours, these were, were, were... well done. I never thought to claim for overtime to nobody... then there are people who, I think they start to working exactly like past times but by reasons that would be they throw the towel* (give up) *earlier and, and there is a higher percentage of people who say, well, this is going to become in a, in a work rather than a vocation.*
>
> Respondent 13

Economic incentives were mentioned as a cause of crowding-out − 144 out of 157 times. Having a statement that points out the existence of crowding out, the probability that this statement refers to some kind of economic incentive is high and close to 1. This is not surprising and it is consistent with what the theory in economics and psychology predicts **?**, Frey and Jegen (2001), Deci (1971), Deci et al. (1999).

Besides *economic incentives*, *control* is the other main code related with crowding out. We consider these two because all the times that any statement belonging to one of them emerges in the course of an interview, it directly points out to crowding out. Furthermore, the jointly appearance proportion of *economic incentives* (10/144) and *control* (10/21) are low. We interpret this low frequency in co-occurrence as an evidence of being independent explanations or causes of crowding out.

Other codes which explain crowding out emerge jointly with *economic incentives* or *control* frequently in the course of interviews. This is the case for instance of *lack of autonomy*, *'peonada'*, *market transaction*, *profesional career*, *damage to prosocial image* or *bureaucratization*.

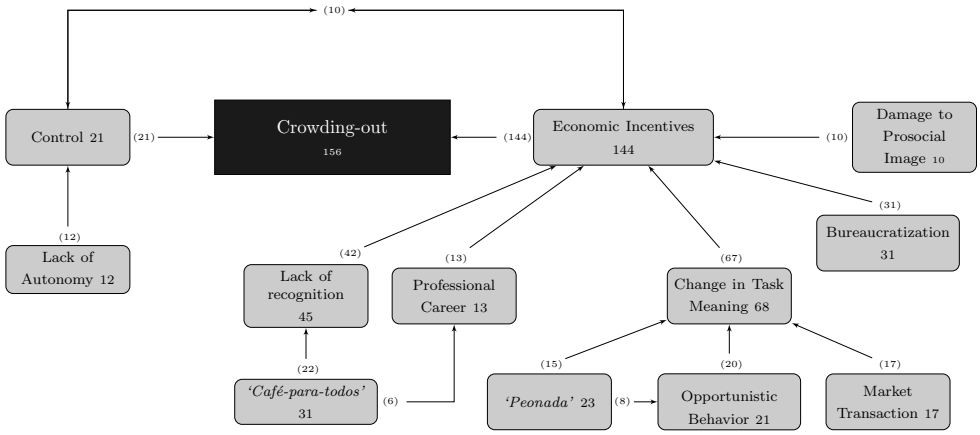

Figure 7: Relations Between Codes Referring to Crowding Out.

Figure 7, shows how the different codes related to crowding out interact between them. Numbers within nodes refer to the number of statements belonging to the

Table 4.5: Crowding out.

Are there other reasons in combination of economic incentives that reinforce the crowding out effect?

Code	Economic incentives (144)	Percentage
Task Meaning Change	67	46,52%
'Peonada'	15	(22,05%)
Opportunistic Behavior	20	(29,85%)
Market Transaction	17	(25%)
Lack of Recognition	42	29,17%
'*Coffee for all'*	22	(48,89%)
Bureaucratization	31	21,52%
Professional Career	13	9,02%
Damage to Prosocial Image	10	6,94%

The number of times and the frequency with which the different codes appear jointly with the main code of economic incentives and referring to crowding out. The codes showed in the table below of *task meaning change* and *lack of recognition*, and justified to the right, are those which appears most times joint with the code just above of them.

code of such a node. Numbers between brackets out of nodes refer to the number of statements which belong either to the code of the node and to the code connected by the arrow. For instance, in the figure it can be seen that there are 45 statements showing *lack of recognition*, and, at the same time, 42 out of these 45 also refer to economic incentives at the same time.

Table 4.5 displays how *economic incentives* combine with other codes in explaining crowding-out. Two of these combinations are particularly interesting. The first is when *economic incentives* combines with *task meaning change*. *Task meaning change* is present in 68 statements and combines with *economic incentives* in 67 times out of the 144. The second is when *economic incentives* combines with *lack of recognition*. *Lack of recognition* is present in 45 statements and combines with *economic incentives* in 42 times out of 144.

From Social Psychology we know that recognition is one of the main determinants

of the intrinsic motivation[7]. In the course of interviews doctors frequently showed feelings about being poorly recognized by the actual effort they exert in medical practice. They consider that the current system of rewards in SNS-O is far from recognizing their work and effort as it should be. We capture such feeling with the code *lack of recognition*. The combination of *lack of recognition* and *economic incentives* seems to be an important cause of crowding-out.

Other important cause in the explanation of crowding-out that combines with *economic incentives* is *task meaning change*. Behavioral Economics **?** shows that incentives frame the decision situation so as to suggest the appropiate behavior. When economic monetary incentives are offered to doctors, they may change their subjective view towards work an move their mind into an economic interaction frame behaving like an economic agent would do, leaving out intrinsic motives.

In table 4.5, there are other codes containing information about the causes and the determinants of *task meaning change* and *lack of recognition*. The first is related with *'peonada'*, *opportunistic behavior* and *market transaction*. The second is related with *'coffee for all'*[8].

Opportunistic behavior occurs when agents act seeking her maximun monetary payoff regardless whether this behavior contributes or not to achieve the goal aimed by the principal. Doctors frequently reported about *opportunistic behavior* as doctors' reactions to *'peonada'*. *Opportunistic behavior*, *'peonada'* and *Market transaction* − that refers to the change in the perception of the task from social act to pure job − are closely related to *task meaning change*.

Finally, *damage to prosocial image* occurs when intrinsically motivated agents feel that being monetarily rewarded may change the image that they project to the

[7] See Deci and Ryan (2000a) and Deci et al. (1999)

[8] A common expression used to describe situations where a group of individuals or institutions are treated equally irrespective of their individual efforts, necessities or results.

society and they start to feel that society view them as greedy agents or, even worse, they start to view themselves as greedy agents **?**.

The mixing of *economic incentives* with *task meaning change* or *lack of recognition* are the most explicative reasons for crowding out.

> '*I perhaps don't generate intentionally that waiting list. But there exists. As a consequence I must be paid for two afternoons, that it is a gift and is money. I have no incentive to make the waiting list to dissappear, and,... and I should have that incentive* (incentive to reduce the waiting list) *because it would be a good thing that the waiting list would dissapear... is a good thing, that means that we are working better.*
>
> Respondent 13

> *"[...] waiting lists are absolutely overgrowth, and generate waiting list is very easy also [...] 'peonada', as an incentive? the problem is, rather than icentive I think that it can be a perversion... of the issue."*
>
> Respondent 3

In table 4.6, there are two other interesting codes. *Bureaucratization* on the one hand, and *professional career* on the other. The first, reveals that the current contractual frame under which the labor relationship between health professionals and health organizations is established, is by itself a cause of crowding-out of economic nature. The second reflects the fact that the SNS-O's implemented incentive scheme called *professional career*, causes crowding-out.

Related to *bureaucratization* doctors frequently referred to this process pointing out that agents lose their interest towards medical profession and accommodate themselves and behave as salaried public workers. Doctors' statements frequently showed *bureaucratization* as a result of treating all agents equally with no incentive − neither monetary, nor non-monetary − in order to reward professional excellence or other merits.

In the case of *professional career*, however, doctors pointed out that *professional career* fails as an incentive mechanism because its requisites are reached by all without doing any effort (by the mere passage of time) and therefore, don't recognize any professional achievement. Thus the *professional career* currently implemented in SNS-O is viewed by doctors as an economic complement that neither incentivize nor motivate and even worse, may crowd out the intrinsic motivation of the highly motivated professionals.

> *"[...] in the system that we are, I say... we are all equal and the equality is downward. That is, the equality is achieved down, never up. Then, when you spent some years, we all are paid the same, we leave the work with the same timetable, and you start to realize that whether you view forty patients and you write a research project, and you study, and you publish... doesn't matter, you are treated equal than the guy who is working besides you, the same that you watch arriving to workplace at quarter to nine, that at quarter past two is leaving, that shirks to asist patients..."*
>
> Respondent 15

> *...now, the professional career we have is also rubbish, because you seat at your chair for fourteen years, and you advance [...] I don't go out of my office for a period of fourteen years and I advance, [...] Apart from the fact that if I go up of professional category is rewarded by a infimum or mediocre economic incentive, which, at the end, you don't do for that.*
>
> Respondent 13

Table 4.6: Crowding out

Control causes crowding-out.

Code	Control (21)	Percentage
Lack of Autonomy	12	57,14%

The number of times and the frequency with which *lack of autonomy* emerges joint with *control* referring to crowding out.

Control is the other main cause of crowding-out in SNS-O's health organizations. However, it is of less importance than economic incentives. This minor importance of *control* relative to *economic incentives* has to do with the fact that it is hard to control physicians and their practice because they own a high amount of complex private information. Doctors told that in many cases they perceived control from managers in some of their medical practice. They often perceive the incentives or the policies implemented as ways to drive the doctors towards managerial goals without taking into account doctors' ones. Interviewees also informed about a high degree of unilateralism in the decision making processes (setting objectives, future planning,...) of health care and health organizations. Doctors perceived this unilateralism as a *lack of autonomy* (12) which demotivates them.

> *"At the end of the year budgets are cut off..."there is not so much freedom ..." perhaps "to do do many surgeries", because the manager gives the order to control, and "cut off the expenses."*
>
> Respondent 6

> *"[...] in our culture to be tough, tough, and... to control... to be 'controller' authorizes you more than other models of management of higher uncertainty. [...] that kind of management, I think that generates much resistence in collectives like this, in such qualified people, who don't want to hear from you what they must do and who they want that you leave them margin to act. Then, there, there is a point of friction.*
>
> Respondent 16

Finally, we are going to put our results in relation to the crowding-out literature. Behavioral Economics **?** and Social Psychology Deci and Ryan (1985), establish several mechanisms through which economic incentives may cause crowding-out of agents' intrinsic motivation. The results of this work fit with three of them: (i)

incentives provide information about the principal who implemented them, (ii) incentives frame the decision situation so as to suggest appropriate behavior and (iii) incentives compromise control averse individual's sense of autonomy.

Our results are consistent with the first mechanism. Doctors shape beliefs about the type of management they are dealing with using incentive and payment schemes implemented in SNS-O as informative signals. In the course of the interviews the *lack of recognition* (45), *profesional career* (13), *'coffe-for-all'* (31) and *'peonada'* (23) throw confirmatory evidence about the first mechanism. Information provided by pay structures and incentives help doctors to ascertain management's goals. We observe that doctors view health management distant, disinterested, far from the doctors' objectives and focused only in their own goals (reduce waiting lists, reduce health expenditure, projecting a good image to the electorate showing great interventions through the media and so on).

Doctors often made statements which evidence this first mechanism:

> *"Professional career is a... well is an overpay... that management invents to compensate, to compensate a little. Then, is made without any criteria of quality..."*
>
> Respondent 14

> *"The major priority is the cost adjustment... as a function of the numeric valuation... nobody questions himself if you are doing the things well or if you are doing the things wrong...*
>
> Respondent 4

> *"[...] complementary actitvity earned* (professional career) *by category. And thus I am in a hospital and thus I am... but here all is... here to extinguish the waiting list is all of the picture. "*
>
> Respondent 9

The second mechanism refers to how the incentive can frame the health management-doctor relation in a pure economic principal-agent interaction. When dealing with an economic incentive, intrinsically motivated agents may change their mind starting to see the activity or the task in which they are performing as an economic transaction. Such change is what we capture with the codes *task meaning change* (67) and *bureaucratization* (31). Rewarded to do extra effort or granted with fixed secure positions, doctors, might start perceiving the social valuable task of helping others as a commodity subject to the labor market rules, with wages and payments being the market price. This change in the perception may disappoint them hurting their intrinsic motivation. This reason also lead us to include *market transaction* (17) as another code with explanatory power. Codes like *opportunistic behavior* (21) or *'peonada'* (23) also provide evidence about this second mechanism.

