Information Structure and Contractual Choice in Franchising

by

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We develop a formal model to explain the existence of dual distribution in franchising by assuming variations in location profitability. We posit that location quality dictates the choice between franchising and company ownership. We analyze the contract choice problem when location quality is (1) private information for the franchisor; (2) private information for the franchisee, and (3) common knowledge. We show that (1) can result in the coexistence of company-owned and franchised stores. Under (2) all stores will be franchised. (3) can lead to only company-owned stores or only franchised outlets, depending on monitoring costs. (JEL: D 82, D 23, L 14)

1 Introduction

One phenomenon that has received considerable attention in the literature on franchising is the existence of dual distribution, i.e., the fact that company-owned and franchised outlets coexist and companies simultaneously open both types of outlets. The models developed to explain the existence of dual distribution can be broadly classified into three groups, though some papers fall into more than one group. First, there are models that argue risk sharing as an explanation for franchise relationships. For representative work in this area see CHEUNG [1969] and STIGLITZ [1974] in the context of sharecropping, and MARTIN [1988] for franchising. The second class of models stress capital-market imperfections as a reason behind franchising (OXENFELDT AND KELLY [1969], CAVES AND MURPHY [1976],

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and COMBS AND KETCHEN [1999]). These models posit that franchisors often face credit constraints in the formal credit market and that franchising some of their units is one way of raising much-needed capital that they are unable to raise from formal financial institutions. Finally, there are models that show that franchising arises as a resolution of agency problems in the presence of informational asymmetries. Some representative papers in that area are RUBIN [1978], ESWARAN AND KOTWAL [1985], MATHEWSON AND WINTER [1985], BRICKLEY AND DARK [1987], MINKLER [1992], GALLINI AND LUTZ [1992], LAFONTAINE [1992], BHATTACHARYYA AND LAFONTAINE [1995], LAFONTAINE AND BHATTACHARYYA [1995], and BAI AND TAO [2000].[1]

Subsequent empirical work has cast doubt on both risk sharing and capital-market imperfections as explanations of the existence of dual distribution. Let us take them in order. The principal idea in the risk-sharing literature is that franchising arises primarily from the need to share risks and that franchisors should bear more risk, either by operating units directly or by increasing their royalty rate (and decreasing their upfront fixed fee) when there is more risk to share. LAFONTAINE AND BHATTACHARYYA [1995] point out that the issue of risk in franchising is a complex one because it is not clear exactly what one should be looking at in order to measure the level of risk. The most frequently used measure is the variance of sales over time, as in MARTIN [1988] and NORTON [1988]. One could, instead, use some measure of the failure rates of outlets as a way to capture the degree of riskiness, as done by LAFONTAINE [1992] or SEN [1993]. The problem with this class of models is that empirical results do not establish that franchisors insure franchisees more when there is greater risk. In fact, empirical results support the notion of franchisors *shedding risk* in that the proportion of risk borne by franchisees seems to go up when there is more risk to be shared. This has been interpreted by some as evidence that the franchisor is more risk-averse than the franchisee, an assumption that runs contrary to what one would expect given their relative sizes and differing access to capital markets. LAFONTAINE AND BHATTACHARYYA [1995, p. 40] comment, " ... we show that the conclusions that one can draw from the existing literature are limited. ... In addition, we show that a model emphasizing informational problems can easily give rise to the patterns found in the data. On these grounds, we argue that the data as they now stand cannot be used to support the conclusion that franchisors use franchising to 'shed' risk." LAFONTAINE [1992], in a careful and extensive empirical study, draws a similar conclusion: that to explain the existence of dual distribution, one needs to appeal to arguments about informational asymmetries rather than rely on risk-sharing arguments. She argues that the data is most consistent with two-sided moral hazard. LAFONTAINE [1992, p. 278] comments that her "set of results lend little support to the notion

[1] There are many other papers on the topic, since this line of research has elicited widespread interest from economists with diverse interests, including franchising, sharecropping, and licensing. The works cited above are representative of the literature in the area and do not by any means constitute a comprehensive list.

that risk sharing or one sided moral hazard can explain the existence of franchising."

The argument about capital-market imperfections runs into some difficulties as well, as LAFONTAINE [1992] points out. First, if franchisors use franchising only when they do not have access to capital on their own, this implies that they should reduce their reliance on franchising as they mature and gain access to capital. Hence we should observe a trend towards more company-owned stores over time. Yet no such trend is apparent. Second, it is not unusual for franchisors to provide financing to their franchisees. *Entrepreneur Magazine*'s annual Franchise 500 for the year 2000 (see http://www.entrepreneur.com) provides a list of franchisors who provide such financing. Nine out of the top 10 franchises listed provide some type of in-house financing to their franchisees. Such financing covers a wide variety of things, including the franchise fee, loans to buy equipment, accounting and payroll services, payroll taxes, and inventory. For a detailed look at types of financing provided by the franchisor, see SCOTT [2000].

On the basis of the available evidence, it seems more likely that the emergence of franchise contracts and the existence of dual distribution has more to do with informational asymmetries than with risk-sharing or capital constraints. The asymmetric-information models can be classified into those that assume asymmetric information on one side and those that assume informational asymmetries on both sides. The first set of models, such as STIGLITZ [1974], NEWBURY [1977], and HALLAGAN [1978] (which discuss sharecropping contracts) and NORTON [1988] and BAI AND TAO [2000] (which discuss franchising contracts), assume that output depends on a local input provided by the agent. The principal cannot infer the exact level of this input, since output is stochastic and has a random component that makes measurement difficult. Ordinarily the solution to this problem would be to make the agent, who possesses superior information, the residual claimant by offering him a fixed rental contract. However, that would place the entire production risk on the agent, and if the agent is risk-averse and the principal risk-neutral, as is usually assumed in the literature, then it is not optimal to have the agent bear the entire risk. Output sharing, as part of a franchise contract, arises as a compromise between the need to share risk and the need to provide an incentive to the agent. Whereas LAFONTAINE [1992] suggested that one-sided moral hazard may not be sufficient to give rise to franchise contracts, NEWBERY [1977] and BAI AND TAO [2000] show that if the informational asymmetry pertains to more than one variable, then franchise (or sharecropping) contracts can emerge.

BAI AND TAO [2000] present a new and different perspective on the issue of franchising. They draw on a number of insights from franchising case studies and develop a multitask model in which the manager of each unit performs two tasks – a unit-specific task s and and a general effort g. The latter has the attributes of a public good and generates system-wide goodwill. They show that low-powered (company-ownership) contracts are offered to some managers to induce production of company-wide goodwill, while high-powered (franchise) contracts are offered to the remaining managers to elicit sales activity and capture the beneficial effects of the company goodwill. This idea of modeling one component of the effort provided by the managers as a public good affecting the entire brand name is a novel approach to explaining the existence of dual distribution.

The second class of papers, such as ESWARAN AND KOTWAL [1985], GALLINI AND LUTZ [1992], and BHATTACHARYYA AND LAFONTAINE [1995], develop two-sided moral-hazard models to explain the existence of the royalty rate. In these models both the franchisor and the franchisee provide a crucial input into the production process, and output sharing arises as the result of both parties' need for incentives. LAFONTAINE [1992] and LAFONTAINE AND BHATTACHARYYA [1995] provide empirical evidence that suggests that two-sided informational asymmetries are the primary reason behind the emergence of franchising and the existence of dual distribution.

One important determinant of franchising that many authors have alluded to is the quality of a location.[2] MARTIN [1988] made the conjecture that variations in location profitability may dictate the choice of institutional form. MARTIN [1988, p. 956] says "heterogenous locations also imply differences in expected profitability and risk by location. If the franchisor is risk-neutral or risk-averse, that person will retain locations with high expected profitability since the opportunity cost of franchising is higher for these locations. The firm's cost of franchising rises relative to the cost of monitoring company-owned outlets as expected profitability increases. Hence there is a strong incentive to retain the more profitable sites as company-owned outlets."

