ABSTRACT

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This dissertation consists of three essays, of which two are related. In the first essay I model the interaction between a franchisor and its franchisees. I examine how a franchisor uses the investment requirements she asks franchisees as a tool to reduce franchisees' underprovision of sales effort. Theoretically, I show that if the franchisor's reputation is highly important the franchisor asks for higher investment requirements when penalizing a misbehaving franchise is more difficult (weaker law enforcement) and when directly monitoring franchisees is more costly.

In the second essay, I empirically test the theoretical predictions of the first essay using two datasets at the franchisor level. I measure weak law enforcement using the passing of state level good-cause termination/nonrenewal laws for franchise contracts and I measure monitoring costs using the number of states in which a franchisor operates. Using a database that contains information for 278 franchisors, before and after the laws were passed in some states, I find that the passing of the laws implied an incremental 4.7% increase in investment requirements for franchisors located in states where the laws were passed. Using a large database (10,047 franchisor-year observations), posterior to the passing of the laws, I find that franchisors located in states where good-cause termination/nonrenewal laws

were passed ask for investment requirements 4.5% higher than franchisors located in states without such laws. Using both datasets I find evidence that franchisors that expand their operations to an additional state increase the average investment requirements they ask a prospective franchisee between 0.6-1%.

The third essay, which is in conjunction with Gordon Phillips, empirically studies how financial distress and bankruptcy affects firms' choices of product quality and prices using data from the airline industry. We find that an airline's quality and pricing decisions are differentially affected by financial distress and bankruptcy. Product quality decreases when airlines are in financial distress, consistent with financial distress reducing a firm's incentive to invest in quality. In addition, firms price more aggressively when in financial distress consistent with them trying to increase short-term market share and revenues. In contrast, in bankruptcy product quality increases relative to financial distress periods.

ESSAYS ON BUSINESS ECONOMICS

By

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DEDICATION

To my wife Francisca for her love and support.

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CHAPTER I

Introduction

Firms are complex decision-making organizations. They decide on the price and quality of their products, their advertising strategy; they decide on how to bargain with suppliers, how to design contracts with their business partners, how to compensate their employees, etc. From an economist's perspective, what is interesting is to study whether there are systematic patterns in firms' decision-making and, if so, examine what causes those patterns. This dissertation studies the determinants of franchisors' investment requirements and airline's product quality and pricing decisions, shedding light on systematic patterns that were overlooked in the literature. In particular, this dissertation studies how the misalignment of incentives between firms' stakeholders (e.g., owners, business partners, debt holders, etc) can act as driving forces on firms' decisions.

In a franchise setting, franchisees that operate under a common brand name have incentives to free-ride on each other's sales effort. As a consequence, franchisees tend to underprovide sales effort relative to the sales effort the franchisor would like them exert. Sales efforts are not perfectly contractible as their observability is imperfect. As a consequence, the franchisor needs to boost franchisees' sales efforts indirectly, because if she does not boost them, her reputation will be negatively affected.

In the first two essays, I show that a potential mechanism to boost franchisees sales effort is to ask them for higher investment requirements. Investment requirements are the amount the franchisor asks the franchisees to invest in the opening of a new franchise unit. Investment requirements are easy to observe, thus they do not suffer from imperfect contractibility as is the case of sales efforts. The intuition of how higher investment requirements can boost sales effort is the following. The more franchisees invest, the higher their selling capacity will be, and thus, they will have more to lose in case of contract termination if they are caught underproviding sales effort. The fear of losing high rents disciplines the franchisees' behavior and, as a consequence, they increase sales effort. The cost of using investment requirements as a disciplining device is that the franchisees are forced to over-invest relative to a situation where sales efforts are perfectly contractible. The burden of the extra investment is ultimately borne by the franchisor as she has to modify other dimensions of the franchise contract to make it equally attractive to franchisees. Therefore, I expect to systematically observe a franchisor asking for higher investment requirements when the incentives to provide sales effort from franchisees are particularly weak, as when incentives are weak is when the benefit of boosting sales effort compensates the costs of asking for higher investment requirements. In other words, the less aligned the incentives between franchisors and franchisees are the higher investment requirements will be.

The first essay provides theoretical evidence of two scenarios where franchisees' incentives are weaker and thus higher investment requirements are set to offset those weak incentives: when penalizing a misbehaving franchise is more difficult (weaker law enforcement) and when directly monitoring franchisees is more costly. These predictions find empirical support in the second essay of the dissertation.

In the third essay, Gordon Phillips and I study how firms' financial condition and bankruptcy can affect firms' product quality and pricing decisions. Maksimovic and Titman (1991) theoretically studied the firms' incentives to cut quality when in financial distress, as firms may produce a lower quality product and attempt to sell this product as higher quality in order to stave off bankruptcy. A similar argument can be given for the price decision as prices are likely to be reduced in financial distress in order to gain market share and avoid immediate bankruptcy. This essay documents those phenomena using data from the airline industry. In addition, it empirically documents a finding disregarded both by the theoretical and empirical literature. Firms' quality increase in bankruptcy relative to their financial distress situation. This result is consistent with firms investing in customer retention and reputation that enables them to get out of bankruptcy.

The findings of the third essay can be easily interpreted in terms of incentives misalignments. When the firms' decision makers, either owners or managers acting in behalf of owners, face financial distress, their incentives are less aligned with those of the debt holders as the potentially negative outcomes of their decisions are bounded by bankruptcy. Debt holders, on the other hand, fully bear the bad outcomes of the firm's decisions as when the firm is declared bankrupt debt holders become the new owners of the firm. If the firm reduces quality in financial distress and bankruptcy is not avoided, debt holders inherit a firm with a damaged product quality reputation. Similarly, if the firm reduces prices in financial distress and bankruptcy is not avoided, debt holder might inherit a firm that operates under a price war triggered by the price reduction initiated by the financially distressed firm. Thus, product quality reduction and price reduction in financial distress are the consequence of incentives misalignment, between debt holders and equity holders.

The goal of this dissertation is to provide a modest contribution to the understanding of firms' strategies, according to their conflict of interests between their stakeholders. It is on my short-term agenda to continue studying how conflicts of interests can affect other dimensions of firms. I leave for future research to study how the conflict of interest between debt holders and equity holders can shape the structure of an organization and to study whether firms' bidding behavior, in case they participate in auctions for inputs, can be affected by their financial condition.

CHAPTER II

Investment Requirements in Franchise Contracts as a Self-Enforcing Device: A Theoretical Model

II.1-Introduction

Investment requirements in franchise contracts are the amount franchisors ask franchisees to invest in the opening of a new franchise unit.[1] The franchisor determines the size of the outlet, specifies the architectural design and leasehold improvements. She also determines the equipment and furniture the franchisee needs to purchase. In addition, investment requirements usually include working capital and sometimes money for the lease. It is commonly thought that once the franchisor's retailing format is defined, variations in the investment requirements depend exclusively on the market characteristics where a franchise unit operates. Contrary to that view, this essay sugsests that franchisors can strategically choose the amount of investment requirements in order to discipline franchisees.

Franchise chains represent over 40% of retail sales in the United States according to the International Franchise Association [IFA], 2004. Franchises encompass variety of business formats. Educational services, such as day-cares, car repair shops, fast food restaurants, clothing retailers and lodging are common formats in franchises, just to mention a few.[2] On average, the investment requirements a franchisor asks franchisees is over half a million dollars.[3] In spite of its great

[1] The franchisee covers 100% of this ex-ante investment.

[2] See table III.4 for a broader characterization of formats common to franchising.

[3] Using 15 years of Bonds' franchise guide, for 2,017 franchisors, the average investment requirements is $520,000.

economic relevance, the determinants of investment requirements have not being studied before, most likely because it is thought that the franchisor does not play a major role in modifying them.

This paper proposes a theoretical model that endogenizes the investment decision in franchise contracts. The model considers a moral hazard problem where each franchisee can free-ride on the other franchisees' sales effort. This engenders a misalignment of incentives between the franchisor and the franchisee even if the franchisee is the residual claimant (zero royalty rate). As a consequence, franchisees will underprovide sales effort, hurting the franchisor's reputation. Alignment of these incentives requires a self-enforcement mechanism. We consider that investment requirements generate a permanent increase in franchisee's earnings as the more franchisees invest, the higher their selling capacity will be. In this scenario, a franchisee that is asked for higher investment requirements will have more to lose in case of contract termination. When a franchisee's incentives to provide the appropriate level of sales effort are weak, the franchisor can correct his incentives by requiring higher investments in order to generate the necessary ex-post rents that discipline the franchisee's behavior. While the higher ex-post rents might not be sufficient to cover the extra investment that generates them, asking for the extra investment might still be a profitable strategy for the franchisor, because it precludes the franchisee from underproviding sales effort and hurting the franchisor's reputation, which is the franchisor's most valuable asset. In particular, the model concludes that if the franchisor's reputation is highly important the franchisor asks for higher investment requirements when penalizing a misbehaving franchise is more difficult (weaker law enforcement) and when directly monitoring franchisees is more costly.

Most prominent works in theoretical franchise literature study franchisor's royalty rates and initial franchise fees decisions (see Mathewson and Winter (1985), Lal (1990) and Bhattacharya and Lafontaine (1995)). These papers, however, do not consider investment requirements as a contract term. Additional papers have offered some arguments about how investment requirements can play a role in franchise contracts. Klein (1980, 1995) considers that investment requirement can affect the franchisee's effort through self-enforcement, because the franchisee can lose some of its investments in case of termination. Klein (1980) puts emphasis on how non-salvageable value of the assets that compose the investment requirements plays a role in self-enforcement, while Klein (1995) puts emphasis on how the future earnings that investment requirements can generate, which are lost in case of a contract termination, play a role in a self-enforcement mechanism. Dnes (1993) adapted Williamson's analysis of transaction costs to empirically study the role that the asset specificity of investment requirements plays on franchise contracts. Through a case study of 15 franchise contracts in the United Kingdom, he argues that the specificity of investment requirements plays a role in generating some termination covenants. In Klein (1980, 1995) and Dnes (1993) analyses, however, investment requirement is not considered a decision variable. Investment requirements is considered just as a channel through which asset specificity and future earnings play a role in generating new contract covenants and boosting the franchisee's effort through self-enforcement. The present essay adds to the literature by being the first to explicitly model the franchisor's choice of investment requirements and exploring what its determinants are.

Outside of the franchise literature, the present model shares similarities with an employee posting a bond to his employer, which is recovered if he does not shirk (see Shapiro and Stiglitz 1984).[4] This mechanism was argued not to work in an employer/employee relationship as presumably the employee does not have enough initial wealth to post the bond in the first place. In a franchise setting, however, this mechanism is more plausible, as potential franchisees are expected to invest in opening a franchise unit and the franchisor just modifies investment requirements on the margin in order to generate better enforceability conditions.[5]

The results presented here highlight that investment requirements are endogenously determined. It is shown that investment requirements can be adjusted on the margin to generate better enforceability conditions. The academic and practical importance of these results, for understanding the economics of franchise contracts, is substantially enhanced by the size of the investment requirements. To put it in context, investment requirements are, on average, more than 15 times higher than initial franchise fees.

The rest of the essay is organized as follows. In section II.2, the general structure of the model is outlined and its placement in the literature is explained. In section II.3, the model is presented and solved. In section II.4 we study how investment requirements are affected by the strengh of law enforcement and monitoring costs. In section II.5, we extend the comparative statics to analyze initial

[4] This mechanism is an extension of the efficiency wage model proposed by the same authors.

[5] In theory, the franchisor could ask the franchisee to post a bond with her rather than incurring in a costly overinvestment to improve the enforceability conditions. However, in practice, this would generate incentives for the franchisor to refrain returning the bond even if the franchisee has behaved according to her specifications. This, in turn, would make termination even harder as the courts would anticipate the franchisors' perverse incentives, backfiring on the franchisors efforts to improve the self-enforceability of the contracts.

franchise fees. Finally, conclusions are given in section II.6.

II.2-General Structure of the Model

In franchise contracts, incentives of the franchisor and their franchisees do not always coincide even if the franchisees are the residual claimers of the franchisor's business, because franchisees can free-ride on a common brand name.[6] As Klein (1995) points out *"... when franchisees use a common brand name, each franchisee can reduce its costs by reducing the quality of the product it supplies without bearing the full consequences of doing so. Because a reduction in quality has the effect of reducing the future demand facing all franchisees using the common name, not just the future demand facing the individual franchisee who has reduced quality, the incentives for individual franchisees to supply the desired level of quality is reduced"* (pp. 12-13).

In our setting, we will treat what Klein (1995) calls 'quality' more broadly. We will define quality as sales effort, which is the effort the franchisee exerts to operate the franchise unit according to the terms agreed upon in the franchise contract with the franchisor. Within the sales effort, we are considering several dimensions of distribution services, like ambiance, product assortment, maintaining a certain level of customer service and maintaining a standardized level of

[6]Klein (1995) points out three other reasons of why incentives might be misaligned. First, franchisees can free-ride on pre-purchase services that can be obtained free from other franchisees. Second, franchisors and franchisees can disagree in the optimal amount of marketing effort. Finally, franchisees can sell the franchisor's products at a high markup if they have some monopoly power, creating a double marginalization problem. In contrast with franchising on a common brand name, none of these situations are present in all franchise contracts. However, the first two situations are captured by our model, given that they translate into franchisees under providing sales effort.

quality for the products sold.[7] We assume these terms can be contracted on, but their observability is imperfect. The franchisor relies on inspections as a monitoring device to detect, with some probability, any underprovision of sales effort of franchisees. The idea of the optimal contract is that the franchisor uses the investment requirements she asks franchisees to generate a self-enforcement mechanism. This mechanism is essential for the franchisor since the value of his brand relies heavily on maintaining a uniform level of distribution services. In short, the main assumptions of the model are that investment requirements are perfectly observable, while sales efforts are not.[8]

The idea that investment requirements in franchise contracts can be used as a tool for self-enforcement is not new. Klein (1980) states that if a franchisee's investment is highly specific, the non-salvageable investment can act as a "collateral bond," because if the franchisee cheats (i.e., under-provide sales effort) and is caught, he is left almost empty-handed, given that the resale price of the assets in which he invested to run the franchise unit diminishes with their specificity. Klein (1995) additionally states that investment increases the ongoing value of the relationship, no matter who pays for the investment. In sum, higher investment increases the value of staying in the relationship but also alters the value of cheating since it affects the residual value of investment for any given asset specificity. We will add these two ingredients to our model.[9] The main difference between Klein's papers and the present model is that in Klein's papers the investment level is fixed, while here it can modified to generate better enforceability conditions.

[7] For a broader definition of distribution services see Betancourt (2004).

[8] The franchisor is closely involved in the installation of a new franchisee, so he can enforce the investment requirements specifications.

[9] Dnes (2003) provides a similar argument regarding the dual role of investments.

The future profits and the outside option of the franchisee are not the only components of the self-enforcement mechanism. As pointed out by Lafontaine and Raynaud (2002), self-enforcement also depends on the franchisor's monitoring and her ability to terminate the franchise contract.

The monitoring frequency is endogenously determined by the franchisor. To focus on the investment decision and keep the model tractable, we assume that there are only two possible monitoring intensities, high and low, such that the franchisor's decision on monitoring intensity depends solely on the cost difference of these two available options. In this fashion, a direct mapping between monitoring costs and monitoring intensities allow us to study the effect that monitoring costs has on investment requirements through its effect on monitoring intensities.

On the other hand, the franchisor's ability to terminate the franchise contract is naturally exogenous, because it depends on the legal framework under which franchises operate. We will define weaker law enforcement when it is harder to terminate a franchise agreement in which the franchisee has clearly under-provided sales effort. We assume that if a franchisor ends a relationship, there will be a monetary loss for both the franchisor and the franchisee. The franchisor might be willing to undertake this loss because if he does not commit to terminate an underperforming franchisee, then no franchisee will exert the appropriate level of sales effort.[10] We analyze the effect of law enforcement on the investment requirement.

We assume that the franchisor's actions, such as giving ongoing support to

[10] In reality, monitoring intensity can also be affected by the strength of the law enforcement. We rule out this possibility in our model by only having two possible monitoring intensities.

the franchisees, have no incidence on the franchisees' demand. Allowing this additional feature will turn the model into a double moral hazard problem as the franchisor could also refrain to exert the appropriate level of effort in her actions. Not modeling the franchisor's moral hazard problem can be considered an important omission as Lal (1990), Battacharyya and Lafontaine (1995) showed that this feature is the main justification for the existence of a positive royalty rate.[11] The intuition is that only a positive royalty rate gives the franchisor an interest in the revenues of the franchisees. We do not model the franchisor's opportunistic behavior for mathematical tractability.[12] We focus our attention on the determinants of investment requirements, not considering the potential effects these determinants might have on the royalty rate. If the franchisor's moral hazard problem is modeled, changes in the model exogenous parameters would have two margins of adjustment, royalty rates and investment requirements, rather than just investment requirements. Therefore, its inclusion would only alter the magnitude of the effect of the exogenous parameters on investment requirements, not the sign of the effect.

We also assume that franchisors cannot end (or threaten to end) franchise agreements opportunistically, that is, without a good cause for termination. In other words, we assume that the franchisor does not try to end a relationship to take over a profitable franchisee or threaten to end a profitable franchisee in order to renegotiate the contract terms in its favor. We think this is a reasonable

[11] There are two alternative mechanisms that can generate positive royalty rates: franchisee's risk aversion and franchisee's limited liability. The former has not found empirical support in the literature (see Lafontaine and Slade (2007)), while the latter does not give any prediction about what the determinants of royalty rates are.

[12] The comparative statics will be based on a Hessian rather than on an implicit equation.

assumption for two reasons. First, unfairly terminating a franchise agreement would hurt the franchisor's reputation. Second, Lafontaine and Shaw (2005) found that franchisors target a stable percentage of owned outlets in the long run (after 7 years of operation); therefore, when the franchise gets established no pattern of ownership redirection is observed.

Finally, we leave aside other non pecuniary clauses of franchise contracts that can affect self-enforcement, like exclusive territories (see Klein and Murphy 1988), or the effect that asset specificity might have on contract length or other specific clauses as discussed by Williamson (1975, 1979, 1985).

II.3-The Model

II.3.1-Specific Assumptions

We assume there are N identical franchisees and one franchisor. The franchisor and the franchisees are risk neutral.[13] We assume that the franchisees' demand is $q_i(p_i, I_i, \hat{S})+\varepsilon_i$, where p_i is the price of the good sold, $I_i \in [0, \infty)$ is the investment requirement, $\hat{S}$ is a compound of the firm's sales effort and the other franchisees' sales efforts and ε_i is a white noise random shock in the realization of the demand.

We assume that the price is fixed at $p_i = 1$, for simplicity, although relaxing this assumption does not change the results of the model.[14] $\hat{S} = (1-\theta)S_i +$

[13] LaFontaine and Slade (1997, 2007) document that there is no evidence in favor of the hypothesis that franchisees' risk aversion plays an important role in the design of franchise contracts.

[14] Allowing a franchisee to choose price in the model increases the marginal benefits the franchisee obtains from selling an additional unit, because the franchisee can also adjust the price optimally. As a consequence, the marginal benefit of exerting sales effort increases when the franchisee can chose the price, and this implies that more will be lost in case of contract termination. This can only alter the magnitude, but not the directions of the results we derive. The

$\theta \sum_{i=1}^{N} \frac{S_{-i}}{N-1}$, where $S_i \in [0, \infty)$ represents the franchisee's own sales effort, $S_{-i} \in [0, \infty)$ represents the sales effort of other franchisees and the parameter $\theta \in [0, 1]$ is a measure of the magnitude of the externality. We assume this specification so that changes in θ alter only the composition of sales efforts on demand, not its magnitude. The demand has a random shock component $\varepsilon_i \sim N(0, \sigma^2)$. This term is needed because without it the franchisor could infer the sales effort from the quantity demanded. Let $\frac{\partial q_i(I_i,\hat{S})}{\partial I_i} > 0$, $\frac{\partial^2 q_i(I_i,\hat{S})}{\partial I_i^2} = 0$, $\frac{\partial q_i(I_i,\hat{S})}{\partial \hat{S}} > 0$; $\frac{\partial^2 q_i(I_i,\hat{S})}{\partial \hat{S}^2} = 0$ and $\frac{\partial^2 q_i(I_i,\hat{S})}{\partial \hat{S} \partial I_i} = 0$. These derivatives represent that investment and sales effort increase demand and that there are no complementarities between sales effort and investment.[15] The assumption that the second derivatives of demand with respect to investment requirements and sales effort are zero was chosen for simplicity, but all the results of the model still hold if we assume they are negative.

We assume that the marginal cost of producing q_i is constant and equal to zero, without loss of generality. Let $\iota(I_i)$ be the cost of investment and $C(S)$ be the cost of sales effort. Both are assumed to be increasing and convex and satisfy $\iota(0) = \iota'(0) = C(0) = C'(0) = 0$ to guarantee an interior solution.[16] Let ρ be

fixed price model we develop above is equivalent to a reduced-form model of the true underlying phenomenon where the price can be optimally adjusted.

[15] Investment and sales effort can be considered complements. In the case of a franchise restaurant, higher investment can imply a better ambiance or better kitchen appliances. These features makes selling easier, increasing the marginal benefit of sales effort. If this were the case, investment would facilitate self-enforcement not only due to an increased punishment in case of termination, but also by increasing the marginal benefit of sales effort directly. As a consequence, complementarities between sales effort and investment requirements only strengthen the role of investment requirements as a self-enforcing device.

[16] Investment costs are convex for 2 reasons: First, mathematically they help to satisfy the global concavity assumptions of the model. Second, intuitively, when franchisees with limited initial wealth ask for a loan, they are charged higher interest rates the higher the amount they ask, given that the risk of the loan increases. Therefore, the net present value of obtaining the financing increases in a convex fashion. If we want to be more precise, the costs of funding would be better expressed as $I + g(r(I))$ where $g(.)$ is a function of the NPV of the cost of the interest paid over the loan which is an increasing function of the interest rate, which is in turn an increasing function of the investment. Strictly speaking, the cost of the investment needs to

the royalty and f the initial franchise fee. Each franchisee is assumed to have an outside option of U. Let Π^{fe} be profits of the franchisee and Π^{fr} profits of the franchisor. Initially, assume there is no monitoring mechanism.

The timing of the model is as follows. At time 1, the franchisor chooses f, I and ρ. At time 2, the franchisees observes f, I and ρ and chooses the sales effort, S_i. Profits are realized at $t = 2$. In this setting, profits represent the future stream of profits generated in the franchise agreement.

II.3.2-No Monitoring Technology and First Best

Initially, consider a model without a monitoring mechanism: S_i cannot be observed by the franchisor.

The franchisees' objective function is:

$$\max_{S_i} E\left(\Pi^{fe}\right) = (1-\rho)q_i(I_i, \hat{S}) - C(S_i) - \iota(I_i) - f$$

Assume that the franchisor's objective function includes a reputation cost if the franchisees do not provide the socially optimal sales effort, $\bar{S}$. Let this cost be $\beta\varphi\left(\bar{S} - S_i\right)$ if $S_i < \bar{S}$ and 0 if $S_i \geq \bar{S}$; where $\varphi\left(\bar{S} - S_i\right)$ is a function of the underprovision of sales effort and β is a scalar that represents the severity of the loss in reputation. We assume that β is positive and large to represent that the future reputation of the franchisor has a big weight in his objective function. Let the first derivative of $\varphi\left(\bar{S} - S_i\right)$ with respect to sales effort be $-\varphi'(S - S_i) < 0$ and the second derivative be $\varphi''(S - S_i) > 0$. This specification reflects that the

be convex only for the relevant range. It can be flat for small values of investment (i.e: amounts that the franchisee can pay in cash).

cost of reputation increases at an increasing rate with the underprovision of sales effort.[17] Strictly speaking, the reputation cost is the loss of future reputational rents.[18] When a franchisor cannot maintain a high level of sales effort from her actual franchisees, future franchisees that choose to contract with the franchisor will have their demand reduced and this, in turn, reduces the rents the franchisor can extract from those future franchisees.

The franchisor's objective function is:

$$\max_{\rho,I,f} E\left(\Pi^{fr}\right) = \sum_{i=1}^{N} \left(\rho q_i(I_i,\hat{S}) + f - \beta\varphi\left(\bar{S} - S_i\right)\right)$$

$$s.t$$

$$\text{Individual Rationality constraint}_i \ \forall i$$

$$\text{Best Response function}_i \ \forall i$$

The franchisor incorporates each franchisee's best response function at $t = 2$ and their individual rationality constraints. The franchisee's best response function is the franchisee's first order condition of profits with respect to sales effort, in a symmetric equilibrium. The individual rationally is the constraint that a franchisee's gets, in expectation, at least as much as what he would have obtained

[17] A reputation cost is needed because, in absence of it, when a franchisee is underproviding sales effort, the franchisor will not use investment requirements to overcome this problem. As the marginal cost of investment is increasing, the franchisee needs to be compensated through a lower franchise fee for additional investment requirements. In this scenario, the franchisor allows the underprovision of sales effort rather than asking for a smaller franchise fee. On the other hand, when there is a reputation cost, the cost of underproviding sales effort is large. Therefore, the franchisor prefers to ask for a higher investment requirement even if this implies obtaining a reduced franchise fee.

[18] Another way to incorporate the feature that franchisors want to avoid large under provisions of sales efforts from franchisees is to add the franchisor's reputational cost inside the demand of the franchisees, rather than having a cost that captures the loss in future business as it is modeled here. This last approach was chosen because it simplifies the model and because it provides a clean separation between the externality problem and the reputational concerns.

from his outside option.

In this scenario, the first best is obtained by maximizing the sum the profits of the franchisees and the franchisor. Notice that in this scenario, by definition, $S_i^* = \bar{S}$, implying that the reputation cost is zero. The first best optimization problem can be stated as:

$$\max_{S_i, I_i} \sum_{i=1}^{N} \left(q_i(I_i, \hat{S}) - C(S_i) - \iota(I_i) \right)$$

Taking the first order conditions with respect to investment and sales, and given the symmetry of the franchisees, we obtain:

$$\frac{\partial q_i(I_i, \hat{S})}{\partial I_i} = \iota'(I_i) \tag{1}$$

$$\frac{\partial q_i(I_i, \hat{S})}{\partial S_i} = \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}} = C'(S_i) \tag{2}$$

Considering that $\frac{\partial^2 q_i(I_i, \hat{S})}{\partial \hat{S} \partial I_i} = 0$, equation (1) uniquely determines the first best investment requirement that a franchisor asks a franchisee, I_{FB}^*, and equation (2) uniquely determines the first best level of sales effort that a franchisee should exert, S_{FB}^*.

Without a monitoring technology, this equilibrium will not be achieved due to the externality problem. Absent monitoring, the franchisee, in period 2, chooses S_i to maximize his objective function obtaining:

$$(1-\rho)\frac{\partial q_i(I_i, \hat{S})}{\partial S_i} = (1-\rho)\frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta) = C'(S_i) \tag{3}$$

By symmetry $S_i = S_{-i} = S$. Thus, equation (3) can be expressed as:[19]

$$(1-\rho)\frac{\partial q(I,\hat{S})}{\partial \hat{S}}(1-\theta) = C'(S) \tag{4}$$

According to equation (4) sales effort does not depend on the investment requirement. This is because we do not have a monitoring mechanism that can create the threat of termination and cause self-enforcement. Additionally, even without solving the franchisor's optimization problem we can see that the only way the franchisor can affect the franchisee's sales effort is through the royalty rate. The lower royalty rate, the higher the sales effort is. However, even when royalty is set to be equal to zero, there is an underprovision of sales effort given that each franchisee considers the marginal benefit of their own sales effort and not the benefit their sales effort has on the other's franchisees. The higher the externality θ, the more severe the underprovision of sales effort is. Therefore, the franchisor needs a method to boost sales effort.

II.3.3-Monitoring Mechanism

The probability of detecting a franchisee underproviding sales effort has two components: the monitoring intensity, which is how often a franchisor inspects a franchisee, and the franchisor's ability to detect an underprovision of sales effort during an inspection.

The monitoring intensity is endogenously chosen by the franchisor. Given that

[19] The fact that each franchisee's sales effort does not depend on the other's franchisee's sales effort is not a consequence of symmetry. This result follows our simplifying assumption that $\frac{\partial^2 q_i(I_i,\hat{S})}{\partial \hat{S}^2} = 0$.

the model only has two periods, the monitoring intensity represents the probability of being monitored. Let η be the monitoring intensity which can be either high, η^H, or low η^L, and they satisfy $0 < \eta^L < \eta^H < 1$. Let Φ be the monitoring cost. Without loss of generality let $\Phi^L = 0$ and $\Phi^H > 0$. We only allow for two intensities in order to keep the model tractable.[20] Initially, we assume that Φ^H is small such that it is always profitable for the franchisor to monitor more intensively, η^H, for any investment requirement and sales effort. Later, we study the consequences of an increase in monitoring costs.