Doctors told that in many cases colleagues start to behave following pure economic motives in reaction to incentives or payment schemes:

> *"[...] you just do the 'peonada' and after that if the waiting list fall or not... is not your problem [...] the problem is the waiting list by per se and no that the activity grows just because. Of course if they tell you, 'your activity have to increase', you think,'ok, ok, it will increase but I can operate people who maybe do not... who is in the limit of the necessity to be operated or not'*
>
> Respondent 2

> *"I don't make 'peonadas' because I don't believe... I don't view myself in... that isue of money. There are people, physicians, and no physicians, nurses, auxiliars and all the people, who, given that 'peonadas' are so well paid, they start o think that to do one or two 'peonadas' per week compensates because are very well paid, and doing these is usefull for your expenses, for your son's university, or for any other thing. And that, perverts... perverts the system. Perverts the system.*
>
> Respondent 8

Self Determination Theory Deci and Ryan (1985) and Deci et al. (1999) establishes that this mechanism may occur in strategic situations where incentives convey the desire of a principal to control the agent. From this third mechanism we would expect that incentives may compromise control averse doctors' sense of autonomy. As doctors often told in the course of interviews, they view *'peonadas'*, *professional career* or other managerial decisions as tools, designed unilaterally by management, to drive doctors actions.

In doctors' words, incentives, pay structures and managerial decisions which constraint doctors' autonomy or which were perceived as controlling may cause crowding-out :

> *"when we did 'peonadas', many of my mates... 'but if I don't want to do 'peonadas', after be at work in the morning, I don't want to be also at work in the afternoonÕ*
>
> Respondent 2

> *"'Peonada'? within our unit, nobody wants to do. Because... there are units that want to do. This also strongly depends on the units, But our unit, is a unit of women, practically, there are two men only. And this, you know? women, children, married, anything else,... that is... is different from men, eh. And they don't want to do 'peonadas'. They don't want. Young people, that we talked about they before, I have some young people in the unit who what they want to do is to research, to study, to do anything else... and they don't want to spend the afternoon here reviewing patients' medical records which don't add anything to you. Because medical records does not add anything to me.*
>
> Respondent 15

4.3.3 Crowding In

The last category we test in this work is crowding-in. Interviewees made 172 statements pointing out crowding-in. Figure 8 shows the distribution of these statements respondent by respondent.

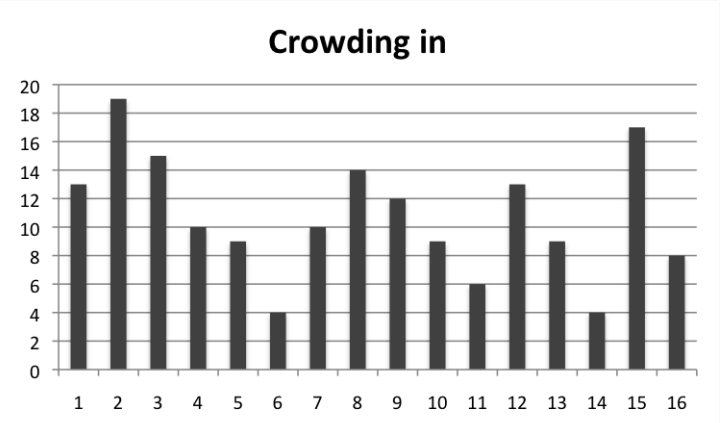

Figure 8: Crowding-out statements distribution respondent by respondent.

Respect to crowding-in a fact that saturates rapidly is that it is mainly caused by *non-economic incentives*. In the course of interviews just a few experiences of crowding-in were explained. However a lot of proposals and ideas of crowding-in were proposed. This imbalance offers a precise picture of the current state of health organizations in SNS-O.

Table 4.7 shows the codes related to crowding-in. The main code explaining this category is *non-economic incentives*. Under this code all the statements which expressed proposals or experiences of *non-economic incentives* were included. *Non-economic incentives* is also related with almost all the other codes. That is, almost all statements included in it emerged jointly with other codes among which *recognition*, *autonomy*, *professional development*, *research* or *further education* seem to be the most important ones. All these codes or labels refer to incentive methods alternative to the economic incentives. Therefore all of these methods should be considered in the design of new incentive schemes.

Recognition appears frequently in doctors explanations with the meaning of being a potential and an effective incentive. In some cases also emerged jointly with *economic incentives* as a way to complement these in order to change their nature from crowding-out to crowding-in. Usually doctors claim for new incentives which

Table 4.7: Crowding In

Are there incentives schemes, pay schedules or other non-economic rewards which may cause crowding in?

Code	Respondents 16 (%)	Statements 172 (%)
Non-economic Incentives	16 (100%)	157 (91,28%)
Recognition	16 (100%)	49 (28,49%)
Autonomy	13 (81.25%)	50 (29,06%)
Professional Development	14 (87.5%)	38 (22,09%)
Research	10 (62.5%)	37 (21,51%)
Further Education	10 (62.5%)	29 (16,86%)
Economic Incentives	9 (56.25%)	15 (8,72%)
Service	8 (50%)	10 (5,81%)
Auto-Organization	8 (50%)	22 (12,79%)
Relatedness	7 (43.75%)	12 (6,98%)
Professional Career	7 (43.75%)	12 (6,98%)
Science	6 (37.5%)	17 (9,88%)
Flexibility	6 (37.5%)	16 (9,3%)
Teaching	4 (25%)	13 (7,56)%
Agree Objectives	4 (25%)	10 (5,81%)

Codes of crowding-in. The number of doctors who at least make one statement related to each code and the percentage is shown in the second column. The third column shows the number of statements referring to each code and the percentage.

will be useful to differentiate or positively discriminate physicians following quality, excellence or other merit based criteria.

> *"we all are different, each one have his capabilities, his motivations, and that has to be reflected, right? that is no, no... uniformity doesn't stimulate, right? to... to the people, right? that is... you have to recognize the differences."*
>
> Respondent 2

> *"Sometimes is preferable to be pated on the back and be told what well you have done, this year you operate a lot... and results have been excellent. [...] that is, being told what well you have done, being told, 'hey!... do you want to go to this place to learn a new technique?'."*
>
> Respondent 5

Giving more *autonomy* to professionals seems to be potentially another good *non-economic incentive*. Doctors frequently asked for more *autonomy* to manage their work at workplace and adjust the work burden to their personal circumstances and interests. To offer this possibility as much as possible, could motivate physicians for work and encourage their intrinsic motivation.

> *"... in the scope of the... of the autonomy... more freedom in management... in the management of your activity, that would be at professional's level, as it is. Or at organization's level, you know? of how you manage yourself..."*
>
> Respondent 4

> *"be able to manage the unit of service, that is to be able to deal managerial agreements with the hospital management, in which you can make a proposal of this year plan, 'we are going to do that, with...' right?with this kind of incentives."*
>
> Respondent 15

Research is another incentive which appears often in the course of interviews. Some doctors refer to basic *research* others to applied clinical *research*, and a few told about the need for linking hospitals to the university as one big policy which would result in a better quality of *research*, technical advance and scientific knowledge. Doctors refer to these issues as ways different to the economic which could motivate them.

> *"It would not be necessarily monetary... instead of being told that they say to me, we are going to disapear the waiting list and you will see all patients the next day, right? if you achieve that goal, eh... we organize a unit of clinical trials, equiped with three nurses, two data managers, and in addition we release the fifty per cent of two of your assistants... I watch such a big carrot..."*
>
> Respondent 13

Finally the last code that we shall analyze from table 7 is *professional development*. This code reveals the limited possibilities that doctors have to develop a professional career, to grow as physicians, expand their activities and knowledge and promote. In the interviews they consider the expansion of these possibilities as a potential incentive which may boost their intrinsic motivation.

> *...from that money a fifteen percent was extracted for the institution, and twenty percent for the 'residents' fund'. That was a thing...that...that was, because the 'residents' fund', what stimulates was that residents published, and present things. And then, there was a congress, then what you present were watched and the interest in...travel expenses were paid to him."*
>
> Respondent 12

Remaining codes of the table 4.7 also explain many crowding-in features and also propose many crowding-in incentives design. However we will analyze relations between codes to establish which of them are catching the same or similar phenomenon. The first remarkable thing is the prevalence of the *non-economic incentives* as the main cause of crowding-in. The second is that the combination of *economic incentives* with *recognition*, also may cause crowding in. Finally, we want to remark also that the redesign of the *professional career* could transform this crowding-out incentive scheme into a crowding-in one.

Table 8 shows between codes relationships. That is, which codes appear at the same time with a given statement in the course of interviews and also how many times appear jointly and relative to the times that they emerge in total.

Looking at table 4.8 we first say that the main code that may be on the basis of crowding-in is *non-economic incentives*. From all statements referring to crowding-in, 91,28% of them are pointing out to some kind of non-economic incentives. The rest of the codes which appear in table 8 can be considered alternative ways to incentivize doctors without money.

Table 4.8: Crowding In

Are there incentives schemes, pay schedules or other non-economic rewards which may cause crowding in?

Code	Crowding-in (172)	Percentage
Non-Economic Incentives	157	91,28%
Autonomy	45	28,66%
Self-management	21	46,67%
Recognition	43	27,39%
Research	36	22,93%
Science	13	36,11%
Professional development	36	22,93%
Further education	13	16,11%

Relations between crowding-in codes. In the first level to the right, first column shows the codes which appear jointly with *non-economic incentives*. In the second level, even further to the right, first column shows the codes which appear jointly with the first level ones. Second column shows the number of times that each code in the first level to the right appears jointly with *non-economic incentives*, and also the number of times that each code in the second level appears jointly with the code of the first level just above in the table. Relative precenteges are shown in the third column.

Autonomy was quoted 45 times (28,66%) to be a *non-economic incentive* which may cause crowding-in. Leaving professionals acting at the workplace with more freedom and with a sense of behaving with *autonomy* seems to be a way to foster doctors' intrinsic motivation. More precisely, when doctors claimed for more *autonomy* they meant *self-management* of time, task schedule or work goals and objectives.

Research activities also emerged often (22,39%) in the course of interviews as a potential *non-economic incentive*. *Research* include the interest through *science* that share many of the doctors. When they claim more *research* activities, sometimes they speak about clinical trials, or facilities to spend research visits in other institutions, facilities to collaborate with other research groups and to publish, research assistance or time to do research within hospitals at working time.

Another form of *non-economic incentive* that doctors report is *professional development* (22,93%). In doctors' words, currently the possibility to develop a career into SNS-O is very low and there are no facilities to *professional development*. In their

view to set some criteria in order to give opportunities to develop a career and push up doctors to grow as professionals is crucial to motivate physicians. Frequently, 13 times out of 36 (16,11%), when doctors speak about *professional development* they point out to *further education*.

Recognition is also something that doctors' claim. Being recognized could be a good *non-economic incentive* looking at doctors' explanations. As we saw in the previous section of this work, *professional career* is, in its current design, an incentive scheme that fails to recognize the merits and/or the excellence of the professionals. Is an incentive that treat equally all doctors: the "good" and the "bad". This lack of recognition is perceived negatively and hurts professionals' intrinsic motivation. However, almost all respondents believe that a well designed *professional career*, which will recognize the effort, the excellence and quality, would do a lot in motivating doctors and pushing all the staff toward a norm of good practice at high quality standards.

All the relevant relationships between crowding-in category and *non-economic incentives* in their different forms are captured in figure 7.

4.3.4 Crowding-in in the field: what it is and what it should be

More insights can be drawn analyzing the normative or positive nature of statements and the information that this classification provides to evaluate the degree of crowding-out within the SNS-O. As we explained above, all the statements drawn from the interviews were classified into normative and positive. As normative we labelled hypothetical statements referring to how things should be or could be in the SNS-O. As positive we labelled descriptive statements that refer directly to the actual state of the SNS-O. We use this information to determine if current management in the SNS-O is causing crowding-out or not. Our approach is as follows: if the fraction

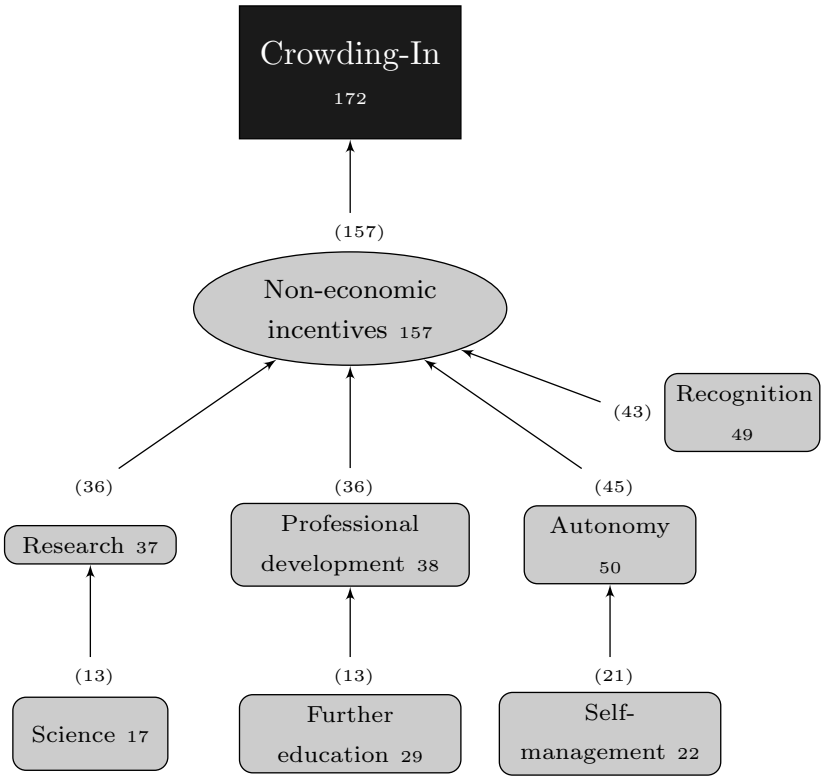

Figure 7: Rectangle form node show the category: crowding-in. Codes are shown in the rest of the nodes. Connected with the category the figure shows *non-economic incentives*. Numbers displayed within each node represent the number of quotes of each code. Numbers between brackets displayed in arrows represent the number of times that a given code appears jointly with the other code that is connected with it by the arrow.

of all statements referring crowding-out that were classified as positive is close to one, then it can be interpreted as evidence of management causing crowding-out. This result will be more consistent if comparing with crowding-in if the reverse happens.