In this paper we build a formal model of franchising that takes into account the role of location-specific factors. We assume that both the principal and the agent provide an input into the production process, and therefore the optimal contract must preserve the incentives of both parties. We also make the plausible and intuitive assumption that profitability of stores differs across the types of locations. We analyze three separate cases – (1) where the location quality is private information for the franchisor, (2) where it is private information for the franchisee, and (3) where it is common knowledge for both the franchisor and the franchisee. Later on in the paper we point out situations that are most appropriately modeled using one of these three assumptions.

The value added of this paper is to develop a comprehensive theoretical model that shows how location profitability dictates whether to open a company-owned or a franchised store. We show, given the assumptions of our model, that (1) can lead to the coexistence of company-owned and franchised stores, while (2) will lead to exclusive reliance on franchised outlets. Under (3) we will see only franchised stores or only company-owned stores, depending on the costs of monitoring.

Subsumed under our assumption about differential profitability of locations is the idea that risk characteristics may vary across them, i.e., more profitable locations may be less risky and require less monitoring, and therefore be more likely to be company-owned. However, given the sparse evidence in favor of risk-sharing models

[2] MARTIN [1988], RUBIN [1978], MINKLER [1992], and GALLINI AND LUTZ [1992].

(see for example LAFONTAINE [1992] and LAFONTAINE AND BHATTACHARYYA [1995]), we do not explicitly incorporate risk attitudes in our model.

Our model complements a number of prior models, including that of GALLINI AND LUTZ [1992], based on private information about product quality, and that of MINKLER [1992], based on search costs. Before turning to the model itself, we would like to briefly summarize those two papers.

MINKLER [1992] develops a theory that relies on location-specific variables. He posits that franchisees have better information about local market conditions and that franchising is a way of exploiting this superior knowledge. GALLINI AND LUTZ [1992] assume that franchisors have better information than franchisees about the product's quality, because the franchisor has developed the product. In their model franchising is profitable for the company because of the potential moral hazard on the part of the unit operators (franchisees or the managers of company-owned stores). "Company ownership and/or distortionary royalties can be used by the franchisor to convince potential franchisees about profitability" (GALLINI AND LUTZ [1992, p. 473]). The authors show that in their model incorporating private information about the product quality, as well as moral hazard on the part of the agent (franchisee or store manager), the franchisor will use both available instruments to convey information about the new product.

In fact GALLINI AND LUTZ [1992, p. 474] provide a nice segue to our paper when they say in their paper "Our theory, for simplicity, ignores location specific factors; in reality, franchisors probably company-own units for a combination of reasons, with signaling being important during the first years of franchising and other location-specific explanations becoming more important as information about franchise profitability is gradually learned by potential franchisees." Our paper focuses explicitly on the location-specific factors that Gallini and Lutz mention in their paper.

Section 2 presents our model and its assumptions. Section 3 presents the contract problem and the main theoretical results. Section 4 concludes.

2 The Model

The environment consists of two kinds of economic agents. One kind of agents are the owners of a brand name that is valued by the market. The other kind of agents are the ones who work for these owners in an outlet. We will refer to the first kind of agents as the *company* or *franchisor*, and to the second kind as the *manager* or *franchisee*. At the beginning of a production period the company and the manager come together to start an outlet and sign a contract that specifies the way in which the revenue from the outlet is going to be shared among them. As in BHATTACHARYYA AND LAFONTAINE [1995], the production or the revenue-generating process requires effort from both these agents. We will refer to effort provided by the manager and the company in the production process as e and s respectively. These inputs to the production process belong to the sets A and S. The revenue generated in an outlet is given by

$$Y = F(e, s; t), \tag{1}$$

where $e \in A$ and $s \in S$ denote the amounts of effort provided by the manager and the company respectively. The effort provided by the manager can be interpreted as his level of efficiency or how conscientiously he carries out the work required of him in the operation of an outlet. By its very nature effort cannot be costlessly observed by the company. The effort s exerted by the firm increases revenues at the local outlet and is outlet-specific. It does not include national advertising, menu development, or other kinds of effort that are public goods across the different outlets. (Later on in the paper we discuss issues relating to monitoring of store managers. We would like to point out that any such monitoring effort is also excluded from the outlet-specific effort s.)

The other factor affecting the revenue of the outlet is the signal t, or type, of the outlet, which is noncontractible. However, the type t might be observed by one of the contracting parties or both.

In writing the revenue function as in (1), we have normalized the price of the product to 1. This is done assuming that price charged is independent of the royalty rate. Typically the standard double-marginalization argument shows that if franchisees are free to choose prices, then price does change as royalties change. However, allowing prices to vary with royalty rates would have introduced another variable in our model. We have chosen to normalize prices to 1 in the interest of tractability while realizing that this does sacrifice some generality.[3]

Assumption 1: (a) $e \in A = [0, \overline{A}]$ and $s \in S = [0, \overline{S}]$. (b) The revenue function obeys the following conditions: $F_1(e, s; t), F_2(e, s; t) > 0$, $F_{11}(e, s; t), F_{22}(e, s; t) < 0$, and $F(0, s; t) = F(e, 0; t) = 0$. (c) The cross partial derivatives of the output function, i.e., $F_{12}(e, s; t)$ and $F_{21}(e, s; t)$, are positive.

The first assumption ensures that effort and supervision levels are bounded. The second assumption says that the output function obeys standard concavity conditions and that revenue requires the presence of both managerial effort and company effort. The third says that the marginal product of effort provided by the agent is greater at higher levels of effort by the company and that the marginal product of effort provided by the principal is greater at higher effort levels of the agent. Thus we are assuming complementarity between the inputs provided by the company and the manager.[4]

[3] We thank an anonymous referee for pointing out the issues associated with normalizing prices to 1.

[4] The complementarity between supervision and effort is a key assumption that ensures that both inputs are employed in equilibrium. If they were substitutes, then it would be possible that a company does not have to employ a manager and operates an outlet by itself. Results derived later on in the paper depend crucially on this complementarity assumption.

Assumption 2: The type of an outlet is given by $t \in [0, T]$. Revenue is increasing in t within this interval, i.e., $F(e, s; t) \to 0$ as $t \to 0$, $F_3(e, s; t) > 0$ for all $t > 0$, and $F_{33}(e, s; t) > 0$.

The second assumption helps us in interpreting the influence of the outlet type t on the revenue from an outlet. This assumption says that outlet type t belongs to an interval where 0 signifies the worst possible and T the best possible outlet type. Everything else being the same, the revenue from a better outlet is higher. Finally we assume that output is convex with respect to location quality, i.e., output increases at an increasing rate with an increase in location quality.

Assumption 3: The company is risk-neutral. The manager is risk-averse, and his payoff is described by a strictly increasing and concave utility function $u(w)$, where w denotes the payment received by the manager on entering the contract with the company. The reservation wage of the manager at any outlet is fixed and denoted by $\overline{K}$. The reservation utility of the manager is $u(\overline{K})$, which will be denoted by $\overline{u}$.

Assumption 4: (a) Let $v(e)$ denote the disutility of providing effort for the manager. Let $h(s)$ denote the opportunity cost of providing effort for the company. The functions $v(\cdot)$ and $h(\cdot)$ satisfy the following properties: $v(0) = h(0) = 0$; $v'(\cdot), h'(\cdot) > 0$, and $v''(\cdot), h''(\cdot) > 0$. (b) If $\overline{s}_t$ solves $F_2(\overline{A}, s; t) = h'(s)$, then $\overline{s}_t \in (0, \overline{S})$. If $\overline{e}_t$ solves $u'(0)F_1(e, \overline{S}; t) = v'(e)$, then $\overline{e}_t \in (0, \overline{A})$.