Even if the franchisor inspects the franchisee and the franchisee is underproviding sales effort, it can still be the case that the underprovision is not perceived because the underprovision is small and can go unnoticed, or because an error of assessment. Therefore, we assume there is only a probability of detecting underprovision of sales effort when there is underprovision. Let the probability of detecting underprovision during an inspection be $F(\bar{S} - S_i)$, where $F(\bar{S} - S_i) > 0$ $\forall S_i < \bar{S}$ and $F(\bar{S} - S_i) = 0$ $\forall S_i \geq \bar{S}$. For $\forall S_i \leq \bar{S}$ we assume that higher sales effort makes detection of an underprovision less likely, $-f(\bar{S} - S_i) \leq 0$, and that higher sales effort decreases this probability at a decreasing rate, $f'(\bar{S} - S_i) < 0$. Further, we assume that $f(0) = 0$ and $f''(\bar{S} - S_i) = 0$. The intuition for this specification is that during an inspection, if the underprovision of sales effort is small it is harder to detect it than when it is large.

Putting together the monitoring intensity and the probability that the franchisor detects an underprovision of sales effort, when there is one, during an inspection, we get the ex-ante probability of detecting an underprovision of sales

[20] If we allow the monitoring intensity to be a continuous variable the comparative statics will be based on Hessians rather than single equations.

effort: $F(\bar{S} - S_i)\eta$. This monitoring mechanism expresses the contractibility of imperfectly observed sales effort. The timing of the game is as follows: The franchisor selects the monitoring intensity at $t = 1$ along with f, ρ and I, and the franchisees, observing those decisions, simoultaneosuly select their sales efforts at $t = 2$.

We assume that if the franchisor finds a franchisee underproviding sales effort she would like to sanction the franchisee by terminating the franchise contract. Nevertheless, if the law enforcement under which they operate is weak it might be difficult to impose this sanction. Let $\gamma \in [0, 1]$ be the probability of terminating the franchise contract when an underprovision has been detected. A higher γ means stronger law enforcement. Therefore, the probability of terminating a franchise contract can be expressed as $F(\bar{S} - S_i)\eta\gamma$.[21]

We assume that if a franchisee is found cheating the franchise relationship will be terminated and the franchisee will only have access to the salvage value of his investment: $(1 - \alpha) I$. Let $\alpha \in [0, 1]$ be the degree of asset specificity; $\alpha = 1$ means complete specificity and $\alpha = 0$ means complete generality.[22]

[21] The probability of termination/nonrenewal has been quantified in the franchise literature. Dnes (2003) surveyed 57 franchisors in the United Kingdom finding that 58% of them declared to have used anticipated termination as a control device when observing misbehaving franchisees. Additionally, 5% if the franchisors responded that they have not renewed a franchise agreement for the same reasons. In the United States, Blair and Lafontaine (2005) using USDOC (1988) data, provide evidence that in 1986, 3% of the 246,664 franchised outlets in operation in the United States were terminated in anticipation. This rate is consistent with Williams (1996) finding of a 15.7% of contract termination for a four-year period for 1,001 contracts analyzed. Blair and Lafontaine (2004) further document that around 40% of the anticipated contract terminations were propitiated by franchisors.

[22] Allowing for the possibility that the franchisee can sell the franchise to other potential franchisees pre-selected by the franchisor would lead to the same conclusions. In that case, specificity plays the role of limiting the number of potential buyers, reducing the resale value of the franchise. Other types of penalties such as non-renewal of the agreement or the franchisor's encroachment of the franchisee's territory have similar implications as contract termination. These penalties reduce the profits of the franchisee in case of misbehavior, so they can also act as self-enforcing devices.

In this setting the franchisee's optimization problem at $t = 2$ is:

$$\begin{aligned}\max_{S_i} E\left(\Pi^{fe}\right) &= (1-\rho)\left[q_i(I_i,\hat{S})(1-F(\bar{S}-S_i)\eta\gamma)\right] \\ &\quad + \left(F(\bar{S}-S_i)\eta\gamma\right)(1-\alpha)I_i - C(S_i) - \iota(I_i) - f\end{aligned}$$

The first order condition is:

$$(1-\rho)\begin{bmatrix} q_i(I_i,\hat{S})f(\bar{S}-S_i)\eta\gamma + \\ \frac{\partial q_i(I_i,\hat{S})}{\partial \hat{S}}(1-\theta)(1-F(\bar{S}-S_i)\eta\gamma) \end{bmatrix} - f(\bar{S}-S_i)\eta\gamma(1-\alpha)I_i = C'(S_i) \quad (5)$$

By symmetry $S_i = S_{-i} = S$. This implies that $\theta\sum_{i=1}^{N}\frac{S_{-i}}{N-1} = \theta S$. Thus, we can dispense the subindex i from investment and demand.

Manipulating terms we obtain:

$$(1-\rho)\begin{bmatrix} \left(q(I,\hat{S}) - \frac{(1-\alpha)I}{(1-\rho)}\right) f(\bar{S}-S)\eta\gamma + \\ \frac{\partial q(I,\hat{S})}{\partial \hat{S}}(1-\theta)(1-F(\bar{S}-S)\eta\gamma) \end{bmatrix} = C'(S) \quad (6)$$

For the monitoring technology to be useful it should increase the sales effort relative to the no monitoring scenario. This will happen if the marginal benefit of sales effort in equation (6) is higher than the marginal benefit of sales effort in equation (4) (without monitoring technology). This condition holds if:

$$\frac{f(\bar{S}-S)}{F(\bar{S}-S)} > \frac{\frac{\partial q(I,\hat{S})}{\partial \hat{S}}(1-\theta)}{\left(q(I,\hat{S}) - \frac{(1-\alpha)I}{(1-\rho)}\right)} \quad (7)$$

We assume the monitoring technology satisfies this criterion. The intuition is that the marginal effect of the monitoring technology, $f(\bar{S}-S_i)$, is strong enough so that the marginal benefits of increasing sales effort are big in comparison to the expected losses from ending the relationship and losing profits. If $F(\bar{S} - S)$ is large relative to $f(\bar{S} - S_i)$ the franchisee will end up exerting a lower sales effort than in the no-monitoring case since he will anticipate that his efforts will be in vain with a high probability.

We also assume that using the monitoring technology is profitable for the franchisor: the boost the monitoring technology generates in sales effort exceeds the expected losses from ending the agreement and the monitoring cost Φ. In other words, we are using the assumption that the reputation cost is large. Finally, we assume that the monitoring technology is effective in controlling the externality. In equilibrium, S is below, but near, the desired $\bar{S}$.

II.3.4-Solving the Model

The model is solved by backwards induction. Solving at $t = 2$, we obtain equation (5), the reaction function of the franchisee. Applying the implicit function theorem to this equation it can be shown that franchisees' sales efforts are strategic complements: $\frac{dS_i}{dS_j} > 0$. The intuition is that the higher the sales effort of the other franchisees, the higher the demand is, and thus it is more costly for the franchisee to lose profits, which in turn motivates them to exert a higher sales effort. Recall that using symmetry we can obtain equation (6). Here, we will write equation (6) in a more general way as:

$$\phi(S, \Omega, \rho, I) = 0 \tag{8}$$

Equation (8) represents the behavior of each franchisee in equilibrium at $t =$

2; Ω represents all the parameters in the model, from the point of view of the franchisee, besides ρ and I.

At $t = 1$ the franchisor solves:

$$\max_{\rho,I,f,\eta} E\left(\Pi^{fr}\right) = \sum_{i=1}^{N} \left(\begin{array}{c} \rho q_i(I_i, \hat{S})(1 - F(\bar{S} - S_i)\eta\gamma) \\ +f - \beta\varphi\left(\bar{S} - S_i\right) - \Phi \end{array} \right)$$

$$\begin{array}{rcl} \text{subject to} & : & \\ \phi(S, \Omega, \rho, I) & = & 0 \\ E\left(\Pi^{fe}(S, \Omega, \rho, I)\right) & \geq & U \end{array}$$

The loss in the franchisors' profits due to the termination of a contract is captured by the probability of termination: $F(\bar{S}-S_i)\eta^H\gamma$. Only in the nontermination scenarios does the franchisor perceive the fraction ρ of the franchisee's revenues. Franchisees are symmetric, implying that $\hat{S} = S_i = S$. This, in turn, implies that the outside summation can be simplified into just N. Recall that we are initially assuming that the costs of monitoring at high intensity are low, implying that the franchisor always decides to monitor with high intensity. Thus, the franchisor only needs to choose ρ, I and f. Replacing the individual rationality constraint, which is binding through the appropriate choice of f, in the franchisor's objective function further reduces the choice variables to: I, ρ. Moreover, we can incorporate $\phi(S, \Omega, \rho, I) = 0$ in the objective function by using the notation $S^*(I, \rho, \Omega)$.

Then, the optimization problem can be expressed as:

$$\max_{\rho,I} E\left(\Pi^{fr}(I,\rho,S^*(I,\rho,\Omega),\Omega)\right) = \begin{pmatrix} q(I,S^*(\rho,I,\Omega))(1-F(\bar{S}-S^*(\rho,I,\Omega))\eta^H\gamma \\ +\left(F(\bar{S}-S^*(\rho,I,\Omega))\eta^H\gamma\right)(1-\alpha)I \\ -\beta\varphi\left(\bar{S}-S^*(\rho,I,\Omega)\right)-C(S^*(\rho,I,\Omega)) \\ -\iota(I)-U-\Phi^H \end{pmatrix}$$

Since it is assumed that there is no moral hazard problem for the franchisor, the optimal royalty rate will be zero. This is shown in Appendix A. All the conclusions of the model are invariant to the inclusion of a royalty rate. The only variable left in the franchisor's optimization problem is the investment requirement.

II.4-Comparative statics

Our main goal is to analyze the effect on the investment requirement of an increase in the monitoring costs, Φ^H, and weaker law enforcement, measured as a decrease in γ. We study the effect of these two parameters on investment requirements rather than studying the effect of all the model parameters on the investment requirements because only the predictions from these two parameters are empirically testable using the available franchise data sources.[23] This is of great relevance, as in the next essay we attempt to empirically test the predictions generated by this model.

To begin, we analyze the effect of a change in any parameter in Ω on the investment requirement. Our starting point is the first order condition of the franchisor with respect to investment. We can write this first order condition in

[23] For instance, in the available data sources there is no decomposition of investment in order to assess how specific it is. In addition, any variable that can be used to measure the franchise externality, such as the number of outlets the franchisors operate or the franchisor's experience also captures the franchise brand-name value, which in turn affects the level of the franchisees' demand. Thus, externality and franchisor's brand-name value cannot be told apart.

a general way as the following implicit function:

$$\omega(\Omega, I^*(\Omega), S^*(I^*(\Omega), \Omega)) = 0 \tag{9}$$

Total differentiation of equation (9) with respect to Ω and algebraically manipulating terms we obtain:

$$\frac{\partial I^*}{\partial \Omega} = -\frac{\left(\frac{\partial \omega}{\partial \Omega} + \frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial \Omega}\right)}{\left(\frac{\partial \omega}{\partial I} + \frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial I}\right)} \tag{10}$$

First, consider the denominator of equation (10), which is composed of $\frac{\partial \omega}{\partial I}$, $\frac{\partial \omega}{\partial S}$ and $\frac{\partial S^*}{\partial I}$. In Appendix B it is derived that $\frac{\partial S^*}{\partial I} > 0$. Intuitively, for sales efforts to increase with investment requirements it has to be the case that the marginal net benefit of exerting sales efforts for the franchisees increases when investment is higher. In other words, what is needed is that $\frac{\partial \Pi_i^{fe}}{\partial S_i I} > 0$. In the model, $\frac{\partial \Pi_i^{fe}}{\partial S_i I} = (\frac{q_i(I,\hat{S})}{\partial I} - (1-\alpha))f(\bar{S} - S_i)\eta^H \gamma$, where $f(\bar{S} - S_i)$ is the marginal decrease in the probability of termination that an increase in sales effort generates, and $(\frac{q_i(I,\hat{S})}{\partial I} - (1-\alpha))$ are the extra ex-post rents that the franchisee avoids losing by increasing sales efforts when investment requirements increase. Therefore, to the extent that higher investment generates higher ex-post rents, the marginal net benefit of exerting sales effort for the franchisees increases as the franchisees have more to lose in case of contract termination. An increase in investment generates higher ex-post rents if the increase in rents that investment generates, $\frac{q_i(I,\hat{S})}{\partial I}$, is greater than the increase in residual value of the investment, $1 - \alpha$. The model assumes that this is the case for two reasons. First, because in practice the costs of funds are increasing in the amount invested, implying that for investments near the first-best level the marginal benefit of investment, $\frac{q_i(I,\hat{S})}{\partial I}$, is higher than its residual value, even when assets are completely general. This can be seen in equation (1), as $\frac{q_i(I,\hat{S})}{\partial I} = \iota'(I) > 1 > 1 - \alpha$. Second, because in practice the assets in which a franchisee invests are highly specific: α is not small.

From the second order condition of the franchisor's problem we know that the marginal net benefit of investment for the franchisor decreases with investment: $\frac{\partial \omega}{\partial I} < 0$. Then, to get the sign of the denominator of equation (10), we need to derive the sign of $\frac{\partial \omega}{\partial S}$. That is, how does the marginal net benefit of investment for the franchisor changes with a change in sales effort. In Appendix C we show that if the reputation cost, β, is positive and large, then $\frac{\partial \omega}{\partial S} < 0$. The interpretation of $\frac{\partial \omega}{\partial S} < 0$ is that the higher the sales effort, the lower the marginal net benefit of asking for a large investment requirement. When sales effort is near the desired $\bar{S}$, the loss in reputation is small, given the convex cost of reputation, and using investment as a mechanism to increase the franchisee's benefits from not under-providing sales effort is not profitable given that the franchisor has to compensate the franchisee for his costly investment through a reduction in the initial franchise fee. On the other hand, when the sales effort is far below the desired $\bar{S}$, the loss in reputation is large, given the convex cost of reputation, and given that β is large this loss in reputation diminishes heavily the franchisor's profits. Therefore, the marginal net benefit of investment requirements is large since it disciplines franchisees and reduces the large loss in reputation for the franchisor. In other words, the franchisor is willing to bear the cost of the negative net present value of the franchisees' overinvestment if this avoids her a big loss in reputational capital.

Using $\frac{\partial S^*}{\partial I} > 0$, $\frac{\partial \omega}{\partial I} < 0$ and $\frac{\partial \omega}{\partial S} < 0$ we obtain that:

$$\left(\frac{\partial \omega}{\partial I} + \frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial I}\right) < 0 \tag{11}$$

Plugging this into equation (10) we can conclude that:

$$sign\left(\frac{\partial I^*}{\partial \Omega}\right) = sign\left(\frac{\partial \omega}{\partial \Omega} + \frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial \Omega}\right) \tag{12}$$

The effect of any parameter change on the investment can be decomposed into the direct effect of it on the marginal net benefit of investment, $\frac{\partial \omega}{\partial \Omega}$, and the indirect effect, $\frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial \Omega}$. The indirect effect holds more economic meaning because it refers to how a change in the parameter affects sales effort and how sales effort affects the incentives of the franchisor to ask for investment requirements. The intuition of the model can be summarized as follows: if some parameter diminishes the franchisees' provision of sales effort, $\frac{\partial S^*}{\partial \Omega} < 0$, then the marginal net benefit of asking for higher investment requirements increases given that $\frac{\partial \omega}{\partial S} < 0$. In other words, the franchisor sets investment to avoid a big loss in reputation.[24]

II.4.1-Law Enforcement

Adapting equation (12) to analyze the effect of law enforcement we get:

$$sign\left(\frac{\partial I^*}{\partial \gamma}\right) = sign\left(\frac{\partial \omega}{\partial \gamma} + \frac{\partial \omega}{\partial S}\frac{\partial S^*}{\partial \gamma}\right) \tag{13}$$

In Appendix D we show that the direct effect of stronger law enforcement on the marginal net benefit of investment, $\frac{\partial \omega}{\partial \gamma}$, is negative. The intuition is that the

[24]If franchisees are initially assymetric in terms of size this will still be the case as the overinvestment to avoid a reputational loss will occur irrespective of the initial size of the franchisees.

stronger the law enforcement, the higher the probability of termination is, reducing the marginal net benefit of asking for high investment requirements as more is lost in case of termination.[25] In Appendix E we show that sales effort increases with law enforcement: $\frac{\partial S^*}{\partial \gamma} > 0$. The intuition is that the expected punishment for misbehaving franchisees is larger when the probability of terminating a franchise contract is higher. This, in turn, increases the franchisees incentives to exert a higher level of sales effort.

Therefore,

$$\begin{array}{cccccc} sign\left(\frac{\partial I^*}{\partial \gamma}\right) = & sign(\frac{\partial \omega}{\partial \gamma}) & + & sign((\frac{\partial \omega}{\partial S})\left(\frac{\partial S^*}{\partial \gamma}\right)) & < 0 \\ & (-) & + & (-)(+) & \end{array}$$

An increase in the probability of being able to end the franchise agreement, provided that underprovision of sales effort has been observed, decreases the investment requirement. The intuition is that stronger law enforcement increases the sales effort of franchisees. This, in turn, decreases the marginal net benefit to the franchisor of requiring high levels of investment.

We thus generate the following implication:

Hypothesis 1: Franchisors ask for lower (higher) investment requirements when law enforcement is stronger (weaker).

[25] The direct effect is expected to be small. If the franchisor is effective in controlling the franchisees' sales effort to maintain her reputation, the probability of finding a franchisee underproviding sales effort when he under provides it is low, so the increase in the probability of termination conditional on a detected misbehavior is low as well. The direct effect cannot drive the comparative static on its own right, that is, without the presence of the indirect effect that correct sales effort. If the comparative statics were driven solely by the direct effect, the franchisor would ask for higher investments to franchisees that she knows are more prone to underprovide sales effort. In equilibrium, bigger franchisees, in terms of investment requirements, would have lower expected sales effort and the reputation of the franchisor would be severely damaged.

II.4.2-Monitoring Costs

So far we have assumed that the cost of monitoring intensively, Φ^H, is so small that the franchisor always prefers the high monitoring intensity to the low monitoring intensity. Now, let us assume that the cost of monitoring intensity increases and it is no longer profitable for the franchisor to monitor with high frequency. This might be the case of a franchisor that has broadened his geographical scope of operations. In this scenario, maintaining a high monitoring frequency is only possible at a very high cost. As a consequence, the franchisor optimally monitors less often, choosing η^L. Thus, the effect of an increase in the monitoring costs is exactly the same of weaker law enforcement, because when monitoring costs are high, monitoring intensity will diminish. When monitoring intensity is lower, the expected punishment of a misbehaving franchisee is reduced and its sales effort is hindered. As a consequence the franchisor increases the investment requirements in order to offset this underprovision.

We thus generate the following implication:

Hypothesis 2: Franchisors ask for higher (lower) investment requirements when monitoring costs are higher (lower).

II.5-Extension: Initial Franchise Fee

Although the focus of the model is to analyze how law enforcement and monitoring costs affect investment requirements, the model can also generate comparative statics for the initial franchise fee. The initial franchise fee is determined residually from the individual rationality constraint. We now show that the model has ambiguous predictions concerning the effect of a change in the strength of the law enforcement, γ, on the initial franchise fee. As a change in the monitoring costs, Φ, has the opposite effect as a change in γ, it also has an ambiguous effect on initial franchise fee.

In Appendix F we derive that the effect of a change in any parameter Ω on the initial franchise fee follows equation (14):

$$\frac{df(I,S^{*}(I,\Omega),\Omega)}{d\Omega}=\left(\begin{array}{c}\frac{\partial\Pi^{fr}(.)}{\partial\Omega}+\\ \left(\frac{\partial S}{\partial\Omega}+\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)\left(\frac{\partial q_i(I_i,\hat{S})}{\partial S}\theta(1-F(\bar{S}-S^{*}(\rho,I,\Omega))\eta\gamma)\right)\end{array}\right) \tag{14}$$

As can be seen in equation (14), the sign of $\frac{df(I,S^{*}(I,\Omega),\Omega)}{d\Omega}$ is composed of a direct effect, $\frac{\partial\Pi^{fr}(.)}{\partial\Omega}$, and an indirect effect, which is the multiplication of $\left(\frac{\partial S}{\partial\Omega}+\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)$ and $\left(\frac{\partial q_i(I_i,\hat{S})}{\partial S}\theta(1-F(\bar{S}-S^{*}(\rho,I,\Omega))\eta\gamma)\right)$. The sign of the indirect effect depends on the sign of $\left(\frac{\partial S}{\partial\Omega}+\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)$ given that $\left(\frac{\partial q_i(I_i,\hat{S})}{\partial S}\theta(1-F(\bar{S}-S^{*}(\rho,I,\Omega))\eta\gamma)\right)>0$. The expression $\left(\frac{\partial S}{\partial\Omega}+\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)$ is composed of the initial effect that the exogenous parameter has on sales effort, $\frac{\partial S}{\partial\Omega}$, and the offsetting effect, which is the offsetting reaction of investment to that change in sales effort, $\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}$. Because the role of investment in this model is to offset the initial change in sales effort, the initial effect is by definition as big as the offsetting effect. If the value of reputation is large the offsetting effect can offset a large amount of the indirect effect. This implies that $sign\left(\frac{\partial S}{\partial\Omega}+\frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)=sign\left(\frac{\partial S}{\partial\Omega}\right)$ but the magnitude is expected to be small.

The effect of law enforcement on sales effort, $\frac{\partial S}{\partial\gamma}$ is positive, so the overall indirect effect is likely to be positive and small. The intuition of this term being positive is that when the law enforcement is stronger, less opportunistic behavior occurs. Therefore, a higher franchise fee can be extracted. The direct effect, on the other hand, is negative, $\frac{\partial \Pi^{fr}(.)}{\partial \gamma} < 0$. The intuition is that the higher the probability of termination, the higher the losses of the franchisee, and the franchisor needs to compensate the franchisee for those expected losses. Considering both the direct and the indirect effect together the impact of γ on the initial franchise fee is ambiguous. Thus, this is also true for the monitoring cost. Therefore, we cannot derive concrete empirical predictions regarding how the strength of the law enforcement and monitoring costs affect initial franchise fees.

II.6-Conclusion

The theory presented here suggests that investment requirements in franchise contracts could be partially determined by the franchisor's ability to directly monitor her franchisees and enforce contract termination. The mechanism proposed is that franchisors increase investment requirements when the franchisees' opportunities to free-ride on the franchisor's brand-name, without being caught and punished, are greater. The intuition is that higher investment requirements increase franchisees' selling capacity; therefore, franchisees have more to lose in case of termination. As a consequence, franchisees tend to avoid misbehaving when investment requirements are higher.

We show that franchisors increase investment requirements when penalizing a misbehaving franchisee is more difficult (weaker law enforcement) and when directly monitor a franchisee is more costly. These hipotheses are empirically tested in the next essay.

The present results are novel because the investment requirements franchisors asks franchisees are shown to be able to play a unique role in self-enforcing franchise contracts that was not documented in the literature. In addition, these results are of high economic relevance as the average investment requirement a franchisor asks a franchisee is quite large: it is over half a million dollars.

CHAPTER III

Investment Requirements in Franchise Contracts as a Self-Enforcing Device: Empirical Evidence

III.1-Introduction

Investment requirements in franchise contracts are the amount franchisors ask franchisees to invest in the opening of a new franchise unit. It is commonly thought that once the franchisor's retailing format is defined, variations in the investment requirements depend exclusively on the market characteristics where a franchise unit operates. On the first essay of this dissertation an additional use for investment requirements was proposed. Investment requirements were proposed as a tool to discipline franchisees' behavior. This theory provides two testable implications. Franchisors ask for higher investment requirements when penalizing a misbehaving franchise is more difficult (weaker law enforcement) and when directly monitoring franchisees is more costly. This essay empirically evaluates these theoretical predictions.

We measure weak law enforcement with the passing of state level good-cause termination/nonrenewal laws, which weaken the franchisor's ability to terminate/not-renew a contract with an underperforming franchisee. These laws were passed in 14 states between 1971 and 1980 and in Iowa in 1992. We measure monitoring costs using the number of states in which a franchisor operates. We use two panel datasets to test our predictions. The unit of observation in both datasets is a franchisor-year. The first dataset consists of 278 franchisors that offered contracts to prospective franchisees both in 1979 and 1982 (556 franchisor-year observations). The main result from this dataset is that franchisors headquartered in the states in which the good-cause laws were passed in 1980, California (39 franchisors) and Illinois (21 franchisors), incrementally increased the average investment requirements asked to prospective franchisees by 4.7% relative to franchisors located in states where there was no change in the law. The second dataset is a large unbalanced panel dataset for the period 1994-2009. This dataset contains yearly prospective contract information for 2,017 franchisors, totalizing 10,047 franchisor-year observations. As this dataset is posterior to the passing of the laws it only allows us to analyze the between franchisor contract variation according to the franchisors' state regulation. It is found that franchisors located in the states where good-cause laws were passed ask for investment requirements 4.5% higher than franchisors located in states without such laws. Additionally, using both datasets we find evidence that franchisors that expand their operations to an additional state increase the average investment requirements they ask a prospective franchisee between 0.6-1%. This result is robust to the inclusion of controls variables that capture the endogeneity of the expansion decision and to the inclusion of additional variables that control for alternative explanations other than the monitoring cost hypothesis.

Due to the lack of theoretical guidance regarding the determinants of investments requirements there was no previous attempt to empirically study this variable. Empirical research in the franchise literature revolved around the study of initial franchise fees, royalty rates (Lafontaine (1992), Sen (1993), Wimmer and Garen (1997), Lafontaine and Shaw (1999), among others) and some other contract terms such as area development agreements, mandatory advertisement expenditures, franchisee's passive ownerships (Brickley (1999)) and contract length (Brickley et al. (2006)).

This essay adds to existing literature in being the first to empirically study the determinants of investment requirements. As the empirical evidence presented in this essay is in agreement with the theoretical predictions of a model in which investment requirements are used as a tool to discipline franchisees, we conclude that investment requirements are indeed used as a tool to discipline franchisees behavior. Moreover, in the previous literature investment requirements are considered an exogenous explanatory variable, while the present paper shows that it is an endogenous contract term.[26]

The rest of the essay is organized as follows. In section III.2 the empirical strategy is described. In section III.3 the data is presented. Section III.4 presents the empirical results. Finally, section III.5 concludes.

III.2-Empirical Strategy

In our empirical analysis we examine the effect of law enforcement and monitoring costs on investment requirements. Investment requirement data, as well all contract data, are available solely at the franchisor level.[27] Franchisor level data come from private and government surveys in which the franchisor is asked about the contract terms that she will ask prospective franchisees. This type of data also contains information on how many outlets a franchisor operates, in how many

[26] Betancourt (2004) was the first to critique the use of investment requirements as an exogenous variable in the empirical franchise literature, given its potential endogeneity. However, he does not provide a theoretical model to guide what the determinants of investment requirements are.

[27] With the exception of study cases such as Dnes (1993).

states, where the franchisors' headquarters is located as well as other franchisors' characteristics. It does not contain, however, the location of her franchise units or the identity of the states where they operate. In what follows we explain how we measure law enforcement and monitoring costs using data at the franchisor level to empirically analyze their impact on investment requirements. Our measures are based on previous works that have studied the effects of law enforcement and monitoring costs on royalty rates.

III.2.1-Law Enforcement

From 1971 to 1992, 15 states have passed good-cause termination/nonrenewal laws.[28] Good-cause laws are laws that restrict the franchisor's ability to terminate and not renew, a franchise agreement. These laws were passed because it was feared that franchisors could use their bargaining power to unfairly terminate, or threat to terminate, a franchise agreement in order to get back a profitable outlet or renegotiate contract terms in their favor. One consequence of these laws is that it is more difficult to control franchisees' sales effort because these laws increase the costs of termination and non-renewal (Brickley et al 1991). Courts ask for more detailed evidence about the cause of the termination/nonrenewal of the franchise contracts. Arguments like "economic reasons" or that a franchisee is not on "good standing" are not usually considered good causes (Brickley et al 1991). In our terminology, law enforcement is weakened with the passing of these laws.

[28] From the 15 states that passed these laws, only Virginia has good-cause restrictions for termination and does not have any restriction for nonrenewal. The other 14 states that passed a good-cause law are Arkansas, California, Connecticut, Delaware, Hawaii, Indiana, Illinois, Iowa, Michigan, Minnesota, Nebraska, New Jersey, Washington and Wisconsin. Additional states have passed milder termination restrictions, such us a 90- or 30-days notice upon termination.