We calculate the probability of having a positive (normative) statement knowing that it is a statement referring to crowding-in for each respondent $i = 1, 2, ..., 16$, using the following expression:

$$P_{\mathrm{j}}(\mathrm{p}|\mathrm{ci}) = \frac{P_j(\mathrm{ci}|\mathrm{p}) \cdot P_{\mathrm{j}}(\mathrm{p})}{P_j(\mathrm{ci}|\mathrm{p}) \cdot P_{\mathrm{j}}(\mathrm{p}) + P_{\mathrm{j}}(\mathrm{ci}|\mathrm{n}) \cdot P_{\mathrm{j}}(\mathrm{n})}$$

Where p means positive, n normative and ci crowding-in. Then $P_j(ci|n)$ will be the probability for any normative statement of the respondent i of referring also to

Table 4.9: Crowding in

Measuring crowding-in degree in the SNS-O through probabilities.

Respondents	Weight	Probability positive *(weighted)*	Probability normative *(weighted)*
1	0.0606	0.0071 *(0.0005)*	0.9928 *(0.0750)*
2	0.0774	0.2551 *(0.02818)*	0.7448 *(0.0822)*
3	0.0723	0.1185 *(0.0103)*	0.8814 *(0.0768)*
4	0.0572	0.5000 *(0.0290)*	0.5000 *(0.0290)*
5	0.0690	0.0745 *(0.0039)*	0.9254 *(0.0484)*
6	0.0336	0.1000 *(0.0023)*	0.9000 *(0.0209)*
7	0.0555	0.0588 *(0.0034)*	0.9412 *(0.0547)*
8	0.0808	0.1997 *(0.0162)*	0.8003 *(0.0651)*
9	0.0740	0.1000 *(0.0069)*	0.9000 *(0.06279)*
10	0.0639	0.0986 *(0.0051)*	0.9013 *(0.04716)*
11	0.0454	0.5000 *(0.0174)*	0.5000 *(0.0174)*
12	0.0572	0.8105 *(0.0612)*	0.1895 *(0.0143)*
13	0.0707	0.1358 *(0.0071)*	0.8642 *(0.0452)*
14	0.0387	0.1000 *(0.0023)*	0.9000 *(0.0209)*
15	0.0808	0.5671 *(0.0560)*	0.4329 *(0.04278)*
16	0.0622	0.9140 *(0.0425)*	0.0859 *(0.0039)*
TOTAL		**0.2837** ***(0.2929)***	**0.7162** ***(0.7071)***

Respondent by respondent weighted probabilities of having a positive/normative statement conditional to being a crowding-in statement.

crowding-out and $P_i(n)$ will be the probability for any statement of respondent i of being normative[9].

We also calculate respondent specific weights,

$$W_{ci}^{i} = \frac{s_{ci}^{i}}{S_{ci}}$$

Where s_{ci}^{j} refers to the number of crowding-in statements made by the respondent j, and S_{ci} refers to the total number of crowding-in statements drawn from the interviews. Using weights we have the weighted probability of a positive statement condi-

[9] Analogously we have the other probabilities of the expresision: $P_i(ci|p)$ will be the probability for any positive statement of the respondent i that refers to crowding-out and $P_j(p)$ will be the probability for any statement of respondent i of being positive.

tional to be crowding-in. Table 9 shows the probability of being positive/normative for any statement or quote which refers to crowding-in. With these probabilities we want to measure the crowding-in degree of the current management in the SNS-O. Probabilities are calculated for each interviewee, and then added to obtain the total probability weighting by respondent or calculating the average.

Probabilities in table 4.9 show that crowding-in is, in words of the respondents, predominantly a normative phenomenum. The probability for a crowding-in statement to be normative is $P(\text{p}|\text{ci}) \approx 0.7$. That is, when doctors make an statement pointing out crowding-in the probability of such an statement of being some advice or opinion about how things should be is near 70%. In other words, there is more work to do in fostering doctors' intrinsic motivation than is currently being done.

But fortunately this is not the whole of the picture. Looking at table 9 doctor by doctor some remarkable numbers jump to our view. More precisely the probabilities corresponding to respondents 11, 12, 15 and 16. The first two correspond to two senior doctors who speak openly about their experiences rather than of their ideas or ideals. Having spent long time in positions with managerial responsibilities and working at high levels of autonomy, they were inclined to speak about succesfull actions, organizative changes they implemented.

We found a particularly interesting case of respondents 15 and 16. During a period of time, one of them held a management position at hospital and the other was head of a unit. During this period they started to bargain and agree upon unit objectives and goals. They were successful in reducing waiting lists without making *'peonadas'*. In words of the respondent who was the head of that unit that was the result of giving to professionals more autonomy and extend their working hours possibilities. Also, it was a consequence of organizing autonomous teams and mutidisciplinary workgroups. These teams worked on each case at a high cooperation rate from a multidisciplinary approach. The changes implemented changed the mind

and the mood of the medical staff. Doctors in the unit started to feel themselves part of the picture because they started to participate in the design of objectives and also in the goal-setting process. Among these objectives also managerial specific ones were included (waiting lists, reducing costs,...) and doctors committed on them, but in exchange they perceived more facilities to work on their research projects, to attend conferences and courses or to publish papers. Many of their statements described this.

The following quotes took from respondent 15 and respondent 16 may help to illustrate this last case.

> *"...there where people who, eh..., that I knew that they were able to offer more from the research point of view, or grants, or... and I gave to them more hours... to that. While other people, were attending more patients. 'You don't want to do research. You don't want to apply for aid, so you will attend more patients. I am going to give more time to the ones for that to the other. To give him more chances to do his things', right? There I discriminated".*
>
> Respondent 15

> *"What I try to do in the unit... is to offer to people much ability for, for,... that is, to strengthen the development, right? the professional development... within the unit, there are also non-economic incentives, but within the pathologies of, of... to give conferences, attend to places* (conferences) *congresses, of... right?"*
>
> Respondent 15

> *"Free time is starting to appear joint with the work-life balance. Once the profession is feminized, there is a new... even in men also, the issue of enjoying from..... more auto-organization* (self-management) *is starting to come. Is becoming a very important question."*
>
> Respondent 16

4.4 Concluding Remarks

Doctors are intrinsically motivated toward medical practice because they express to like and enjoy medicine. They are willing to put extra effort in profesional performance even in absence of external rewards or in exchange of low ones. Vocation is another determinant of doctors' intrinsic motivation. Despite its incidence is lower than the pleasure from practicing medicine, vocation also makes doctors feel well from performing at health care.

Doctors' intrinsic motivation seems to be two-dimensional. Doctors like or enjoy from technical or scientific oriented tasks of medical practice, on the one hand, and also like or enjoy human or patient oriented tasks of medical practice, on the other. Related with the former, doctors consider medicine as an attractive profession because it involves activities like research, learning to acquire further education or technical skills, improving methods and drugs, teaching and so on. The latter involves the welfare of patients as human beings. In this case doctors express that they like or enjoy their work because they help people, they have to empathize with patients in trouble, they work providing a social valuable good and they view themselves as prosocial agents.

With respect to intrinsic motivation, we conclude that doctors motivations towards work and medical practice go beyond the purely economic ones. Therefore the design of optimal incentive schemes should take into account these internal motivations.

Intrinsic motivation and extrinsic motivation are not independent. Then neglecting the role played by the inner motivations of individuals in their behavior can lead to set perverse incentives and unexpected outcomes. Monetary rewards, economic incentives or other extrinsic consequences like sanctions, or regulations, may hurt intrisic motivation. This is the so called crowding-out effect that it is well established

by behavioral and experimental economics **?**, Deci et al. (1999) and Frey and Jegen (2001).

In our study, doctors, in general, value economic incentives as negative, specially when these come joint with a notorious absence of recognition. The current professional career −an incentive scheme implemented in the SNS-O− is considered demotivating by almost all doctors in the interviews mainly because it fails to recognize effort, quality or excellence of work from other opportunistic behaviors.

Another *Fee-For-Service* payment scheme known as *'peonada'* (usually, contracting surgical activity out of hours to reduce the waiting list), is also considered demotivating because it sends a bad signal to doctors about the type of principal and it changes the frame of the medical act which results in a source of opportunistic behaviors. Furthermore, it clearly fails in the goal of reducing waiting lists. *'Peonada'* is also perceived as an attempt to control the professional activity.

Control over doctors is the other main cause of crowding-out. Doctors are highly qualified professionals with a high private information. These features make doctors control averse. Incentives, or organizational issues may demotivate doctors because they often perceive them as controlling or constraining their autonomy.

On the other face of the picture we have the crowding-in effects. Actions or external rewards −mainly non-monetary but also monetary− which properly designed may boost agents' intrinsic motivation. In the study we find few experiences and a lot of proposals for crowding-in.

We sum up in two the most remarkable experiences. Measures and changes that provide with more autonomy, more possibilities for doctors to self-manage their own activity, more participation in the design of objectives and agree upon them, were the common features of these experiences. In both they stopped making *'peonadas'* and fixed the rewards to real objectives that involved challenge. Other interesting characteristics of these experiences were that the decision structure becomes less hi-

erarchical and more participative and that incentives −often non-economic rewards− were agreed between doctors and taking into account their hopes, wishes and professional goals.

Physicians of the SNS-O made many proposals for incentives. Below we list some of them:

i.- Facilities to engage in scientific and researching activities: clinical trials, infraestructure, technical assistance, conferences attendance and so on.

ii.- Activities involving professional development: further education, stays in centers or institutions of excellence to learn new and useful specific knowledge, teaching and the like.

iii.- More autonomy to organize own work, to self-manage and to set and agree objectives joint with colleagues and management.

iv.- Recognition at workplace: the necessity of a renewed professional career designed with clear criteria to reward professional excellence.

The last point above might need more exploration. The current professional career implemented in the SNS-O fails to recognize dedication, professional development, excellence or quality of doctors outcomes. It is a source of dissatisfaction because it rewards equally to all professionals irrespective of their effort, merits or results. It demotivates the more motivated doctors because they feel an absolut lack of recognition. A widely shared claim of doctors is to design a new professional career which fulfill this objective of rewarding −not necessarily only with money− the merits, the professional development and quality of outcomes.

Finally, we want to underline that a very common claim from doctors is the need for politically independent professional managers. If politically designed, managers have goals far from doctors' goals. Managers have short term goals, not beyond

the legislature length and politically focused. Contrary, doctors are career oriented agents intrinsically motivated for work, with stable long term goals. This divergence leads managers to design incentives to meet its own objectives but which are far from being an incentive for doctors. This might be a source of doctors demotivation and medical staff dissatisfaction.

Chapter 5

Concluding Remarks

5.1 Conclusion

This thesis is a step forward in developing richer models of *Behavioral Contract Theory*. Chapter 2 and chapter 3 present models of principal-agent and moral hazard in which new behavioral assumptions have been included.

In Chapter 2 the notion of identity is introduced in a model of principal agent with moral hazard. Also we incorporate the principal's ability to change agents' identity. Results show the conditions under which spending resources in changing agents' identity is profitable for organizations. These conditions are the length of the contracts (the number of periods that the game is played), the total cost for the principal of investing in changing agents' identity, the informative value of the signal used to observe and incentivize effort, and the degree of agents' risk aversion.

A change in agents' identity will result effective to control public organizations expenditure in the long run despite the initial cost of the investment in motivational capital. Thus, Governments, political advisors and public organizations should take this into account and incorporate these findings into policy design. Proposition 1establishes that in the long run, an investment in *motivational capital* to foster agents' identity is the most profitable action for the organization.