The first part of Assumption 4 says that the marginal costs of providing effort are positive and increasing. The second part of the assumption guarantees an interior solution to the contract problem we are going to discuss next.

Now we can study the nature of franchise contracts that will be written between the company and the manager. We will confine our attention to linear contracts, as they are the most commonly observed contractual form and also satisfy desirable optimality properties (see BHATTACHARYYA AND LAFONTAINE [1995]).

3 Optimal Contract

Before we state the contract problem, let us characterize the kinds of contracts we are likely to encounter. Let α denote a fixed payment made by the manager to the company, and β denote the share of the company in the revenue of an outlet (i.e., the royalty rate). The payoff to the company from any contract is $\alpha + \beta F(e, s; t)$, and the payoff to the manager is $u[-\alpha + (1 - \beta)F(e, s; t)]$. Depending on the value of α and β, we will label the contracts as follows: (i) Fixed-license-fee contract: $\alpha > 0$, $\beta = 0$. (ii) Franchise contract: $\alpha \geq 0$, $\beta \in]0, 1[$. (iii) Company ownership: $\alpha < 0$, $\beta = 0$.

The timing of the contract problem is as follows:

Company-Owned Store. If the company decides to open a company-owned store, the company will hire a manager, promising to pay him an announced wage provided he puts in a certain level of effort. Once the manager is hired, the company will monitor the manager and incur monitoring costs. If the manager is caught shirking, he will be fired without any wage. Otherwise he will receive the wage specified in the contract. Along with monitoring the manager, the company will also provide the optimal level of outlet-specific effort.

Franchised Outlet. Following MYERSON [1982], we will concentrate only on direct mechanisms. The timing of the game is the following. The company announces a franchise contract (α_t, β_t), which may or may not be made contingent upon t. The company also promises to provide a certain level of effort $\widehat{s}_t \in S$ and directs the manager to provide an effort level $\widehat{e}_t \in A$. However, because of the unobservability of these inputs it must be in the interest of both the company and the manager to provide the levels of effort specified in the contract. Thus we can think of this second part of the contract as a simultaneous-move game. Let this game be denoted by $G(\alpha_t, \beta_t; t) = [(C, F); (S, A); (\Pi^F, u^F)]$. The game is played after the contract has been specified and is contingent upon the revenue-sharing arrangement and the type of the location. (C, F) stands for the company and the franchisee (manager), respectively, who are the players in this game. (S, A) denotes their strategy sets, and $\Pi^F = \alpha_t + \beta_t F(e, s; t) - h(s), u^F = u[-\alpha_t + (1 - \beta_t)F(e, s; t)] - v(e) - \overline{u}_t$ denote the payoffs of the franchisor and the franchisee respectively. The effort levels specified in the contract must satisfy

$$\widehat{s}_t \in \arg\max_{s \in S} \alpha_t + \beta_t F(\widehat{e}_t, s; t) - h(s)$$

and

$$\widehat{e}_t = \arg\max_{e \in A} u[-\alpha_t + (1 - \beta_t)F(e, \widehat{s}_t; t)] - v(e) - \overline{u}_t.$$

In other words, s_t and e_t must be a Nash equilibrium of $G(\alpha_t, \beta_t; t)$. Let us denote the set of Nash equilibria of this game as $E(\alpha_t, \beta_t/t)$. The following two lemmas and Proposition 1 help us in studying the properties of these Nash equilibria.

Lemma 1: $G(\alpha_t, \beta_t; t)$ is supermodular if

$$\frac{F_{12}(\cdot)}{F_1(\cdot)F_2(\cdot)} \geq -\frac{u''(\cdot)}{u'(\cdot)}.$$

Proof: See the Appendix.

A game is supermodular if the marginal payoff to each player is increasing in the strategy of the other players (see MILGROM AND ROBERTS [1990]). Lemma 1 says that if the coefficient of absolute risk aversion of the manager is not too high, then the manager's payoff is increasing in the amount of effort provided by the franchisor.[5] This assumption also allows us to study the set of Nash equilibria of $G(\alpha_t, \beta_t; t)$ easily and simplifies the problem we study.

[5] Notice that if the manager is risk-neutral, then this condition is automatically satisfied.

Lemma 2: $E(\alpha_t, \beta_t/t)$ is nonempty and possesses greatest and least equilibrium points $(\underline{s}_t, \underline{e}_t)$ and $(\overline{s}_t, \overline{e}_t)$. Also, $\Pi^F(\overline{s}_t, \overline{e}_t) \geq \Pi^F(s_t, e_t), u^F(\overline{s}_t, \overline{e}_t) \geq u^F(s_t, e_t)$ for any $(s_t, e_t) \in E(\alpha_t, \beta_t/t)$.

Proof: See the Appendix.

Lemma 2 proves that $G(\alpha_t, \beta_t; t)$ has at least one Nash equilibrium.[6] Also the Nash equilibrium $(\overline{s}_t, \overline{e}_t)$ gives the highest payoff to the company as well as the manager. Hence in designing the contract the company will always want to implement $(\overline{s}_t, \overline{e}_t)$.

Proposition 1: The greatest Nash equilibrium pair $(\overline{s}_t, \overline{e}_t)$ will solve

$$(\mathrm{MH_c}) \qquad \beta_t F_2(\overline{e}_t, \overline{s}_t; t) = h'(\overline{s}_t),$$

$$(\mathrm{MH_m}) \qquad (1 - \beta_t)u'(\cdot)F_1(\overline{e}_t, \overline{s}_t; t) = v'(\overline{e}_t).$$

Proof: See the Appendix.

$\mathrm{MH_c}$ and $\mathrm{MH_m}$ are commonly called the moral-hazard constraints for the company and the manager. Proposition 1 says that if the company designs the contract so that these moral-hazard constraints are satisfied, it will be able to implement the desired effort levels as a Nash equilibrium.

3.1 *Location Quality is Private Information for the Franchisor*

Now we proceed to study the contract problem faced by the company if it has private information regarding the type of the outlet. The franchisor has sole discretion over which location to award to a potential franchisee. There is evidence that this assumption is in keeping with the practices of some franchise chains. McDonald's, for instance, often requires franchisees to relocate after being awarded a franchise (KAUFMANN AND LAFONTAINE [1994]). BRICKLEY AND DARK [1987, p. 402] remark that "... McDonald's will decide on a particular location for a new unit and then decide whether to franchise it or maintain ownership by operating the unit through a corporate subsidiary." In any case, as long as the franchisor has monopsonistic power (which is entirely plausible) and decides how to allocate locations to franchise applicants, and as long as potential franchisees accept those allocations, this assumption is valid.

The franchise manager has a subjective probability distribution about the type of the outlet, given by $\Phi(t)$. In this scenario a company has two distinct options: (1) to open a company-owned outlet or (2) to open a franchised outlet.

At a company-owned store the company's problem is to hire a manager to oversee the work. The manager gets paid a fixed salary (actually an efficiency wage), making the company the residual claimant.

[6] In fact $s = 0$ and $e = 0$ is a Nash equilibrium of $G(\cdot)$.

3.1.1 Hiring a Manager for a Company-Owned Store

Since the company is the residual claimant in the company-owned store, there is no moral hazard on the part of the company. At a company-owned store the company pays a fixed remuneration to the manager. This will normally lead to a moral-hazard problem on the part of the manager. He has no incentive to provide the optimal effort at a fixed wage (W), since providing effort is costly. In fact, since the payoff to the manager is the wage minus the disutility of effort $[u(W) - v(e)]$, he will provide the minimum amount of effort possible.