Brickley (2002) studies the effect of termination laws on royalty rates using data at the franchisor level. As this type of data does not contain information on where each of the franchisees are located, Brickley (2002) measures the effect of the good-cause laws with a dummy that takes a value of one if the franchisor's headquarters is located in a good-cause law state and zero otherwise. The validity of using this dummy variable depends on whether good-cause laws apply to a franchisor located in a good-cause law state, considering that franchisors can operate in multiple states. There are two scenarios under which, if the franchisor is located in a good-cause law state, the good-cause law is likely to influence the franchise contracts and one scenario where it is unlikely to influence them. First, if a franchisor's headquarters is located in a good-cause law state and the franchisee is located in the same state, the law is going to affect the contract between the two parties. This scenario is particularly important given that, between 32% to 46% of the franchisors' units are located in the same state in which the franchisor is located.[29] Second, Brickley (2002) points out that *"Franchisors headquartered in a state without a termination law sometimes can avoid termination laws in other states by contractually specifying that all litigation must take place in the home state and under the law of the home state."* (p. 520).[30] Therefore, when a franchisor's headquarters is located in a good-cause law state, she cannot contract around the law while a franchisor located in a state without a good-cause law po-

[29] In our main data we have information for the number of units a franchisor has in the three states in which they operate more units. If these states happen to coincide with the state in which the franchisor is headquartered, then we know what fraction of units that state represents for each franchisor. Using these observations we obtain that 46% of the outlets are located in the headquarters state, on average. This number represents an upper bound. Alternatively, if we assume that the franchisor that does not has its headquarters state among the three states with more outlets has zero outlets in it, we obtain a lower bound of 32%.

[30] See Klick et al. (2010) for the specific details when the firms can select the law and courts of non-regulating states.

tentially can. On the other hand, if the franchisee is located in a state without a good-cause law the contract between the parties is unlikely to be affected by good-cause laws even if the franchisor is located in a good-cause law state. It is in the best interest of the franchisor to be ruled by the franchisees' state regulations, in case the good-cause laws do not apply there. This last scenario adds noise to the dummy that measures the effect of good-cause laws.[31]

In sum, using a dummy variable based on the franchisor's headquarters location is a reasonable measure for the influence of the good-cause laws on contract terms since it captures the law's influence when the franchisee is located in the same state as the franchisor and when the franchisee is located in another good-cause law state. The scenario in which a franchisee is located in a state without a good-cause law adds noise to the dummy variable, weakening our empirical analysis. We address the mismeasurement in two ways. First, we add as an explanatory variable the interaction between the franchisors' headquarters location and the number of states in which they operate, as the passing of the law at the franchisors' headquarters state should have a lower impact on the average investment requirements they ask franchisees when they operates in more states. Second, in some of the regressions we will restrict the sample to franchisors that only operate their units in their headquarters state.

[31] In practice, a franchisor cannot choose any state when she has choice of law. She can only choose between the state where the franchisee is located and her headquarters state as there needs to be "substantial relationship" with the designated state (see Klik et al. 2010 for details).

III.2.2-Monitoring Costs

Rubin (1978) and Brickley and Dark (1987), among others, have pointed out that the further away outlets are, the less frequently they will be monitored, because monitoring costs are higher. This intuition was also shared by industry experts.[32] Lafontaine (1992) and Lafontaine and Shaw (1999) study the effect of monitoring costs on royalty rates using data at the franchisor level. As they do not have information about the location of franchisees, they measure monitoring costs using the number of states in which a franchisor operates.

In our setting, the number of states in which a franchisor operates is a valid measure for monitoring costs only after controlling for the franchisor's brand-name, which can have a direct impact on investment requirements, and is likely to be positively correlated with the number of states. Therefore, once one controls for variables such as the number of outlets a franchisor operates and franchisor's experience, which affect a franchisor's brand-name value, the number of states in which a franchisor operates is a good measure of monitoring costs.[33]

The mechanism by which the number of states in which a franchisor operates affects investment requirements asked to prospective franchisees is as follows. The average investment requirement a franchisor asks a prospective franchisee is determined based on past experience and future expectations, and the number of states in which a franchisor operates affects both factors. When a franchisor increases the number of states in which she operates, she adjusts the investment requirements she asks considering the amounts involved in the recent deals, which are

[32] Victor Dacarret, CEO franchising Chile.

[33] We consider several robustness checks to evaluate the validity of this measure.

related to the latest geographic expansion. For example, a franchisor that used to operate only in California and recently expanded her operations to Oregon is going to update the investment requirements asked to prospective franchisees considering the amounts involved in the contract she just signed with the new franchisee located in Oregon. Additionally, the franchisor expects that new deals are likely to occur in the market to which she has expanded. Thus, the average investment requirement she asks prospective franchisees is likely to incorporate the expectation of new openings in a broader geographical area. In the recent example this translates as follows: the franchisor that has just expanded to Oregon forecasts that, given the realization of an opening in Oregon, it is more likely that new franchise units are going to be opened in that state. The higher probability of new openings in Oregon affects the average investment requirements she asks prospective franchisees.

III.3-Data

We have two data sources: the Handbook of Franchise Opportunities (HFO) and Bond's Franchise Guide (BFG). They both contain information about contract terms that franchisors offer prospective franchisees.[34] The HFO data main advantage is that is older, so it allows us to study the within franchisor effect of the passing of the good-cause laws on investment requirements, at the time some of the laws were passed. The BFG data main advantage is that it is much richer, allowing us to perform robustness tests on our results. In what follows we describe in detail the data available to us from each data source.

[34] Both datasets contain information about business format franchises only.

III.3.1-Bond's Franchise Guide

BFG is a private survey that started in 1993, issuing yearly editions, except for the year 2000, when there was no survey. Since 1994 the dataset has a complete computerized version. We have access to the computerized version of the data for the period 1994-2009. As the good-cause laws were passed from 1971-1980 in 14 states, and in 1992 in Iowa, this dataset does not allows us to analyze the within franchisor effect of the passing of the good-cause laws on investment requirements. However, it does allow us to study the long run effect of the passing of the good-cause laws. That is, we are able to analyze whether a franchisor whose headquarters is located in a good-cause law state asks for investment requirements higher than a franchisor located in a state without such laws. Additionally, this dataset allows us to study the within-franchisor effect of monitoring costs, measured by the number of states in which the franchisor operates, on investment requirements. Moreover, given the richness of this dataset we are able to perform several robustness tests using some variables reported in it.

We drop observations below the 1st percentile and above the 99th percentile of franchisors' annual percentage change in investment requirements to avoid obtaining results driven by the presence of outliers.[35] Our final dataset consists of 10,047 franchisor-year observations. The number of franchisors in the sample is 2,017 and the average number of years a franchisor appears in the sample is five. Our panel is highly unbalanced for two reasons: franchisors' entry and exit; and because franchisors do not always answer the survey. Table III.1 summarizes the

[35] These observations are likely to be misreports. The 1th percentile represents an 82% decrease in the yearly investment requirement and the 99th percentile represents an increase of 200%. Results still hold when including these observations.

number of franchisors according to the number of years they appear in the sample. It shows that the number of franchisors decreases nonmonotonically with the number of years they appear in the sample. For instance, while 494 franchisors appeared only once in the sample just 61 of them appeared in all 15 years.

Table III.2 shows the summary statistics of the main variables we use in our analysis. The main dependent variable of our analysis is the investment requirement a franchisor asks prospective franchisees, net of the initial franchise fee.[36] Additional contract terms shown in Table III.2 are franchise fee and royalty rate. Investment requirements and franchise fee are expressed in nominal thousands of dollars, while royalty rate is expressed as a percentage of the franchisee's revenues. Whenever a franchisor asks for a range in any of these contract terms, we report the average between the two points of the range. This implies that these contract terms should be interpreted as the average contract terms a prospective franchisee would face if he chooses to do business with the franchisor.

Table III.2 shows that while the mean investment requirement is $520,000 the mean initial franchise fee is only $31,700, highlighting that the economic magnitude of the investments requirements is quite large, relative to other contract terms. There are 9,648 franchisor-year observations for the royalty rate, 399 observations less than for the other contract terms because some franchisors answered in the survey that their royalty rate varied or was a fixed monthly amount. Additional variables included in Table III.2 are the number of outlets a franchisor operates, the number of states in which they operate, the experience they have franchising, measured as the number of years since they started franchising, and

[36] Franchise fee does not increase a franchisee's demand, so it should not be considered as part of the self-enforcement mechanism.

Table III.1

Franchisor-Years in the Sample

This table summarizes the number of franchisors according to the number of years they appear in the sample. Column I shows the number of years that a franchisor can appear in the BFG database. Given that the sample contains information from 1994 to 2009, excluding the year 2000, the maximum number of years a franchisor can appear in the sample are 15. Column II shows the distribution of franchisors according the number of years they appear in the sample. Column III shows the number of observations (franchisor-years) according to the number of years franchisors appear in the sample.

Years	N of Franchisors	Franchisor-Year
1	494	494
2	333	666
3	214	642
4	137	548
5	137	685
6	85	510
7	108	756
8	75	600
9	68	612
10	69	690
11	60	660
12	65	780
13	65	845
14	46	644
15	61	915
Total	**2,017**	**10,047**

Table III.2

BFG: Summary Statistics

This table reports sample statistics for Bond's Franchise Guide data. We present the 10th percentile, mean, median, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of an unbalanced panel of 2,017 franchisors for the period 1994-2009. Net Investments are the investment requirements asked by franchisors to franchisees, net of initial franchise fee. Franchise Fee is the initial lump sum amount the franchisee has to pay the franchisor in order to operate under her brand-name. Net Investments and Franchise Fees are measured in nominal thousands of dollars. Royalty Rate is the percentage of the franchisee's revenues that franchisors ask franchisees. Experience is the number of years the franchisor has been franchising. Total units are the number of units a franchisor operates. States is the number of states in which a franchisor operates. Dummy Law is a dummy that takes a value of one if the franchisor's headquarters is located in a good-cause termination/nonrenewal state, and zero otherwise. %Δ Investment is the within franchisor yearly percentage change in Net Investments. ΔUnits is the within franchisor yearly change in the number of units she operates. ΔStates is the within franchisor yearly change in the number states where she operates.

Variable	Pctile 10	Mean	Median	Pctile 90	sd	N
Net Investment (000's)	13.7	520.1	120	625	8236	10047
Franchise Fee (000's)	9.9	31.70	22	39	529.3	10047
Royalty Rate (%)	0.03	0.06	0.05	0.08	0.039	9648
Experience (years)	3	15.38	13	31	11.76	10047
Total Units (#)	7	341	60	530	1476	10047
States (#)	1	17.72	12	43	15.73	10047
Dummy Law	0	0.36	0	1	0.481	10047
%Δ Investment	0	0.043	0	0.184	0.211	8032
Δ Units (#)	-6	17.82	0	34	241.9	8032
Δ States (#)	0	0.532	0	2	3.18	8032

the dummy law, which takes a value of one if the franchisor is located in a state that has passed a good-cause termination/nonrenewal law and zero otherwise.[37] Thirty six percent of the franchisors are located in states that have passed good-cause laws.

Finally, the bottom three rows of Table III.2 show the yearly within-franchisor variation of investment requirements, expressed in percentage change; and the yearly within-variation of the number of units and number of outlets, expressed in simple differences. Showing the yearly differences is helpful since in some of the econometric analyses we study within franchisors' contract variations. We express the first difference of investment requirements in percentage rather than in simple differences to get a more accurate picture of this variable. As the magnitude of investments requirements in different industries can be quite large, if measured in simple differences, the yearly change in investment would be driven mainly by industries with big investment requirements, distorting the real picture. A franchisor, conditional on staying in the sample, on average increases the investment requirement she asks prospective franchisees by 4.3% a year, opens 18 new units and expands her operations by "half" a state.

III.3.2-Handbook of Franchise Opportunities

The HFO data is a periodic survey that the Department of Commerce conducts. It was issued yearly from 1972 to 1987, and afterwards it has been issued irregularly. The main advantage of this data base is that it goes back to the period

[37] Alternatively, we could have measured experience as the number of years that a firm is in business, rather than the number of years since it started franchising. Results are insensitive to the way experience is defined.

where some of the termination laws were passed, allowing us to study the within franchisor effect of the passing of the good-cause laws and number of states on investment requirements. Nevertheless, it has several shortcomings. First, there is no electronic version of this data, so it has to be hand-collected. Second, it does not have as many variables as the BFG data base. It only contains information on the number of states in which a franchisor operates, the number of outlets a franchisor operates, the year the franchisor started his business —from which a proxy for experience can be constructed— and investment requirements. Third, the way they report investment requirements, makes it a noisy measure of the real variable. Rather than having separate information about the investment requirements and the initial franchise fee, the HFO reports the sum of these two variables.[38] In addition, it is not clear whether they report the equity needed or the total investment that is needed for opening a new franchise unit.

We hand-collected data for the years 1979 and 1982. We selected these two years because in 1980 California and Illinois passed good-cause laws. These two states are the states with biggest economic relevance, in terms of total income, among the 15 states that passed these laws. This allows us to have many observations from which to derive our results, as many franchisors are headquartered in California or Illinois. We collected data for 1982, rather than 1981, to allow franchisors to adapt their contracts to the new economic environment, after the passing of the law.

[38] Entrepreneur Magazine's Franchising in the Economy has information about the capital a franchisor needs to start a business, separate from the amount franchisors ask as a franchise fee. This survey has yearly editions starting in 1980. As the information in this database is presented with a one year lag, the 1980 edition actually contains information about 1979. However, the question asked about capital requirements changed after the 1980 edition, making the comparison between surveys unreliable.

We address the HFO data shortcomings in two ways. First, we take advantage of the richness of the BFG data. Using the BFG database we are able to show that the control variables that are not available in the HFO database play no significant role in the estimations. Also, using the BFG data base, we show that when the dependent variable is defined as investment requirements, including franchise fees rather than just investment requirements net of initial franchise fees, the effect of the number of states and good-cause laws are biased downwards. Hence, using this aggregate measure of investment requirements understates the effect of the explanatory variables of interest on the true dependent variable rather than overstating it. This implies that the effect of monitoring costs and weaker law enforcement that it is found using the HFO database can be considered a lower bound of the true effect. Second, we carefully hand-collect the HFO data for franchisors that have consistent data descriptions for both 1979 and 1982. When it is not explicitly mentioned that the data represents total investment, meaning it could represent equity investments, we only include the observations in which the financial terms remain unaltered in both periods. If it is the case that equity requirements is what is reported, when financial terms remain unaltered the percentage change in equity requirements is, on average, equivalent to a percentage change in total investment requirements. This adds noise to the dependent variable, but does not bias the parameters on the explanatory variables.

Consistent with the procedure we use for the main sample, we drop observations below the 1st percentile and above the 99th percentile of franchisors' percentage change in investment requirements to avoid obtaining results driven by the presence of outliers. The final sample consists of 278 franchisors that did not change their headquarters location for the years 1979 and 1982. Table III.3 shows the summary statistics of the HFO database. Investment is measured in nominal thousands of dollars. The mean investment is $49,800. A franchisor, conditional on staying in the sample, on average increases the investment requirement she asks prospective franchisees by 33% in the three-year period; opens 60 new units and expands her operations in 1.2 states.[39] Out of the 278 franchisors, 39 are located in California and 21 in Illinois, representing 21.5% of the franchisors in the sample.

III.3.3-Sample Industry Composition

In both datasets there is a description of the industry to which each franchisor belongs. The industry description is much richer in the BFG than in the HFO. BFG provides 45 industries classifications, while in the HFO database there are only 9. Table III.4, panel A, shows the industry composition of the BFG data and panel B shows the industry composition of the HFO data.

III.4-Results

In this section, we empirically examine the effect of monitoring costs and law enforcement on franchisors' investment requirements. First, using the HFO database, we analyze franchisors' investment requirements within variation. Then, using the BFG database we analyze within industry variation of investment requirements. Finally, we perform robustness tests using the BFG database and

[39] Considering franchisors that appear three consecutive years in the BFG database, the average percentage investment requirement change is only 19%. The bigger change in investment requirements in the HFO database is likely to be attributable to differences in the sample periods, because in former years experimenting with contracting terms was more likely to occur.

Table III.3

HFO: Summary Statistics

This table reports sample statistics for Handbook of Franchise Opportunities data. We present the 10th percentile, mean, median, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of a balanced panel of 278 franchisors that operated both on 1979 and 1982. Investments are the investment requirements asked by franchisors to franchisees, measured in nominal thousands of dollars. Experience is the number of years the franchisor has been in business. Total units are the number of units a franchisor operates. States is the number of states in which a franchisor operates. Dummy Law is a dummy that takes a value of one if the franchisor's headquarters is located in a good-cause termination/nonrenewal state, and zero otherwise. %Δ Investment is the within franchisor percentage change in Investments for the 1979-1982 period. ΔUnits is the within franchisor change in the number of units she operates for the 1979-1982 period. ΔStates is the within franchisor change in the number states where she operates for the 1979-1982 period.

Variable	Pctile 10	Mean	Median	Pctile 90	sd	N
Investment (000's)	7.2	49.8	35	100	64.3	556
Experience (years)	6	19.40	16	35	13.95	556
Total Units (#)	5	330.6	51	490	1432	556
States (#)	1	16.2	11	43	15.4	556
Dummy Law	0	0.323	0	1	0.468	556
%Δ Investment	0	0.332	0.160	1	0.573	278
Δ Units (#)	-21	60.24	1.00	79	611.1	278
Δ States (#)	-2	1.189	0.000	7	4.93	278

Table III.4

Industry Composition per Sample

This table shows the industry composition for Bonds Franchise Guide database and Handbook of Franchise Opportunities database. The left column shows the industry classification, the center column shows the number of Franchisor-Year observations per industry classification and the right column shows the percentage of the total number of observations that each industry classification represents. There are 45 industry classifications in Bonds Franchise Guide data and 9 industry classifications in the Handbook of Franchise Opportunities dataset.

Panel A: BFG

Industry	Firm-Years	%
Auto/Truck Rental	51	0.5%
Car Repair	716	7.1%
Building & Remodeling	448	4.5%
Business: Advertising	80	0.8%
Business: Financial	255	2.5%
Business: Telecom.	157	1.6%
Child Development	315	3.1%
Education	206	2.1%
Employment & Personnel	323	3.2%
Food: Coffee	133	1.3%
Food: Donuts / Cookies	328	3.3%
Food: Ice Cream / Yogurt	241	2.4%
Food: Take-out	1641	16.3%
Food: Restaurant	618	6.2%
Food: Specialty Foods	366	3.6%
Hairstyling Salons	136	1.4%
Health / Fitness / Beauty	237	2.4%
Laundry & Dry Cleaning	183	1.8%
Lawn and Garden	109	1.1%
Lodging	217	2.2%
Maid Service	109	1.1%
Maintenance / Cleaning	578	5.8%
Medical / Dental Products	80	0.8%
Miscellaneous	229	2.3%
Packaging & Mailing	162	1.6%
Printing & Graphics	148	1.5%
Publications	50	0.5%
Real Estate Inspection	130	1.3%
Real Estate Services	160	1.6%
Recreation & Entertainment	105	1.0%
Rental Services	66	0.7%
Retail: Art Supplies	65	0.6%
Retail: Sporting Goods	129	1.3%
Retail: Clothing / Shoes	33	0.3%
Retail: Convenience Stores	92	0.9%
Retail: Home Furnishings	190	1.9%
Retail: Home Improvement	72	0.7%
Retail: Miscellaneous	47	0.5%
Retail: Pet Products	58	0.6%
Retail: Photography	93	0.9%
Retail: Specialty	439	4.4%
Retail: Electronics	67	0.7%
Security & Safety	36	0.4%
Signs	102	1.0%
Travel	47	0.5%
Total	**10,047**	

Panel B:HFO

Industry	Firm-Years	%
Auto Repair/Rental	62	11.1%
Business Services	60	10.8%
Construction	24	4.3%
Educational	18	3.2%
Employment	42	7.5%
Food	238	42.7%
Home Furnishing	34	6.1%
Real Estate	20	3.6%
Retail	60	10.8%
Total	**558**	

consider alternative hypotheses.

III.4.1-Main Results: HFO Database within Franchisor Variation

The dependent variable is the logarithm of investment requirements. We use logarithms rather than levels to avoid obtaining results driven by a few changes in investment requirements from franchisors that ask for big amounts. The explanatory variables are the number of states in which a franchisor operates, the dummy law, the interaction between these last two terms and control variables. We include the interaction between the dummy law and the number of states to examine two competing effects that might be at work. On the one hand, when a franchisor expands to other states, the franchisor might be able to avoid his in-state regulation.[40] As a consequence, the effect of the good-cause law in the franchisor's headquarters state would have less impact on the average investment requirement she asks. Under this logic, the expected sign of the interaction term is negative. On the other hand, it can be argued that higher monitoring costs and weaker law enforcement could strengthen each other's effect on investment requirements, since more extreme measures are needed to avoid franchisees' underprovision of sales effort. In this scenario, the interaction effect is expected to be of positive sign. For simplicity reasons, this last possibility was not considered in the theoretical model. It was assumed that a change in monitoring costs directly maps into monitoring intensity, without interacting with the degree of law

[40] By 1980, besides California and Illinois, there were only 12 states that have passed good-cause laws and 36 states that did not. Therefore, a franchisor operating in more states, on average, has more chances of avoiding the in-state regulation by setting the litigation in the franchisee's state when possible.

enforcement.[41] If the reinforcement effect is important empirically the theoretical assumption would need to be revised.

We include franchisor fixed effects to examine franchisors' within variation. The identification of the effect of the good-cause laws on investment requirement is given by the two states that adopted good-cause laws in 1980: California and Illinois. Equation (15) summarizes the specification described.

$$\ln(I_{fit}) = \alpha + \beta states_{fit} + \gamma Law_{fit} + \delta(states_{fit} * Law_{fit}) + \phi x_{fit} + \eta_f + \varphi_t + \varepsilon_{fit} \quad (15)$$

Where I_{fit} represents the investment requirement that franchisor f in industry i at time t asks prospective franchisees; $states_{fit}$ represents the number of states in which franchisor f in industry i operates at time t; x_{fit} are control variables; η_f are franchisor fixed effects; and ε_{fit} is the error term. In this setting φ_t is dummy variable that takes a value of 1 for 1982 and zero otherwise. This specification is equivalent to a difference-in-difference estimation. We correct standard errors to account for clustering at the industry level.

The control variables included are state controls, number of outlets, its quadratic term and experience squared.[42] We do not include experience alone as all franchisors gain the same 3 years of experience in the 1979-1982 period, making experience perfectly collinear with the constant. Experience and number of outlets are included to control for the franchisor's brand-name value. The state controls included are income per capita and population from the state in which the fran-

[41] Analyzing the interaction between these two effects implies generating comparative statics from a Hessian rather than a single equation. This complicates the model without providing further insight.

[42] Number of outlets squared is included to control for franchisors that operate a particularly large number of outlets.

chisor's headquarters is located. These state-level variables are included to control for state-specific economic trends that might be related to changes in investments requirements.

Table III.5, column I, shows the estimation of equation (15). Both theoretical hypotheses find support in the data. Monitoring costs and weaker law enforcement increase investment requirements. The parameters of the variables number of states and dummy law are 1.2% and 11.4%, respectively. Both parameters are statistically significant.

The interaction between the number of states and the change in the law is negative and insignificant, implying that the avoidance of in-state regulation dominates any potential reinforcing effect between weak law enforcement and high monitoring costs. The fact that the reinforcement effect is not empirically relevant supports the simplifying theoretical assumption that monitoring costs maps directly into monitoring intensity, without interacting with law enforcement.

The marginal effects of the passing of the law and number of states, on investment requirements, considering the interaction term evaluated at the sample means, are 4.7% and 1%, respectively. However, the impact of the passing of the law evaluated for a franchisor that only operates in one state is much larger: 11%. This is to be expected as a franchisor that operates only in one state –which is likely to be the franchisor's headquarters state- cannot contract around the law.[43]

The standard errors reported in column I can be biased. While we correctly cluster at the industry level, there are only 9 industry classifications and the

[43]From BFG data we observe that 93% of the franchisors that operate units in one state operate them in their headquarter state. Therefore, it is reasonable to assume that if a franchisor operates in one state, this state is her headquarters state.

Table III.5

Main Results: HFO Database within Franchisor Variation

This table reports two regressions estimated using HFO data. The dependent variable in both regressions is the logarithm of investment requirements. In column I the main explanatory variables are the number of states in which the franchisor operates, the Dummy Law, which takes a value of one if the franchisor's headquarter is located in a state that have passed a good-cause law by the time they were surveyed (1979 and 1982), and zero otherwise, and the interaction between these two variables. The within franchisor variation in the passing of the laws is given by franchisors located in California and Illinois, given that the good-cause law was passed in those states in 1980. Additional controls are experience squared, total units, total units squared, firm fixed effects, state controls and the dummy 1982, which takes a value of 1 for 1982 and zero for 1979. The explanatory variables in column II differs from the ones in column I, in that there are two dummies measuring the passing of the laws: one that takes a value of one if the franchisor's headquarter is located in California in 1982, and zero otherwise; and another that takes a value of one if the franchisor's headquarter is located in Illinois in 1982, and zero otherwise. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) log(Investment)	(II) log(Investment)
States	0.0116**	0.0108**
	(0.0047)	(0.0038)
Dummy Law	0.1137***	
	(0.0316)	
States*(Dummy Law)	-0.0041	
	(0.0028)	
Dummy Δ law California		0.1077**
		(0.0389)
Dummy Δ Law Illinois		0.1099**
		(0.0432)
States*(Dummy Δ law California)		-0.0049***
		(0.0009)
States*(Dummy Δ Law Illinois)		-0.0013
		(0.0042)
Experience squared	-0.0004*	-0.0004*
	(0.0002)	(0.0002)
Total Units	0.0002	0.0001
	(0.0001)	(0.0001)
Total Units squared	-0.0000	-0.0000
	(0.0000)	(0.0000)
Firm-Fixed Effects	Yes	Yes
Time-Fixed Effect	Yes	Yes
State Controls	Yes	Yes
Industry Cluster	Yes	Yes
R-squared	0.3193	0.3204
N	556	556

cluster-robust standard errors we compute assume that the number of clusters is large enough to apply asymptotic properties in their computation. Cameron et al (2008a), doing a Monte Carlo experiment for a data generating process with small number of clusters, showed that the cluster-robust estimation gives under-estimated standard errors. Therefore, there is a possibility that we are incorrectly rejecting the null hypotheses that the parameters of number of states and the dummy law are zero. Cameron et al. (2008a) propose asymptotic refinements that try to consistently compute the parameters true p-values when the number of clusters in the sample is as small as 5. The asymptotic refinement that showed better performance was the wild cluster bootstrap-t. In this type of bootstrap the resampling is over the residuals of the OLS estimation with the null hypothesis imposed. In addition, the residuals drawn are multiplied by minus one and plus one with 50% of probability. We performed this methodology for the parameters of the variables number of states and dummy law. We obtain that the p-values are virtually unchanged for the dummy law, remaining statistically significant at the 1% level. For the number of states, the p-value increases. However, this variable remains statistically significant, now at the 10% level. Therefore, we find empirical support to both theoretical hypotheses even after correcting for the finite sample problem in the computation of the parameters standard errors.

We modify equation (15) by including two dummy variables to account for the passing of the good-cause laws, rather than one. We include a dummy variable for the California change in the law and another for Illinois. We also include the interaction of these dummies with the number of states. The purpose of this specification is to show that the results are not driven solely by one state. The results of this specification are shown in Table III.5, column II. The parameters that accompany both California and Illinois good-cause laws are positive (10.8% and 11%, respectively), statistically different from zero, and not statistically different from each other.

To sum up, it is shown that some of the within franchisors investment requirements variation is due to changes in their average monitoring costs and enforceability conditions. Consistently with the theoretical predictions, franchisors ask for higher investment requirements when the franchisees' incentives to provide the appropriate level of self-effort are weaker (i.e., when good-cause laws apply -weaker law enforcement- and when the franchisor operates in more states -higher monitoring costs).[44,45]

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[44] Notice, though, that franchisors can increase investment requirements not only to improve self-enforcement conditions in franchise contracts, but also to improve the quality of franchisees they want to attract. The intuition follows closely the logic of the theoretical model. Low quality franchisees—with intrinsically higher probability to under provide sales effort—will be discouraged to sign a contract with the franchisor when they are asked for high initial investments, given that they have a high probability of being terminated. Although empirically we cannot assess whether investment requirements increase to improve the enforceability conditions within franchise contracts or to improve the quality of applicants, most likely both factors are at work. Higher investments generate a permanent increase in earnings that would be lost in case of termination. Under providing sales effort and/or being of a cheating type increases the probability of termination, thus sales effort is increased endogenously and/or better franchisees apply, reducing the under provision of sales effort.