Another interesting conclusion from chapter 2 is that the more noisy is performance as a signal of effort, the more profitable is for a principal to change agents' identity through motivational investments. In other words, the higher the agent rent extraction power is, the more profitable will be for a principal to have agents with identity that share organizational goals. This confirms the following,

> *"[...] a change in identity is the ideal motivator if, [...], effort is hard to observe or hard to reward* (Akerlof and Kranton (2005), p. 10).

Agent's risk aversion also affects the profitability of motivational investments. In presence of risk averse agents more profitable results for a principal to implement a plan of actions to change agents' identity and motivate them. Furthermore, the more risk averse agents are, the more profitable will be to invest in identity for the organization.

In Chapter 3, the notion of intrinsic motivation is introduced in a model of principal agent with moral hazard applied to the case of health care organizations. Also, we incorporate the crowding effects of extrinsic incentives.

Results show that in the long run, to dedicate resources to crowd in doctors intrinsic motivation, although costly at inception, will be more efficient than the use of monetary incentives. However, if health care managers are focused on the short run (legislative period), then they will have a tendency to choose purely monetary rewards.

A health manager considering to invest or not in motivation will compute the present value of the expected returns of both alternatives. As long as health manager has a lower discount factor, more weight will put in the short run and less attractive will find to invest in doctors' motivation. This strengthens the previous conclusion.

In the model investments in motivational capital entails depreciation costs. If the cost of depreciation is so large that the benefit from doctors intrinsic motivation can

not compensate it, then an investment in doctors' motivation will not be optimal at all for the health manager.

Doctors outside options affect positively to the optimality of making investments in motivational capital. Then, in public health, investments in motivational capital will be more attractive in those medical specialties which have better outside options in the private sector.

When doctors are risk-averse, investments in motivational capital are more likely to be profitable for the health manager. When doctors are intrinsically motivated they are paid with lower uncertainty to exert high effort and this results in a benefit for the health manager.

Whenever doctors own a large amount of private information or performance is a poor signal of effort, then investments in motivational capital are more profitable.This is particularly interesting because in health, outcomes are hard to measure and often the factors which determine them are not only doctors' effort. Furthermore, physicians are highly qualified professionals in areas of advanced and complex knowledge. As a consequence, they own a large amount of private information. Our results predict that health organizations are excellent candidates to benefit from motivational capital investments due to the informational features that characterize them.

Chapter 4 consists in a qualitative research conducted to doctors of the *Servicio Navarro de Salud - Osasunbidea* (SNS-O) using semi-structured interviews.

Doctors are intrinsically motivated toward medical practice because they express to like and enjoy medicine. They are willing to put extra effort in profesional performance even in absence of external rewards or in exchange of low ones. Vocation is another determinant of doctors' intrinsic motivation. Despite its incidence is lower than the pleasure from practicing medicine, vocation also makes doctors feel well from performing at health care.

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joy from technical or scientific oriented tasks of medical practice, on the one hand, and also like or enjoy human or patient oriented tasks of medical practice, on the other. Related with the former, doctors consider medicine as an attractive profession because it involves activities like research, learning to acquire further education or technical skills, improving methods and drugs, teaching and so on. The latter involves the welfare of patients as human beings. In this case, doctors express that they like or enjoy their work because they help people, they have to empathize with patients in trouble, they work providing a social valuable good and they view themselves as prosocial agents.

With respect to intrinsic motivation, we conclude that doctors motivations towards work and medical practice go beyond the purely economic ones. Therefore the design of optimal incentive schemes should take into account doctors' intrinsic motivation. If principals in health neglect the role played by the intrinsic motivation of doctors in their behavior, they can be in risk of setting perverse incentives and having unexpected outcomes.

In our study, doctors, in general, value economic incentives as negative, specially when these come joint with a notorious absence of recognition. The current professional career −an incentive scheme implemented in the SNS-O− is considered demotivating (crowding-out) by almost all doctors in the interviews mainly because it fails to recognize effort, quality or excellence of work from other opportunistic behaviors.

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We sum up in two the most remarkable experiences. Measures and changes that provide with more autonomy, more possibilities for doctors to self-manage their own activity, more participation in the design of objectives and agreement upon them, were the common features of these experiences. In both they stopped making *'peonadas'* and fixed the rewards to real objectives that involved challenge. Other interesting characteristics of these experiences were that the decision structure becomes less hierarchical and more participative and that incentives −often non-economic rewards− were agreed among doctors and taking into account their hopes, wishes and professional goals.

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5.2 Further Research

A first way in which the research involved in this thesis could be extended, has to do with theoretical models of chapter 2 and chapter 3. In these models the distribution of agents according to identity and intrinsic motivation seems to be of high importance to determine when motivational investments will be optimal for health manager. The form of these distributions and how socialization and crowding effects affect them, are crucial to determine the effects produced by incentives −economic or motivational− on principal's profits, agents' utilities and on the total welfare of all the members of the organization. This is a field that deserves further exploration.

Another possible extension of the theoretical models would be to change the games from moral hazard to adverse selection. This change may help to explore more conditions under which a principal could benefit from changing agents' identity or fostering their intrinsic motivation. For instance, a lump sum offered to an agent in case of rejection before she accepts or rejects the contract makes the difference between a separating or a pooling equilibrium. Comparing these equilibria with the

pooling equilibrium that occurs after socialization or crowding effects materialize may throw light about the profitability of making motivational investments.

Introducing group effects into models of chapter 2 and chapter 3 might be another field to explore. It is reasonable to think that the socialization process or the crowding-in effect may depend on the group behavior, group culture or work teams composition. How the work group organization is and the diffusion of values whithin them happens seem to be relevant in the profitability of making investments to motivate workers.

Another interesting question emerged from theoretical models is that wherever the principal in the public organization or the health organization are politically designated, their time horizon will be the legislative time period and then it is more likely that they focus on the short term goals. Thus, they will have a willingness to choose pure monetary rewards as incentive schemes, despite in the long term the best choice is to invest in *motivational capital*. Workers or doctors are career professionals whose contracts are much longer that legislative piece of time. This divergence in the time horizons might be leading the public organizations to internal conflict environment. Chapter 4 shows evidence pointing out this question and confirms by the way that this is an interesting question to explore.

From the results of chapter 4 it may be concluded that the current professional career implemented in the SNS-O fails to recognize dedication, professional development, excellence or quality of doctors outcomes. It demotivates the more motivated doctors because they feel an absolute lack of recognition. A widely shared claim of doctors is to design a new professional career which fulfill this objective of rewarding −not necessarily only with money− the merits, the professional development and quality of outcomes. The design and implementation of a new professional career taking into account the results of this thesis and after a more in depth research on this, can be another interesting field to explore.

Appendix A

Mathematical Appendix: Chapter 2

A.1 Socialization: the Evolution of Identity Distribution.

Let $F(\upsilon_t|s_0)$ be the probability distribution function of the $\mathcal{A}$s' identity υ_t, where $\upsilon_t \in [\underline{\upsilon}, \overline{\upsilon}]$, $\underline{\upsilon} < \overline{\upsilon}$ and $\underline{\upsilon}, \overline{\upsilon} \in \mathbb{R}_+$.

Assume that for any decision choice of s_0, $F_0(\upsilon_0|S) = F_0(\upsilon_0|0) = F_0(\upsilon_0)$. Socialization will reflect evolution of identity distribution through time, conditional to the choice of s_0.

We separate the socialization into two cases: socialization and conflict. The distribution of identity will evolve oppositely depending on the $\mathcal{P}$'s s_0 investement strategy.

Thus for every value of $\upsilon_t = \upsilon^*$ when $s_0 = 0$ the distribution function at any period t is stochastically dominated by the distribution function of the previous period $t-1$. Alternatively for every value of υ_t when $s_0 = S$ the distribution function at any period t dominates stochastically the distribution function of the previous period $t-1$. This property is formally written as follows,

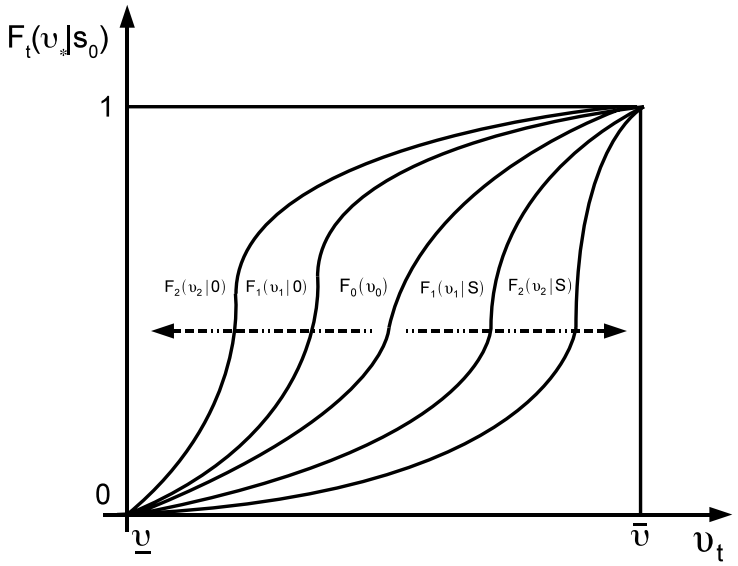

FIGURE A.1: Identity. Stochastic Dominance.

$$F_t(\upsilon_t = \upsilon^*|0) \geqslant F_{t-1}(\upsilon_{t-1} = \upsilon^*|0) \geqslant \cdots \geqslant F_0(\upsilon_0)$$
$$\geqslant \cdots \geqslant F_{t-1}(\upsilon_{t-1} = \upsilon^*|S) \geqslant F_t(\upsilon_t = \upsilon^*|S)$$

As figure A.1 shows stochastic dominance implies that, regardless of $\mathcal{P}$'s choice on s_0, for every pair of distribution functions corresponding to different time periods, they never cross each with the other.

Finally assume that $F_t(\upsilon_t|S)$ converges to put all the probability on the upper bound of the identity $\upsilon_t = \overline{\upsilon}$, and $F_t(\upsilon_t|0)$ converges to put all the probability on the lower bound of the identity $\upsilon_t = \underline{\upsilon}$.

$$\lim_{t \to T^S} F_t(\upsilon_t|S) = \lambda \qquad \text{where} \quad \lambda = \begin{cases} 1 & \text{if } \upsilon = \overline{\upsilon} \\ 0 & \text{otherwise} \end{cases} \quad \text{for some } T^S \in [0, \infty) \text{ and,}$$

$$\lim_{t \to T^0} F_t(\upsilon_t|0) = 1, \text{ for every } \upsilon \in [\underline{\upsilon}, \overline{\upsilon}], \text{ and for some } T^0 \in [0, \infty).$$

Let $E_t[\upsilon_t|s_0]$ be the mathematical expectation in t of the value of υ_t conditional to the incentive policy s_0. Implications of the s_0 conditioned stochastic dominance on $E_t[\upsilon_t|s_0]$:

$$\forall t = 0, 1, ..., T, ... \qquad E_t[\upsilon_{t+1}|0] < E_t[\upsilon_t|0]$$

$$\forall t = 0, 1, ..., T, ... \qquad E_{t+1}[\upsilon_{t+1}|S] > E_t[\upsilon_t|S]$$

$$\forall t = 0, 1, ..., T, ... \qquad E_t[\upsilon_t|0] < E_t[\upsilon_t|S]$$

Where,

$$E_t[\upsilon_t|s_0] = \int_{\underline{\upsilon}}^{\overline{\upsilon}} \upsilon_t f(\upsilon_t|s_0) d\upsilon_t$$

A.2 Problem Solving

Let us now to simplify the notation in order to make algebraic operations easier. We relabel some variables of the model in order to do that. All changes are summarized in table A.1.