Let e_t^* denote the level of effort that the company wants to implement at an outlet type t. The company can extract the desired effort from the manager by paying an efficiency wage W_t^* and writing a forcing contract of the following form: If $e \geq e_t^*$ the manager gets paid the efficiency wage W^*, but if $e < e_t^*$ the manager's employment is terminated. In that case the manager leaves and accepts alternative employment, which gets him his reservation wage at that location. Faced with a forcing contract of this form, the manager will put forth the optimal effort e_t^* (SCHOTTER [1999, Ch. 8]). However, the company will have to monitor the manager to detect shirking. Let the monitoring cost be fixed and equal to M.

We should point out, before proceeding, that we have chosen to model monitoring and the cost associated with it in a very simple way. Our model does not include RUBIN's [1978] point that franchise royalties give a central firm an incentive to monitor franchisee effort and very often the monitoring frequency is explicitly written into the contract. Secondly, monitoring cost is independent of location, and we are not allowing for BRICKLEY AND DARK's [1987] idea that monitoring costs increase with distance from headquarters. Incorporating a more complicated monitoring technology might add more realism but would also add more complications to our model and reduce its tractability. Thus we have chosen to stick with the somewhat simple (maybe even simplistic) way of modeling monitoring.

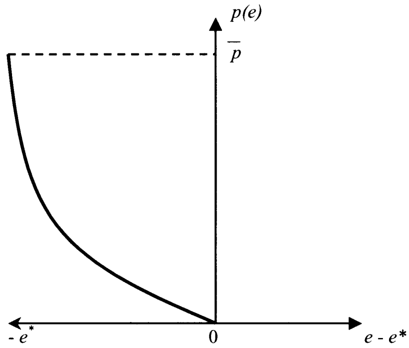
The manager will not shirk as long as the payoff from providing the optimal effort exceeds that from being found shirking and getting fired. Let $p(e - e_t^*)$ denote the probability of the manager getting caught if he is shirking. Denote by $p(-e_t^*) = \overline{p}$ the probability of the manager being detected for putting in zero effort. As the manager provides more effort, the probability of detection goes down, i.e., $p'(e - e_t^*) < 0$. In addition we will assume that the change in the probability becomes progressively smaller, which means that $p''(e - e_t^*) > 0$. Clearly the manager will never want to provide more effort than e_t^*.

The next proposition derives a sufficient condition for an extremely simple characterization of the efficiency wage that has to be provided by the company to implement the desirable level of effort from the manager.

Proposition 2: There exists an efficiency wage W_t^* for any effort level e_t^* the company wants to implement. The efficiency wage satisfies the following equation:

$$u(W_t^*) = \overline{u} + \frac{v(e_t^*) - v(\widetilde{e})}{p(\widetilde{e} - e_t^*)}, \tag{2}$$

Figure 1
Probability of Getting Caught While Shirking



where

$$\widetilde{e} = \arg\max_{e} \{p(e - e_t^*)\overline{u} + [1 - p(e - e_t^*)]u(W) - v(e)\}.$$

Proof: See the Appendix.

We are assuming that the employee managers in a company-owned store are motivated through using an efficiency wage and monitoring. We are ignoring the possibility that the firm motivates employee managers by offering a sales-based bonus to reward higher effort.

Now we can state the contract problem faced by the company when it wants to open a company-owned store. The company will solve the following problem:

$$\max_{e,s,W} \Pi^0(t) = F(e, s; t) - h(s) - W - M,$$

subject to equation (2), which derives the optimal efficiency wage. Notice that with the efficiency wage the company will automatically satisfy the participation constraint of the manager. Let the solution to the above problem be (e_t^*, s_t^*, W_t^*). The profit from a company-owned store is

$$\Pi^0(t) = F(e_t^*, s_t^*; t) - h(s_t^*) - W_t^* - M.$$

The change in the profit from a company-owned store due to a change in outlet type is given by

$$\text{(3)} \qquad \frac{\partial \Pi^0(t)}{\partial t} = F_3(e_t^*, s_t^*; t) > 0.$$

By assumption, $F(\cdot)$ is convex, i.e., $F_{33}(\cdot) > 0$. This implies that the profit function is convex in location type.

3.1.2 Opening a Franchised Outlet

Now let us look at the profits of the company from a franchised outlet at some outlet type t. The usual franchise contract takes the form of a fixed franchise fee α, which is a fixed payment made by the franchisee to the company, and a royalty rate β, which is the share of the company in the revenue of the outlet. Since the type t of the outlet is noncontractible, the terms of the contract cannot be made contingent on t. The problem faced by the company now is to maximize the following:

$$\max_{\alpha,\beta,s} \alpha + \beta F(e, s; t) - h(s)$$

subject to

$$\text{(IR)} \qquad \int_{t \in T_F} u[-\alpha + (1-\beta)F(e, s; t)]\, d\Phi(t) - v(e) \geq \overline{u},$$

$$\text{(MH}_\text{c}\text{)} \qquad \beta F_2(e, s; t) = h'(s),$$

$$\text{(MH}_\text{m}\text{)} \qquad (1-\beta) \int_{t \in T_F} u'(\cdot) F_1(e, s; t)\, d\Phi(t) = v'(e).$$

IR, MH_c, and MH_m are respectively (1) the individual rationality constraint for the manager, (2) the moral-hazard constraint for the company, and (3) the moral-hazard constraint for the manager. The participation constraint states that the manager must be given an adequate remuneration that covers his opportunity cost. For a solution to this problem with moral hazard on both sides see BHATTACHARYYA AND LAFONTAINE [1995]. We will just point out that when there is moral hazard on the part of both the company and the manager, the optimal contract will have revenue sharing between the two contracting agents, i.e., $\beta \in]0, 1[$, which implies that the royalty rate is a strict fraction and cannot be either zero or one. Let the solution to the above problem be denoted by $(\widehat{\alpha}, \widehat{\beta}, \widehat{e}_t, \widehat{s}_t)$. Let the effort induced by the franchise contract be denoted by $\widehat{e}_t$.[7] The profit from a franchise contract is

$$\Pi^F(t) = \widehat{\alpha} + \widehat{\beta} F(\widehat{e}_t, \widehat{s}_t; t) - h(\widehat{s}_t).$$

Using the envelope theorem, the change in the profit from a company-owned store due to a change in outlet type is given by

$$\text{(4)} \qquad \frac{\partial \Pi^F(t)}{\partial t} = \widehat{\beta} F_3(\widehat{e}_t, \widehat{s}_t; t) > 0.$$

By assumption the output function is convex in location type t, i.e., $F_{33}(e, s; t) > 0$. So $\Pi^F(t)$ is convex as well.

7 $\widehat{e}_t$ and $\widehat{s}_t$ are the best responses of the manager and the company to each other's action.

3.1.3 Equilibrium

The equilibrium in this model will be characterized by the company choosing whichever contractual form provides greater profit. Hence we are interested in $\max\{\Pi^F(t), \Pi^0(t)\}$. The next proposition helps us in characterizing a part of the equilibrium.

Proposition 3: There exists a t^* such that for all $0 < t < t^*$ the company will open a franchised outlet, and for all $t^* < t < T$ the company will open a company-owned outlet.

Proof: See the Appendix.