[45] Notice that even though there is an optimal adjustment through investment requirements due to the passing of the laws, franchisors should still be worst off because of the good-cause laws as they increase investment requirements at the cost of losing potential franchisees or at the cost of compensating franchisees for the extra investment they ask them to do. Brickley et al (1991) show that franchisors are indeed worst-off with the passing of the laws. They provide evidence that franchisors located in California suffered a reduction in stock prices due to the passing of the good-cause law in that state.

III.4.2-Main Results: BFG Database within Industry Variation

Relative to the HFO database, the BFG database has the disadvantage of covering a period of time posterior to the passing of the good-cause laws, 1994-2009. This implies that we are unable to analyze the within franchisor effect of good-cause laws on investment requirements. However, we can analyze the long-run effects of the laws. We can study whether franchisors located in states where these laws apply ask for higher investment than franchisors located in states without such laws. The main drawback of this analysis is that if the franchisors' characteristics are correlated with their location we will obtain biased parameters. We partially address this concern by controlling for industry fixed effects. This specification is summarized in equation (16).

$$\ln(I_{fit}) = \alpha + \beta states_{fit} + \gamma Law_{fit} + \delta(states_{fit} * Law_{fit}) + \phi x_{fit} + \eta_i + \varphi_t + \varepsilon_{ijt} \quad (16)$$

The main difference between equation (16) and equation (15) is that in equation (16) we replace franchisor's fixed effects for industry fixed effects. Additionally, now φ_t incorporates 14 time dummies rather than just one.

The most conservative clustering strategy is to correct standard errors by clustering at the industry level (45 industry classifications), given that franchisors are nested within industry classifications. This type of clustering captures the potential autocorrelation of the variables, which is especially relevant in long panels such as this, and the common group component of the error term at the same time (see Cameron et al. (2008b)).[46] However, once one controls for industry fixed effects,

[46] See Bertrand et al (2004) for an example of policy autocorrelation in long panels.

if there is no suspicion of autocorrelation within industries, standard errors can be corrected by clustering franchisor level as well. This method has the advantage that the number of groups is large (2,017 franchisors), so there are few concerns regarding whether the asymptotic properties used to compute the cluster-robust standard errors apply. The results we present show standard errors corrected by clustering at the industry level. However, when standard errors are corrected by clustering at the franchisor level, they are reduced slightly. Therefore, the results we are presenting are the most conservative between the two types of clustering alternatives.

The BFG database has the advantage of reporting investment requirements and initial franchise fees separately. This allows us to analyze the effect of good-cause laws and number of states on investment requirements, net of franchise fees, and on total investment requirements. While investment requirements net of franchise fees is our main variable of interest, analyzing the impact of the number of states and good-cause laws on total investments is useful for comparison reasons, as the results from Table III.5 were generated using total investments. Table III.6, column I, shows the estimation of equation (16) using investment net of franchise fees as dependent variable and column II shows the estimation of equation (16) using total investment as dependent variable.

The results presented in Table III.6, column I, give support to both theoretical predictions and are in agreement with the results found in Table III.5. The number of states in which a franchisor operates, and operating in states where good-cause laws have been passed, increase investment requirements in a statistically significant way. Also, consistent with the HFO database results, the interaction between

Table III.6

Main Results: BFG Database within Industry Variation

This table reports three regressions estimated using BFG data. The dependent variables of columns I, II and III and IV are logarithm of net investments, logarithms of total investments, royalty rates and logarithm of initial franchise fees, respectively. The main explanatory variables are the number of states in which the franchisor operates, the Dummy Law, which takes a value of one if the franchisor's headquarter is located in state that has passed good-cause termination/nonrenewal laws, and zero otherwise, and the interaction between these two variables. Additional controls are experience, total units, the squared values of these two variables, state level controls, industry and time fixed effects. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) log(Net Investment)	(II) log(Investment)	(III) Royalty	(IV) log(Franchise Fee)
States	0.0088***	0.0074***	0.0001*	0.0049***
	(0.0017)	(0.0012)	(0.0000)	(0.0013)
Dummy Law	0.1074*	0.0904*	0.0022	0.0638
	(0.0652)	(0.0509)	(0.0021)	(0.0630)
States*(Dummy Law)	-0.0035*	-0.0024	-0.0001	-0.0019
	(0.0021)	(0.0018)	(0.0001)	(0.0032)
Experience	0.0003	-0.0031	-0.0003	-0.0101**
	(0.0048)	(0.0046)	(0.0003)	(0.0047)
Experience squared	0.0001	0.0001*	0.0000	0.0001*
	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Total Units	-0.0000	0.0000	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Total Units squared	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry-Fixed Effects	Yes	Yes	Yes	Yes
Time-Fixed Effects	Yes	Yes	Yes	Yes
State Controls	Yes	Yes	Yes	Yes
Industry-Cluster	Yes	Yes	Yes	Yes
R-squared Within	0.1757	0.2226	0.0022	0.0613
R-squared Between	0.4075	0.4234	0.0372	0.1154
R-squared Overall	0.4454	0.4648	0.0285	0.1066
N	10,047	10,047	9,648	10,047

number of states and the dummy law is negative. Considering the interaction term evaluated at the sample means, the marginal effects are the following. Franchisors, within the same industry, ask for investment requirements 0.75% higher for every additional state in which they operate. In addition, franchisors, within the same industry, that operate in states where good-cause termination/non-renewal have been passed ask for investment requirements 4.5% higher than franchisors operating in states without such laws.[47] The parameters of the variables of interest and the marginal effects obtained here are very similar to the ones obtained using HFO database, suggesting that the phenomenon that we are trying to document is robust to different time periods and the use of franchisors fixed effects.[48,49]

The results using total investment as dependent variable—column II—are similar to the results using investment net of franchise fee—column I. More importantly, the parameters of number of states and dummy law are smaller when using when total investments, rather than net investments, as dependent variable.[50] Therefore, when using the HFO data, the evidence in favor of the theoretical hypotheses is found in spite of measuring investments including franchise fees rather than because of it.

[47] These results are robust to the inclusion of the additional control variables presented in the next subsection. In addition, the effect of the passing of the laws increases its relevance when Virginia is not considered in the good-cause law group. Virginia is the only state, within the states that have passed good-cause laws, which did not require a good-cause for renewal. It only required a good-cause for anticipated termination.

[48] In BFG data less than 8% of the franchisors changed their headquarters state during the sample period. When restricting the sample only to franchisors that did not changed their headquarters location similar results are found.

[49] There is no statistically significant difference in the impact of the passing of the laws between franchisors that were established before the passing of the laws in their states and franchisors established after the passing of the laws.

[50] The marginal effects, which consider the interaction between the dummy headquarter good-cause and number of states, evaluated at the sample means, are similar.

In the theoretical model we do not model the franchisor's moral hazard problem. The consequence of this omission is that the optimal royalty rate in the model is zero. If the franchisor's moral hazard would have been modeled, royalty rate would have been positive, and law enforcement and monitoring costs may have had an impact on royalty rates. Considering the franchisees' moral hazard problem, we would expect that when the franchisees' incentives to provide sales effort are weaker the franchisor might choose to reduce the royalty rate, in addition to increase investment requirements, to correct the franchisee's incentives. However, considering the franchisor's moral hazard problem, when monitoring and terminating is more costly, the franchisor needs a higher interest in the franchisees' sales in order to not abandon her policing activities. Thus, from the franchisors' moral hazard problem perspective, it can be argued that royalty rates should increase when monitoring and enforcing is harder. We can examine these effects by estimating equation (16) replacing investment requirements with royalty rates. This result is presented in Table III.6, column III. The dummy law does not have a statistically significant impact on the franchisor's royalty rate. The impact of the number of states on royalty rates is positive, though economically small: for every additional state in which a franchisor operates she increases the royalty rate by 0.01%.[51] The theoretical ambiguity that weak law enforcement and monitoring costs have on royalty rates, in addition to the weak empirical results, justify not explicitly modeling the franchisor's moral hazard problem and focusing in the investment dimension.

In column IV of Table III.6 we analyze the effect number of states and the

[51] In unreported regressions we find that the statistical significance impact of number of states on investment requirements is lost when fixed effects are introduced.

passing of good-cause laws on initial franchise fees. In the extension of the first essay we show that the effect of monitoring costs and law enforcement on initial franchise fees cannot be unambiguously signed. On the one hand, weaker law enforcement and higher monitoring costs could increase the initial franchise fee that can be extracted from franchisees, because the probability of an anticipated contract termination is reduced, increasing the expected rents the franchisee can obtain from the franchise contract. We call this the direct effect. On the other hand, weaker law enforcement and higher monitoring costs could imply lower sales effort, in equilibrium. As sales effort has a positive externality effect, an average reduction of sales effort could lead to lower revenues for the franchise chain, and thus, lower franchise fees can be extracted. We call this the indirect effect. The dependent variable used in column IV is the logarithm of initial franchise fees. The results presented in this column show that number of states and the passing of good-cause laws have a positive impact on initial franchise fees, suggesting that the direct effect is dominating the indirect effect. However, only the number of states is statistically significant.

In Tables III.5 and III.6 it is shown that the impact of the passing of the laws on the average investment requirements a franchisor asks is decreasing in the number of states in which a franchisor operates, given that a franchisor has more chances of contracting around the law when she operates in multiple states. The inclusion of the interaction term, however, is imposing a functional form which implies that the impact of the law on investment requirements decreases at a constant rate for every additional state in which a franchisor operates: $\frac{\partial \ln(I)}{\partial Law} = \gamma + \delta * states$. Using this functional form it was found that the impact of the law for a franchisor that operates only in one state was 10-11%.

If the functional form is not correct, we might over or under estimate the true effect of the passing of the law on franchisors that operate only in one state. To avoid imposing any functional form on the interaction term, we divide the BFG data in two subsamples. One subsample contains franchisors that operate units only in one state. About 10% of the sample (1,032 franchisor-year observations) satisfies this criterion. The other subsample contains franchisors that operate in multiple states (9,015 franchisor-year observations). The average multi-state franchisor operates in 20 states. Column I of Table III.7 shows the impact of the passing of the laws for franchisors that operate only in one state and column II shows the average impact of the passing of the law for franchisors that operate in multiple states. The impact of the passing of the law on the average investment requirements is 24% for franchisors that operate only in one state, but it is only 3% for franchisors that operate in multiple states. These results suggest that franchisors that cannot contract around the good-cause law in their home state are greatly affected by the passing of the law and that this effect was underestimated in Tables III.6 and III.7. On the other hand, the impact of the passing of the law is not that important for franchisors that can contract around it.

While it is likely that a franchisor that operates in a single state operates her franchise units in her headquarters state, this may not always be the case. For some franchisors BFG data provides information about the identity of state in which they operate more units. Considering franchisors that operate only in a single state we can identify whether the state where the units operate is the same as the state where the franchisor's headquarters is located. Among the

Table III.7

Main Results: BFG database within Industry Variation for Franchisors that Operate in One State and Multiple States

This table reports three regressions estimated using BFG data. The dependent variables of columns I, II and III is the logarithm of net investments. The results shown in column I are estimated using data only for franchisors that operate in one state. The results shown in column II are estimated using data from franchisors that operate in multiple states. The results shown in column III are estimated using data only for franchisors that operate in one state and the franchisor's headquarters state and the state where she operates her units coincide. The main explanatory variable in columns I and III is the Dummy Law, which takes a value of one if the franchisor's headquarter is located in state that has passed good-cause termination/nonrenewal laws, and zero otherwise. In column II, the main explanatory variables are the Dummy Law and the number of states in which a franchisor operates. Additional controls are experience, total units, the squared values of these two variables, the franchisors' headquarters state-level income per capita and population, and industry fixed effects. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) log(Net Investment)	(II) log(Net Investment)	(III) log(Net Investment)
States		0.0072***	
		(0.0020)	
Dummy Law	0.2388***	0.0314	0.3771***
	(0.0857)	(0.0506)	(0.1440)
Experience	-0.0169*	0.0028	-0.0187**
	(0.0098)	(0.0049)	(0.0090)
Experience squared	0.0001	0.0001	0.0001
	(0.0002)	(0.0001)	(0.0002)
Total Units	0.0059*	-0.0000	0.0114
	(0.0034)	(0.0000)	(0.0081)
Total Units squared	-0.0000**	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)
Industry-Fixed Effects	Yes***	Yes***	Yes***
Time-Fixed Effects	Yes***	Yes***	Yes***
State Controls	Yes	Yes	Yes
Industry-Cluster	Yes	Yes	Yes
R-squared Within	0.0527	0.1859	0.085
R-squared Between	0.3605	0.4392	0.4109
R-squared Overall	0.3573	0.4639	0.4033
N	1,032	9,015	909

1,032 franchisors-year observations that operate units in a single state, there are 53 observations without data regarding the state in which the franchisor operates her units. For 909 observations, the franchisor's headquarters state and the state where they operate their units coincides. For 70 observations it doesn't. Using only the 909 observations where the location of the franchisors' headquarters coincides with the state of operations the results get even more striking. The impact of the passing of the law on investment requirements go up to 38%. This estimation is shown in Table III.7, column III. This result reinforces the notion that when it is harder to contract around the law the impact on the average contract terms a franchisor offers increases.[52]

III.4.3-Robustness Checks

One of the results shown in the previous subsections is that monitoring costs, measured by the number of states in which a franchisor operates, is positively related with investment requirements. This relation is unlikely to be driven by reverse causality because the data with which the results were generated comes from surveys in which franchisors are asked the number of states in which they operate in the present date and what are the contract terms they set for prospective franchisees. Thus, contract terms decisions are made after the geographic expansion is realized. However, the positive relationship between number of states and investment requirements can potentially be spurious and simply be due to an omitted variable that affects simultaneously both variables in the same direction. We propose four alternative mechanisms that could be driving the results and

[52] Considering only the franchisors that operate all their units in their headquarters state we find that the impact the passing of the law on royalty rates is negative and not statistically significant.

show that after controlling for them the number of states in which a franchisor operates and investments requirements are still positively correlated. The variables that are going to be included as additional explanatory variables to control for those mechanisms are: franchisor's projected new units, franchisor's financial assistance, contract length and advertisement fees. These variables are available in the BFG database. While incorporating these variables is a good exercise to discard the possibility of omitted variable bias, the parameters that are estimated might be biased as franchisor's financial assistance, contract length and advertisement fees are endogenous contract terms chosen by the franchisor. This is why they were not included in the previous estimations based on the BFG data.

Once we control for the number of outlets in which a franchisor operates, a franchisor that operates in more states arguably has higher monitoring costs as she has a broader geographic scope of operations. However, the decision to operate in a broader geographical area is endogenous and the underlying reason of the geographic expansion might be what really causes the increase in investment requirements. Thus, higher monitoring costs, which is a consequence of the expansion, might be unrelated to investment requirements once the reason of the expansion is properly controlled for. The most likely reason for a franchisor to geographically expand is having good investment opportunities. It can be argued that a franchisor with better investment opportunities might also be interested in franchising bigger outlets, which require higher investment. Therefore, we need to control for franchisor's investment opportunities to discard the possibility that its omission is what drives the positive relation between number of states and investment requirements. The ideal control for investment opportunities is Tobin's

q. The usual proxy for Tobin's q is constructed dividing firms' market value by firms' asset value. Thus, this measure can be constructed only for publicly traded firms. This implies several shortcomings. First, only a handful of the franchisors in our data are publicly traded firms. Second, most franchisors that are publicly traded have nationwide operations, implying no variability in the number of states in which they operate. Third, many of the franchisors that are publicly traded belong to a parent company, so their investment opportunities cannot be told apart from the investment opportunities of all the firms that operate under the same parent company. An alternative variable that proxies for investment opportunities and is available at BFG database is franchisor's projected new units. If a franchisor thinks her business is likely to have a big expansion, she projects that a large number of units are going to be opened in the upcoming year. Thus, projected new units is one of the additional control variables we use.

Variations in the financial assistance that franchisor's offer franchisees can also be thought as an important omitted variable. It can be the case that franchisors that expand to newer states concurrently start offering financial assistance. If this is the case, investment requirements are likely to increase, given that credit constraints are relaxed for franchisees. In the BFG database there is information regarding the offering of financial assistance by the franchisor. The answer that franchisors give when asked if they give financial assistance is either Yes or No. Thus, we construct a dummy variable for financial assistance and include it as an additional control.

Longer contract lengths imply more protection for the franchisees investment; thus, more investment is expected, in equilibrium, when longer contract terms are offered. To the extent that longer contract terms are offered to franchisees in new markets it can be the case that the positive relationship between investment requirements and number of states is driven by the omission of the contract length as an explanatory variable. Contract length can be found in the BFG database. It ranges from 1 to 40 years with a mean of 11.2. This variable is also included as an additional control.

A franchisor that expands to newer markets might find it optimal to advertise more given her broaden scope of operations. This, in turn, can increase the optimal size of the outlets. Therefore, we include the advertisement fee rate that franchisors ask, as a percentage of the franchisees' revenues, as an additional explanatory variable. This variable can also be found in the BGF database.

Besides including additional explanatory variables to shoot down a potential omitted variable bias, in the present setting we reincorporate franchisors' fixed effects to address the potential correlation between franchisor's characteristics with the explanatory variables. As we use BFG to perform this additional estimation, the cost of using franchisor's fixed effects is that the dummy law has to be dropped as there is no within franchisor variation in the passing of the laws. This is not a major drawback since in this section we are interested in providing robustness to the positive relationship between number of states and investment requirements. Equation (17) is what we estimate.

$$\ln(I_{fit}) = \alpha + \beta states_{fit} + \phi x_{fit} + \eta_f + \varphi_t + \varepsilon_{fit} \tag{17}$$

We estimate equation (17) correcting standard errors by clustering at the industry level (45 industries). The results are reported in Table III.8. Column I shows the estimation of equation (17) without including the additional controls. It is shown that even after including franchisor fixed effects the number states increases investment requirements in a statistically significant way using the BFG data. In column II, the additional controls are included. The number of observations is only 7,837 as the additional control has some missing values. Besides contract length, no control variable has a statistically significant effect on investment requirements. More important, the number of states still has a positive and statistically significant effect on investment requirements after including these additional control variables. A franchisor that expands its operations to another state increases the investment requirements she asks prospective franchisees by 0.63%.

To the extent that the decision of not replying is not random, the missing observations of the additional controls can potentially generate sample selection problems by considering only the franchisors that choose to answer. We use a multiple imputation procedure to overcome this problem. Multiple imputation procedure replaces each missing value with a set of plausible values to represent the uncertainty about the right value to impute (Rubin 2004). Using states, experience squared, number of outlets, number of outlets squared, firm and time fixed effects, we generate the deterministic component of the imputation. Then, standard errors are adjusted to account for the uncertainty in their generation. After replacing the missing values for projected new units, financial assistance and contract length (advertisement fees has no missing observations) we re-run equation (17). These results are shown in Table III.8, column III. The results are qualitatively unaltered relative to the ones reported in column II. Thus, we can

Table III.8

Robustness Checks: BFG Database within Franchisor Variation I

This table reports three regressions estimated using BFG data. The dependent variable of columns I, II and III is logarithm of net investments. The main explanatory variable is the number of states in which the franchisor operates. Control variables common to all three columns are experience squared, total units, total unit squared, state controls, franchisor and time fixed effects. Additional control variables used in columns II and III are the projected units a franchisor estimates to open in the present year; the dummy financial assistance, which takes a value of one if financial assistance is offered to prospective franchisees, and zero otherwise; the average contract length offered to prospective franchisees, measured in years; and the advertisement fee that franchisors ask prospective franchisees, measured as a percentage of the franchisees revenues. Column III replaces the missing observations of the additional controls using a Multiple Imputation procedure. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) log(Net Investment)	(II) log(Net Investment)	(III) log(Net Investment)
States	0.0078***	0.0063**	0.0076***
	(0.0020)	(0.0025)	(0.0020)
Experience squared	0.0001**	0.0001*	0.0001**
	(0.0000)	(0.0001)	(0.0000)
Total Units	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)
Total Units squared	0.0000	-0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)
Projected new Units		-0.0004	-0.0003
		(0.0003)	(0.0003)
Dummy Fin. Assistance		0.0228	0.0271
		(0.0347)	(0.0274)
Contract Length		0.0069*	0.0053*
		(0.0037)	(0.0027)
Advertisement fee		0.1291	0.1685
		(0.1102)	(0.1375)
Firm-Fixed Effects	Yes	Yes	Yes
Time-Fixed Effects	Yes	Yes	Yes
State Controls	Yes	Yes	Yes
Industry Cluster	Yes	Yes	Yes
R-squared	0.1747	0.1621	0.1796
N	10,047	7,837	10,047

conclude that the number of states effectively increases investment requirements even after controlling for variables that account for alternative explanations and after correcting for the potential sample selection problem generated from missing observations in these controls.

An additional robustness check can be performed in our setting. Rather than using number of states as independent variable, we exploit franchisors' headquarters location to obtain a new explanatory variable. This new variable is designed to measure the average distance a franchisor travels to directly monitor her franchisees. We call this variable 'distance'. Franchisors expansion patterns is usually regional. They expand first to the states nearer the state from where they are headquartered and last to the states that are further away from their headquarters location. We compute the distance between each state to all other possible states, generating a 51 by 51 matrix, where the 51st state is the District of Columbia. Then, each state is sorted according their distance to each other, from closer to further, and the average travel distance from each state to the "ith" closer states is computed. For instance, the average distance from Alabama to its 10th nearer states is 296 miles and the average distance to its 30th nearer states is 606 miles; while the average distance from Arizona to its 10th nearer states is 550 miles and the average distance to its 30th nearer states is 986 miles. This average distance is merged with the number of states in which a franchisor operates according to their headquarters state. Thus, a measure of the average distance to monitor is computed, according to the franchisors location and how many states she serves. This variable is expressed in hundreds of miles.

The distance variable has one advantage and one disadvantage relative to measuring geographic dispersion using the number of states. The advantage is that it does not assign the same incremental value for each additional state; it computes the increase in the average distance to monitor depending on the franchisor's headquarters location. The disadvantage is that it uses the assumption that the franchisor's expansion is perfectly ordered, expanding to the closer states first and later to the ones that are further away. Column I of Table III.9 shows the result of estimating equation (17) reaplacing the variable number of states by the variable distance and including all the controls used in Table III.8. We find that when a franchisor increases its average monitoring distance by 100 miles, she increases the investment requirements she ask franchisees by 2.1%. This result is statistically significant at the 1% level. In column II of Table II.9 we replicate the estimation of column I using the aforementioned multiple imputation procedure. Now the coefficient of the variable distance increases to 2.9%, remaining statistically significant at the 1% level. The main intuition that Table III.9 conveys is that the increase of investment requirements due to higher monitoring costs is robust to the use of an alternative variable that captures geographic dispersion other than number of states.

The BFG database allows us to perform a final robustness check. This database contains not only the total number of outlets a franchisor operates, but also the number of units that are franchised and owned by the franchisor. This allows us to construct the percentage of franchised units a franchisor operates from the data. The sample mean of franchised units is 81%. Previous literature finds that higher monitoring costs increases the percentage of franchised units a franchisor operates (see Lafontaine and Slade (2007) for a literature review on this topic). Thus, if

Table III.9

Robustness Checks: BFG Database within Franchisor Variation II

This table reports two regressions estimated using BFG data. The dependent variable of columns I and II is logarithm of net investments. The main explanatory variable is the average distance between the franchisor's headquarters from its "ith" nearer states when they operate in "ith" states. Control variables used are experience squared, total units, total unit squared, state level controls, projected units a franchisor estimates to open in the present year; the dummy financial assistance, which takes a value of one if financial assistance is offered to prospective franchisees, and zero otherwise; the average contract length offered to prospective franchisees, measured in years, the advertisement fee that franchisors ask prospective franchisees, measured as a percentage of the franchisees revenues, franchisor and time fixed effects. Column II replaces the missing observations of the additional controls using a Multiple Imputation procedure. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) log(Net Investment)	(II) log(Net Investment)
Distance	0.0224***	0.0296***
	(0.0082)	(0.0067)
Experience squared	0.0001*	0.0001**
	(0.0001)	(0.0000)
Total Units	0.0000	0.0000
	(0.0000)	(0.0000)
Total Units squared	-0.0000	0.0000
	(0.0000)	(0.0000)
Projected new Units	-0.0003	-0.0003
	(0.0003)	(0.0003)
Dummy Fin. Assistance	0.0251	0.0289
	(0.0354)	(0.0284)
Contract Length	0.0070*	0.0054**
	(0.0035)	(0.0026)
Advertisement fee	0.1300	0.1685
	(0.1147)	(0.1434)
Firm-Fixed Effects	Yes	Yes
Time-Fixed Effects	Yes	Yes
State Controls	Yes	Yes
Industry Cluster	Yes	Yes
R-squared	0.1599	0.1784
N	7,837	10,047

the number of states is a good measure of monitoring costs we would expect it to have a positive impact on the percentage of franchise units a franchisor operates.

The intuition behind higher monitoring costs increasing the percentage of franchised units is as follows. A franchisee has more powerful incentives than an owned unit, managed by an employee, as the franchisee is the residual claimant of the store revenues. Thus, free-riding on the store brand-name, by reducing sales effort, is less likely to occur in a franchised outlet than in an owned outlet when the monitoring frequency is the same. This implies that when monitoring costs increase it is optimal for franchisors to franchise a larger fraction of outlets as it is relatively harder to control sales effort in owned units.

We estimate equation (17) replacing investment requirements with percentage of franchise units. The results of this estimation are shown in Table III.10, column I. In column II we repeat this estimation utilizing multiple imputation procedure. We show that it is actually the case that a franchisor that operates in more states franchises a higher proportion of their outlets, even after controlling for her experience. This result reinforces the notion that number of states is a good measure of franchisors' monitoring costs.

To sum up, this subsection provides evidence that monitoring costs are indeed the cause of the increase of investment requirements by eliminating concerns regarding potential omitted variable bias, by using an alternative measure of geographic dispersion, other than number of states, and by showing that our measure of geographic dispersion also affects other dimensions of franchise contracts (i.e., percentage of franchise units) in the direction expected by the theory.

Table III.10

Robustness Checks: BFG Database within Franchisor Variation III

This table reports two regressions estimated using BFG data. The dependent variable of columns I and II is the percentage of franchise units a franchisor operates (franchised/total units). The main explanatory variable is the number of states in which a franchisor operates. Control variables used are experience squared, total units, total unit squared, state controls, projected units a franchisor estimates to open in the present year; the dummy financial assistance, which takes a value of one if financial assistance is offered to prospective franchisees, and zero otherwise; the average contract length offered to prospective franchisees, measured in years, the advertisement fee that franchisors ask prospective franchisees, measured as a percentage of the franchisees revenues, franchisor and time fixed effects. Column II replaces the missing observations of the additional controls using a Multiple Imputation procedure. Robust standard errors adjusted by clustering at the industry level are reported in parentheses. The statistical significance are *10%, **5% and ***1%.

Variable	(I) % Franchised Units	(II) % Franchised Units
States	0.0019***	0.0017***
	(0.0006)	(0.0005)
Experience squared	-0.0001***	-0.0000
	(0.0000)	(0.0000)
Total Units	0.0000	0.0000
	(0.0000)	(0.0000)
Total Units squared	-0.0000	-0.0000
	(0.0000)	(0.0000)
Projected new Units	-0.0000	-0.0000
	(0.0000)	(0.0000)
Dummy Fin. Assistance	0.0110	0.0090
	(0.0112)	(0.0081)
Contract Length	-0.0007	-0.0011
	(0.0011)	(0.0008)
Advertisement fee	0.0264	0.0392
	(0.0279)	(0.0328)
Firm-Fixed Effects	Yes	Yes
Time-Fixed Effects	Yes	Yes
State Controls	Yes	Yes
Industry Cluster	Yes	Yes
R-squared	0.0456	0.0384
N	7,837	10,047

III.4.4-Alternative Hypotheses

In this subsection we consider two alternative hypotheses that could explain why investment requirements increase after the passing of good-cause laws, other than the franchisors using investments as a self-enforcing device. However, we argue below that one of these hypotheses is at odds with additional evidence presented in previous studies, while the other hypothesis is implicitly accounted for in our empirical analysis. Therefore, the self-enforcement hypothesis remains as the most likely explanation for our results. Moreover, the self-enforcement hypothesis is the only hypothesis that can also explain why broader geographic dispersion of outlets results in franchisors asking for higher investment requirements.