Utility from monetary payments:	$u_t(\overline{w}) = \overline{u}$; $u_t(\underline{w}) = \underline{u}$
Disutility from effort:	$\psi_t(\overline{e}, \upsilon_t(s_0)) = \psi_t$
$\mathcal{P}$'s revenue function:	$R_t(\overline{q}) = \overline{R}$; $R_t(\underline{q}) = \underline{R}$
$\mathcal{P}$'s revenue variation:	$\Delta R_t \equiv \overline{R} - \underline{R}$
Payments variability:	$\Delta w_t^S = \overline{w}_t^S - \underline{w}_t^S$
	$\Delta w_t^0 = \overline{w}_t^0 - \underline{w}_t^0$
Change of variables:	$\overline{w} = h(\overline{u})$; $\underline{w} = h(\underline{u})$
Probability variation:	$\Delta\theta = (\theta_1 - \theta_0)$
Reservation utility:	$\overline{U}$

Table A.1: Notational simplification

Then we can rewrite the $\mathcal{P}$'s problem as follows:

$$Max_{\{w_t(q_t),s_0\}} \quad \alpha_t \cdot \Big(\theta_0 \left(\overline{R} - h(\overline{u})\right) - (1-\theta_0)\left(\underline{R} - h(\underline{u})\right)\Big)$$

$$+ (1-\alpha_t) \cdot \Big(\theta_1 \left(\overline{R} - h(\overline{u})\right) - (1-\theta_1)\left(\underline{R} - h(\underline{u})\right)\Big) - C_t(s_0) \tag{A.1}$$

Subject to

$$\theta_1\overline{u} + (1-\theta_1)\underline{u} - \psi_t \geqslant \theta_0\overline{u} + (1-\theta_0)\underline{u} \text{ (ICC)} \tag{A.2}$$

$$\theta_1\overline{u} + (1-\theta_1)\underline{u} - \psi_t \geqslant \overline{U} \quad \text{(PC)} \tag{A.3}$$

$$\underline{u} \geqslant 0 \quad \text{(LLC)} \tag{A.4}$$

Note that the $\mathcal{P}$'s objective function is now strictly concave in $\overline{u}$ and $\underline{u}$, because $h(\cdot)$ is strictly convex. The function $u^{-1} = h(u)$ gives back *ex post* the monetary payments from utility levels. We have now linear constraints and a nonempty interior of the constrained set and therefore the problem is concave and the Kuhn-Tucker conditions are sufficient and necessary for characterizing optimality.

Letting λ and μ be the non-negative multipliers associated respectively with the (ICC) and (PC) constraints. First-order conditions of this problem yield:

$$\frac{1}{u'(\overline{w})} = \mu + \lambda\frac{\Delta\theta}{\theta_1} \tag{A.5}$$

$$\frac{1}{u'(\underline{w})} = \mu - \lambda\frac{\Delta\theta}{1-\theta_1} \tag{A.6}$$

The equations (2.9) and (2.10) jointly with (2.6) and (2.7) form a system of four equations with four variables $(\overline{w}, \underline{w}, \mu, \lambda)$ which allows us to calculate the solution.

Multiplying (2.9) by θ_1 and (2.10) by $(1-\theta_1)$ and adding those two modified equations, we obtain,

$$\mu = \frac{\theta_1}{u'(\overline{w})} + \frac{1-\theta_1}{u'(\underline{w})} > 0 \tag{A.7}$$

Hence, $\mu > 0$ and the participation constraint (2.7) is binding. Using (2.11) and (2.9), we also obtain,

$$\lambda = \frac{(1-\theta_1)\theta_1}{\Delta\theta}\left(\frac{1}{u'(\overline{w})} - \frac{1}{u'(\underline{w})}\right) > 0 \tag{A.8}$$

And the incentive compatibility constraint (2.6) is also binding. Thus we can obtain immediately the values of $u(\overline{w})$ and $u(\underline{w})$ by solving a system with two equations and two unknowns. The result is shown below,

$$u_t(\overline{w}) = \underline{U} + \frac{(1-\theta_0)}{\Delta\theta}\psi_t(\overline{e}, \upsilon_t(s_0)) \tag{A.9}$$

$$u_t(\underline{w}) = \underline{U} - \frac{\theta_0}{\Delta\theta}\psi_t(\overline{e}, \upsilon_t(s_0)). \tag{A.10}$$

A.3 Proof of Proposition 1

We want to establish that, in case in which $\overline{w}_T^0 > \gamma \cdot S + h(\overline{U})$ always there exists a threshold $t^* \in \{0, \ldots, T, \ldots\}$ for which the following equality holds.

$$CNV^{mk} = \Gamma^S - \Gamma^0 = 0 \tag{A.11}$$

We can rewrite the above expression in the following way,

$$CNV^{mk} = \sum_{t=0}^{T} \delta^t \Big[E\Pi_t^S - E\Pi_t^0 \Big] = 0$$

As we know, in the first period of the game $t = 0$ the elicit high effort using incentive payments that $\mathcal{P}$ must offer to elicit $\mathcal{A}$ to exert high effort is exactly equal independently of using socialization incentives ($s_0 = S$) or pure monetary rewards ($s_0 = 0$). This is so because in the first period neither socialization nor conflict cause any effect. Therefore, in $t = 0$ we have that $(\overline{w}_0^0, \underline{w}_0^0) = (\overline{w}_0^S, \underline{w}_0^S)$ and then we know that,

$$CNV^{mk} = \sum_{t=0}^{0} \delta^0 \Big[E\Pi_0^S - E\Pi_0^0 \Big] = -S < 0$$

In words, using socialization incentive scheme has negative returns $t = 0$. But in subsequent periods $t = 1, 2, \ldots$ socialization and conflict processes start to work,

$$\text{Socialization:} \quad \frac{d\big[\theta_i \overline{w}_t^S + (1-\theta_i)\underline{w}_t^S\big]}{dt} < 0$$

$$\text{Conflict:} \quad \frac{d\big[\theta_i \overline{w}_t^0 + (1-\theta_i)\underline{w}_t^0\big]}{dt} > 0 \text{ for } i = 0, 1.$$

And this means that at $t = 1, 2, \ldots$

$$\frac{dE\Pi_t^S}{dt} > 0 \qquad \text{and} \qquad \frac{dE\Pi_t^0}{dt} < 0,$$

therefore,

$$\frac{d\big[E\Pi_t^S - E\Pi_t^0\big]}{dt} > 0$$

Without loss of generality assume that the game reaches the period $t = K$ for which the processes of socialization (in case that $\mathcal{P}$ chooses $s_0 = S$) and conflict (in case that

$\mathcal{P}$ chooses $s_0 = 0$) are completed. Let T^S the number of periods necessary for agents to reach the maximun level of identity due to socialization: $\upsilon_{T^S} = \overline{\upsilon}$. Analogously, let T^0 the number of periods necessary for agents to reach the minimum level of identity due to conflict: $\upsilon_{T^0} = \underline{\upsilon}$. Then $K \geqslant T^S$ and $K \geqslant T^0$.

Then at period $t = K$ disutility from effort for an agent with identity $\upsilon_K = \overline{\upsilon}$ will be zero $\psi_K(e_K, \overline{\upsilon}) = 0$. This involves that in order to elicit from her high effort the principal should offer to him a dupla of incentive payments such that $\overline{w}_K^S = \underline{w}_K^S = w_K^S$. Formally,

$$\overline{w}_K^S = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta} \cdot \overbrace{\psi_K(\overline{e}, \overline{\upsilon})}^{=0}\right) = h\left(\overline{U}\right) = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta} \cdot \overbrace{\psi_K(\overline{e}, \overline{\upsilon})}^{=0}\right) = \underline{w}_K^S$$

Analogously, to incentivize an agent with identity $\upsilon_K = \underline{\upsilon}$, the principal should offer to him a dupla of incentive payments like the following,

$$\overline{w}_K^0 = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta} \cdot \overbrace{\psi_K(\overline{e}, \overline{\upsilon})}^{=\Psi}\right) = h\left(\overline{U} + \frac{(1-\theta_0)}{\Delta\theta} \cdot \Psi\right)$$

$$\underline{w}_K^0 = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta} \cdot \overbrace{\psi_K(\overline{e}, \overline{\upsilon})}^{=\Psi}\right) = h\left(\overline{U} - \frac{\theta_0}{\Delta\theta} \cdot \Psi\right)$$

We also know that, the probabilities in $t = K$ of having full identity $\upsilon_K = \overline{\upsilon}$ or be in conflict $\upsilon_K = \underline{\upsilon}$, conditional to $s_0 = S$ and $s_0 = 0$ are respectively the following,

$$P_K(\upsilon_K = \overline{\upsilon}|S) = 1 \qquad \text{and} \qquad P_K(\upsilon_K = \underline{\upsilon}|0) = 1,$$

At this point there is no agent who shirk because the average level of identity, in each case, matches exactly $\upsilon_K = \overline{\upsilon}$ or $\upsilon_K = \underline{\upsilon}$. Then all the agents within the organization will have and expected identity level of $E_K[\upsilon_K|S] = \overline{\upsilon}$ or $E_K[\upsilon_K|0] = \underline{\upsilon}$ respectively.

All the above lead us to write the $\mathcal{P}$'s expected profits conditional to chosen incentives $s_0 \in \{0, S\}$:

$$E\Pi_K^S = \theta_1 \overline{R} + (1-\theta_1)\underline{R} - w_K^S - \gamma S$$
$$E\Pi_K^0 = \theta_1\big(\overline{R} - \overline{w}_K^0\big) + (1-\theta_1)(\underline{R} - \underline{w}_K^0)$$

In the following we calculate the difference in expected profits due to selected incentive policies at the point of socialization and conflict effects are completed.

$$E\Pi_K^S - E\Pi_K^0 = \big(\theta_1 \overline{w}_K^0 + (1-\theta_1)\underline{w}_K^0\big) - \big(w_K^S + \gamma S\big)$$

For proposition 1 we focus our attention in the case of $\theta_1 \overline{w}_K^0 + (1-\theta_1)\underline{w}_K^0 > \gamma S + h(\overline{U})$. Also we know that $w_K^S = h(\overline{U})$ and therefore we have,

$$E\Pi_K^S - E\Pi_K^0 = \big(\overbrace{\theta_1 \overline{w}_K^0 + (1-\theta_1)\underline{w}_K^0}^{>\gamma S + h(\overline{U})}\big) - \big(\underbrace{w_K^S}_{=h(\overline{U})} + \gamma S\big) > 0$$

As we have seen up to this point, CNV^{mk} starts being negative at $t = 0$. Also we know that once $\mathcal{P}$'s selected incentive policy has completed his associated effect, socialization or conflict, the subsequent added values to the CNV^{mk} will remain positive period after period up to the game ends. We know also, that socialization and conflict processes imply that added values to the CNV^{mk} will be increasing in time. Then at some period $t = \hat{t} < K$ $E\Pi_{\hat{t}}^S = E\Pi_{\hat{t}}^0$.

$$CNV^{mk} = \underbrace{\sum_{t=0}^{\hat{t}} \delta^t \Big[E\Pi_0^S - E\Pi_0^0\Big]}_{<0} + \overbrace{\sum_{t=\hat{t}+1}^{T} \delta^t \Big[E\Pi_0^S - E\Pi_0^0\Big]}^{>0}$$

Up to $t = \hat{t}$, CNV^{mk} will be decreasing and negative but limited. After the game overcomes $t = \hat{t}$ and up to $t = T$, CNV^{mk} will be increasing and limited only by

the length of the game. That is, the positive value of CNV^{mk} will find its limit determined by the total number of periods $t = T$ of the game.

Let us to assume the following limited negative value of the current net value of motivational capital in $t = \hat{t}$,

$$CNV^{mk} = \sum_{t=0}^{\hat{t}} \delta^t \left[E\Pi_0^S - E\Pi_0^0 \right] = -M \text{ where } M \in \mathbb{R}_{++}$$

Assume for simplicity that $\hat{t} + 1 = K$. Then we have that,

$$E\Pi_K^S - E\Pi_K^0 = \left(\theta_1 \overline{w}_K^0 + (1 - \theta_1)\underline{w}_K^0\right) - \left(w_K^S + \gamma S\right) = m \text{ where } m \in \mathbb{R}_{++}$$

Then for a discount factor large enough $\delta > \frac{M-m}{M}$ we have that,

$$\sum_{t=K+1}^{\infty} \delta^t m - M > 0$$

then at some period $t^* \in (K, \infty)$,

$$\sum_{t=K+1}^{t^*} \delta^t m - M = 0$$

and therefore $CNV_{t^*}^{mk} = 0$.

A.4 Proof of Proposition 2

Immediate by comparison of (2.10) and (2.18), joint with the application of *Proposition 1.* Proof available from the authors upon request.

A.5 Proof of Proposition 3

Inmediate. If, at the limit, there is no positive return from changing agents identity at any period $t \in \{0, 1, 2 \ldots, T, \ldots\}$, then the initial investmet never becomes profitable

and the best choice is to not invest any amount to change agents identity. Proof available from the authors upon request.

A.6 Proof of Proposition 4

Inmediate. Proof available from the authors upon request.

A.7 Proof of proposition 5.

Preliminary assumptions over θ_i:

$$P(q_t = \overline{q}|e_t = \overline{e}) = \theta_1 \qquad P(q_t = \overline{q}|e_t = \underline{e}) = \theta_0$$
$$P(q_t = \underline{q}|e_t = \overline{e}) = 1 - \theta_1 \quad P(q_t = \underline{q}|e_t = \underline{e}) = 1 - \theta_0$$

Assume also that performance is an informative signal about effort, $\theta_1 > \theta_0$. Results show that the parameter θ_i affects payments $w_t = \{\overline{w}, \underline{w}\}$.