The intuition here is the following.[8] The company faces a choice between incentive costs. Outlet sales depend on the effort taken by the manager as well as the effort provided by the company. Direct company ownership produces efficient effort levels by managers as well as the company. However, in order to guarantee any managerial effort at all, the company must pay managers an efficiency wage and engage in costly monitoring. Franchising the outlet results in inefficient effort on both sides. However, with franchising the firm need not leave any rent with the franchisee, and need not spend money on monitoring. Profitable locations are company-owned because sales at these locations depend most heavily on effort but to elicit that effort the company must incur costly monitoring charges. Thus it makes sense to open company-owned stores at the better locations and not at the worse ones. The company will retain locations with high expected profitability because the opportunity cost of franchising is higher for these locations. From Assumption 2 we know that as $t \to 0$, revenue goes to 0. Hence the optimal effort levels $\widehat{e}$, $\widehat{s}$ and the profits from a franchised store at $t = 0$ are zero. As t increases, the optimal effort levels and profits from franchised outlets increase and become positive. Thus the company finds it profitable to open franchised stores even at lower location types. Proposition 3 shows that when location type becomes sufficiently high the company will find it profitable to open a company-owned store.

Figure 2 shows the unique intersection between $\Pi^0(t)$ and $\Pi^F(t)$. For all locations such that $0 < t < t^* < T$, a franchised store is opened, while for all locations such that $0 < t^* < t < T$, a company-owned store is opened.

However, even if there is a unique intersection between $\Pi^0(t)$ and $\Pi^F(t)$, it is possible that the company will not find it profitable to open a company-owned store, if that intersection occurs at a $t^* > T$. In this case profits from franchised stores exceed those from company-owned stores for all location types, and as a result all stores will be franchised. Figure 3 depicts such a situation. However, as long as the set of location types is sufficiently large, we will expect to see both franchised and company-owned stores.

[8] We are indebted to an anonymous referee for succinctly summing up the intuition behind the results derived in this part of the paper. The argument that follows has been reproduced from the report provided to us by this referee.

Figure 2
Profit from Company-Owned vs Franchised Outlet

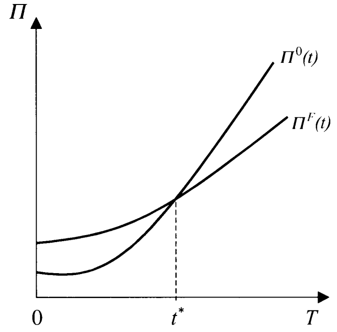
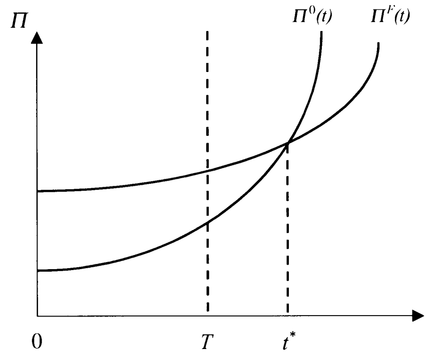


Figure 3
All Stores will be Franchised



MARTIN [1988] provides evidence that suggests that a franchisor usually retains the higher-quality locations for company-owned stores while franchising the lower-quality locations. A quick look at Table 1 shows that the average sales at company-owned stores exceed those in franchised outlets for every category listed.

MARTIN [1988, Table 1, p. 957] shows that not only are sales higher in company-owned stores, the rate of growth of sales is also higher in company-owned stores than in franchised stores. The ratio of the compound growth rate of sales in company-owned stores to the growth rate of sales in franchised stores is 1.27. CHAUDHURI AND MAITRA [2002] provide similar evidence in the context of agricultural tenancy contracts. They show that higher-value plots of land are usually kept for owner cultivation (similar to company ownership) while lower-value plots are leased out to tenants (similar to franchising).

Table 1
Average Sales per Establishment 1986–1988 (Thousands of Dollars)

Sector	1986 Company-owned	1986 Franchisee-owned	1987* Company-owned	1987* Franchisee-owned	1988* Company-owned	1988* Franchisee-owned
Automotive products and services	783	235	828	238	875	254
Business aids and services	350	238	384	242	413	249
Construction, home improvement, maintenance, and cleaning services	1807	180	1902	179	1938	188
Convenience stores	750	694	788	715	818	749
Educational products and services	387	90	443	86	479	89
Restaurants (all types)	772	621	788	635	811	648
Hotels, motels, and campgrounds	4413	1548	4369	1535	4229	1553
Laundry and dry-cleaning	253	121	266	136	257	148
Recreation, entertainment, and travel	1735	377	1854	416	1768	496
Rental (auto-truck)	1439	372	1508	372	1574	376
Rental (equipment)	460	200	338	200	342	202
Retailing (non-food)	652	461	688	481	715	486
Retailing (food other than convenience stores)	793	487	842	480	873	449
Miscellaneous	587	182	582	194	573	226

Key: * Estimated by respondents.
Source: KOSTECKA [1988].

In our next proposition we try to understand the effect of monitoring cost and improvements in monitoring technology of the company on its decision to open a franchised or a company-owned outlet.

Proposition 4: The set of outlet types in which the company opens a company-owned store is increasing in $p(\cdot)$ and decreasing in M.

Proof: See the Appendix.

Improvement in the monitoring technology available to the company is manifested through a shift in the function $p(e - e_t^*)$ to some function $\widehat{p}(e - e_t^*) \geq p(e - e_t^*)$.

It reduces the efficiency wage that the company has to provide a manager to implement the effort level it desires. The result is an increase in the profits from a company-owned outlet. A decrease in monitoring cost M also has a similar effect.

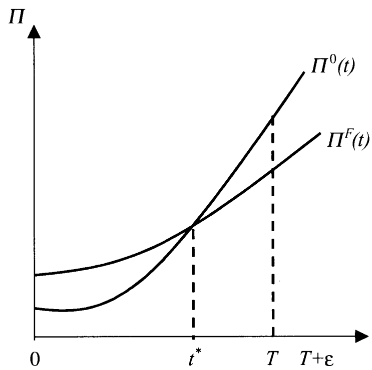
This finding is borne out by prior research. BRICKLEY AND DARK [1987] found that outlets physically close to monitoring headquarters (which consequently had lower monitoring costs) were more likely to be company-owned than outlets further away from these headquarters. However, as a referee pointed out to us, there is an alternative interpretation to Brickley and Dark's finding – that franchisors are more likely to franchise in distant areas specifically because the franchisor cannot distinguish between good and bad locations in an area far from headquarters. Thus, they rely on franchisees to do so. As residual claimants, franchisees would have much greater motivation to search out good locations than a salaried manager. In the next section, we develop a model where the franchisees are charged with site selection and therefore possess superior information about the location. We show that in these cases companies will rely heavily on franchising. Thus the model in the next section can also be viewed as an alternative way of interpreting the results in BRICKLEY AND DARK [1987].

Proposition 5: An improvement in the set of outlet types will lead to an increase in the set of locations where the franchisor opens a company-owned outlet.

Proof: See the Appendix.

An improvement in the set of outlet types can be thought of as an increase in T to say $T + \varepsilon$. Note that improvement in the set of outlet types (i.e., an increase in T) does not change the profit function of franchised outlets at any t.

Figure 4
Improvement in the Set of Location Types



3.2 Location Quality is Private Information for the Franchisee

Next we consider the contract problem faced by the company when the manager has private information regarding the quality of the location. The three franchises owned by Tricon, namely Taco Bell, Pizza Hut, and KFC, are good examples of this situation. Tricon, in recent years, has required potential franchisees to find ideal sites. A franchisee can spend thousands of dollars on surveys, architect fees, and site studies as predevelopment expenses. Thus in this case the franchisee obviously has better information about the location type than the franchisor.