The good-cause laws were lobbied by the service-station-dealer association and the National Franchisee Association Coalition (Brickley et al. 1991). One of the arguments that were given to pass the bills was that without the law a franchisor could unfairly terminate a franchisee and reconvert it into an owned unit. If franchisors were indeed unfairly terminating contracts, the passing of the law would have benefited them, and the franchising activity as a whole, as it allows franchisors to commit not to unfairly terminate contracts. This, in turn, will generate the necessary conditions to protect the franchisees' investments. Thus, investment requirements could have increased for this reason and not because franchisors were using them as a self-enforcing device. However, there are two pieces of evidence that contradict the commitment hypothesis. First, Brickley et al. (1991) show that the stock prices of franchisors located in California dropped after the passing of the law in that state. Second, Brickley et al. (1991) and Klick et al. (2007) show that the franchise activity went down in the states were the laws were passed. These two pieces of evidence are at odds with the laws being beneficial to franchisors or the franchising activity in general. Therefore, the commitment hypothesis is unlikely to explain the increased in investments that was observed after the passing of the laws.

An alternative hypothesis that could explain an increase in investments after the laws were passed is the following. Klick et al. (2007) document that after the passing of the laws the total number of units a franchisor operates decreases: the number of franchise units decreases more than the increase in franchisor-owned units. They interpret this pattern as franchisors having more trouble in maintaining a standard level of quality in their franchised units. The reduction in the total number of outlets, however, could imply that the optimal size of the outlet increases and investment requirements could have increased for this reason.

The fewer, but bigger outlets hypothesis, however, cannot explain our results. We find that investment requirements increase even after controlling by the total number of units a franchisor operates (franchised and owned). What can be argued is that the total number of units is not exogenous as it is also determined by the passing of the laws and that this could bias the parameter of the dummy law on investment requirements. Nevertheless, this bias works against our results. If the dummy law has a negative impact on the number of outlets, the parameter that accompanies the dummy law in the regressions we run not only captures the true effect of the passing of the law on investment requirements, but also the projection of the dummy law on the number of outlets, which is negative. Therefore, we find that the passing of the law has a positive impact on investment requirements in spite of the potential endogeneity of the number of outlets. Furthermore, when we run the number of outlets on the dummy law we do not find that the reduction in the number of outlets is statistically significant in any of our two samples, implying that this effect is not of major relevance.[53]

III.5-Conclusion

The evidence presented in this essay finds support for the hypotheses derived on the first essay, where investment requirement was assumed to be used by franchisors as a tool to boost franchisees' sales effort. We show that franchisors increase investment requirements after the passing of the good-cause termination/nonrenewal laws as these laws weakened the franchisor's ability to terminate a contract with a misbehaving franchisee. We also show that a franchisor increase investment requirements when they expand geographically as her ability to directly monitor is hindered.

The results presented here are economically sizable. A franchisor who operates all her outlets in a state where a good-cause law has been enacted asks for investment requirements 38% higher than a franchisor that operates in a state without such law. In addition, a franchisor that expands its operations by one state increases investment requirements between 0.6-1%. Thus, the conflict of interests between the franchisor and the franchisees is shown to be economically relevant.

In addition, our results show that investment requirements are an endogenous contract term. This contrasts with the previous empirical franchise literature in which investment requirement was considered as an exogenous explanatory

[53] A similar argument can be constructed for the number of states.

variable. Knowing what the determinants of investment requirements are can help to generate new identification strategies when using investment requirements as an explanatory variable.

CHAPTER IV

How Do Firm Financial Conditions Affect Product Quality and Pricing?

(joint with Gordon Phillips)

IV.I-Introduction

Financial distress is frequently cited as influencing firm value by causing firms to take actions that would be suboptimal in normal times in order to reduce their chance of entering bankruptcy and potentially being liquidated.[54] Potential costs of financial distress and bankruptcy are commonly given as a reason for firms to have less debt than they would have otherwise chosen given the potential tax advantages of debt. The potential costs of financial distress and bankruptcy include the possibility that customers and suppliers may not wish to do business with a firm that is likely to fail as they may lose value if the firm is liquidated (Titman 1984). Additionally, in financial distress, the firm may produce a lower quality product and attempt to sell this product as higher quality in order to stave off bankruptcy as modeled by Maksimovic and Titman (1991). Empirically, the importance of these effects is unknown.

We examine how product quality and pricing decisions vary with financial distress and bankruptcy in the airline industry. We analyze whether managers reduce product market quality and prices in periods of financial distress before the firm actually defaults, as well as quality and pricing decisions in bankruptcy.

[54] See for example, the Wall Street Journal, Dec 17, 2008, p B1. Also see Asquith, Gertner and Scharfstein (1994) for firm-specific actions taken by a sample of junk-bond issuers to avoid bankruptcy.

Our measure of financial distress is a firm's probability of default, calculated using Merton's distance to default measure. Changes in the probability of default may reduce a firm's incentives to produce a high quality product since a reduction in quality may increase current cash flows at the expense of bondholders who may receive less in the future. Similarly, the firm may also have incentives to lower prices to increase market share and current cash flow even if this triggers a price war in the future. Bankruptcy, however, can have a different effect. In bankruptcy, the time horizon of firm managers may be longer, as debtholders and other fixed claimants are closer to becoming future owners of the firm and management may also wish to be involved in the firm post-bankruptcy.[55] In addition, firm claimants' incentives to invest in customer retention may increase under bankruptcy, as they need to demonstrate to the bankruptcy judge that the firm is viable as a going concern. Thus the firm managers and claimants to the firm may have incentives to increase quality in bankruptcy relative to periods of financial distress to keep existing customers.

We examine how two different components of product quality in the airline industry, mishandled baggage and on-time performance, and airline pricing, are related to financial distress and bankruptcy. Econometrically, we estimate a simultaneous system of equations for price, quantity and quality along with financial distress and bankruptcy.

We find that airlines' quality and pricing decisions are affected by financial distress and bankruptcy. Financial distress reduces a firm's incentive to invest

[55] Hotchkiss (1995) examines firms post-bankrutcy and finds that the management of many bankrupt firms does not change after emerging from Chapter 11 and finds evidence of inefficient continuation of firms post bankruptcy. Strömberg (2000) documents that conflicts of interest in bankruptcy auctions can lead to inefficient continuation decisions.

in quality. In addition, firms price more aggressively when in financial distress, consistent with them trying to increase short-term market share and revenues. Interestingly, the negative effects of financial distress on product quality are not present during bankruptcy. In bankruptcy, product quality *increases* relative to the pre-bankruptcy financial distress period, consistent with airlines investing in customer retention and reputation through product quality. We do not find evidence that firms price differently in bankruptcy relative to periods of financial distress.

We add to the previous literature on bankruptcy and financial distress by focusing on identifying real effects on quality. Hoshi, Kashap, and Scharfstein (1990), Asquith, Gertner, and Scharfstein (1994), Sharpe (1994) and Hotchkiss (1995) find that financially distressed firms have a greater tendency to cut investment, sell assets, and reduce employment than their non-leveraged counterparts. Campello (2003) shows that sales growth of leveraged high debt firms drops more in recessions. However, Andrade and Kaplan (1998) and Khanna and Poulsen (1995) find no differences in actions by financially distressed firms versus benchmarked competitors. Maksimovic and Phillips (1998) find that industry conditions are a primary determinant of bankruptcy outcomes and largely efficient liquidation decisions. Khanna and Tice (2005) show that high debt firms are more likely to exit low price cities and are more likely to be efficient.

Previous research on financial distress in airlines by Pulvino (1998) has documented that asset sales by distressed airline firms are associated with a significant price discount. Additional articles have examined the effect of financial conditions on airline accident rates. Rose (1990) examines airline accidents and finds that accident rates decrease with an airline's operating margin – a measure of financial health of an airline. Dionne et al (1997) criticizes Rose's approach arguing that operating margin is not the right measure of financial health because underinvestment in airline safety can increase operating margin in absence of accidents. They propose leverage as a measure of financial condition and obtain mixed results for the effect of financial condition on airline safety. Noronha and Singal (2004) use bond ratings to capture the financial health of an airline and find that better bond ratings are related to lower accident rates. However, they only examine cross-sectional variation between firms. It is likely that better-run airlines could have caused both lower accident rates and higher bond ratings creating an omitted variable bias. Several papers examine pricing decisions directly. Busse (2002) examines how financially distressed firms price in the airline industry and finds prices are cut when leverage is high or interest coverage is low. Borenstein and Rose (1995) show that prices decline pre-bankruptcy but then remain constant in bankruptcy. They conclude that firms change their prices due to financial distress and not due to bankruptcy because consumers believe that financially distressed firms offer lower quality, which in turn lowers demand and optimally lowers firm price. While this is a possible interpretation there is no evidence in that paper that financially distressed firms actually offer lower quality or that the reduction in price is due to a reduction in demand. Our article documents the direct effect of financial conditions on product quality showing that there is an additional cost of financial distress in the form of reduced quality of service for the airline's customers and examines the differences between the effects of financial distress and bankruptcy.

Lastly, a series of papers examines bankruptcy and not financial distress. Borenstein and Rose (2003) examine the effect of the share of airport capacity operated by airlines in bankruptcy on the number of flights and destinations from a given airport. They find that the number of flights from a given airport decreases for bankrupt airlines. However it is hard to interpret this finding given that bankruptcy is an endogenous outcome. Two recent papers by Ciliberto and Schenone (2009, 2010) focus just on bankruptcy and examine the impact of bankruptcy on airline pricing, product variety and on-time performance. They do not examine financial distress as they exclude two quarters of data prior to the firm declaring bankruptcy and they also do not compute any probability of bankruptcy for non-bankrupt periods and non-bankrupt airlines. They thus compare bankruptcy to non-distress periods for airlines that declare bankruptcy.[56] Lastly Benmelech and Bergman (2010) examine how bankruptcy of one firm imposes negative externalities on non-bankrupt industry competitors by driving down the collateral value of assets used in the industry. They show that the cost of debt financing increases for nonbankrupt industry firms.

Our paper contributes on multiple dimensions to our understanding of how financial distress and bankruptcy affect firm quality and pricing decisions. First, our paper examines the effect of both financial distress and bankruptcy on product quality and pricing. We show that firms' quality decisions are substantially different in financial distress and bankruptcy versus non-bankrupt periods. Our paper is the first to show econometrically that firms reduce quality when faced with financial distress in order to increase their probability of near term survival.

[56] Financial distress might start earlier than just 2 periods before bankruptcy. In that scenario, they compare a compound of distressed and not distressed peridos with bankruptcy.

In contrast we show that firms increase quality in bankruptcy relative to periods of financial distress. Second, we simultaneously estimate equations for the firm's pricing, quantity, quality decisions and its financial condition, explicitly controlling for the endogeneity of financial condition using the tangibility of the firm's assets as instrument. Without controlling for the endogeneity of financial condition, the estimated effects of financial condition on quality and prices might be biased, because lower firm quality or prices may be the cause of financial distress and bankruptcy in the first place. Lastly, we have a more precise measure of a firm's financial distress than the previous literature as we use Merton's probability of default, which is a continuous and more accurate measure of financial distress.

Our paper proceeds as follows. In Section IV.2 we give the theoretical background and also present our econometric model. In section IV.3, we describe our data. Section IV.4 presents the results for financial distress and bankruptcy. Section IV.5 concludes.

IV.2-Quality and Pricing in Financial Distress and Bankruptcy

In this section we describe how financial distress and bankruptcy may affect a firm's quality and pricing decisions. In section IV.2.1 we describe the theoretical background and also describe the implications we test from the prior theoretical literature. In section IV.2.2 we present the econometric model we estimate.

IV.2.1-Theoretical Background

We draw on the theoretical article by Maksimovic and Titman (1991) in formulating the hypotheses we test. Consider a firm with some degree of market power, to the extent it can choose price and quality. Assume also that the good sold by the firm is an experience good so the quality is not known beforehand. In periods of financial distress, firm managers and equity holders may have incentives to lower the quality of the product they sell if they can earn higher profits until the lower quality is observed. Firms can cut quality and given that quality provision is costly, this will lower the marginal cost of production. Until consumers realize the good sold is of lower quality, firms will earn higher profits. Once the lower quality is observed, firms will face reduced demand. If the claimants do not bear the full cost of this reduced demand or face a very high discount rate, they may have incentives to shift profits into nearby periods. These features fit well the airline industry. In the airline industry, firm's provision of quality is to some extent unobserved at the time an airline ticket is sold. Consumers can observe lagged measures of quality, but quality at the actual time the flight is taken may be quite different than past quality. Firms may also face a very high demand for current profits and may be willing to trade future profits for current profits.

Debt, financial distress and bankruptcy play a role just as in the Maksimovic and Titman model, as financial distress and *expected* bankruptcy can increase the incentives of firms to lower quality. The intuition for financial distress to play a role is simple and follows directly from their model. If the firm defaults on its debt, debtholders rather than equityholders bear the loss of the future market share. If a firm faces a significant chance of defaulting on its debt, it may choose to cut quality today in order to survive in the hopes that there is a positive demand shock before consumers discover the lower quality. The positive demand shock may enable survival, despite the demand reduction that comes as a consequence of lower past quality. Afterwards, the firm can rebuild its reputation.

Put differently, the probability of default enters in the airline's supply of quality decision. The firm's supply of quality will be affected by a higher probability of default because the future benefits of quality diminish, given that there is a higher probability that the firm will enter into bankruptcy (equivalent to a higher discount rate). To the extent that not all consumers are aware of this present cut in quality, the firm optimally reduces quality taking an involuntary loan from consumers. This might help the firm, in the short run, to avoid bankruptcy.

Airline pricing can also be affected by financial distress. Morrison and Winston (1996) and Busse (2002) have found evidence that the prices in the airline industry are characterized by alternating periods of tacit collusive agreements and price wars. Price wars can be triggered as a firm reduces prices and deviates from the tacit collusive agreement prices in order to gain market share in the short run. As a higher default probability is equivalent to a higher discount rate a firm in financial distress will be more prone to reduce prices even if this triggers a price war in the future, given that bondholders might be the ones who receive less in the future if this happens. This logic holds only if there is no immediate detection of the price deviation. While the reduction in prices can be observed, airlines can modify the average price of their tickets by changing the composition of seats sold without changing their posted prices and this action may go unnoticed by other airlines for a significant period, giving scope for a non immediate detection from competitors.[57] This logic differs from Borenstein and Rose (1995) interpretation of pre-bankruptcy price reduction. They argue that prices go down because demand is lower for a distressed firm. Our hypothesis is that even after controlling for demand changes there is still an incentive to reduce prices as a firm's financial distress increases.

We thus test the following central implication:

Hypothesis 1: Firms cut product quality and price as the probability of default increases.

Our main focus is on financial distress but we extend our analysis to Chapter 11 bankruptcy. We also consider the effect of operating in Chapter 11 bankruptcy on firms' decisions. Chapter 11 bankruptcy is a state in which the firm continues to operate while it is attempting to reorganize. There are several key provisions of Chapter 11 bankruptcy that are relevant to our analysis: the *automatic stay* provision, the *voting procedure* in Chapter 11, the *feasibility test,* and *debtor-in-possession financing.* These provisions are described fully in Gertner and Scharfstein (1991), who theoretically show how they affect firm investment and emergence from Chapter 11.

During Chapter 11, under the automatic stay provision payments to creditors are deferred while the firm reorganizes.[58] Firm management has the right to

[57] It is well known that airlines charge different prices even within economy class. Each airline decides how many seats to offer at each price using an optimization package (e.g: PROS). The cheapest seats are sold first and as time passes the more expensive ones start to sell as well. If an airline decides to sell all the economy seats at the cheapest price the average price of that airline will be reduced, yet the posted price might not have changed. This makes the detection of price deviations difficult because other firms will find out only after observing that their bookings are not behaving as expected.

[58] Aircraft financing is exempt from automatic stay provision (section 1110 of chapter 11 bankruptcy).

propose a reorganization plan to emerge from Chapter 11 to the bankruptcy judge. The plan is then voted upon by claimants to the firm, with each class approving the plan if one-half by number and two thirds of the aggregate face value agree to the plan. The plan involves offering new securities to existing claimants under which they exchange their old debt securities for less senior and covenant free securities like equity. This exchange offer is also called the exit consent provision. Management's right to propose a plan legally exists for the first hundred and twenty days, but extensions are generally automatically granted by the bankruptcy judge. In addition the bankruptcy judge can approve additional debt securities, called debtor in possession financing, that are senior to existing debt issued before Chapter 11. The additional debt securities allow the firm to have funds to invest and continue to operate, reducing the debt overhang problem.

This bankruptcy reorganization plan also has to pass a *feasibility* test – specifically management has to demonstrate to the judge that the firm is viable as a going concern under the new plan. This plan can include a request to the bankruptcy judge that past union contracts be changed and a new wage structure imposed on the firm's employees. In addition, the firm can ask the bankruptcy judge to turn over past union pensions to the government pension fund, the Pension Benefit Guarantee Corporation (PBGC). The value of the pension paid by the PBGC is typically much lower than previous commitments under past labor agreements.

We hypothesize that Chapter 11 bankruptcy affects the incentives of managers differently than the probability of distress. Given that management wishes to emerge from bankruptcy, it has a much longer term perspective than during financial distress. We hypothesize that it now has incentives to treat existing customers well and to increase quality and thus invest in its long run reputation. The effect on price is less clear. There are three conflicting incentives. Two of them imply that prices do not increase with respect to the distress period and one of them implies that they increase. First, the management does not have to make interest and principal payments and as such has more flexibility to reduce price[59]. Second, airlines need to convince consumers to fly with them in spite of potential recent quality cuts and the consumer's potential belief that the firm may be liquidated. Therefore, prices shouldn't increase. However, an airline also has to demonstrate feasibility to the bankruptcy judge and thus, controlling for demand, it must demonstrate that it can make profits on a per customer basis, which may give an incentive to raise prices. Given the ambiguity in the effect of bankruptcy on prices, we are only able to state our second central hypothesis in terms of product quality:

Hypothesis 2: In bankruptcy, firms increase product quality relative to pre-bankruptcy financial distress periods.

IV.2.2-Empirical Strategy and Econometric Model

Our empirical strategy analyzes the effects of financial distress, measured as default probability, and bankruptcy on a firm's supply decisions (product-quality and price). We analyze financial distress separately from bankruptcy as a firm's default probability is not defined when a firm is in bankruptcy. Our measure of default probability is based on stock prices and when firms go into bankruptcy,

[59] Additionally, airlines can renegotiate pension benefits, reducing their costs (section 1113, chapter 11).

specifically Chapter 11, are not traded in the market, so there is no information about their stock price. Following the analysis of the impact of financial distress on a firm's supply decision we analyze the differential effect of bankruptcy relative to periods of high financial distress.

Analyzing the periods of distress is the primary focus of our paper. Analyzing distress separately from bankruptcy has the advantage of not imposing any value on the default probability when it is not defined (during bankruptcy). This is important since we hypothesize that before bankruptcy the default probability plays the role of a higher discount rate, shortening the firm's horizon; but while in bankruptcy a higher financial distress does not have any direct implication regarding a firm's horizon. We thus first analyze distress excluding bankruptcy periods and then separately analyze bankruptcy compared to pre-bankruptcy financial distress periods. The cost of analyzing distress separately from bankruptcy is that we do not use the whole sample in both estimations. We use only non-bankruptcy firm-quarter observations in analyzing the effect of financial distress and we use only distressed and bankrupt firm-quarters to analyze the differential effects of bankruptcy and financial distress.

Following our analysis of financial distress and bankruptcy separately, we use the whole sample to estimate simultaneously a system that contains both financial distress and bankruptcy. We end up finding similar results using this approach as when we estimate financial distress and bankruptcy in separate estimations. Thus in the interest of space, this method and the associated results are presented in Appendix I. The benefit of this approach is that we can analyze the effects of default probability and bankruptcy on the firm's supply decisions at the same time. However, there are some limitations to this combined analysis. The main limitation is that we cannot estimate the probability of financial distress when the firm is in bankruptcy. Thus in this case, we set the financial distress variable to be undefined with a value of zero when the firm is in bankruptcy and let a "predicted" bankruptcy dummy pick up the full effect of distress and bankruptcy. Note that we are not explicitly saying the firm is not distressed when in bankruptcy, but econometrically we are letting the bankruptcy variable to pick up the different degrees of financial distress that a firm might face when the firm is actually in bankruptcy.[60]

We now present the econometric approach that we use to analyze financial distress and bankruptcy. We first present the econometric model we use to analyze financial distress and then follow with the model for bankruptcy.

IV.2.2.1 Financial distress

In this analysis of financial distress, we drop firm-quarter observations where the firm is in bankruptcy as financial distress is not defined in bankruptcy. We use a simultaneous equation approach to estimate the impact of the probability of default on supply decisions. Specifically, we jointly examine a firm's supply decisions of quality (S) and price (P) with its quantity demanded (Q) and the probability of default (Pr_def).

The following 4 simultaneous equations describe the airline economic environment:

$$S_{it} = h(P_{it}, Q_{it}, Pr\_def_{it}, Y_{it}) \tag{18}$$

[60] With this approach we can think of the firm as operating under 3 different regimes: non-distressed and not bankrupt; distressed but not bankrupt, and bankrupt.

$$P_{it} = g(S_{it}, Q_{it}, Pr\_def_{it}, X_{it}) \tag{19}$$

$$Q_{it} = f(Pr\_def_{it}, P_{it}, S_{it}, W_{it}) \tag{20}$$

$$Pr\_def_{it} = j(Q_{it}, P_{it}, S_{it,} Z_{it}) \tag{21}$$

In the above equations, S are the two measures of quality, either the mishandled bags rate or on time departures, P is our measure of price which following the airline industry convention is calculated as a yield or average price per mile, Q is the total quantity of total enplaned passengers (TEP), and Pr_def is the default probability. Equations (1a) and (2a) can be obtained from the optimization problem of a firm that maximizes profits, Π(P(.),S(.),Q(.),Pr_def(.)), with respect to S and P. Equations (20) and (21) are the demand and default probability equations. Both of them can be affected by the firm's pricing and quality decisions.

In order to choose the simplest setting to generate these first order conditions, we assume linear demand and assume that the marginal cost of transporting a passenger and the marginal cost of providing quality are independent. In this simpler setting, which we adopt for the remaining equations we present, the marginal effect of quality on price and vice-versa are independent and we can drop P from equation (18) and S from equation (19). However, the results we obtain are invariant to their inclusion.

Y, X, W and Z are exogenous variables. Y are the factors that affect supply of quality; X the factors that affect the pricing strategy; W the factors that affect quantity demanded, and Z the factors that affect the default probability, which include a firm's capital structure. The variable that affects the supply of quality in Y is airport decongestion. The variables in X that affect pricing are oil fuel cost, average miles per flight, oil efficiency and airport decongestion. The variables in W that affect quantity demand are competition, income, unemployment and airport decongestion and the variable in Z is the percentage of liquidable assets. We will discuss these variables in the data section.

Equations (18)-(21) imply that the quantity demanded, Q, affects the pricing strategy, as usual, but might also affect the quality supply decision because when there are high numbers of passengers providing higher quality might be more costly. Additionally, Q affects the default probability, because lower demand presumably increases the default probability. Given that pricing and quality decisions might affect the default probability they are included in equation (21) as well. Finally, Q is affected by the default probability because consumers might anticipate the incentives of the airlines to under-provide quality while in financial distress.

Our instruments for P (Price) are the elements of X that are excluded from the other 3 equations. Similarly, the instruments of quality (S), quantity (Q) and Pr_def are the excluded components of Y, W and Z. We instrument Price or yield (P) with average miles per flight, oil fuel cost and oil efficiency; we instrument total enplaned passengers (Q) with local income, competition and local unemployment and we instrument the default probability with the percentage of liquidable assets. We discuss these instruments and our identification strategy further below. For now, we just limit ourselves to give a brief intuition of why they satisfy the exclusion restriction. Oil prices, local area income and unemployment are exogenous to firm's decisions. The percentage of liquidable assets is likely to satisfy the exclusion restriction as it is unlikely that having more valuable assets in case of liquidation will affect directly the quality of a firm's product or its prices. What can be argued is that this measure of tangibility has a relation with performance, because better performance can lead a firm to acquire more fixed assets, which increase the percentage of liquidable assets. In that case, our instrument could directly affect the firms' real outcomes, because it might be capturing unmeasured productivity to the extent that our controls are not perfect. Nevertheless, this is unlikely, because we observe that higher percentage of liquidable assets is positively related with high financial distress and bankruptcy, states in which productivity is unlikely to be high.

We do not have any variable that belongs to the set Y and is excluded from the other three equations. As a consequence, we are unable to instrument S directly, thus we replace quality in equations (20) and (21), and estimate:

$$S_{it} = h(Q_{it}, Pr\_def_{it}, Y_{it}) \tag{22}$$

$$P_{it} = g(Q_{it}, Pr\_def_{it}, X_{it}) \tag{23}$$

$$Q_{it} = f(Pr\_def_{it}, P_{it}, Y_{it}, W_{it}) \tag{24}$$

$$Pr\_def_{it} = j(Q_{it}, P_{it}, Y_{it,} Z_{it}) \tag{25}$$

We estimate this system using 3 stage least squares (3SLS) to take advantage of the potential error correlation structure between the equations. In this specification, we are able to analyze the effect of financial distress on the price and quality supply decisions. We also use firm and time fixed effects.

IV.2.2.2 Bankruptcy

After considering the effect of financial distress, we examine the impact of bankruptcy. We hypothesize that Chapter 11 bankruptcy may affect a firm's quality positively relative to financial distress given that a firm wishes to keep customers as it attempts to emerge from bankruptcy. We do not have a clear prediction for prices. The firm has more flexibility to lower prices in bankruptcy as it does not has to pay principal and interests on its debt; it also may want to lower prices to attract reluctant customers that may have observed lower quality during the period of financial distress; but the firm also may want to raise prices relative to those in financial distress to raise cash to demonstrate to the bankruptcy judge that it can successfully emerge from bankruptcy.

Instead of including all firm-quarters, we analyze bankrupt firms and compare their behavior relative to when they were highly financial distressed. We thus drop firm-quarters where the firms have low probability of default. Econometrically, we estimate a similar set of equations as for the financial distress case, but examining the impact of bankruptcy (a dummy variable) instead of default probability:

$$S_{it} = h(Q_{it}, Bankrupt_{it}, Y_{it}) \tag{26}$$

$$P_{it} = g(Q_{it}, Bankrupt_{it}, X_{it}) \tag{27}$$

$$Q_{it} = f(Bankrupt_{it}, P_{it}, Y_{it}, W_{it}) \tag{28}$$

$$Bankrupt_{it} = j(Q_{it}, P_{it}, Y_{it}, Z_{it}) \tag{29}$$

IV.3-Data

IV.3.1-Airline Data

Our data consists of an unbalanced quarterly panel of 21 airlines from the first quarter of 1997 to the fourth quarter of 2008. The data was constructed using information from *Transtats*, a site managed by the Bureau of Transportation Services (BTS); *Air Travel Consumer Reports (ATCR)* also from the BTS; Compustat; the Center for Research in Security Prices (CRSP); and the Bureau of Economic Analysis (BEA).

Our final sample is limited to firms included in all data sets. Airlines must have annual operating revenues of at least US$20 million to be included in Transtats; they have to have a domestic revenue market share greater than 1% to appear in *ATCR* and they must be publicly traded to have their financial information included in Compustat and CRSP. Given that we have an unbalanced panel with some firms entering and exiting the panel, our final sample contains 647 firm-quarter observations for the 21 airlines in our sample.[61] Table IV.1 summarizes the names of the carriers, the number of quarters they appear in the sample and whether each of these carriers had a bankruptcy episode during those quarters. Of the 21 carriers, 13 never entered into bankruptcy in our sample, 7 had one bankruptcy episode and only 1 firm, US Airways, had two bankruptcy episodes.

From Transtats we obtain each airline's domestic operating passenger revenue (DOPR), domestic passenger revenue miles (DPRM) and domestic total enplaned passengers (TEP) by segment.[62] TEP represents our measure of quantity, measured in millions of passengers; dividing DORP by DRPM we obtain the "yield", which is our measure of price. Yield is a common price indicator in the airline

[61] Our unit of analysis is firm-quarters as there is no information at the route level for mishandled baggage.

[62] We measure TEP on a segment basis; measuring TEP on a leg basis leads to similar results. The difference between legs and segments is best understood by an example. Suppose an airlline flies from A to B, and from B to C. A passenger flying from A to B or B to C would be counted as one segment and one leg. A passenger flying from A to C, with a setpover in B, would be counted as one passenger in terms of segments, but two passengers in terms of legs.