Let us to analyze the impact of θ_0 on both payments,

$$\overline{w}_t^{s_0}(E_t[\upsilon_t|s_0]) = h\left(\overline{U} + \frac{(1-\theta_0)}{(\theta_1-\theta_0)}\psi_t(\overline{e}, E_t[\upsilon_t|s_0])\right) \tag{A.12}$$

$$\underline{w}_t^{s_0}(E_t[\upsilon_t|s_0]) = h\left(\overline{U} - \frac{\theta_0}{(\theta_1-\theta_0)}\psi_t(\overline{e}, E_t[\upsilon_t|s_0])\right). \tag{A.13}$$

By definition $h'(\cdot) > 0$ and $h''(\cdot) > 0$. Let us to recall $\psi_t(\overline{e}, E_t[\upsilon_t|s_0]) = \Psi$ to simplify notation. Then,

$$\frac{d\underline{w}(\underline{q})}{d\theta_0} = h'(\underline{u})\frac{\partial\left(\underline{U} - \frac{\theta_0}{\theta_1-\theta_0}\Psi\right)}{\partial\theta_0} = -h'(\underline{u})\left[\frac{\Psi\theta_1}{(\theta_1-\theta_0)^2}\right] < 0.$$

The sign of this first derivative of $h(u(\underline{w}))$ from θ_0 is negative for any value $\theta_0 \in [0, \theta_1]$. Then the low stochastic payment depends negatively from θ_0

Now we calculate the second derivative of $\underline{w}$ from θ_0,

$$\frac{d^2\underline{w}(\underline{q})}{d\theta_0^2} = \Big[- h''(\underline{u}) \cdot \Big(\frac{\Psi\theta_1}{(\theta_1 - \theta_0)^2} \Big)^2 \Big] + [-h'(\underline{u})] \cdot \Big(\frac{2\Psi\theta_1}{(\theta_1 - \theta_0)^3} \Big) < 0$$

The second derivative is negative. Then, the value of the utility experienced from the low payment, decreases more quickly on θ_0 as mean as the latter increases. Is straightforward to se that in the limit the low payment $\underline{w}$ converges to $-\infty$ when θ_0 goes to θ_1

$$\lim_{\theta_0 \to \theta_1} h\Big(\overline{U} - \frac{\theta_0 \Psi}{\theta_1 - \theta_0} \Big) = -\infty$$

On the other hand, the first derivative on θ_0 of the high payment is as follows,

$$\frac{d\overline{w}(\overline{q})}{d\theta_0} = h'(\overline{u}) \cdot \frac{\partial u(\overline{w}(\overline{q}))}{\partial \theta_0} = h'(\overline{u}) \cdot \frac{\partial \Big(\overline{U} + \frac{(1-\theta_0)\Psi}{\theta_1 - \theta_0} \Big)}{\partial \theta_0} = h'(\overline{u}) \cdot \Psi \frac{(1-\theta_1)}{(\theta_1 - \theta_0)^2} > 0$$

The sign of the first derivative in the case of high payment, is possitive. Then, as mean as the value of θ_0 increases, the high payment also increases. The sign of the second derivative show whether the payment increases faster or slower as mean as θ_0 increases.

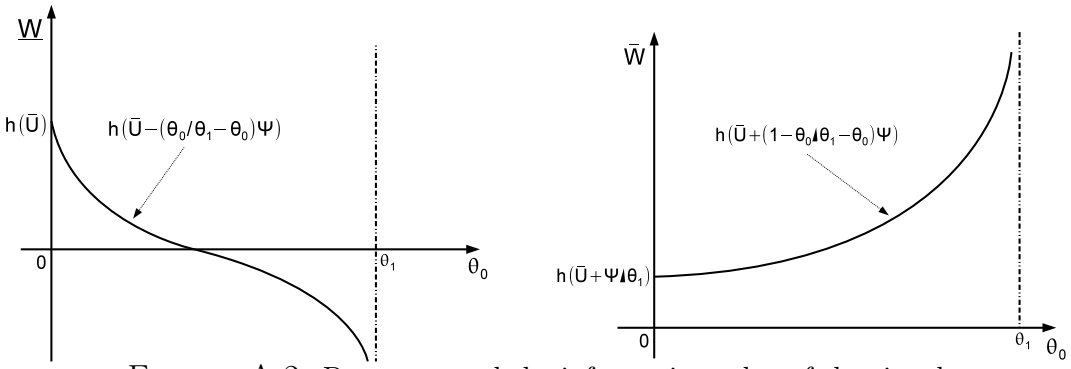

FIGURE A.2: Payments and the informative value of the signal

$$\frac{d^2\overline{w}(\overline{q})}{d\theta_0^2} = \left[h''(\overline{u}) \cdot \frac{\partial\left(\overline{U}+\frac{(1-\theta_0)\Psi}{\theta_1-\theta_0}\right)}{\partial\theta_0}\right] \cdot \left(\Psi\frac{(1-\theta_1)}{(\theta_1-\theta_0)^2}\right) + \left[h'(\overline{u}) \cdot \frac{2\Psi}{(\theta_1-\theta_1)^3}\right] =$$

$$= h''(\overline{u}) \cdot \left(\Psi\frac{(1-\theta_1)}{(\theta_1-\theta_0)^2}\right)^2 + h'(\overline{u}) \cdot \frac{2\Psi}{(\theta_1-\theta_1)^3} > 0$$

Is straightforward to see that the high payment is increasing in θ_0 and this positive relation is also increasing in θ_0. Then, when θ_0 value converges to θ_1, the high stochastic optimal payment converges to ∞.

$$\lim_{\theta_0\to\theta_1} h\left(\overline{U} + \frac{(1-\theta_0)\Psi}{\theta_1-\theta_0}\right) = \infty \tag{A.14}$$

We know that for a given value $\theta_0 = \hat{\theta}_0$ enough close to θ_1, $\underline{w}$ will fall below 0. Then, applying LLC (2.6), for all $\theta_0 \in [\hat{\theta}_0, \theta_1)$ we have $\underline{w} = 0$ and, (A.14).

In the model an agent with $\upsilon_t = \overline{\upsilon}$ experiences no-disutility from effort and he will not need incentives to exert high effort.

$$\psi_t(\overline{e}, \overline{\upsilon}) = 0 \tag{A.15}$$

Consequently payments will not depend on the effectiveness of the signal θ_i because the agent will always choose $e = \overline{e}$ action in every t in exchange of a constant payment $w_t^S = h(\overline{U})$. Then,

$$\lim_{\theta_0 \to \theta_1} \left[\alpha_t \cdot \left(\theta_0 \overline{w}_t^0 + (1-\theta_0) \underline{w}_t^0 \right) + (1-\alpha_t) \left(\theta_1 \overline{w}_t^0 + (1-\theta_1) \underline{w}_t^0 \right) - w_t^S \right] = \infty \quad \text{(A.16)}$$

and (A.16) proves the proposition 5.

A.8 Proof of Proposition 6

First let us to recall some assumptions of the model and some properties of functions of the model. Let us start with $\psi_t(e_t, \upsilon_t)$. We now that, this function is continuous and differentiable, and depends negatively on $\mathcal{A}$'s identity

$$\psi'_{\upsilon} = \frac{\partial \psi_t(e_t, \upsilon_t)}{\partial \upsilon_t} < 0 \quad \text{(A.17)}$$

Then, for every pair of agents $i = A, B$ with $\upsilon_{t,A}$ and $\upsilon_{t,B}$ identities respectively, where $\upsilon_{t,A} > \upsilon_{t,B}$ whe have that,

$$\psi_t(\overline{e}, \upsilon_{t,A}) = \Psi_A < \Psi_B = \psi_t(\overline{e}, \upsilon_{t,B})$$
$$\psi_t(\underline{e}, \upsilon_{t,A}) = \psi_t(\underline{e}, \upsilon_{t,B}) = 0$$

$\mathcal{A}$s' identity affects $\mathcal{P}$'s expected costs,

$$EC_t = \alpha_t \cdot \Big[\theta_0 \cdot \overbrace{h\left(\overline{U} + \frac{(1-\theta_0)}{(\theta_1 - \theta_0)} \cdot \psi(e_t, \upsilon_t) \right)}^{h(\overline{u}=\overline{w})} + (1-\theta_0) \cdot \overbrace{h\left(\overline{U} + \frac{-\theta_0}{(\theta_1 - \theta_0)} \cdot \psi(e_t, \upsilon_t) \right)}^{h(\underline{u}=\underline{w})} \Big]$$

$$+(1-\alpha_t)\cdot\Big[\theta_1\cdot\underbrace{h\left(\overline{U}+\frac{(1-\theta_0)}{(\theta_1-\theta_0)}\cdot\psi(e_t,\upsilon_t)\right)}_{h(\overline{u})=\overline{w}}+(1-\theta_1)\,\underbrace{h\left(\overline{U}+\frac{-\theta_0}{(\theta_1-\theta_0)}\cdot\psi(e_t,\upsilon_t)\right)}_{h(\underline{u})=\underline{w}}\Big]+C_t(s_0)$$

Let EC_t^r the $\mathcal{P}$'s expected cost function when $\mathcal{A}$ are risk averse. We differentiate EC_t^r with respect to υ_t,

$$\frac{\partial EC_t^r}{\partial \upsilon_t}=\frac{\alpha_t}{(\theta_1-\theta_0)}\cdot\left[\theta_0(1-\theta_0)\cdot h'(\overline{u})\cdot\psi'_\upsilon-\theta_0(1-\theta_0)\cdot h'(\underline{u})\cdot\psi'_\upsilon\right]$$

$$+\frac{(1-\alpha_t)}{(\theta_1-\theta_0)}\cdot\left[\theta_1\cdot(1-\theta_0)\cdot h'(\overline{u})\cdot\psi'_\upsilon-\theta_0(1-\theta_1)\cdot h'(\underline{u})\cdot\psi'_\upsilon\right] \tag{A.18}$$

We know that agents are risk averse: $u'>0$ and $u''<0$. The inverse of utility function $h(u(w))=w$ is defined in order to calculate payments. By risk aversion we have that $h'>0$ and $h''>0$. Then for $\overline{u}>\underline{u}$ we have that,

$$h'(\overline{u})>h'(\underline{u})$$

Also we know that performance is an informative signal of effort: $\theta_1>\theta_0$, and then $\theta_1(1-\theta_0)>\theta_0(1-\theta_1)$. Therefore, joint with (A.17), it is straight forward to see that,

$$\frac{\partial EC_t^r}{\partial \upsilon_t}<0$$

The interpretation of (A.18) is that as agents' identity increases, the cost of incentivize them to exert high effort decreases.

Let us now to use as benchmark the risk neutrality case to confront with the risk aversion case. If agents are risk neutral, then $u(w)=k\cdot w$ with $k>0$. Then $u'=k>0$ and $u''=0$. Let EC_t^n the $\mathcal{P}$'s expected cost function when $\mathcal{A}$ are risk neutral. We differentiate EC_t^r with respect to υ_t,

$$\frac{\partial EC_t^n}{\partial \upsilon_t}=\frac{(1-\alpha_t)}{(\theta_1-\theta_0)}\cdot k\cdot\psi'_\upsilon\cdot(\theta_0-\theta_1) \tag{A.19}$$

Which is also negative,

$$\frac{\partial EC_t^n}{\partial \upsilon_t} < 0$$

It is immediate to see that the negative effect of the identity on $\mathcal{P}$'s cost is always of higher magnitude when agents are risk averse.

$$\left|\frac{\partial EC_t^r}{\partial \upsilon_t}\right| > \left|\frac{\partial EC_t^n}{\partial \upsilon_t}\right| \tag{A.20}$$

And then, in presence of risk averse agents, $\mathcal{A}$s' identity diminishes $\mathcal{P}$'s expected costs more than in the case of risk neutral agents.

Next, let us to analyze the consequences of this on CNV_t^{mk}. Conditional to $\mathcal{P}$'s choice on $s_0 \in \{0, S\}$, $\mathcal{A}$s' identity will increase or decrease, and consequently, the expected costs will decrease or increase along time.

$$\frac{\mathrm{d}\upsilon_t(S)}{\mathrm{d}t} > 0 \Rightarrow \frac{\mathrm{d}EC_t}{\mathrm{d}t} < 0$$
$$\frac{\mathrm{d}\upsilon_t(0)}{\mathrm{d}t} < 0 \Rightarrow \frac{\mathrm{d}EC_t}{\mathrm{d}t} > 0$$

From (A.20) we know that,

$$\left|\frac{\mathrm{d}[EC_t^r]}{\mathrm{d}t}\right| > \left|\frac{\mathrm{d}[EC_t^n]}{\mathrm{d}t}\right| \Rightarrow \frac{\mathrm{d}[E\Pi_t^r]}{\mathrm{d}t} > \frac{\mathrm{d}[E\Pi_t^n]}{\mathrm{d}t} \quad \text{if} \quad s_0 = S$$
$$\frac{\mathrm{d}[EC_t^r]}{\mathrm{d}t} > \frac{\mathrm{d}[EC_t^n]}{\mathrm{d}t} \Rightarrow \left|\frac{\mathrm{d}[E\Pi_t^r]}{\mathrm{d}t}\right| > \left|\frac{\mathrm{d}[E\Pi_t^n]}{\mathrm{d}t}\right| \quad \text{if} \quad s_0 = 0$$

And,

$$CNV_t^{mk,r} > CNV_t^{mk,n}$$

For every $t = 1, 2, \ldots, T, \ldots$ as we want to proof.