When the manager has private information regarding the location type, the company will want to offer a contract that makes him reveal the true type of the location. Thus the contract has to be incentive-based. The company, in such situations, will have to rely on franchise contracts to induce the managers to reveal the true type of the location.[9]

Let $\Phi(t)$ now denote the subjective distribution of t for the company. Denote the payoff of the manager at each location t as $\widehat{u}(t) = u[-\alpha_t + (1-\beta_t)F(e_t, s_t; t)] - v(e_t) - \bar{u}$. Notice that $\partial\widehat{u}(t)/\partial t = u'(\cdot)[(1-\beta_t)F_3(e_t, s_t; t)] > 0$ from our Assumption 5. This provides us with the single-crossing property. (This in turn guarantees a unique solution to the franchise problem at hand.) The company's contract problem is to solve

$$\max_{\alpha_t,\beta_t,s_t} \int_0^T [\alpha_t + \beta_t F(e_t, s_t; t) - h(s_t)]\, d\Phi(t)$$

subject to

(IR) $\qquad \widehat{u}(t) \geq 0 \qquad \text{for all} \quad t \in [0, T],$

(IC) $\qquad \widehat{u}(t) = \widehat{u}(0) + \dfrac{\partial\widehat{u}(t)}{\partial t} \qquad \text{for all} \quad t \in [0, T],$

(MH_c) $\qquad \beta_t F_2(e_t, s_t; t) = h'(s_t),$

(MH_m) $\qquad (1-\beta_t)u'(\cdot)F_1(e_t, s_t; t) = v'(e_t).$

From Lemma 1, Lemma 2, and Proposition 1, we know that subsequent to the announcement of the revenue-sharing arrangement (α_t, β_t), the game played between the company and the manager has a Nash equilibrium. Moreover, the Nash equilibrium can be characterized by the moral-hazard constraints of the company and the manager (MH_c and MH_m respectively). The IC constraint[10] is to ensure that the manager of type t cannot be better off by pretending to be of some other type t' and accepting the contract designed for t'. The solution to the problem above will

[9] An efficiency wage contract will not work, because the company does not know what optimal effort level to implement and the manager has no incentive to reveal the true location type with wage contracts.

[10] This is the standard incentive compatibility constraint when there is a continuum of types.

yield $\beta_t \in]0, 1[$ to ensure that the moral-hazard constraints are satisfied. α_t will be chosen to satisfy the IC constraints. The managers at location types strictly greater than zero will receive an informational rent. The outcome, when the franchisee has private information about location type, is summed up in the following proposition.

Proposition 6: If the franchisee possesses private information about location type, then in equilibrium, stores at all locations are franchised.

Proof: See the Appendix.

As we mentioned above, in recent years Taco Bell, KFC, and Pizza Hut have required the potential franchisee to acquire specific information about the store location. We posit that when the franchisee has superior information, the franchisor will find it optimal to use only franchise contracts. There is evidence that all three franchises have been moving in that direction. If one looks at the last few annual reports for Tricon, then one finds that for all three franchises in the last four years, there has been a substantial reduction in the number of company-owned stores and an increase in the number of franchised stores. See Table 2. In the case of Taco Bell, for instance, the number of company-owned stores has declined from 2149 in 1997 to 1162 in 2000 (a decrease of almost 46%) while the number of franchised stores has increased from 2826 to 3996 (an increase of about 41%). KFC and Pizza Hut display a similar trend of declining numbers of company-owned stores and increasing numbers of franchised outlets. This information is taken from the last few years' annual reports for Tricon Global, which is the parent company that owns Taco Bell, Pizza Hut, and KFC. See Tricon's website http://www.triconglobal.com for these annual reports, or http://yum.com. The current policy of moving away from company-owned stores towards more franchised outlets began in 1995. The annual 10K for Tricon, filed in March 2002, states: "Since 1995, the Company has been rebalancing the system toward more franchisee ownership to focus its resources on what it believes are high growth potential markets where it can more efficiently leverage its scale. Since the strategy began, the Company has refranchised 6,128 units: 233 units in 2001, 757 units in 2000, 1,435 units in 1999, 1,373 units in 1998, 1,407 units in 1997, 659 units in 1996 and 264 units in 1995. As a result of the Company's refranchising activity, coupled with new points of distribution added by franchisees and licensees and the program to upgrade the asset portfolio by closing underperforming stores, the Company's overall ownership of total system units declined 26 percentage points in seven years from 47 percent at year-end 1994 to 21 percent at year-end 2001."

In an interesting recent study LAFONTAINE AND SHAW [2001] make the point that most franchisors aim for a desired level of distribution between company-owned stores and franchised outlets. After a firm becomes established and gets involved in franchising, there is a decline in the number of company-owned stores and an increase in the number of franchised outlets in the initial stages of the firm's expansion. This is because in the beginning there is 100% company ownership, and this proportion declines as the firm starts to franchise. Over time firms adjust the distribution of company-owned and franchised stores as they aim for their target level

Table 2
Tricon: Franchised vs Company-Owned Stores

Sector	Taco Bell Company-owned	Taco Bell Franchisee-owned	KFC Company-owned	KFC Franchisee-owned	Pizza Hut Company-owned	Pizza Hut Franchisee-owned
1997	2149	2826	1850	3190	3823	3581
1998	1614	3494	1633	3441	2985	4041
1999	1190	3921	1439	3743	2355	4446
2000	1162	3996	1339	3978	1801	4888

Source: Tricon Inc.'s annual reports for the relevant years. For details see http://www.triconglobal.com.

of distribution between the two. However, the recent changes at long-established companies like Taco Bell or Pizza Hut are probably not due to any such attempts to achieve a desired level of distribution. Their increased reliance on franchising is very possibly driven by changes in corporate policy and business model rather than an attempt to achieve a target level of distribution of stores.

Even though the franchisor should offer a menu of contracts to screen potential franchisees, it is often observed that many franchisors, though not all, rely on a single franchise contract for all the franchisees. BHATTACHARYYA AND LAFONTAINE [1995], in their study of 54 franchisors, find substantial variations in contract terms. They find that out of the 54 franchisors 19 use a single franchise fee while 35 use multiple franchise fees. Even for the royalty rate 41 use a single rate while 13 use multiple rates. LAFONTAINE [1992] provides some rationale why franchisors often use one single franchise contract, even where screening contracts would be optimal. Lafontaine says that franchisors often justify the use of one contract because developing and enforcing a variety of contracts would be too costly. "Similarly, federal and state disclosure requirements might have influenced franchisors to adopt this practice. Franchisors may also reduce their need for a variety of contracts by choosing the location and the density of stores ... appropriately" (p. 269). However, the main insight of Proposition 6 does not change if the franchisor is constrained to offer a uniform franchise contract. All that this would imply is that the franchisor would have to concede much greater informational rent to some of the franchisees than when the franchisor can offer a menu of contracts. However, faced with the option of offering only one uniform contract, the franchisor may decide not to offer a franchise contract at low-quality locations. The following propostion summarizes the outcome if the franchisor is constrained to offer a single uniform franchise contract.

Proposition 7: If the franchisor is constrained to offer the same contract to all franchisees, the payoff to the franchisor is lower. In addition, franchised stores may not be opened at low-quality locations.

Proof: See the Appendix.

3.3 Location Quality is Common Knowledge

At the outset we would like to point out that in this case the contract problem and profits from a company-owned outlet are the same as when location quality was known only to the company. So we begin this section by studying the contract offered when the company decides to open a franchised outlet. Later on we will compare the profits earned from a franchised outlet and a company-owned outlet. At any location t, if the company decides to open a franchised outlet, then the franchise contract will solve

$$\max_{\alpha_t, \beta_t, s_t} \alpha_t + \beta_t F(e_t, s_t; t) - h(s_t)$$

subject to

(IR) $$u[-\alpha_t + (1 - \beta_t)F(e_t, s_t; t)] - v(e_t) \geq \overline{u},$$

(MH_c) $$\beta_t F_2(e_t, s_t; t) = h'(s_t),$$

(MH_m) $$(1 - \beta_t)u'(.)F_1(e_t, s_t; t) = v'(e_t).$$

IR, MH_c, and MH_m are the individual rationality constraint for the manager, the moral-hazard constraint for the company, and the moral-hazard constraint for the manager respectively. The solution to the problem above is analytically simple. The royalty rate β_t is pegged from the moral-hazard constraints. The franchise fee α_t will be chosen to keep the manager at his reservation utility, i.e., IR will bind for all location types $t \in [0, T]$.