Table IV.1

Carriers and Bankruptcies

The left column of this table presents the names of the 21 carriers that had annual operating revenue greater than US$20 million, had a domestic revenue market share greater than 1% and were publicly traded, for any quarter between the first quarter of 1997 and the fourth quarter of 2008. The middle column shows how many quarters each firm appears in the sample. All 21 firms appear in consecutive quarters. The right hand side column shows how many bankruptcy episodes each carrier has in the sample.

Carrier	Quarters in the sample	Bankruptcy episodes
ATA Airlines	15	1
Air Tran Airways	23	0
Alaska Airlines	36	0
America West Airlines	36	0
American Airlines	48	0
American Eagle Airlines	31	0
Atlantic Southeast Airlines	23	0
Comair	19	1
Continental Airlines	48	0
Delta Air Lines	48	1
ExpressJet Airlines	22	0
Frontier Airlines	14	1
Hawaiian Airlines	20	1
JetBlue Airways	23	0
Mesa Airlines	11	0
Northwest Airlines	48	1
SkyWest Airlines	23	0
Southwest	48	0
Trans World Airways*	15	0
United Airlines	48	1
US Airways	48	2
Total Airlines: 21	**Total firm-quarters: 647**	**Bankruptcy episodes: 9**

*TWA went bankrupt in 2002, but was acquired by American Airlines before that bankruptcy episode.

industry, measuring the average price per mile a passenger is paying. Yield is measured in $US cents following common industry practice. Prices are measured at the time tickets are purchased, not when they are used.

We study two measures of quality: on time performance from Transtats and mishandled bags per 1,000 customers from ATCR. We do not consider accidents as these are rare events and because Rhoades and Waguespack (2000) find safety and service quality to be highly correlated. We also considered including the number of customer complaints but the Department of Transportation (DOT) reports that it has not determined the validity of the complaints - thus our measures are more objective.[63] The BTS classifies a flight as late if it is 15 or more minutes late from the scheduled arrival time. Nevertheless, constructing a dummy variable that takes a value of 1 if the flight is late and zero otherwise may hide information on how late are flights.[64]

Our variable "Late" is constructed as the average delay of late flights times the percentage of late flights. For instance, if a firm in a quarter has 20% of its flights arriving late and their late flights are on average 50 minutes late, the variable "Late" takes a value of 50*0.2=10. To get higher quality as an increasing function, we define "On Time Performance" as the inverse of Late.

From ATCR we obtain the mishandled baggage rate per 1,000 passengers. According to the DOT, the definition of mishandled baggage is "lost, damaged,

[63] We do not consider other measures of service quality, such as the flight cancellation rate, not because we think they are not important, but because they do not satisfy the Maksimovic and Titman (1991) framework in which quality cuts increase short term profits. There is no short-term benefit of cancelling a flight since passengers have to be relocated in other flights in the short run. The determinants of flight cancellation can be better explained at the route level (See Rupp and Holmes, 2003).

[64] Airlines sometimes are able to manipulate arrival times for flights that are on the border of being on time. Our measure does not suffer as significantly from this potential manipulation.

delayed or pilfered baggage". Note that airlines, and not airports, control important aspects of baggage handling given that airlines have to relabel baggage when there is a change in schedule. Also airlines can decide whether to invest in a better monitoring technology in terms of bar-coding and decide how many personnel to assign to the monitoring of bags. Again, to get higher quality as an increasing function, we define our variable as the inverse of the mishandled baggage rate, so the higher this rate is, less baggage is lost. Our sample starts in the first quarter on 1997 because there is no previous information about mishandled baggage.

Figures IV.1 through IV.3 present some initial summary statistics for firms in the quarters preceding and following bankruptcy. Figure IV.1 presents the inverse of mishandled bags, Figure IV.2 presents on-time performance and Figure IV.3 presents airline pricing. All data is quarterly, with quarter zero representing the first quarter a firm is in bankruptcy.

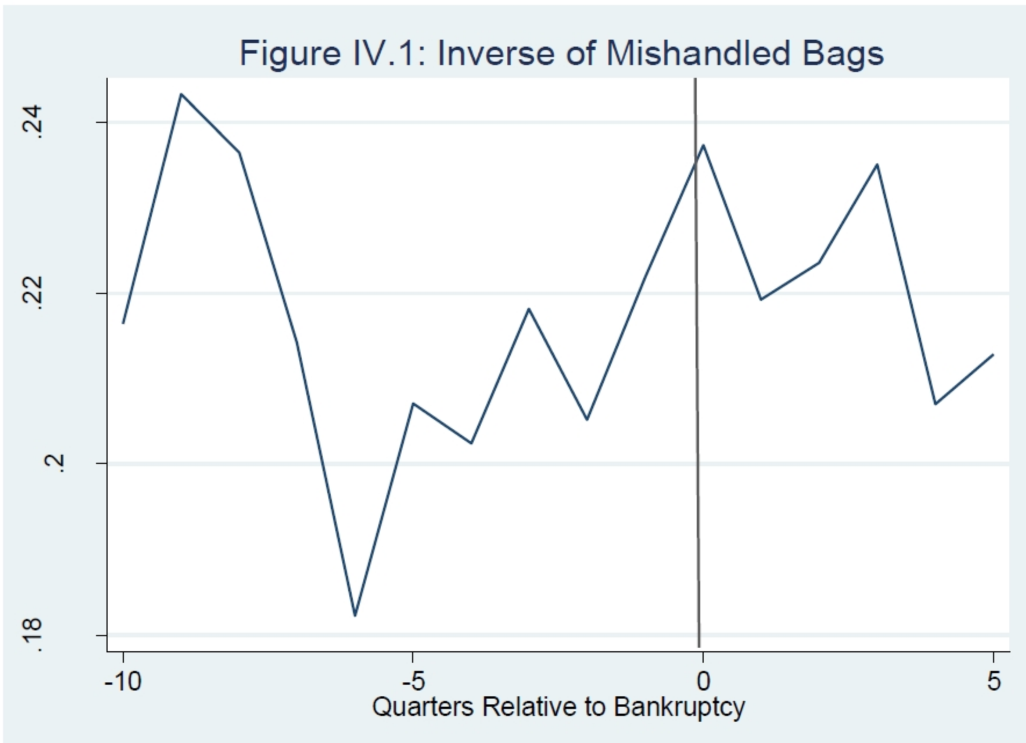
The figures show that quality and price measures decrease in the quarters prior to bankruptcy. Additionally, figures 1A and 1B show that quality increases after bankruptcy is declared.

Table IV.2 presents similar summary statistics. However, in this table we report detrended data, where we detrend the quality and price variables by regressing the raw measures on time dummies and firm dummies. Thus we use the residuals of these equations to construct Table IV.2. This table includes data only for firms that go into bankruptcy at some point in the sample and splits the data into observations more than four quarters before bankruptcy, the four quarters right before bankruptcy and the period the firm is in bankruptcy itself. The omitted default category is post-bankruptcy.

Figures IV.1 – IV.3

Evolution of Quality and Prices Relative to Bankruptcy

"Quarters relative to Bankruptcy" are the number of quarters before and after a firm enters into bankruptcy. Quarter zero is defined as the quarter when firms enter into bankruptcy, if they do. The mean quality, in terms of inverse of mishandled baggage and on-time performance, and the mean price (yield) are plotted for each quarter relative to bankruptcy, for firms that entered into bankruptcy. Figure IV.1 shows the evolution of the inverse of mishandled bags, figure IV.2 shows the evolution of on-time performance and figure IV.3 shows the evolution of prices.



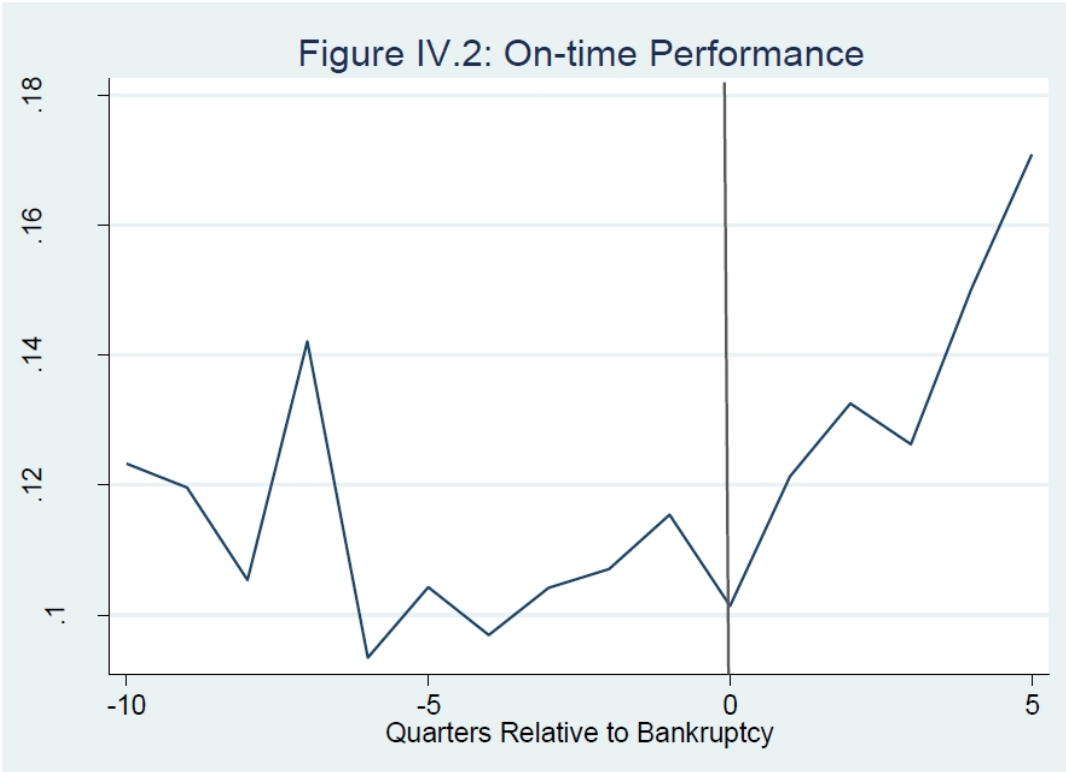


Figure IV.2: On-time Performance
.18
.16
.14
.12
.1
-10
-5
0
5
Quarters Relative to Bankruptcy

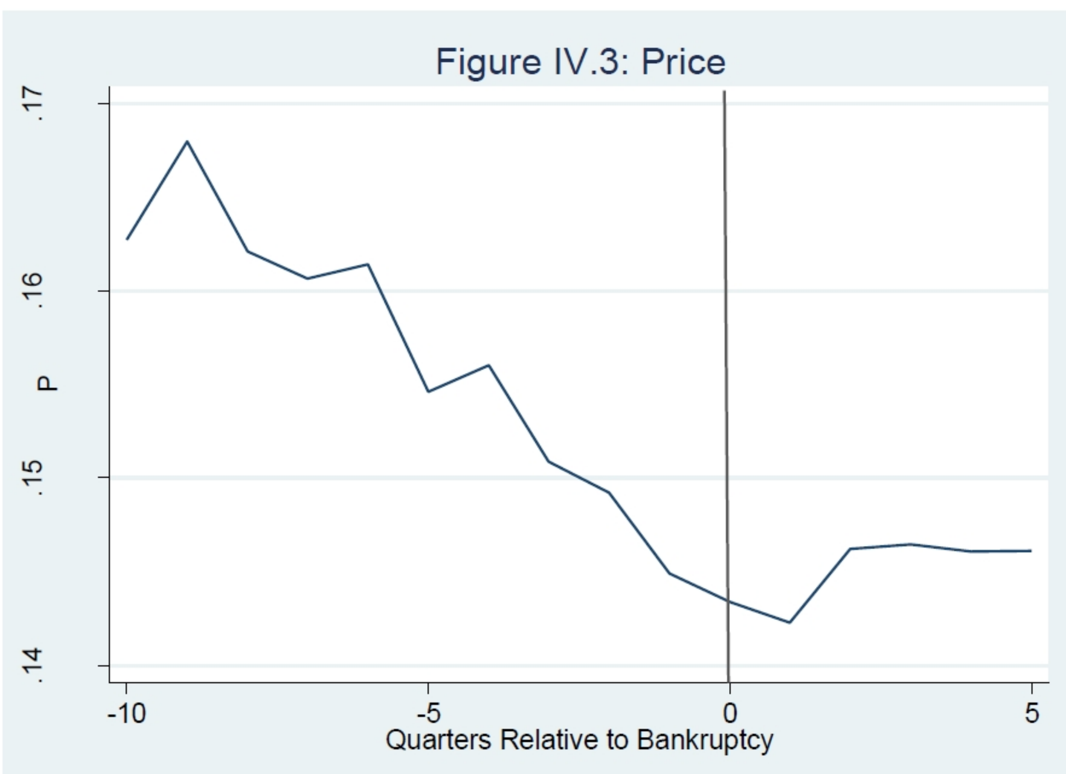


Figure IV.3: Price
.17
.16
.15
.14
P
-10
-5
0
5
Quarters Relative to Bankruptcy

Table IV.2

Quality, Yield and Firm Financial Situation

This table presents detrended summary statistics surrounding bankruptcy for price and two measures of quality: Inverse of Mishandled Baggage and On Time Performance. The data consists of an unbalanced panel of 21 airlines for 48 quarters (1st quarter of 1997 to 4th quarter of 2008). The omitted category is post-bankruptcy. Firms that went bankrupt are categorized according to time periods in reference with their bankruptcy episode(s). The pre-distress period contains all the firm-quarter observations of firms that went bankrupt 5 quarters or more before they filed into bankruptcy. The Distress period contains all the firm-quarter observations of firms that went bankrupt in the 4 quarters before they filed for bankruptcy. Bankruptcy includes the 59 firm-quarter bankruptcy episodes in the sample. In our sample period, only US Airways went bankrupt twice. All measures are detrended by regressing each measure against time and firm fixed effects. The measures below are the resulting residuals of those regressions, scaled by 10,000. The table presents the median, standard deviation and number of observations of these detrended measures are presented according to the different financial situation of the firm-quarter. Only firms that went bankrupt are included in this table. The statistical significance are *10%, **5% and ***1%.

	Pre-distress	Distress	Bankruptcy
Detrended Within Variation			
Quality: Inv. of Mishandled Baggage	29.02	-105.72***	165.53***
	(41.29)	(46.87)	(56.36)
Quality: On time Performance	3.92	-66.069**	16.25
	(24.66)	(30.20)	(58.06)
Price (Yield)	-7.51	-50.873***	-15.07
	(14.38)	(14.62)	(13.89)
N	103	32	59

Table IV.2 shows several striking patterns. First, both measures of quality decrease sharply in the four quarters prior to bankruptcy - a period of time we label as the "distress" period. Yield (our measure of price) also decreases sharply during the distress period. The differences in the medians of the residuals of the quality and price measures, between the pre-distress and distress periods are statistically different from zero at the 5% level of significance using a one-sided Fisher test for a non-parametric two sample comparison. Second, during bankruptcy both measures of quality and price increase relative to the distress period. However, only the differences in the medians of the quality measures for the bankruptcy and distress periods are significantly different from zero.

This initial evidence is interesting, but it does not consider firms with a high probability of default that do not enter into bankruptcy nor does it control for the endogeneity of distress or bankruptcy. These simple differences may thus be driven by other exogenous changes and merely related to firm bankruptcy. We now turn to the task of disentangling whether bankruptcy and financial distress affect firms' decisions after controlling for other exogenous demand and supply changes and the endogeneity of a firm's financial condition itself.

IV.3.2-Probability of Default and Bankruptcy

In our analysis of default probability we examine both firms that manage to avoid bankruptcy and to those that do not. We construct a direct measure of the probability of default and use this to examine firm quality and pricing decisions. In addition our analysis takes into account that this probability of default might be endogenous. The probability of default is based on the Bharath and Shumway

(2008) probability of default measure which, in turn, is based on the Merton (1974) model.[65] The idea is to compare the firm to a bond using the standard deviation of its equity and the value of its debt to construct its probability of default. Daily stock price information was obtained from CRSP and short and long term debt were obtained from quarterly Compustat. At least 25 stock price observations were required to construct the standard deviation of equity.

Our measure of default probability differs slightly from Bharath and Shumway (2008) in two ways. First, we construct the default probability quarterly rather than annually. Second, we incorporate as an additional component of long run debt the underfunding of pension liabilities[66] given their importance in airline default.[67] A default probability of, say, 50% is interpreted as implying that the firm has a 50% of chance of entering bankruptcy in the next quarter.

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[65] Merton (1974) derives that a firm's probability of default follows the following formula: $\pi_{Merton} = \left(-\frac{\ln\left(\frac{V}{D}\right) + (\mu - 0.5\sigma_V)T}{\sigma_V \sqrt{T}} \right)$, where V is the economic value of the firm, D is the economic value of the firm's debt and T is the forecasting horizon. This model uses a system of non linear equations to numerically infer the economic value of the firm and its standard deviation from the value of equity. Bharath and Shumway (2008) show that a naïve version of this default probability performs better in hazard models and in out-of-sample forecasts than the one that uses the numerical solution to obtain the economic value of the firm and its standard deviation. They proxy the economic value of debt, D, to its face value F; they proxy the standard deviation of debt value with $\sigma_D = 0.05 + 0.25\sigma_E$, they proxy the economic value of the firm V as the sum of the face value of the debt plus the value of equity, E, implying that the standard deviation of the firm value can be derived as $\sigma_V = \frac{E}{E+F}\sigma_E + \frac{F}{E+F}\sigma_D$. They also replace the expected return, μ , with the last period return, r_{it-1}. Thus, the naïve Merton's default probability, for a one period forward forecast, can be expressed as $\pi_{Merton-naive} = \left(-\frac{\ln\left(\frac{E+F}{F}\right) + \left(r_{it-1} - 0.5\left(\frac{E}{E+F}\sigma_E + \frac{F}{E+F}(0.05+0.25\sigma_E)\right)\right)}{\frac{E}{E+F}\sigma_E + \frac{F}{E+F}(0.05+0.25\sigma_E)} \right)$. This expression is based on stock price and debt value information only.

[66] 'Pension net liabilities' was constructed from BTS as 'pension liabilities' minus 'special funds'. If this was less than zero it was replaced by zero because the plan is overfunded. 'Pension liabilities' are the liabilities that a carrier has due to its defined benefit pension plan. 'Special funds' contain pension assets and other minor assets. Nevertheless, in the data it can be seen that airlines that do not have a defined benefit plan almost invariably have special funds equal to zero, so 'special funds' is a good approximation of pension assets.

[67] Not incorporating pension liabilities or even the long run debt in the default probability does not affect the results of the paper.

We impute the probability of default when a corporation owns more than one airline in the sample, as is the case of AMR, which owns American Airlines and American Eagle Airlines. In this case, the probability of default was calculated for AMR and used for both companies. A similar situation occurs in the case of mergers. When one airline buys another, the subsequent probability of default for both is constructed using the information of the consolidated firm after the merger takes place.

We choose Merton's default probability over other traditional distress measure, like Altman's Z, because the latter is not robust to changes in industry financial structure, such as the increasing trend in operational leases (see Gavazza 2010). Altman's Z is constructed using Multi Discriminant Analysis (MDA), a technique similar to econometric regressions that selects the financial ratios with the best ability to discriminate between distressed and not distressed firms. Using MDA for the airline industry, Chow, Gritta and Leung (1991) found that interest coverage, revenue to shareholders' equity and equity to total assets were the most important factors among the financial ratios examined for predicting airlines' default.[68] The final computation of the distress indicator assigned each of the three ratios a weight equivalent to a reduced-form parameter in the regression analysis. Nevertheless, changing trends in the financing of aircrafts makes all of the parameters, especially the interest coverage, quite unstable.

We use Merton's default probability because it is a more structural measure of default probability, given that it is theoretically derived and depends on basic elements of a firm's risk like its debt and the standard deviation of its equity. In

[68] Interest coverage was the single most relevant financial ratio in their estimation.

addition, in preliminary regressions, Merton's default probability predicted the bankruptcy episodes in our sample far better than Altman's Z in our sample. Finally, the advantages of Merton's default probability over Altman's Z apply to any other financial ratio given that Altman's Z is composed of multiple financial ratios.[69]

In our analysis of bankruptcy, we examine all firm-quarters in bankruptcy and compare them to observations in which the firm is in high financial distress but is not in bankruptcy. Bankruptcy takes value 1 when a firm declares itself (or is declared) in Chapter 11 and zero otherwise. There are 59 firm-quarter observations where the firm is in Chapter 11 bankruptcy in our sample, but there are no Chapter 7 episodes.[70]

For the non-bankruptcy sample that we compare to the bankrupt sample, we use highly distressed observations on firms that enter later into bankruptcy. Given that we are analyzing the within variation (by including firm fixed effects) our interest is to study how a given firm changes its decisions when transitioning from distress into bankruptcy. Including firms that are highly distressed but did not enter into bankruptcy might bias our estimates as some of the firms in the distress group could not be compared with themselves in the bankruptcy state. The criterion for selecting distressed firms is that our measure of default probability exceeds 10%. We select this criterion arbitrarily balancing not dropping too many non-bankrupt observations while ensuring that the included are, on average, quite

[69] Merton's default probability is also potentially more accurate than bond ratings given that bonds rating barely vary over time, and are frequently adjusted downward after a default.

[70] Independence Air did enter Chapter 7 but shrank to a small size before actually entering Chapter 7 so they could not be included given that they do not satisfy the 1% market share requirement of the ATCR.

distressed, with an average default probability of 66%. Nevertheless, relaxing this criterion does not change the results.[71] We get a final sample of 121 observations: 59 bankrupt firm-quarters and 62 distressed firm-quarters.

IV.3.3-Demand and Supply Variables

To identify any effect of distress or default on firm quality it is critically important to control for demand and supply shocks. To construct demand shift variables (denoted W above), we use the average income and unemployment rate per state-quarter from the BEA.[72] We use these state level variables in the following way for each airline. For each airline, we compute the total number of passengers originating from each state for each quarter, and divide them by the total number of passengers that the firm carried in that quarter. This gives us the percentage of origin passengers that each state represents for each airline. These percentages are lagged one period, to avoid potential endogeneity problems, and are multiplied by the average income and unemployment of each state in each quarter, yielding weighted average income and unemployment at origin for each airline. We do the same for destinations. To minimize the collinearity between weighted unemployment and weighted income we use average income weighted at the origin state and the average unemployment rate weighted at the destination

[71] All the results hold if we drop observations with default probability lower than 5%, 15% and 20%, or even higher. However, results do get weaker if we do not drop any observations. This is to be expected because when dropping observations with default probability lower than 5%, 10%, 15% and 20% the average default probability of the non-bankrupt firms in the sample is 60%, 66%, 70% and 74% respectively. Comparing those observations with the bankrupt firm quarters is correctly comparing distressed firms with bankrupt firms. However, when we do not drop any observations the average default probability of the non-bankrupt firm quarters is 20%, which implies that these firm-quarters are not that distressed and thus are not good candidates to be compared with bankrupt firm quarters.

[72] Average income is in thousands of dollars. Income and yield are in 2009 dollars (cents).

state.[73] We call these variables local income and local unemployment.

Another variable that shifts the demand of a firm is the competition it faces. Our measure of competition is the weighted average number of competitors that an airline faces by route. We do the computation in a similar way as the one for weighted income and unemployment. We sort the data by route and see how many airlines operate on a given route, measured as a pair of cities.[74] Then, we weight routes using lagged passengers to obtain our measure of competition.

Our supply variables, denoted as X in the previous equations, are based on cost items that vary over time. The two most important supply variables are oil prices and the efficiency with which each airline uses fuel. "Oil Fuel Cost" is constructed as the actual price per gallon that an airline pays in a quarter. This is obtained by dividing the total fuel cost of an airline by the number of gallons it used in that quarter. This price measure has two advantages over the oil spot price per gallon. First, it incorporates airlines' fuel hedging strategies as this price incorporates future or forward contracts the airlines signed. Second, it is not perfectly collinear with the time fixed effects. Thus, the overall economic conditions are captured by time fixed effects while the specifics conditions on an airline's oil price are captured by this variable. Efficiency, on the other hand, is defined as the number of ASM (available seat miles) an airline produces for each gallon of fuel they use. The more efficiently airlines use oil, due to new aircraft technology, the lower the costs of the firm.

Another variable that influences supply, through cost, is average distance of

[73] Including both variables at the origin or destination states does not affect the results.

[74] We exclude airlines that transport less than a 100 passengers in a route-quarter, because they represent irrelevant competition.

flights. The longer the distance that an airplane flies the lower the cost of the flight per mile, because the take-off and landing use more fuel, and thus firms with shorter flights will look less efficient all other things equal. This variable can be obtained by dividing Domestic Revenue passenger miles (which is the product of passengers and miles) by total enplaned passengers.[75]

Finally, we consider a variable that might affect both demand and supply conditions: "Congestion", which measures how congested the markets in which an airline operates are on average. Given that we are measuring positive characteristics as increasing variables, we will construct a measure of decongestion rather than congestion. To construct this measure we take the average percentage of on time flights (arriving within 15 minutes of the scheduled arrival time) of each airport, for each firm, excluding the firm's own flights. Then, we weight each airport by the lagged number of passengers for each firm. With this variable we can control for airport quality independent of the firm itself.

Congestion might affect the firms' pricing decision, because operating in congested markets is similar to facing capacity constraints in that the firm cannot increase supply as much as it would want to. Since operating under capacity constraints makes competition softer, we expect that (de)congestion should increase (decrease) prices. Congestion might affect demand as well, because congestion might reflect high consumer valuation for those markets. Finally, congestion can also affect our measures of quality, because it is easier to improve on-time performance and decrease the rate of mishandled baggage in less congested markets.

[75] Controlling for this variable is important because Low Cost Carriers (LCC) typically have similar yields to major carriers in the data, but after adjusting for the average miles per flight, which are lower for LCCs, we find that their yield is actually lower.

Thus by controlling for congestion we will not penalize a firm because it operates a large proportion of its flights in congested airports like JFK or La Guardia. Given that the only quality supply shift variable is decongestion, which also affects supply and demand, we cannot instrument quality.

IV.3.4-Variable Summary Statistics

Table IV.3 presents summary statistics for the full sample of firms. Table IV.3 shows the 10th percentile, mean, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of an unbalanced panel of 21 airlines for 48 quarters (1st quarter of 1997 to 4th quarter of 2008).

The main message that Table IV.3 conveys is that there is high variation in our measures of quality and default probability over the sample. Note that the statistics on default probability do not include the quarters the firm is actually in bankruptcy, as we cannot calculate Merton's default probability for companies without publicly traded stock. Despite not covering these quarters, the default probability goes from 0% at the 10th percentile to 69.2% at the 90th percentile. The maximum for this variable is close to 1.

IV.3.5-Financial Condition and Identification

One of the central problems that researchers face when attributing effects to financial variables like the probability of default or bankruptcy is that these variables are endogenous and potentially related to firm quality and prices. Thus we face a typical identification problem. Having low quality might have driven

Table IV.3

Summary Statistics

This table reports sample statistics for the full sample of all airlines in our sample. We present the 10th percentile, mean, median, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of an unbalanced panel of 21 airlines for 48 quarters (1st quarter of 1997 to 4th quarter of 2008). Price is defined as Domestic Operating Passenger Revenue divided by Domestic Revenue Passenger Miles, expressed in 2009 US cents. Inverse of Mishandled Baggage is defined as one divided by the rate of mishandled baggage per 1,000 customers. On time Performance is defined as one divided by "Late", where "Late" is the average flight delay by airlines of their late flights times the percentage of late flights. A flight is considered late it is arrives 15 minutes or later after its schedule arrival time. Total Enplaned Passengers is the Domestic Total Passenger by segment each airline transports, expressed in millions. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered, expressed in 2009 US dollars. Competition represents the weighted average number of competitors an airline faces across its markets. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Decongestion is average on-time performance by airport excluding the airline's own flights, weighted by the airline's lagged share of customers. The Default Probability is computed following Bharath and Schumway (2008). The information used to construct this variable comes from Compustat and CRSP. From the 647 observations, 59 of them are bankruptcy firm-quarters, thus we should have 588 Default Probability observations. However, for 9 firm-bankruptcy episodes it was possible to construct the Default Probability measure, as there was enough pre-bankruptcy information within those quarters. Additionally, there was no enough information to construct this measure for 11 non-bankruptcy quarters. Thus, the total number of Default Probability observations is 586. % Liquidable Assets is the fraction of the face value of assets a firm can recover in case of liquidation, constructed following Berger et al (1996).