Appendix B

Mathematical Appendix: Chapter 3

B.1 Stochastic Dominance

Crowding effects move the distribution of doctors intrinsic motivation with a stochastic dominance. Then for any fixed value of $\phi_t = \phi^*$ we have,

$$F_t(\phi_t = \phi^*|w_t, 0) \geqslant F_{t-1}(\phi_{t-1} = \phi^*|w_{t-1}, 0) \geqslant \cdots \geqslant F_0(\phi_0)$$
$$\geqslant \cdots \geqslant F_{t-1}(\phi_{t-1} = \phi^*|w_{t-1}, S) \geqslant F_t(\phi_t = \phi^*|w_t, S)$$

Assume that $F_t(\phi_1|w_t, S)$ converges to the upper bound of intrinsic motivation $\phi_t = \Phi$ and that $F_t(\phi_1|w_t, 0)$ converges to the lower bound of intrinsic motivation $\phi_t = 0$.

$$\lim_{t\to\infty} F_t(\phi_t|w_t, S) = \rho \qquad \text{in which} \qquad \rho = \begin{cases} 1 & \text{if } \phi_t = \Phi \\ 0 & \text{otherwise} \end{cases}$$

and

$$\lim_{t\to\infty} F_t(\phi_t|w_t, 0) = 1, \text{ for every } \phi_t \in [0, \Phi].$$

Let $E_t[\phi|s_0, w_t]$ be the mathematical expectation in t of the value of ϕ_t given the incentive policy s_0 and incentives w_t. Consequently, stochastic dominance on $E_t[\phi_t|\cdot]$ assumes:

$$\forall t = 0, 1, ..., T, ... \qquad E_{t+1}[\phi_{t+1}|w_{t+1}, 0] < E_t[\phi_t|w_t, 0]$$

$$\forall t = 0, 1, ..., T, ... \qquad E_{t+1}[\phi_{t+1}|w_{t+1}, S] > E_t[\phi_t|w_t, S]$$

$$\forall t = 0, 1, ..., T, ... \qquad E_t[\phi_t | w_t, 0] < E_t[\phi_t | w_t, S]$$

In which:

$$E_t[\phi_t | w_t, s_0] = \int_0^{\Phi} \phi_t f(\phi_t | w_t, s_0) d\phi_t$$

B.2 Proof of Proposition 7

We have to study the sign of the following expression:

$$\begin{aligned}
\Gamma^S - \Gamma^0 = \sum_{t=0}^{T} \delta^t \Big[& \alpha_t \cdot \Big(\theta_0 \left(\overline{R}_t - \overline{w}_t^S \right) + (1 - \theta_0) \left(\underline{R}_t - \underline{w}_t^S \right) \Big) \\
& + (1 - \alpha_t) \cdot \Big(\theta_1 \left(\overline{R}_t - \overline{w}_t^S \right) + (1 - \theta_1) \left(\underline{R}_t - \underline{w}_t^S \right) \Big) \Big] \\
& - \sum_{t=0}^{T} \delta^t \Big[\alpha_t \Big(\theta_0 \left(\overline{R}_t - \overline{w}_t^0 \right) + (1 - \theta_0) \left(\underline{R}_t - \underline{w}_t^0 \right) \Big) \\
& + (1 - \alpha_t) \Big(\theta_1 \left(\overline{R}_t - \overline{w}_t^0 \right) + (1 - \theta_1) \left(\underline{R}_t - \underline{w}_t^0 \right) \Big) \Big] - \sum_{t=0}^{T} \delta^t C_t(S)
\end{aligned}$$

We have to show that there is a given threshold $t^* \in t = 0, 1, 2, \ldots, T, \ldots$ such that,

$$\Gamma^S - \Gamma^0 = 0$$

Crowding effects, stochastic dominance, and (3.39) imply that for all $\hat{t} \in \{0, 1, \ldots, T, \ldots\}$ such that $\hat{t} \geqslant t^0$ and $\hat{t} \geqslant t^S$, the following condition holds,

$$E\Pi_{\hat{t}}^S - E\Pi_{\hat{t}}^0 > 0$$

As we know in $t = 0$,

$$E\Pi_0^S - E\Pi_0^0 < 0$$

Then there exists a $\bar{t}$ such that $0 < \bar{t} < \hat{t}$ in which,

$$E\Pi_{\bar{t}}^S = E\Pi_{\bar{t}}^0 \tag{B.1}$$

and then,

$$\sum_{t=0}^{\bar{t}} \left[E\Pi_t^S - E\Pi_t^0 \right] < 0 \tag{B.2}$$

$$\sum_{t=\bar{t}}^{T} \left[E\Pi_t^S - E\Pi_t^0 \right] > 0 \tag{B.3}$$

where (B.2) results in a negative and finitely bounded value and (B.3) is unbounded and only finds its limit when the game ends. Formally,

$$\sum_{t=0}^{\bar{t}} \left[E\Pi_t^S - E\Pi_t^0 \right] = -M \tag{B.4}$$

$$\lim_{t\to\infty} \sum_{t=\bar{t}}^{\infty} \left[E\Pi_t^S - E\Pi_t^0 \right] = \infty \tag{B.5}$$

From (B.1) and (B.5) we now that there exists a $t^* \in \{\bar{t}+1, \dots, T, \dots\}$ such that,

$$\sum_{t=\bar{t}}^{t^*} \left[E\Pi_t^S - E\Pi_t^0 \right] = M$$

And therefore the following holds,

$$\Gamma^S - \Gamma^0 = 0$$

B.3 Proof of Proposition 8

Immediate. The analogous case of proposition 1. Proof available from the authors upon request.

B.4 Proof of Proposition 9

Using (13), (14) and $h(u) : u \longrightarrow w$ we have that incentive payments are,

$$\overline{w}_t = h\left(\overline{U} - E[\phi_t|w_t, s_0] + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right) \tag{B.6}$$

$$\underline{w}_t = h\left(\overline{U} - E[\phi_t|w_t, s_0] - \Big(\theta_0/\Delta\theta\Big)\Psi\right). \tag{B.7}$$

From (45) and (46) we now that for any pair of expected values of intrinsic motivation $\phi^1, \phi^2 \in \phi(w_t, s_0)$ such that $\phi^1 > \phi^2$ we have that,

$$\overline{w}_t^1 = h\left(\overline{U} - \phi^1 + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right) < h\left(\overline{U} - \phi^2 + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right) = \overline{w}_t^2 \tag{B.8}$$

$$\underline{w}_t^1 = h\left(\overline{U} - \phi^1 - \Big(\theta_0/\Delta\theta\Big)\Psi\right) < h\left(\overline{U} - \phi^2 - \Big(\theta_0/\Delta\theta\Big)\Psi\right) = \underline{w}_t^2. \tag{B.9}$$

Assume first that agents are risk neutral to set a benchmark case. That is to say that $u_t(w_t) = w_t$. Then $\mathcal{P}$ will pay lower incentives to the higher motivated $\mathcal{A}$,

$$\overline{w}_t^1 - \overline{w}_t^2 = \phi^2 - \phi^1$$

$$\underline{w}_t^1 - \underline{w}_t^2 = \phi^2 - \phi^1 \qquad \text{if} \quad \underline{w}_t^1 > 0 \quad \text{and} \quad \underline{w}_t^2 > 0$$

$$\underline{w}_t^1 - \underline{w}_t^2 = \eta \quad \text{where} \quad \eta = \overline{U} - \phi^2 - \Big(\theta_0/\Delta\theta\Big)\Psi \qquad \text{if} \quad \underline{w}_t^1 = 0 \quad \text{and} \quad \underline{w}_t^2 > 0$$

$$\underline{w}_t^1 - \underline{w}_t^2 = 0 \qquad \text{if} \quad \underline{w}_t^1 = 0 \quad \text{and} \quad \underline{w}_t^2 = 0$$

In the model agents are risk-averse, $h' > 0$ and $h'' > 0$. Then for the cases above we have that,

$$h\left(\overline{U} - \phi^1 + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right) - h\left(\overline{U} - \phi^2 + \Big((1-\theta_0)/\Delta\theta\Big)\Psi\right) > \phi^2 - \phi^1$$

$$h\left(\overline{U} - \phi^1 - \Big(\theta_0/\Delta\theta\Big)\Psi\right) - h\left(\overline{U} - \phi^2 - \Big(\theta_0/\Delta\theta\Big)\Psi\right) > \phi^2 - \phi^1 \quad \text{if} \quad \underline{w}_t^1 > 0 \quad \text{and} \quad \underline{w}_t^2 > 0$$

$$h\left(\overline{U} - \phi^2 - \Big(\theta_0/\Delta\theta\Big)\Psi\right) > \overline{U} - \phi^2 - \Big(\theta_0/\Delta\theta\Big)\Psi \quad \text{if} \quad \underline{w}_t^1 > 0 \quad \text{and} \quad \underline{w}_t^2 = 0$$

$$0 \quad \text{if} \quad \underline{w}_t^1 = 0 \quad \text{and} \quad \underline{w}_t^2 = 0$$

and then, the costs saved by $\mathcal{P}$ because $\mathcal{A}$s are intrinsically motivated are higher when agents are risk averse and therefore CNV_t^{mk} will earlier reach a positive value.

B.5 Proof of Proposition 10

We proof the proposition 10 in two steps.

i.- $\left[\underline{w}_t^0 - \underline{w}_t^S + \theta_1(\Delta w^0 - \Delta w^S)\right] > \left[\theta_1(\Delta w^0 - \Delta w^S)\right]$ and condition (3.39) becomes harder to hold than in the case of $\overline{U} > 0$ and having a $CNV^{mk} < 0$ for all $t = 1, 2, ...$ is more likely.

ii.- For the case in which (3.39) holds, reasoning as in the proof of proposition 3, it is straightforward to see that $\overline{w}_t^0 - \overline{w}_t^S$ is the unique source of savings for $\mathcal{P}$ and in any case will be lower (as much equal if LLC applies) than in the case of $\overline{U} > 0$. So thus, CNV_t^{mk} will become positive earlier when $\overline{U} > 0$.

B.6 Proof of Proposition 11

By (13) and (14) we know that,

$$\overline{u}_t = \overline{U} - \phi_t\left(w_t, s_0\right) + \frac{(1-\theta_0)}{\Delta\theta} \cdot \Psi$$

$$\underline{u}_t = \overline{U} - \phi_t\left(w_t, s_0\right) - \frac{\theta_0}{\Delta\theta} \cdot \Psi.$$

Applying function $h(u) = w$ in order to calculate payments we have that,

$$\overline{w}_t = h\Big(\overline{U} - \phi_t\left(w_t, s_0\right) + \frac{(1-\theta_0)}{\Delta\theta} \cdot \Psi\Big) \tag{B.10}$$

$$\underline{w}_t = h\Big(\overline{U} - \phi_t\left(w_t, s_0\right) - \frac{\theta_0}{\Delta\theta} \cdot \Psi\Big). \tag{B.11}$$

Differentiating (B.10) and (B.11) with respect to θ_0 we have,

$$\frac{\partial \overline{w}_t}{\partial \theta_0} = h'(\overline{u}_t) \cdot \frac{(1-\theta_1)}{(\theta_1-\theta_0)^2}\Psi > 0 \tag{B.12}$$

$$\frac{\partial \underline{w}_t}{\partial \theta_0} = -h'(\underline{u}_t) \cdot \frac{\theta_1}{(\theta_1-\theta_0)^2}\Psi < 0. \tag{B.13}$$

and then higher θ_0 implies higher $\overline{w}_t$ and lower $\underline{w}_t$. Differentiating (51) and (52) with respect to ϕ_t we have that,

$$\frac{\partial^2 \overline{w}_t}{\partial \theta_0 \partial \phi_t} = -h''(\overline{u}_t) \cdot \frac{(1-\theta_1)}{(\theta_1-\theta_0)^2}\Psi < 0 \tag{B.14}$$

$$\frac{\partial^2 \underline{w}_t}{\partial \theta_0 \partial \phi_t} = h''(\underline{u}_t) \cdot \frac{\theta_1}{(\theta_1-\theta_0)^2}\Psi > 0 \tag{B.15}$$

Interpreting the signs of (B.12) and (B.14) we have that, as mean as higher is $\mathcal{A}$'s intrinsic motivation, an increase of same magnitude in θ_0 provokes an increase in $\overline{w}_t$ of lower magnitude. From the signs of (B.13) and (B.15) we interpret that as mean as higher is $\mathcal{A}$'s intrinsic motivation, an increase of equal magnitude in θ_0 provokes an decrease in $\underline{w}_t$ of lower magnitude. Let $\theta_0^{LLC} \in (0, \theta_1)$ be the minimun value of θ_0 such that LLC is applied. Then we have that,

$$\frac{\partial \underline{w}_t}{\partial \theta_0}\Big|_{\theta_0 \geqslant \theta_0^{LLC}} = 0$$

This establishes that, for higher values of θ_0 the benefits from choosing $s_0 = S$ come only from the lower impact the higher θ_0 has on $\overline{w}_t$ when agents intrinsic motivation is higher. Thus, with θ_0 more close to θ_1 more intrinsically motivated agents imply higher values of CNV_t^{mk} for every $t = 0, 1, 2, \ldots, T, \ldots$

Appendix C

Appendix: Chapter 4

C.1 Codification

Codes related with intrinsic motivation and crowding effects are explained. Several tables in this section show a list of codes concerning to Intrinsic motivation, Crowding-out and Crowding-in including the code name, the category the code is related to, the code type: deductive, inductive oandr in-vivo. Finally a brief explanation of the code and some argumentation about why the code is related with the proposed category is shown.