Proposition 8: There exists an $\overline{M}$ such that if $M < \overline{M}$ the company will open only company-owned outlets and if $M > \overline{M}$ the company will open only franchised outlets.

Proof: See the Appendix.

If the monitoring cost is lower than a certain threshold, the company will open only company-owned outlets. If the monitoring cost is too high, then the company will open only franchised outlets. We will not see the existence of both franchised and company-owned outlets at the same time, if location quality is common knowledge.

4 Conclusion

In this paper we have developed a formal model of the location-quality explanation of contractual choice in business format franchising, first proposed by MARTIN [1988]. We assume that locations are of different quality and the choice of a contract is dictated by who has private information about the location type. We show that, given the assumptions of our model, company-owned stores and franchised outlets can coexist if and only if the location type is private information for the franchisor. If, on the other hand, the franchisee possesses private information about the location type, then all locations will be franchised. The franchisee at the worst location will get his reservation wage, while franchisees at successively better locations will get successively higher informational rents. Finally, if the location quality is common knowledge for both the franchisor and the franchisee, then we will see only company-owned stores if monitoring costs are low, and only franchised ones if monitoring costs are high.

As mentioned in our introductory remarks, the existence of dual distribution in franchising, i.e., the coexistence of company-owned and franchised stores, has been the subject of much research. Our paper formalizes the location-quality explanation of franchising and in doing so complements the work of GALLINI AND LUTZ [1992], MINKLER [1992], and BAI AND TAO [2000]. The results derived in this paper apply to issues beyond franchising as well. Very similar questions arise about land tenancy contracts, where one observes the coexistence of owner-cultivated plots (analogous to company-owned stores) and tenant-cultivated plots (analogous to franchised outlets). Our model and results then can be extended to that debate as well.

Appendix

A.1 Proof of Lemma 1

The game $G(\alpha_t, \beta_t; t)$ is supermodular if

$$\frac{\partial^2 \Pi^F}{\partial s\, \partial e} \geq 0 \quad \text{and} \quad \frac{\partial^2 u^F}{\partial e\, \partial s} \geq 0 \quad \text{(MILGROM AND ROBERTS [1990]).}$$

$$\frac{\partial^2 \Pi^F}{\partial s \partial e} = \beta_t F_{21}(e, s; t) > 0 \qquad \text{from Assumption 1(c).}$$

And $$\frac{\partial^2 u^F}{\partial e\, \partial s} = u'(\cdot)(1-\beta_t)F_{12}(e, s; t) + u''(\cdot)(1-\beta_t)^2 F_1(e, s; t)F_2(e, s; t).$$

Hence

$$\frac{\partial^2 u^F}{\partial e\, \partial s} \geq 0 \quad \text{if} \quad \frac{F_{12}(e, s; t)}{(1-\beta_t)F_1(e, s; t)F_2(e, s; t)} \geq \frac{F_{12}(e, s; t)}{F_1(e, s; t)F_2(e, s; t)} \geq -\frac{u''(\cdot)}{u'(\cdot)}.$$

Q.E.D.

A.2 Proof of Lemma 2

The existence of a Nash equilibrium with a least and a greatest element in $E(\alpha_t, \beta_t/t)$ follows directly from MILGROM AND ROBERTS [1990] and the fact that $G(\alpha_t, \beta_t; t)$ is supermodular (from Lemma 1). Since payoffs to the company and manager are non decreasing in (s, e) it follows that $\Pi^F(\overline{s}_t, \overline{e_t}) \geq \Pi^F(s_t, e_t)$, $u^F(\overline{s}_t, \overline{e}_t) \geq u^F(s_t, e_t)$ for any $(s_t, e_t) \in E(\alpha_t, \beta_t/t)$. *Q.E.D.*

A.3 Proof of Proposition 1

From Assumptions 3 and 4a, we know that Π^F and u^F are strictly concave in s and e respectively. If $(\bar{s}_t, \bar{e}_t)$ are a Nash equilibrium pair then it must be the case that $\bar{s}_t = \arg\max_{s\in S} \beta_t F(\bar{e}_t, s; t) - h(s)$, is unique. Also $\beta_t F(\bar{e}_t, \bar{s}_t; t) - h(\bar{s}_t) \leq F(\overline{A}, \bar{s}_t; t) - h(\bar{s}_t) \leq \max_{s\in S} F(\overline{A}, s_t; t) - h(s_t)$. From Assumption 4b we know that $\arg\max_{s\in S} F(\overline{A}, s; t) - h(s) \in (0, \overline{S})$. Note that $\partial \Pi^F(s, \bar{e}_t)/\partial s = \beta_t F_2(\bar{e}_t, s; t) - h'(s) \leq \partial[F(\overline{A}, s; t) - h(s)]/\partial s$. Hence $\arg\max_{s\in S} \Pi^F(s, \bar{e}_t) \in (0, \overline{S})$. Since the maximum lies in the interior of the set S, it must be the case that $\partial \Pi^F(\bar{s}_t, \bar{e}_t)/\partial s = 0$. Hence, $\beta_t F_2(\bar{e}_t, \bar{s}_t; t) = h'(\bar{s}_t)$. A similar argument applies for u^F as well. *Q.E.D.*

A.4 Proof of Proposition 2

Firstly note that for the efficiency wage to induce a manager to provide more effort, it must be greater than the outside wage; hence $u(W^*) > \bar{u}$. Given any efficiency wage W, the manager maximizes his expected payoff, by choosing the appropriate effort level. If he chooses any effort level that falls below the effort level prescribed by the principal, then with probability p, the shirking is detected and the manager gets $\bar{u}$, while with probability $1 - p(e - e_t^*)$, his shirking is not detected and he gets the efficiency wage W^*. So the manager's maximization problem is

$$\max_e p(e - e_t^*)\bar{u} + (1 - p(e - e_t^*))u(W^*) - v(e)$$

and the relevant first order condition is given by

$$-p'(e - e_t^*)[u(W^*) - \bar{u}] - v'(e) = 0.$$

Let $\tilde{e}$ be the solution to the above equality. It is easy to check that $\tilde{e}$ also satisfies the second-order condition for a maximum given our assumptions about the functions $p(\cdot)$ and $v(\cdot)$. The manager will choose to shirk only if $\tilde{e} < e_t^*$, which is the level of effort that the company wants to implement. Hence the company must set the efficiency wage to a level where the maximum of the expected payoff to the manager from shirking is lower than or equal to the payoff from providing the effort required by the company, i.e.,

$$p(\tilde{e} - e_t^*)\bar{u} + (1 - p(\tilde{e} - e_t^*))u(W^*) - v(\tilde{e}) \leq u(W^*) - v(e^*)$$

or

$$u(W^*) = \bar{u} + \frac{v(e^*) - v(\tilde{e})}{p(\tilde{e} - e_t^*)}.$$

Q.E.D.