Variables	10th Pctile	Mean	90th Pctile	Std. Dev.	N
Quality: Inv. of Mishandled Baggage	0.102	0.209	0.313	0.080	647
Quality: On time Performance	0.062	0.106	0.154	0.061	647
Price (Yield)	106.5	143.5	206.9	45.8	647
Total Emplaned Passengers	2.532	9.501	19.284	6.787	647
Default Probability	0.000	0.138	0.692	0.293	586
Bankruptcy	0.000	0.091	0.000	0.288	647
Decongestion	0.718	0.766	0.815	0.038	647
Average Miles per Flight	487.4	886.5	1225.9	276.4	647
Oil Fuel Cost	70.54	153.31	258.30	81.01	647
Competition	1.224	2.013	2.977	0.693	647
Efficiency	0.411	0.578	0.705	0.115	647
% liquidable assets	0.228	0.34	0.429	0.091	647
Income	72547	79197	85261	4968	647
Unemployment	0.041	0.051	0.062	0.085	647
Market Share	0.014	0.066	0.150	0.050	647

the airline into distress or bankruptcy in the first place. A similar argument can be made for high or low prices. Using airline fixed effects and time fixed effects partially mitigates this problem but clearly does not solve it.

We solve the identification problem using instrumental variables. To solve the problem, we need an instrument that affect the probability of default, but does not affect prices, quantity or quality. This also needs to hold for bankruptcy. We use the percentage of liquidable assets as instrument for both financial conditions. In our first analysis as default probability and bankruptcy are analyzed separately only one instrument is needed for identification.

The percentage of liquidable assets proxies for the tangibility of assets and follows Berger et. al. (1996) formulation. Berger et al. used data from Lexis/Nexis on the proceeds from discontinued operations reported by a sample of COMPUSTAT firms from 1984 to 1993 to compute how much the firm's assets were worth in case of liquidation. They found that a dollar of book value yields 72 cents in liquidation value for accounts receivables, 55 cents in liquidation value for inventory and 54 cents in liquidation value for their fixed assets. Our variable percentage of liquidable assets is the expected amount that can be recovered in case of liquidation, using those parameters, divided by the book value of assets.

The percentage of liquidable assets captures what proportion of a firm's assets creditors can recover in case the firm is liquidated. The more creditors can obtain in case of liquidation, the more they are willing to lend to the firm. Thus a higher percentage of liquidable assets is likely to be related with higher leverage and also with a higher probability of default and bankruptcy.

We are not the first to use the percentage of liquidable assets as an instrument for a financial variable. Campello (2006) uses the percentage of liquidable assets, following Berger et al. specification, to instrument leverage when analyzing the effect of leverage on firms' sales growth. We just go one step ahead and use it to instrument default probability and bankruptcy directly.

Conceptually, the percentage of liquidable assets is likely to satisfy the exclusion restriction. It is unlikely that having more valuable assets in case of liquidation will affect directly the quality of a firm's product or its prices. What can be argued is that this measure of tangibility has a relation with performance, because better performance can lead a firm to acquire more fixed assets, which increase the percentage of liquidable assets. In that case, our instrument could directly affect the firms' real outcomes, because it might be capturing unmeasured productivity to the extent that our controls are not perfect. Nevertheless, this is unlikely, because we observe that higher percentage of liquidable assets is positively related with high financial distress and bankruptcy, states in which productivity is unlikely to be high. Moreover, Almeida and Campello(2007), and Campello (2007) (see Table 3 of Campello (2007)) demonstrate that a firm's pledgable assets are independent of its financial constraints and that there is no direct relationship between a firm's percentage of liquidable assets and a firm's performance. Campello (2007) shows that the only relationship between these two variables is through the financing channel. Thus, the firm's percentage of liquidable assets is a good instrument for financial conditions as is unrelated to a firm's performance. In addition, any story that tries to directly relate the percentage of liquidable assets with product quality in one direction faces the hurdle that using the same instrument product quality is shown to have opposite effects in financial distress and bankruptcy.

Specifically, in the airline industry, our measure of percentage of liquidable assets captures not only an increase in debt capacity of the firm, but also the increase in fixed assets that occurs when firms acquire aircrafts using secured debt. According to Benmelech and Bergman (2009) *"...secured debt has become the primary source of external finance of aircrafts by airlines in the US."* Simply put, secured financing implies that an airline issue securities to buy aircrafts and back up those securities using the aircrafts bought as collateral. Thus, when a firm acquires new aircrafts the fixed assets of the firm increases and so does our measure of percentage of liquidable assets.[76] The debt of the firm and the default probability are likely to be higher as well. Thus, through this channel, a firm with higher percentage of liquidable assets is also a firm that is more likely to default in the future given its incremental level of debt.

The exclusion restriction of the percentage of liquidable assets can also be justified when the secured debt channel is at work. According to Gavazza (2010) a firm does not continuously buy or sell aircrafts to adjust its capacity. The decision of buying or selling aircrafts has wide inaction ranges due to the high transaction costs involved with it. According to his model, a firm acquires an aircraft only if it has a high enough productivity shock such that it is worth it to adjust its capacity in the long run (rather than adjusting it on the short run using operational leases). One consequence of his model is that getting rid of aircraft

[76] When aircrafts are acquired or there is a financial lease contract which implies that by the end of the lease the aircraft will be possessed by the airline, then the aircrafts appear in the airlines' balance sheets. When an airline signs an operational lease, that transaction is off the balance sheet (see Morrell 2007). Therefore, our measure of percentage of liquidable assets is not affected by operational leases which are not generally acknowledged as a cause of financial distress.

is difficult when the firm needs to downsize its fleet. Thus, a firm that acquired aircrafts in the past is more vulnerable to adverse shocks because it might be highly indebted and cannot sell their aircrafts to adapt its capacity quickly. Yet, in this story, the initial factors that might have lead a firm to the purchase an aircraft are not contemporaneously related with the factors driving the firm into financial distress, which occurs ex post. They cannot be contemporaneous because a firm facing a negative shock (which is the most likely scenario in financial distress) will not be likely to acquire any aircraft. Therefore, the positive relationship that the percentage of liquidable assets and default probability display in our data is likely to be due to the fact that the percentage of liquidable assets was high from a period previous to financial distress and remains high thereafter.

The "buying first with potential distress later" story is consistent with the persistence patterns of the percentage of liquidable assets and default probability that we find in our data. When running a regression between the percentage of liquidable assets on its lag using firm and time fixed effects as controls, we find that the coefficient of the lag is 0.78, while when doing the same analysis for default probability is just 0.21 (both are statistically significant at the 1%). This implies that the percentage of liquidable assets evolves slowly through time, consistent with Gavazza's story of inaction bands and with the fact that the distress is much less predictable.[77,78]

[77] This argument does not contradict Eisenfelt and Rampini (2008) who argue that firms in financial distress are the ones that lease more and buy less. Our argument is about how a firm enters into distress. They analyze what happens when the firm is already distressed.

[78] A less obvious channel that could potentially violate the exclusion restriction is the following. An airline could acquire more assets to expand faster to other markets. In this scenario, the percentage of liquidable assets may be correlated with faster market expansion. To the extent that expanding faster reduces the airline's ability to provide high quality it can be argued that the percentage of liquidable assets may have a direct effect on quality. We test for this potential effect and find that even after controlling for revenue growth in the quality and price

While we argue that the percentage of liquidable assets is a good instrument, we conduct an additional set of tests to further allay concerns. In additional tests we substitute out for quantity (total enplaned passengers) in the financial condition equation, and vice versa, and thus "borrow" additional instruments - local income and unemployment and competition - from our demand equation to the financial condition equation. In other words, rather than estimating the financial condition and demand *equations*, we estimate the impact that percentage of liquidable assets, competition, local income and unemployment have, *in equilibrium*, on the firm's financial condition and total emplaned passengers, and these instrumented versions are used in the system of equations. The advantage of this approach is that we can use instruments from an overidentified equation (the demand equation, which has 3 instruments) to increase the number of instruments on other equations (the financial condition equations, which are exactly identified). The drawback of this approach is that we cannot estimate the true equations that describe the demand and financial conditions, but only the impact of exogenous variables on their equilibrium values. As estimating the demand and financial condition equation is not our goal, we do not consider this a major drawback in designing this additional set of tests. [79] Local income is shown to be an additional strong instrument –and predictor- for the default probability and local unemployment is shown to be a strong instrument –and predictor- of bankruptcy. The main results of the paper are robust to this alternative approach.

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equations, the effects of instrumented financial distress and bankruptcy on quality and prices were unaltered.

[79] In a simple setting of supply and demand our approach is analogous to run the price and a quantity equations on both supply and demand shifters rather than estimating the demand and supply equations.

IV.4-Results: Multivariate Evidence

Before estimating our simultaneous equation system, we first present some simple regression statistics for quality and pricing. We regress quality and price on quarterly time and firm fixed effects and then examine the residuals of this simple regression for different percentiles of default probability (which is of course not included in the regression). The idea is to see if quality and price exhibit trends that are associated with financial distress after removing quarterly time and firm fixed effects.

Examining the results in Table IV.4 we can see that price per mile declines sharply and monotonically with a firm's default probability by quartile. There is an increase in price (yield) in bankruptcy relative to quartile 4, but not back to the levels of the other quartiles. The results for quality show that the inverse of mishandled bags decreases in quartiles 3 and 4 and sharply increases in bankruptcy. On-time performance also shows a sharp increase in bankruptcy relative to previous quartiles. Thus the most striking fact that we find in this table is the sharp *increase* in quality when firms move into bankruptcy. Quality is the highest when firms are in bankruptcy, consistent with firms increasing quality as they try to retain customers and emerge from Chapter 11.

Of course as we noted earlier, financial distress and bankruptcy are endogenous states and are correlated with other exogenous factors. Thus we now turn to examining quality and pricing when controlling for the endogeneity of financial distress and bankruptcy through simultaneous equations regressions. We analyze separately the effect of financial distress and bankruptcy on product quality and

Table IV.4

Quality and Yield Variation with Firm Default Probability

This table examines how quality and price vary with firm default probability and with bankruptcy. We present mean detrended measures of quality and yield for quartiles of Merton's default probability. To detrend the measures, we follow the procedure used in Table IV.2 and run separate regressions of Price, Inverse of Mishandled Baggage and On Time Performance on time and firm fixed effects. The detrended measures are the residuals from these regressions, scaled by 10,000. These measures thus represent the detrended within-firm variation of yield and the 2 measures of quality. The mean, standard deviation and number of observations of these measures are presented by quartile of default probability, for the non-bankrupt firm quarters, and separately for the bankrupt firm-quarters. The total number of observations sums to 636 rather than 647 because there are 11 missing observations of default probability for non-bankrupt firms. The statistical significance are *10%, **5% and ***1%.

Quartile of Default Probability	Q 1	Q2	Q3	Q4	Bankrupt
Detrended Within Variation					
Quality: Inv. of Mishandled Baggage	22.07	-5.53	-26.00	-13.74	125.5***
	(29.14)	(34.21)	(27.87)	(29.32)	(56.36)
Quality: On time Performance	4.10	-16.71	18.45	-7.11	57.77
	(20.38)	(26.63)	(23.18)	(21.39)	(58.06)
Price (Yield)	8.92	5.56	1.46	-25.841*	-11.60
	(10.75)	(15.30)	(14.32)	(17.10)	(13.88)
N	147	146	147	137	59

prices to avoid imposing any value on the default probability when a firm is in bankruptcy. Later, in the appendix, we show the results when a value of zero is imposed on the default probability.

Finally, a subtle distinction needs to be made in the interpretation of the default probability and bankruptcy when they are instrumented. When instrumented, the default probability has to be interpreted as the predicted probability that a firm enters into bankruptcy the next period, while bankruptcy, when instrumented, has to be interpreted as the predicted probability of being in bankruptcy rather than entering into bankruptcy.

IV.4.1-Financial Distress

We now examine in a multivariate setup how distress affects firm's quality and pricing (yield) decisions. For quality we examine two different quality supply decisions: mishandled baggage (the inverse of mishandled bags per 1000 customers) and on-time performance. The key variable we use to examine financial distress is Bharath and Shumway naïve probability of default. Table IV.5 presents results from estimating equations (22) to (25).

We estimate the system using three stage least squares (3SLS) to take advantage of the potential error correlation between the sets of equations. We use firm fixed effects to isolate firms' within variation in their pricing and quality strategies. We also use time fixed effects to absorb time-varying shocks that affect all firms' quality and prices and that might be correlated with firm's financial distress. We are able to identify temporary shocks from financial distress because financial distress affects different firms at different points in time. Lastly, we express our constructed variables in logarithms, whenever possible, to be able to interpret our results as elasticities. We use logarithms of price (yield), oil fuel cost price, efficiency and income.[80]

Econometrically we identify the direct effect of financial distress on price and quality by instrumenting price, quantity and the default probability. The instruments that satisfy the exclusion restriction for the price equation are average miles per flight, oil fuel cost and efficiency; for the quantity equation are competition, income and unemployment; and for the default probability is the percentage of liquidable assets. Our tests show that all the instruments but unemployment are strong.

Table IV.5 shows that firms' price and quality are negatively affected by their financial distress as captured by the default probability. These results are consistent the conflict of interest between equity holders and debt holders that arises in financial distress. These results as a whole are inconsistent with a cash constrained firm being unable to invest in quality as a firm does not need cash to cut prices.

To understand the economic impact of these results we compare the quality and price decisions of a firm with zero default probability with itself when it is highly distressed, with a 66% of default probability. We select this number because it will allow us to compare our results for financial distress with the later results on bankruptcy, for which sample firms have on average a 66% default probability

[80]Some variables like average miles per flight, competition, percentage of liquidable assets, unemployment and decongestion have a straight forward interpretation, so we do not express them in logarithms. We do not express Quantity in logarithms because the within difference in passengers through time compacts too much. For instance, the difference between 2 million and 2.01 million passengers is almost zero in logarithms. Finally, our quality measures are already in ratios, so the logarithmic transformation does not provide any further insight.

Table IV.5

Quality and Yield with Endogenous Default Probability

This table reports estimated relationships between quality, price and financial status using three-stages least squares. The five dependent variables, quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and default probability, are in columns I to V. Total emplaned passengers, default probability and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality:Inv. of Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers	(V) Default Probability
Default Probability	-0.0979*** (0.0330)	-0.0562** (0.0259)	-0.4717*** (0.0667)	9.6066*** (1.7962)	
Total Emplaned Passengers	0.0033* (0.0019)	-0.0018 (0.0015)	0.0147*** (0.0049)		0.0189** (0.0089)
ln(Price)				-2.3552 (2.1830)	-0.4044** (0.1650)
Decongestion	0.4303*** (0.0903)	0.0656 (0.0706)	-0.6494*** (0.1917)	10.9724** (4.9263)	-0.8305* (0.4451)
Average Miles per Flight			-0.0005*** (0.0001)		
ln(Oil Fuel Cost)			0.1786*** (0.0335)		
ln(Efficiency)			-0.1788*** (0.0328)		
Competition				-2.3256*** (0.3121)	
ln(Income)				42.7624*** (9.6782)	
Unemployment				-7.6814 (32.0400)	
% Liquidable Assets					0.3626** (0.1579)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7692	0.7046	0.8717	0.8831	0.5818
N	577	577	577	577	577

when they are not in bankruptcy.[81]

According to the estimates reported in Table IV.5, a firm that has a probability of 66% (2/3) of going bankrupt next period charges 31.1% less than a healthy firm with zero default probability. The effect on quality is also large. A firm with a 66% probability of defaulting next period decreases the inverse of bags mishandled by 0.065, which represents 0.8 standard deviations, with respect to a firm with zero default probability. Thus financial distress represents a change from the sample mean of 5.8 mishandled bags per 1000 passengers to 8 mishandled bags per 1000 passengers. Similarly, a firm with a 66% probability of defaulting next quarter decreases its on-time performance by 0.037 which represents 0.6 standard deviations, with respect to a firm with zero default probability. Assuming that the overall percentage of late flights remains at its sample mean, financial distress represents a change from late flights arriving 52 minutes late, at the sample mean, to 69 minutes late.

The results for our control variables also make economic sense. In the pricing equation, prices are higher when quantity increases, when oil prices are higher and are lower the less congested are the airports in which they operate. Prices also decrease with average miles per flight and with fuel efficiency. Lastly, both measures of quality increase when airports are less congested, but only the effect on baggage handling rate is statistically significant.

[81] With the exception of Alaskan Airlines, Southwest Airlines and JetBlue Airways, all airlines in our sample were highly distressed at some point in time. Eight airlines entered into bankruptcy and the others were able to avoid it. There is no substantive difference in the impact that financial distress has on airline's pricing and product quality decisions for the firms that later entered into bankruptcy relative to the ones that managed to avoid it. For both set of airlines, prices and the quality measure related to mishandled baggage are reduced in a statistically significant way with financial distress. The quality measure related to on-time performance is also reduced with default probability for both groups. However, this reduction is statistically significant only for the firms that later went bankrupt.

In Table IV.6 we show how the results change when financial distress is treated as an exogenous variable. The estimated coefficient of default probability on yield decreases to -0.046. Though this result is statistically significant it is an order of magnitude smaller than the estimated effect when default probability is instrumented[82]. In addition, not instrumenting financial distress leads to a downward biased coefficients in the estimation of firm product quality. When financial distress is not instrumented its effect on both quality measures is smaller, in absolute value, and looses statistical significance. Thus, we show that instrumenting firms' financial conditions is of critical importance in our results.

Table IV.7 presents the results of additional tests that demonstrates that our previous results are robust to choices of instruments. Table IV.7 substitutes out for quantity (total emplaned passengers) in the default probability equation and thus "borrows" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for default probability in the quantity equation. In other words, we are replacing equation (24) into (25) and vice versa. Local income in particular is shown to be an additional strong instrument for the default probability and is exogenous to firm-level quality and prices.

We find very similar results to those in Table IV.5. In columns I and II of Table IV.7, we can see that the effect on an increase in default probability is associated with a decrease in firm quality - more bags are mishandled and on-time performance decreases. Column III shows that prices also decrease in financial

[82] Lee (2010), treating financial distress as exogenous, found a similar decrease of between 3 to 5% in airline prices in the pre-bankruptcy periods. Her result is in agreement with our non instrumented result.

Table IV.6

Quality and Yield with Exogenous Default Probability

This table reports estimated relationships between quality, price and financial status using three-stages least squares. The four dependent variables, quality: mishandled baggage, quality: on time performance, price and total enplaned passengers, are in columns I to IV. Total emplaned passengers and price are used as right-hand-side variables as well. The only difference with Table IV.5 is that now default probability is not instrumented. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality: Inv. of Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers
Default Probability	-0.0119	0.0019	-0.0458***	-0.8043**
	(0.0082)	(0.0065)	(0.0149)	(0.3777)
Total Emplaned Passengers	0.0024	-0.0024*	0.0107**	
	(0.0018)	(0.0015)	(0.0046)	
ln(Price)				-6.2705***
				(1.8898)
Decongestion	0.4629***	0.0878	-0.4566***	5.6028
	(0.0863)	(0.0680)	(0.1540)	(3.9671)
Average Miles per Flight			-0.0006***	
			(0.0001)	
ln(Oil Fuel Cost)			0.2113***	
			(0.0321)	
ln(Efficiency)			-0.1814***	
			(0.0349)	
Competition				-2.6626***
				(0.2776)
ln(Income)				39.5027***
				(8.9470)
Unemployment				-20.0880
				(32.0429)
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
"R-squared"	0.8089	0.7398	0.9506	0.9487
N	577	577	577	577

Table IV.7

Endogenous Default Probability with Additional Instruments

This table reports estimated relationships between quality, price and financial status using three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and default probability are in columns I to V. This table is similar to Table IV.5, with the exception that in this table, we substitute out for quantity (total emplaned passengers) in the default probability equation in column V and thus "borrow" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for default probability in the quantity regression presented in column IV. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality:Inv. of Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers	(V) Default Probability
Default Probability	-0.0673**	-0.0484*	-0.3565***		
	(0.0332)	(0.0260)	(0.0724)		
Total Emplaned Passengers	0.0020	-0.0028*	0.0104*		
	(0.0019)	(0.0015)	(0.0054)		
ln(Price)				-6.9205***	-0.0173
				(1.9002)	(0.1985)
Decongestion	0.4486***	0.0752	-0.5585***	4.8955	-0.7031
	(0.0903)	(0.0706)	(0.1933)	(4.0174)	(0.4403)
Average Miles per Flight			-0.0005***		
			(0.0001)		
ln(Oil Fuel Cost)			0.2268***		
			(0.0355)		
ln(Efficiency)			-0.1801***		
			(0.0349)		
Competition				-2.6487***	0.0128
				(0.2900)	(0.0294)
ln(Income)				46.8060***	-2.5584***
				(9.0505)	(0.8451)
Unemployment				-15.5707	-4.8830*
				(33.1731)	(2.9170)
% Liquidable Assets				1.7292	0.8095***
				(1.7471)	(0.1826)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7328	0.7281	0.9045	0.972	0.6651
N	577	577	577	577	577

distress.

Next, we explore the effect of financial distress on a firm's market share. If rival firms can perfectly observe the firm's price, and are willing to match the firm's prices for all quantitites, then there may be no gain to cutting price for the financially distressed firm even in the short run. However, while prices can be observed, rivals cannot observe the quantity of seats sold at any given price as discussed earlier. Table IV.8 thus adds a market share equation as an additional equation to the previous system estimated in Table IV.5.[83] This market share equation was run in the same system as in Table IV.5 but presented separately in order to provide the intuition of why prices go down when there is distress: firms are to increase their market share by cutting their prices.

Table IV.8 shows that prices affect firm market shares negatively. Thus, it is consistent with distressed firms gaining market share in the short run by cutting their prices. In addition the coefficient on default probability is positive and statistically significant at the one-percent level, which means that firms in financial distress gain market share for reasons other than price reductions which may include giving away extra frequent flyer miles, a practice United used while it was in financial troubles, when it gave away triple the regular flight miles.

IV.4.2-Bankruptcy

We now examine the impact on price and quality of Chapter 11 bankruptcy. We compare bankrupt firm-quarters with highly distressed firm-quarters. We estimate a similar set of equations as for the financial distress case, but now we

[83] Market share is measured in terms of domestic operating passenger revenue.

Table IV.8

Market Share, Endogenous Default Probability and Prices

This table reports the estimated relationship between market share, default probability and prices. The dependent variable is market share, measured as the airline's proportion of Domestic Operating Passenger Revenues in the US market. This equation was estimated in conjunction with the set of equations shown in Table IV.5 using three stages least squares. Price is instrumented with Oil Fuel Cost, Efficiency, and Average Miles per Flight and Default Probability is instrumented with the % Liquidable Assets. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	**(I)** **Market Share**
Default Probability	0.0721*** (0.0139)
ln(Price)	-0.0276* (0.0169)
Decongestion	0.0931** (0.0385)
Competition	-0.0132*** (0.0024)
ln(Income)	0.2593*** (0.0712)
Unemployment	-0.2258 (0.2329)
Firm fixed effects	Yes
Time fixed effects	Yes
"R-squared"	0.8746
N	577

use a bankruptcy indicator rather than the probability of default as the relevant financial condition. Thus we estimate equations (26) to (29) using three stages least squares. The results of are presented in Table IV.9.

Table IV.9 shows that both of our measures of quality, the inverse of bags mishandled and the on-time performance, increase in bankruptcy relative to the distressed firm-quarters examined (which have a 66% default probability on average). There is no significant effect of bankruptcy on pricing. Low prices during bankruptcy are consistent with lower short-term cost pressures due to interest deferral.

The percentage of liquidable assets is a strong and significant predictor of bankruptcy even in this small subsample (121 firm-quarter observations). The rationale behind this pattern is the following. Firms on their way to bankruptcy reduce both fixed assets and short term assets. However, firms with a higher proportion of fixed assets find it more difficult to avoid bankruptcy as they cannot generate immediate cash from those assets. Thus, the higher the percentage of liquidable assets a firm has, the lower its chances of avoiding bankruptcy when facing a negative shock.

Competition and unemployment are not statistically significant in the TEP equation and the income variable has an incorrect sign. Therefore, we do not expect TEP to be instrumented properly and thus the estimated effects of TEP on price and quality need to be interpreted with caution. Nonetheless, as the effect of TEP on prices and quality are not our main focus, having weak instruments for TEP in this subsample is not a major concern.

The effect of instrumented bankruptcy on both quality measures is positive and

Table IV.9

Quality, Yield and Endogenous Bankruptcy

This table reports estimated relationships between quality, price and financial status using three-stages least squares. The five dependent variables, quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and bankruptcy, are in columns I to V. Total enplaned passengers, bankruptcy and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. The default state is financial distress without bankruptcy. The sample only considers firm-quarters with a default probability higher than 10% or in bankruptcy. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality: Inv. o Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers	(V) Bankruptcy
Bankruptcy	0.0965*** (0.0169)	0.0597*** (0.0175)	0.0498 (0.0596)	0.9023* (0.4777)	
Total Emplaned Passengers	-0.0049 (0.0122)	-0.0266** (0.0124)	-0.0912** (0.0391)		0.2859*** (0.1022)
ln(Price)				0.0814 (2.7596)	-0.9035 (0.8027)
Decongestion	0.8262*** (0.2479)	0.3973 (0.2544)	0.6088 (0.6225)	13.3163** (6.0715)	-8.9621*** (1.9681)
Average Miles per Flight			-0.0005*** (0.0001)		
ln(Oil Fuel Cost)			-0.0412 (0.2260)		
ln(Efficiency)			-1.0257*** (0.3952)		
Competition				-0.1557 (0.2831)	
ln(Income)				-18.5841* (9.8941)	
Unemployment				30.5765 (51.6761)	
% Liquidable Assets					1.1190*** (0.4007)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7137	0.7017	0.86	0.9674	0.1669
N	121	121	121	121	121

strongly significant. When a firm goes from financial distress into bankruptcy, it increases the inverse of bags mishandled by 0.0965 which represents a 1.2 standard deviation increase. Thus bankruptcy represents a change from the estimated 8 mishandled bags per 1000 passengers in financial distress to 5.2 mishandled bags per 1000 passengers. Similarly, a firm in bankruptcy increases its on-time performance by 0.0597 which represents 0.98 standard deviations, with respect to when it was financially distressed. Thus bankruptcy represents a change from late flights arriving 69 minutes late in financial distress to just 37 minutes late. In sum, firms in bankruptcy actually increase their quality slightly with respect to when they are financially healthy. The intuition is that firms during bankruptcy are trying hard to regain the confidence of consumers and convince the bankruptcy judge that they are viable in the long run. The increased quality is also consistent with the firm investing in its reputation for the future. However, similar to the financial distress estimation, when bankruptcy is not instrumented its impact on both quality measures is underestimated. This is shown in Table IV.10. This result provides further motivation for instrumenting firm's financial conditions.

We conduct an additional analysis where we explore whether our results are robust to choices of instruments. As in Table IV.7, we substitute out for quantity (total emplaned passengers) in the bankruptcy equation and we substitute the bankruptcy equation in the quantity equation. This is equivalent to replace equation (28) into (29) and vice versa. These results are reported in Table IV.11. Local unemployment is shown to be an additional strong instrument for bankruptcy and is exogenous to firm-level quality and prices. We find very similar results to those in Table IV.9. In columns I and II of Table IV.11, we can see that bankruptcy is

Table IV.10

Quality, Yield and Exogenous Bankruptcy

This table reports estimated relationships between quality, price and financial status three-stages least squares. The four dependent variables, quality: mishandled baggage, quality: on time performance, price and total enplaned passengers, are in columns I to IV. Total enplaned passengers and price are used as right-hand-side variables as well. Bankruptcy takes a value of 1 if the firm is bankrupt and zero otherwise. The only difference with Table IV.9 is that now bankruptcy is not instrumented. The default state is financial distress without bankruptcy. The sample only considers firm-quarters with a default probability higher than 10% or in bankruptcy. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality: Inv. of Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers
Bankruptcy	0.0436***	0.0167*	-0.0343	-0.7874**
	(0.0108)	(0.0102)	(0.0311)	(0.3228)
Total Emplaned Passengers	0.0313***	-0.0038	-0.1001***	
	(0.0090)	(0.0088)	(0.0295)	
ln(Price)				-0.3316
				(2.5825)
Decongestion	0.2464	-0.0269	0.2406	3.1435
	(0.2079)	(0.1960)	(0.4561)	(5.4379)
Average Miles per Flight			-0.0006***	
			(0.0002)	
ln(Oil Fuel Cost)			-0.0132	
			(0.1864)	
ln(Efficiency)			-0.6805**	
			(0.2855)	
Competition				-0.2683
				(0.2555)
ln(Income)				-27.3355***
				(10.5467)
Unemployment				53.2635
				(50.5825)
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
"R-squared"	0.7054	0.8119	0.8463	0.9741
N	121	121	121	121

associated with an increase in firm quality.