Intrinsic Motivation and Crowding Effects: codes.

Code	Related Category	Type of Code	Explanation of Code
Agree objectives	Crowding in	Inductive	A form of autonomy. Setting organizational goals jointly between agents and principal motivates for work.
Altruism	Intrinsic motivation	Deductive/Inductive	The willingness to help others although this carries a cost. A theoretical concept but also emerged from situations described by doctors.
Attractive profession	Intrinsic motivation	inductive	Doctors' statements mostly shown some perception about medical practice as an attractive activity, profession or task. We consider all those statements as evidence of intrinsic motivation and we capture all of them into attractive profession code.
Autonomy	Crowding in	Deductive	In DeCharms (1968) the need for autonomy is considered, joint with the need for competence, the basis for intrinsic motivation. Research on intrinsic motivation Deci and Ryan (1985), Deci et al. (1999), have shown the benefits of supporting autonomy for motivated persistence, performance, and wellbeing.
Bureaucratization	Crowding out	Inductive/In-vivo	Emerged from participants. 'Bureaucratization' reflect the idea that there is a proportion of acommodated doctors with high degree of conformism. Suffering from bureaucratization doctors give up in the pursuit of their professional goals. The consequence of achieving a safe position ironcladed by a bulletproof contract. The result of being polluted by the absence of professional incentives.

Code	Related Category	Type of Code	Explanation of Code
Challenge	Intrinsic motivation	Deductive	SDT in Deci and Ryan (1985), Deci and Ryan (2000a), Deci and Ryan (2000b) and Deci et al. (1999) show that intrinsically motivated people is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards. Intrinsic motivation is in part the human inherent tendency to seek out challenges, to develop one's capacities to explore and to learn.
'Coffee for all'	Crowding out	Inductive/In-vivo	Emerges from respondents. *'Coffee for all'* is a cliche used by doctors to refer to the equal treatment received for all professionals independently of their individual effort, merits or professional excellence. It is used in a pejorative sense to explain the lack of recognition suffered by doctors from management. Closely related with crowding out.
Control	Crowding out	Deductive	The opposite of autonomy. Rewards and external regulation in general act as extrinsic motivators which externally control people's behavior. People behave to attain a desired consequence such as tangible rewards or to avoid a threatened punishment. This type of extrinsic motivation has been extensively examined and found to be undermining of intrinsic motivation Deci et al. (1999).
Damage to pro-social image	Crowding out	Deductive	MCT Frey (1997), Frey and Jegen (2001) and Behavioral economics Bowles (2008), Bowles and Polanía-Reyes (2012), establish that reputation is a non-economic motivation when people act following their intrinsic motives. In the provision of social valuable goods agents wish to view themselves as a social goal oriented. Money and rewards can hurt this self-view undermining people intrinsic motivation.

Code	Related Category	Type of Code	Explanation of Code
Dedication	Intrinsic motivation	Inductive	Dedication label situations in which good medical practice involves personal costs. Doctors refer to some of this situations. Explicitly and also implicitly.
Economic Incentives	Crowding out	Deductive	Literature from economic theory Benabou and Tirole (2003), Bowles and Polanía-Reyes (2012), Frey and Jegen (2001), and from psychology Deci (1971), Deci et al. (1999) has shown that the use of monetary or material rewards to incentive workers undermine intrinsic motivation.
Effort	Intrinsic motivation	Inductive	Doctors frequently underline situations in which they have to put extra effort, out of hours and without any reward linked. They commit to do that following some sense of duty or ethical values. They describe these situations as inherent to the medicine and something that one know before becoming doctor.
Empathy	Intrinsic motivation	Inductive	Empathy and the ability to empathize is a crucial characteristic that all physicians consider a good doctor should have and from which they get satisfaction. This characteristic refers to the ability to put yourself (doctor) in the shoes of others (patients) and feel their problems or discomfort as own.
Flexibility	Crowding-in	Inductive	More flexible rules at workplace, in work and tasks organization, or in the management of the organization in general and of the consultation in particular.
Further education	Intrinsic motivation/ Crowding in	Inductive	Respondents when openly talk about the features and dimensions of the medical practice that they enjoy the most they point out some specific aspects. Further education and the posibility to aquire and learn new knowledge was quoted by almost all of them.

Code	Related Category	Type of Code	Explanation of Code
Help	Intrinsic motivation	Inductive	This code emerges from respondents' statements. They view themselves as people who help others and contribute this way to the social welfare. This way to behave and feeling to be effective in doing so is considered an internal reward inherent to the medical practice.
Humanity	Intrinsic motivation	Inductive	Often mostly respondents, when speaking about their likings and their expectatives from becominng and being doctors, said that service and the human touch involved by the profession is one of the most valuable reward inherent to medical practice. We capture these statements under humanity code.
Lack of autonomy	Crowding out	Deductive	SDTDeci and Ryan (2000a), Deci et al. (1999), establish that autonomy in work decision taking is an important source of intrinsic motivation. Whenever management practices and implemented incentives and command and control policies are autonomy constraining, they may cause crowding out.
Lack of recognition	Crowding out	Deductive	SDT Deci et al. (1999) establish that recognition or being recognized by ones effort or achievement is a more effective incentive than the monetary for activities that individuals perform by the mere fact of enjoyment. Analogously the lack of any recognition undermines individuals intrinsic motivation to perform in any activity.

Code	Related Category	Type of Code	Explanation of Code
Like/Enjoy	Intrinsic motivation	Deductive	Classical definitions of intrinsic motivation Deci and Ryan (1985), Deci and Ryan (2000b), say that individuals are intrinsically motivated when they get satisfaction (utility) from the very act of doing a given activity or performing in a task. Intrinsically motivated activities were defined as those that individuals find interesting and would do in the absence of operationally separable consequences.
Non-economic incentives	Crowding in	Inductive	Emerged from respondents and data collection. This code collects all mentioned forms of non-monetary rewards which would be welcoed by physicians to improve their work.
Market transaction	Crowding out	Deductive	Coming from MCT and SDT. Closely related with Change in task view. After being rewarded with money people start to understand their work activity and effort as a commodity that trade by a price. Once they swift this view of the activity intrinsic motivation is undermined.
Opportunistic behavior	Crowding out	Deductive	Coming from *Game Theory* opportunistic behavior is an expression conventionally used to refer such player's actions driven by the goal of seeking his own maximun material benefit by gaming the system or the rules, Bowles (2008), Frey and Jegen (2001), LeGrand (2006). This kind of behaviors in health is considered as a consequence of crowding out of doctors intrinsic motivation plus the huge amount of the private information they have performing in their positions.

Code	Related Category	Type of Code	Explanation of Code
Passion	Intrinsic motivation	Inductive	Doctors in many of their explanations explicitly. Other times passion is implicitly present in the discourse when they passionately talk about something related to their work: a new treatment or a surgery technique for instance.
'Peonada'	Crowding out	Inductive/In vivo	Emerged from respondents and data collection. The code *Peonada'* refers to a certain *Fee-For-Service* (FFS) incentive practice implemented in the *Sistema Navarro de Salud-Osasunbidea*. Is considered an 'In vivo' code because its name exactly matches with the expresion used by interviewees. This code appears closely related to crowding out.
Prestige	Intrinsic motivation	Inductive	Often, in the course of interviews, doctors speak about prestige matters emerge as internal rewards different from money.
Professional development	Intrinsic motivation/ Crowding in	deductive	Asked about what they expect from medical practice, doctors often point out the possibility to develop a professional career. Career concerns, prestige and professional recognition also are shown as incentives by physicians. This fact keeps consistent with the model of career concerns proposed by citedht, Dewatripont et al. (1999b).

Code	Related Category	Type of Code	Explanation of Code
Professional Career	Crowding out/in	Inductive	Professional career is an existing incentive scheme in the *SNS*. Although it is a non-economicincentive, doctors perceive consider it to cause crowding out. They view professional career as a disguised wage increase very easy to achieve for every doctor. An element that no recognizes neither merit nor effort. In these cases appears as an evidence of crowding out and also as a positive code. Other times doctors' mention professional career as it should be. As a normative code. in these cases they say that professional career should differentiate professionals who work hard and accumulate merits from the rest.
Pro-social	Intrinsic motivation	Deductive	Pro-social behavior and social preferences have been object of research within behavioral economics Benabou and Tirole (2006), Camerer (2003) and Fehr et al. (2007). Prosocial behavior often involves internal non-material rewards and material costs as doctors describe to frequently happen in public health service.
Recognition	Crowding in	Deductive	Deci (1971), Deci and Ryan (1985) pointed out that giving people unexpected positive feedback on a task increases people's intrinsic motivation to do it. This was because the positive feedback was fulfilling people's need for competence. Recognition (social, patient, or employer) was claimed by respondents in the study as a non-material reward that enforce professionals' sense of competence and encourage physicians to high effort and high quality standars.

Code	Related Category	Type of Code	Explanation of Code
Relatedness	Intrinsic motivation/ Crowding in	Deductive	Theory and research suggest that relatedness, joint with competence and autonomy, plays a role in the maintenance of intrinsic motivation Deci and Ryan (2000a). Relatedness captures the idea that people's effort and achieved outcome is strongly correlated. SDT hypothesizes that intrinsic motivation will be more likely to flourish in contexts characterized by a sense of secure relatedness Ryan and LaGuardia (2000).
Research	Intrinsic motivation/ Crowding in	Inductive	This code captures all the statements that point out the importance that research has for doctors. Research is considered of very importance by physicians because new medical knowledge improves quality of service, patients expectatives of sanation, citicens health and social welfare. Further doctors consider research as a challenge overcoming activity and they find it enjoyable by its own. Then facilitating research is viewed as a non-economic reward that highly motivates for work.
Science	Intrinsic motivation/ Crowding in	Inductive	Respondents frequently mentioned that scientific knowledge, scientific advance, and science related issues are in the basin of their interest and likings toward medical profession. Under science we have captured all these doctors' motives. Scientific adavance oriented incentives also are asked by respondents and considered as crowding in in many times.

Code	Related Category	Type of Code	Explanation of Code
Service	Intrinsic motivation	inductive	Doctors mostly afirm that service and patient care were one of the main motives at the moment they decide to become physicians. After they spent many years of medical practice they confirm this view and they still believe that patient care is one of the most interesting and emotional dimension of being a doctor.
Task Meaning Change	Crowding out	Deductive	*Self determination Theory* (SDT) Deci and Ryan (1985), Deci and Ryan (2000a), Deci and Ryan (2000b), and *Motivation Crowding Theory* (MCT), Frey (1997), Frey and Jegen (2001), Bowles and Polanía-Reyes (2012), both establish that one main reason for crowding out is that once the money enter as an exyternal reward for the performed activity, people switch their perception of performing in this task from the pure joy to a mean of achievement of material rewards. After that change of perception people only are willing to effort in the activity when some reward is expected as a consequence.
Technical knowledge	Intrinsic motivation	Inductive	Respondents when openly talk about the motives by which they decide to become doctors, they point out some aspects of the medical practice. One of the most quoted of these was the technical dimension of medicine.
Vocation	Intrinsic motivation	Inductive	Emerged from interviews and data collection. It was frequently highlighted by respondents as key factor oin the choice of proffession.

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