A.5 Proof of Proposition 3

Define a variable $D(t) = \Pi^F(t) - \Pi^0(t)$. The variable $D(t)$ is the difference between profits from a franchised outlet and profits from a company-owned store. Rearranging, we can write

$$D(t) = \hat{\alpha} + \hat{\beta} F(\hat{e}_t, \hat{s}_t; t) - F(e_t^*, s_t^*; t) + [h(s_t^*) - h(\hat{s}_t)] + W_t^* + M.$$

Note that $s_t^* \geq \widehat{s}_t$. Since $F(e, s; t) \to 0$ as $t \to 0$, we have $D(t) \to N$ as $t \to 0$, where N is some positive number. Hence there must exist some t^* such that $\Pi^F(t) = \Pi^0(t)$ for $t = t^*$ and $\Pi^F(t) > \Pi^0(t)$ for any $t < t^*$. Now consider the fact that $D'(t) = \partial\Pi^F(t)/\partial t - \partial\Pi^0(t)/\partial t = \widehat{\beta}F_3(\widehat{e}_t, \widehat{s}_t; t) - F_3(e_t^*, s_t^*; t) < 0$ for all t, i.e., the function $D(t)$ is monotonically decreasing in t. Therefore the value t^* of t must be unique. From the fact that $D(t)$ is monotonically decreasing it follows that for all $t > t^*$, $\Pi^F(t) - \Pi^0(t) < 0$ or $\Pi^F(t) < \Pi^0(t)$, i.e., the profits from company-owned stores exceed those from franchised stores, and the company will open a company-owned store. *Q.E.D.*

A.6 Proof of Proposition 4

Suppose the monitoring technology of the company improves so that the probability of detection of a manager while shirking is now a function $\widehat{p}(e - e_t^*)$ such that $\widehat{p}(e - e_t^*) \geq p(e - e_t^*)$ for all e. Then the efficiency wage that the company will have to give the manager in a company-owned outlet will be lower. Hence the profit function of the company-owned outlet is going to shift upwards. It is easy to check that increase in the monitoring cost will have the opposite effect. *Q.E.D.*

A.7 Proof of Proposition 5

From Proposition 3 we know that beyond a location value t^*, the profit from a company-owned store is higher. Therefore any increase in the set of locations from $[0, T]$ to $[0, T + \epsilon]$ will lead to an increase in the set of locations with company-owned stores. This can be seen in Figure 4. *Q.E.D.*

A.8 Proof of Proposition 6

The proof follows from the fact that when the manager has private information regarding the location quality, the company wants to induce the manager to reveal that information. That can only be done by opening a franchised outlet. In a company-owned store, the manager has no incentive to reveal the true location quality. *Q.E.D.*

A.9 Proof of Proposition 7

The first part of the proof is straightforward. The franchisor is now solving the same problem as in Proposition 6 with two additional constraints $\alpha_t = \overline{\alpha}$ and $\beta_t = \overline{\beta}$ for all $t \in T_F$. The payoff from the constrained problem cannot be greater. For the second part of the proposition let us take a look at the problem facing the franchisor. The franchisor is solving the following problem:

$$\max_{\alpha,\beta,s} \alpha \int_0^T d\Phi(t) + \beta \int_0^T F(e_t, s; t) d\Phi(t) - h(s) \int_0^T d\Phi(t)$$

subject to

(IR) $$u[-\alpha + (1-\beta)F(e_t, s, t)] - v(e_t) \geq \overline{u}.$$

Since the contract offered now is the same for all types, the incentive compatibility condition cannot be satisfied, and if the individual rationality constraint for the type $t = 0$ is satisfied, then it also holds for all $t > 0$. The supervision provided by the franchisor is given by the solution to the following equation:

$$\overline{\beta}\int_0^T F_2(e_t, s; t)d\Phi(t) = h(s)\int_0^T d\Phi(t).$$

Let that level of supervision be denoted by $\widetilde{s}$. Notice that the franchisor provides the same level of supervision irrespective of the location type. As a result, the optimal level of effort provided by an agent of type t will satisfy

$$(1-\overline{\beta})u'(\cdot)F_1(e_t, \widetilde{s}; t) = v'(e_t).$$

Let us denote the optimal effort by $\widetilde{e}_t$. If $\overline{\beta}F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s}) < 0$ for some t, then the franchisor will be better off by not opening a franchised outlet at low-quality location types. Let $\underline{t}$ solve $\overline{\beta}F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s}) = 0$. It follows from the monotonicity of $F(\cdot)$ with respect to t that $\overline{\beta}F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s}) < 0$ for all $t \in (0, \underline{t})$ and $\overline{\beta}F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s}) > 0$ for all $t \in (\underline{t}, T)$. Profits of the franchisor from the original contract can be written as

$$\overline{\Pi}_F = \overline{\alpha} + \overline{\beta}\int_0^{\underline{t}}[F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s})]d\Phi(t) + \overline{\beta}\int_{\underline{t}}^T[F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s})]d\Phi(t).$$

We have $\overline{\beta}\int_0^{\underline{t}}[F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s})]d\Phi(t) < 0$ since $\overline{\beta}F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s}) < 0$ for all $t \in (0, \underline{t})$. Hence there exists $\widetilde{\alpha} > \overline{\alpha}$ such that

$$\widetilde{\alpha}\int_{\underline{t}}^T d\Phi(t) + \overline{\beta}\int_{\underline{t}}^T[F(\widetilde{e}_t, \widetilde{s}; t) - h(\widetilde{s})]d\Phi(t) > \overline{\Pi}_F.$$

Hence if the franchisor has to provide the same contract to all franchisees, franchise stores may not be opened at low-quality location types. *Q.E.D.*

A.10 Proof of Proposition 8

Let $\{\widetilde{\alpha}_t, \widetilde{\beta}_t, \widetilde{e}_t, \widetilde{s}_t\}$ be the solution to the above problem. From the IR we can write $\widetilde{\alpha}_t$ as

$$\widetilde{\alpha}_t = (1-\widetilde{\beta}_t)F(\widetilde{e}_t, \widetilde{s}_t; t) - u^{-1}[\overline{u} + v(\widetilde{e}_t)].$$

Therefore the profit from a franchised outlet at any location t is given by

$$\Pi^F(t) = F(\widetilde{e}_t, \widetilde{s}_t; t) - u^{-1}[\overline{u} + v(\widetilde{e}_t)] - h(\widetilde{s}_t).$$

Now let us consider profits from a company-owned outlet. From Proposition 1 we know that the company can implement any level of effort from the manager provided it monitors him. The profit from a company-owned store is

$$\Pi^0(t) = F(e_t^*, s_t^*; t) - h(s_t^*) - W_t^* - M.$$

Note that

$$W_t^* = u^{-1}\left[\overline{u} + \frac{v(e_t^*) - v(\widetilde{e}_t)}{p(\widetilde{e} - e_t^*)}\right].$$

Therefore,

$$\Pi^0(t) = F(e_t^*, s_t^*; t) - h(s_t^*) - u^{-1}\left[\overline{u} + \frac{v(e_t^*) - v(\widetilde{e}_t)}{p(\widetilde{e} - e_t^*)}\right] - M.$$

Hence $\Pi^0(t) \geq \Pi^F(t)$ if and only if

$$F(e_t^*, s_t^*; t) - h(s_t^*) - u^{-1}\left[\overline{u} + \frac{v(e_t^*) - v(\widetilde{e}_t)}{p(\widetilde{e} - e_t^*)}\right] - M \geq F(\widetilde{e}_t, \widetilde{s}_t; t) - u^{-1}[\overline{u} + v(\widetilde{e}_t)] - h(\widetilde{s}_t)$$

or

$$M \leq F(e_t^*, s_t^*; t) - h(s_t^*) - u^{-1}\left[\overline{u} + \frac{v(e_t^*) - v(\widetilde{e}_t)}{p(\widetilde{e} - e_t^*)}\right] - F(\widetilde{e}_t, \widetilde{s}_t; t) + u^{-1}[\overline{u} + v(\widetilde{e}_t)] + h(\widetilde{s}_t) = \overline{M}.$$

Q.E.D.

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