Overall these results on quality in bankruptcy as compared to quality in financial distress are unique. We show that quality increases in bankruptcy relative to financial distress. Our results that prices fall with financial distress are robust and agree with Borenstein and Rose (1995) and Busse (2002), although our findings suggest a different mechanism by which prices are lower in financial distress than the arguments proposed earlier. Borenstein and Rose (1995) argue that consumers might anticipate the firm's incentive to reduce quality and thus lower their demand, implying a reduction in prices. In our setting even after controlling for firms demand we find that firms reduce price in the presence of financial distress. This mechanism is consistent with firms in financial distress having a higher discount factor which gives firm managers incentives to cut prices in the short run in order to generate cash by stealing market shares from its competitors, even though this might imply lower profits in the future due to a potential price war. This proposed mechanism is similar to Busse (2002) mechanism as she also argues that firms in distress cut prices in order to get higher profits in the short run even if this triggers a price war in the future. The difference is that she attributes the short run gains to anticipation in ticket purchases while we show they are compatible with stealing market share from competitors.

The fact that prices fall with measures of default probability also indicates that default is involuntary in our setting and that firms adopt strategies that may allow them to recover. In contrast, previous work on voluntary increases in financial leverage by Chevalier (1995) and Phillips (1995) shows that prices increase with voluntary leverage buyouts (LBOs) and management buyouts (MBOs) in most

Table IV.11

Endogenous Bankruptcy with Additional Instruments

This table reports estimated relationships between quality, price (measured by yield) and financial status using three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and bankruptcy are in columns I to V. This table is similar to Table IV.9, with the exception that in this table we substitute out for quantity (total emplaned passengers) in the bankruptcy equation in column V and thus "borrow" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for bankruptcy in the quantity regression presented in column IV. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality: Inv. o Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)	(IV) Total Emplaned Passengers	(V) Bankruptcy
Bankruptcy	0.0934***	0.0541***	0.0053		
	(0.0169)	(0.0174)	(0.0716)		
Total Emplaned Passengers	-0.0019	-0.0239*	-0.0725*		
	(0.0118)	(0.0122)	(0.0393)		
ln(Price)				1.3309	-1.0802
				(3.0720)	(0.8467)
Decongestion	0.7866***	0.3443	0.2696	9.6509*	-7.1290***
	(0.2458)	(0.2531)	(0.6558)	(5.6970)	(1.6141)
Average Miles per Flight			-0.0005***		
			(0.0001)		
ln(Oil Fuel Cost)			0.1458		
			(0.2212)		
ln(Efficiency)			-1.0306**		
			(0.4816)		
Competition				0.2169	-0.0834
				(0.3467)	(0.1089)
ln(Income)				-31.8588**	-1.1064
				(13.4848)	(3.9399)
Unemployment				47.3923	40.6460***
				(52.3424)	(15.5670)
% Liquidable Assets				0.2481	1.3804***
				(1.5183)	(0.4290)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7137	0.7017	0.86	0.9674	0.1669
N	121	121	121	121	121

industries. Phillips (1995) does show that in the gypsum industry there were price cuts following the large increases in leverage. In this industry there was entry by a Canadian firm and gypsum firms that undertook leveraged buyouts ended up in involuntary financial distress followed by bankruptcy. Our paper is unique relative to these papers as we focus on product quality and compare supply decisions in both distressed and bankruptcy periods.

IV.5-Conclusions

Our paper examines the impact of financial distress and bankruptcy on airlines' quality and pricing decisions. We show that firms reduce quality and price when faced with financial distress. These findings are consistent with firms facing incentives to take advantage of other stakeholders such as customers when faced with financial distress, as in the model of Maksimovic and Titman (1991).

We also show that these incentives to reduce quality disappear during Chapter 11 bankruptcy. We document that firms *increase* quality relative to pre-bankruptcy financial distress. These findings are consistent with firms in Chapter 11 trying to retain customers and invest in reputation in order to emerge as a viable company.

Overall our paper shows an important dimension of how a firm's financial condition impacts its real product market decisions and impacts its customers. Our analysis can be extended in several directions. Currently, we do not make a distinction between healthy firms that came out of bankruptcy and firms that never have gone into bankruptcy. Their product market behavior might differ given more apprehension from customers or creditors about the firm's reputation for product quality. Additionally, it would be interesting to extend the analysis to see if there is any interaction between the duration of bankruptcy and a firm's product market behavior. We leave these extensions for future research.

Appendix A

To see that the optimal royalty rate is zero, $\rho^* = 0$, we take total derivatives on the franchisor's profit $\Pi^{fr}(I, \rho, S^*(I, \rho, \Omega), \Omega)$ and evaluate them at $\rho = 0$.

$$\frac{d\Pi^{fr}(I, \rho, S^*(I, \rho, \Omega), \Omega)}{d\rho} = \frac{\partial \Pi^{fr}(.)}{\partial \rho} + \frac{\partial \Pi^{fr}}{\partial S}\frac{dS^*(.)}{d\rho} \tag{30}$$

If by evaluating equation (30) at $\rho = 0$ we find that it is negative this implies that $\rho^* = 0$ given the concavity properties of the optimization problem.

From the franchisor's objective function we can see that the direct effect is zero, $\frac{\partial \Pi^{fr}}{\partial \rho} = 0$. Additionally, after algebraic manipulation:

$$\begin{aligned} \frac{\partial \Pi^{fr}}{\partial S}|_{\rho=0} &= \phi(S, \Omega, \rho, I)|_{\rho=0} \\ &+ \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}\theta(1 - F(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma) + \beta\varphi'\left(\bar{S} - S^*(\rho, I, \Omega)\right) \end{aligned} \tag{31}$$

Note that in a symmetric equilibrium $S^* = \hat{S}$.

We can decompose the effect of sales effort over the franchisor's profits as the effect of sales effort over the franchisee's symmetric equilibrium profits plus the effect of the externality and reputation which were not considered by the franchisees. In other words, we utilized a slightly modified version of the envelope theorem to obtain that $\phi(S, \Omega, \rho, I) = 0 \; \forall \rho$.

Then,

$$\frac{\partial \Pi^{fr}}{\partial S} = \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}} \theta(1 - F(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma) + \beta \varphi' \left(\bar{S} - S^*(\rho, I, \Omega)\right) > 0 \ \forall \rho \tag{32}$$

Finally, for obtaining $\frac{dS^*(.)}{d\rho}$ we use the implicit function theorem. We know $\frac{\partial S^*(.)}{\partial \rho}|_{\rho=0} = -\frac{\frac{\partial \phi(S,\Omega,\rho,I)}{\partial \rho}}{\frac{\partial \phi(S,\Omega,\rho,I)}{\partial S}}|_{\rho=0}$. When using the implicit function theorem we usually rely on the fact that the denominator is a second order condition, and given that we know second order conditions are negative, we just need to find out the sign of the numerator to get the sign of the whole expression. However, we do not know the exact sign of $\frac{\partial \phi(S(I,\rho),\Omega)}{\partial S}$ because it is not exactly a second order condition, it is the second derivative of sales effort over the franchisee profits *in a symmetric equilibrium*. In any case, we can overcome this ambiguity by using the fact that individual sales effort are strategic complements: if the reaction function of sales effort with respect to royalty rate diminishes the equilibrium sales effort will diminish as well, implying that:

$$sign\left(\frac{\partial S^*(.)}{\partial \rho}|_{\rho=0}\right) = sign\left(-\frac{\frac{\partial \phi(S,\Omega,\rho,I)}{\partial \rho}}{\frac{\partial \phi(S,\Omega,\rho,I)}{\partial S}}|_{\rho=0}\right) = sign\left(-\frac{\frac{\partial \Pi_i^{fe}}{\partial S_i \rho}}{\frac{\partial^2 \Pi_i^{fe}}{\partial S_i^2}}|_{\rho=0}\right) \tag{33}$$

We know that $\frac{\partial^2 \Pi_i^{fe}}{\partial S_i^2} < 0$ by second order conditions. So equation (33) can be re-expressed as:

$$sign\left(\frac{\partial S^*(.)}{\partial \rho}|_{\rho=0}\right) = sign\left(\frac{\partial \Pi_i^{fe}}{\partial S_i \rho}|_{\rho=0}\right) \tag{34}$$

Where

$$\frac{\partial \Pi_i^{fe}}{\partial S_i \rho} = \begin{pmatrix} \left(q_i(I_i, \hat{S}) - \frac{(1-\alpha)I}{(1-\rho)}\right) f(\bar{S} - S_i)\eta^H \gamma \\ + \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)(1 - F(\bar{S} - S_i)\eta^H \gamma) \end{pmatrix} < 0 \tag{35}$$

Then,

$$\frac{\partial S^*(.)}{\partial \rho}|_{\rho=0} < 0 \tag{36}$$

Replacing equations (36), (32) and $\frac{\partial \Pi^{fr}}{\partial \rho} = 0$ on equation (30) we obtain:

$$\frac{d\Pi^{fr}(I,\rho,S^*(I,\rho,\Omega),\Omega)}{d\rho}|_{\rho=0} = \quad \frac{\partial \Pi^{fr}(.)}{\partial \rho}|_{\rho=0} \quad + \quad \left(\frac{\partial \Pi^{fr}}{\partial S}|_{\rho=0}\right) x \left(\frac{dS^*(.)}{d\rho}|_{\rho=0}\right)$$

This implies that:

$$\begin{array}{lcl} sign\left(\frac{d\Pi^f r(I,\rho,S^*(I,\rho,\Omega),\Omega)}{d\rho}|_{\rho=0}\right) & = & \\ \quad sign(\frac{\partial \Pi^{fr}(.)}{\partial \rho}|_{\rho=0}) & + & sign\left(\frac{\partial \Pi^{fr}}{\partial S}|_{\rho=0}\right) \; x \; sign\left(\frac{dS^*(.)}{d\rho}|_{\rho=0}\right) \\ \quad\quad 0 & + & \quad\quad (-)(+) \quad\quad\quad\quad < 0 \end{array}$$

So, $\rho^* = 0$.

Appendix B

For obtaining that $I^* > 0$, we just need to show that $\frac{d\Pi^f(\rho,s(I))}{dI}|_{I=0} > 0$.

We know that we can decompose the derivative as follows:

$$\frac{d\Pi^{fr}(I,S^*(I,\Omega),\Omega)}{dI} = \frac{\partial \Pi^{fr}(.)}{\partial I} + \frac{\partial \Pi^{fr}}{\partial S}\frac{dS^*}{dI} \tag{37}$$

The direct effect is:

$$\frac{\partial \Pi^{fr}}{\partial I} = \frac{\partial q(I,S^*(\rho,I,\Omega))}{\partial I}(1 - F(\bar{S} - S^*(\rho,I,\Omega))\eta^H\gamma) - \iota'(I) \tag{38}$$

Recall that as the marginal cost of investment is zero when it is evaluated at zero investment. Thus, equation (38) is always positive.

$$\frac{\partial \Pi^{fr}}{\partial I}|_{I=0} = \frac{\partial q(I,S^*(\rho,I,\Omega))}{\partial I}|_{I=0}(1 - F(\bar{S} - S^*(\rho,I,\Omega)|_{I=0})\eta^H\gamma) - \iota'(I)|_{I=0} > 0 \tag{39}$$

From equation (32) we know that: $\frac{\partial \Pi^{fr}}{\partial S} > 0\ \forall I$. The only term left to look for is $\frac{dS}{dI}$. Using the same logic as for finding the sign of $\frac{dS^*}{d\rho}$ we get:

$$sign(\frac{dS^*}{dI}|_{I=0}) = sign(\frac{\partial \Pi_i^{fe}}{\partial S_i I}|_{I=0}) \tag{40}$$

Where

$$\frac{\partial \Pi_i^{fe}}{\partial S_i I} = (\frac{q_i(I,\hat{S})}{\partial I} + \alpha - 1)f(\bar{S} - S_i)\eta^H\gamma > 0 \forall I. \tag{41}$$

The intuition for the above expression to be greater than zero is that $\frac{q_i(I,\hat{S})}{\partial I}$ has to be greater than 1, because if this is not the case, the marginal net benefit of the investment in the franchisee will be lower than its price on the market and thus investment will never be profitable. We can re-express equation (41) as follows:

$$\frac{dS^*}{dI} \propto (\frac{q_i(I,\hat{S})}{\partial I} + \alpha - 1) > 0 \ \forall I \tag{42}$$

Plugging equations (32), (39) and (42) in equation (37) we get:

$$\frac{d\Pi^f(I,S^*(I,\rho,\Omega),\Omega)}{dI}|_{I=0} = \frac{\partial\Pi^{fr}(.)}{\partial I}|_{I=0} + \left(\frac{\partial\Pi^{fr}}{\partial S}|_{I=0}\right)\left(\frac{dS^*(.)}{dI}|_{I=0}\right)$$

Which implies that:

$$\begin{array}{lcl} sign\left(\frac{d\Pi^f(I,S^*(I,\rho,\Omega),\Omega)}{dI}|_{I=0}\right) & = & \\ sign(\frac{\partial\Pi^{fr}(.)}{\partial I}|_{I=0}) & + & sign\left(\frac{\partial\Pi^{fr}}{\partial S}|_{I=0}\right) \ x \ sign\left(\frac{dS^*(.)}{dI}|_{I=0}\right) \\ (+) & + & (+)(+) \qquad > 0 \end{array}$$

So, $I^* > 0$.

Appendix C

We want to get the sign of $\frac{\partial\omega}{\partial S}$. Our starting point is the first order condition of the franchisor with respect to investment (equation (37)). Replacing $\frac{\partial\Pi^{fr}(.)}{\partial I}$ from equation (38) and $\frac{\partial\Pi^{fr}}{\partial S}$ from equation (32), on equation (37), we obtain:

$$\frac{\partial q(I,S^*(\rho,I,\Omega))}{\partial I}(1-F(\bar{S}-S^*(\rho,I,\Omega))\eta^H \\ -\iota'(I)+\left(\begin{array}{c}\frac{\partial q_i(I_i,S^*(\rho,I,\Omega))}{\partial S}\theta(1-F(\bar{S}-S^*(\rho,I,\Omega))\eta^H\gamma) \\ +\beta\varphi'\left(\bar{S}-S^*(\rho,I,\Omega)\right)\end{array}\right)(\frac{\partial S}{\partial I}) \tag{43}$$

We did not replace the term $(\frac{\partial S}{\partial I})$ because any derivative over this term will be of second order of magnitude. All we need to know is that $\frac{dS^*}{dI}>0$ (equation (42)).

$$\begin{aligned}\frac{\partial\omega(.)}{\partial S} = & \frac{\partial q(I,S^*(\rho,I,\Omega))}{\partial I}f(\bar{S}-S^*(\rho,I,\Omega))\eta^H\gamma+ \\ & \left(\begin{array}{c}\frac{\partial q_i(I_i,S^*(\rho,I,\Omega))}{\partial S}\theta f(\bar{S}-S^*(\rho,I,\Omega))\eta^H\gamma \\ -\beta\varphi''\left(\bar{S}-S^*(\rho,I,\Omega)\right)\end{array}\right)*(\frac{\partial S}{\partial I}) \\ & +\frac{\partial(\frac{\partial S}{\partial I})}{\partial S}\left(\begin{array}{c}\theta(1-F(\bar{S}-S^*(I^*(\Omega),\Omega))\gamma) \\ +\beta\varphi\left(\bar{S}-S^*(I^*(\Omega),\Omega)\right)\end{array}\right)\quad\}O^2\end{aligned} \tag{44}$$

Equation (44) represents the effect that sales effort has on the marginal net benefit of investment for the franchisor. It can be decomposed in 3 terms. First, the direct effect that sales has on the franchisee's marginal net benefit of investment, which is the reduction in the probability of ending the relationship times the marginal net benefit of investment if the relationship continues. Second, the second derivative of franchisor's profits with respect to sales effort times the effect that investment has over sales effort. The higher the externality is, the higher these benefits are; nevertheless, the marginal net benefit of sales effort decreases with sales effort since the loss in reputation is not sufficiently large. The higher the sales effort, the nearer S_i^* and $\bar{S}$ will be and smallest the cost in reputation the franchisor has. The final tern is the benefit of sales effort over the franchisor's profits times the term $\frac{\partial(\frac{\partial S}{\partial I})}{\partial S}$ which is the effect that sales effort has over the derivative of sales effort with respect to investment. This term is of second-order of magnitude because it does not have to do with how sales effort affect investment, but how sales effort affect the strength with which investment affects sales effort. We will focus on the first-order magnitude effects for simplicity. Including the second-order term does not change the results. It will only reinforce them since it has a negative sign and we will argue that the whole expression is negative without it.

Not considering the second order of magnitude effect we obtain:

$$\begin{aligned}\frac{\partial \omega}{\partial S} &= \frac{\partial q(I, S^*(\rho, I, \Omega))}{\partial I} f(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma + \\ & \left(\begin{array}{c} \frac{\partial q_i(I_i, S^*(\rho, I, \Omega))}{\partial S} \theta f(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma \\ -\beta\varphi'' \left(\bar{S} - S^*(\rho, I, \Omega)\right) \end{array} \right) * (\frac{\partial S}{\partial I})\end{aligned} \tag{45}$$

We know the direct term, $\frac{\partial q(I,S^*(\rho,I,\Omega))}{\partial I} f(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma$ is positive. Signing the second term, $\left(\frac{\partial q_i(I_i,S^*(\rho,I,\Omega))}{\partial S}\theta f(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma - \beta\varphi'' \left(\bar{S} - S^*(\rho, I, \Omega)\right)\right) * (\frac{\partial S}{\partial I})$, is more difficult. As $\frac{\partial S}{\partial I} > 0$ the sign of whole expression depends on the sign of $\left(\frac{\partial q_i(I_i,S^*(\rho,I,\Omega))}{\partial S}\theta f(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma - \beta\varphi'' \left(\bar{S} - S^*(\rho, I, \Omega)\right)\right)$. Given that we assumed that β is positive and large this term should be negative and large. Moreover, we also assumed that, in equilibrium S^* will be below and near $\bar{S}$. This implies that $f(\bar{S} - S^*(.))$ will be small. To sum up, the first term of the right hand side of equation (45) is positive and small, but the second term is large and negative, making the whole expression negative. This result is completely driven by our assumption that reputation is vital to the franchisor.

So, given that $\beta >> 0$,

$$\frac{\partial \omega}{\partial S} < 0$$

Appendix D

Deriving equation (43) with respect to γ we can obtain $\frac{\partial \omega}{\partial \gamma}$:

$$\frac{\partial \omega}{\partial \gamma} = -F(\bar{S} - S^*(.))\eta^H \frac{\partial q(I, S^*(\rho, I, \Omega))}{\partial I}(1 + \theta)$$

$$+ \left(\begin{array}{c} \frac{\partial q_i(I_i, S^*(\rho, I, \Omega))}{\partial S}\theta(1 - F(\bar{S} - S^*(\rho, I, \Omega))\eta^H \gamma) \\ +\beta\varphi' \left(\bar{S} - S^*(\rho, I, \Omega)\right) \end{array} \right) * \frac{\partial(\frac{\partial S}{\partial I})}{\partial \gamma} \} O^2 \qquad (46)$$

As $\frac{(\frac{\partial S}{\partial I})}{\partial \gamma}$ is of second order of magnitude we just consider the first term of the right hand side of equation (46), which is negative. Therefore: $\frac{\partial \omega}{\partial \gamma} < 0$.

Appendix E

We want to get the sign of $\frac{\partial S^*}{\partial \gamma}$. Using the implicit function theorem on the franchisees' first order condition and the fact that sales effort are strategic complements, we obtain that:

$$sign(\frac{\partial S^*}{\partial \gamma}) = sign\left(\frac{\partial \Pi^{fe}}{\partial S_i \partial \gamma}\right) \tag{47}$$

Deriving equation (5) with respect to γ we get:

$$\begin{aligned} \frac{\partial \Pi^{fe}}{\partial S \partial \gamma} &= q_i(I_i, \hat{S}) f(\bar{S} - S_i)\eta^H \\ &\quad - f(\bar{S} - S_i^*)\gamma\eta^H(1-\alpha)I \\ &\quad - \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)F(\bar{S} - S_i)\eta^H) \end{aligned} \tag{48}$$

Even though this expression might look ambiguous, it is not. Manipulating equation (5) we get:

$$\begin{aligned} & q_i(I_i, \hat{S}) f(\bar{S} - S_i)\eta^H - f(\bar{S} - S_i^*)\gamma\eta^H(1-\alpha)I \\ & - \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)F(\bar{S} - S_i)\eta^H\gamma) \\ = \; & \frac{C'(S_i) - \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)}{\gamma} \end{aligned} \tag{49}$$

Where the left hand side of equation (49) is exactly $\frac{\partial \Pi^{fe}}{\partial S \partial \gamma}$. Therefore,

$$\frac{\partial \Pi^{fe}}{\partial S \partial \gamma} = \frac{C'(S_i) - \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)}{\gamma} \tag{50}$$

The expression $C'(S_i) - \frac{\partial q_i(I_i, \hat{S})}{\partial \hat{S}}(1-\theta)$ can be signed using the following logic. We assumed a monitoring technology such that it increases the sales effort of the franchisees, in equilibrium, relative to the sales effort that the franchisees would have exerted in case there was no monitoring technology. This condition is satisfied if the marginal benefit of sales effort when there is monitoring is greater than the marginal benefit of sales effort when there is no monitoring. As $C'(S_i)$ has to be equal to the marginal benefit of sales effort when there is monitoring and $\frac{\partial q_i(I_i,\hat{S})}{\partial \hat{S}}(1-\theta)$ is the marginal benefit of sales effort when there is no monitoring technology $C'(S_i) > \frac{\partial q_i(I_i,\hat{S})}{\partial \hat{S}}(1-\theta)$. Therefore, $\frac{\partial \Pi^{fe}}{\partial S \partial \gamma} > 0$ and, thus, $\frac{\partial S^*}{\partial \gamma} > 0$.

Appendix F

We want to expand the expression $\frac{\partial f(I,S^*(I,\Omega),\Omega)}{\partial\Omega}$ and express it in a tractable fashion. Manipulating the franchisor's objective function, assuming $\alpha = 1$, for simplicity, and taking as given the result that $\rho^* = 0$ we get:

$$f(I,S^*(I,\Omega),\Omega) = \Pi^{fr}(I(\Omega),S^*(I(\Omega),\Omega) + \beta\varphi\left(\bar{S} - S^*(I(\Omega),\Omega)\right) \tag{51}$$

Taking derivatives we obtain:

$$\frac{df(I,S^*(I,\Omega),\Omega)}{d\Omega} = \frac{d\Pi^{fr}(I,S^*(I(\Omega),\Omega)}{d\Omega} + \frac{d\beta\varphi\left(\bar{S} - S^*(I(\Omega),\Omega)\right)}{d\Omega} \tag{52}$$

Manipulating terms in equation (52) we get:

$$\begin{aligned} \frac{df(I,S^*(I,\Omega),\Omega)}{d\Omega} = & \frac{\partial\Pi^{fr}(.)}{\partial\Omega} + \frac{\partial\Pi^{fr}(.)}{\partial I}\frac{\partial I}{\partial\Omega} \\ & + \frac{\partial\Pi^{fr}(.)}{\partial S}\left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right) \\ & - \beta\varphi'\left(\bar{S} - S^*(I(\Omega),\Omega)\right)\left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right) \end{aligned} \tag{53}$$

From the envelope theorem we know that $\frac{\partial\Pi^{fr}(.)}{\partial I} = 0$, so we can simplify equation (53):

$$\begin{aligned} \frac{df(I,S^*(I,\Omega),\Omega)}{d\Omega} = & \frac{\partial\Pi^{fr}(.)}{\partial\Omega} \\ & + \frac{\partial\Pi^{fr}(.)}{\partial S}\left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right) \\ & - \beta\varphi'\left(\bar{S} - S^*(I(\Omega),\Omega)\right)\left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right) \end{aligned} \tag{54}$$

Simplifying terms,

$$\frac{df(I,S^*(I,\Omega),\Omega)}{d\Omega} = \frac{\partial\Pi^{fr}(.)}{\partial\Omega} + \left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)\left(\begin{array}{c} \frac{\partial\Pi^{fr}(.)}{\partial S} - \\ \beta\varphi'\left(\bar{S} - S^*(I(\Omega),\Omega)\right) \end{array}\right) \tag{55}$$

Recall that from equation (31) we get $\frac{\partial\Pi^{fr}}{\partial S}$. Plugging this in equation (55) we obtain:

$$\frac{df(I,S^*(I,\Omega),\Omega)}{d\Omega} = \left(\begin{array}{c} \frac{\partial\Pi^{fr}(.)}{\partial\Omega} + \\ \left(\frac{\partial S}{\partial\Omega} + \frac{\partial S}{\partial I}\frac{\partial I}{\partial\Omega}\right)\left(\frac{\partial q_i(I_i,\hat{S})}{\partial S}\theta(1 - F(\bar{S} - S^*(\rho,I,\Omega))\eta\gamma)\right) \end{array}\right)$$

Appendix G

Simultaneous Estimation of Financial Distress and Bankruptcy

We analyze the effects of financial distress and bankruptcy simultaneously on firm supply decisions. This analysis has efficiency gains, relative to the separate analyses, but it also has two drawbacks. First, we have to impose a value of zero on the default probability when it is not defined. Second, we are no longer able to identify the demand equation since we need to borrow instruments from the demand to identify the separate effects of default probability and bankruptcy.

The probability of default is not defined when the firm is in bankruptcy. Therefore, we set it equal to zero for bankrupt observations. Note we are not explicitly asserting that the firm is not distressed when in bankruptcy, but rather we let the bankruptcy indicator variable probability pick up the full effect of financial distress when the firm is actually in bankruptcy. Ideally, we would use a dummy variable that takes value of 1 when the default probability has a missing value and zero otherwise, rather than just imposing a zero. However, this variable will be perfectly collinear with bankruptcy because when a firm is in bankruptcy its default probability is not defined. The cost of imposing a zero on the default probability when it is undefined -during bankruptcy- will be explained when we present the results.

The system of equations we would like to estimate is the following:

$$S_{it} = h(Q_{it}, Pr\_def_{it}, Bankrupt_{it}, Y_{it}) \tag{56}$$

$$P_{it} = g(Q_{it}, Pr\_def_{it}, Bankrupt_{it}, X_{it}) \tag{57}$$

$$Q_{it} = f(Pr\_def_{it}, Bankrupt_{it}, P_{it}, S_{it}, W_{it}) \tag{58}$$

$$Pr\_def_{it} = j(Q_{it}, P_{it}, S_{it}, Z_{it}) \tag{59}$$

$$Bankrupt_{it} = k(Q_{it}, P_{it}, S_{it}, Z_{it}) \tag{60}$$

However, as we only have one instrument in Z, the percentage of liquidable assets, to instrument both financial conditions we have to use instruments from other equations to instrument bankruptcy and default probability. We replace equation (56) in equations (58) to (60) as in the previous analysis, but now we also replace equations (57) and (58) into equations (59) and (60), equations (59) and (60) into equation (58) and equation (57) into equation (58), obtaining the following system:

$$S_{it} = h(Q_{it}, Pr\_def_{it}, Bankrupt_{it}, Y_{it}) \tag{61}$$

$$P_{it} = g(Q_{it}, Pr\_def_{it}, Bankrupt_{it}, X_{it}) \tag{62}$$

The following three equations for quantity and two financial condition are estimated in terms of exogenous instruments.

$$Q_{it} = f(Y_{it}, X_{it}, W_{it}, Z_{it}) \tag{63}$$

$$Pr\_def_{it} = j(Y_{it}, X_{it}, W_{it}, Z_{it}) \tag{64}$$

$$Bankrupt_{it} = k(Y_{it}, X_{it}, W_{it}, Z_{it}) \tag{65}$$

We have 4 instruments to instrument Q, Pr_def and Bankrupt in the price equation: the percentage of liquidable assets, competition, income and unemployment and we have seven instruments, these same four instruments plus the oil fuel cost, average flights per mile and oil efficiency, to instrument Q, Pr_def and Bankrupt in the quality equation. The cost of this approach is that now we do not estimate the demand and financial condition equations, but only how exogenous variables affect them in equilibrium. This is not an important issue as the estimation of demand and financial condition is not our main goal.

In Table G1, we present first stage regressions for the three endogenous variables that we use as explicative variables in the supply equations: Total emplaned passengers (quantity), default probability and bankruptcy. The estimated equations correspond to equations (63), (64) and (65). Note that in Table G2 below we use the fitted values of these equations, replacing the predicted default probability with a zero when the firms are bankrupt, to estimate the effect of financial distress and bankruptcy on quality and price.

The results in the first column of Table G1 are sensible, showing that quantity increases with income and decreases with unemployment and competition. In column II, we see that the default probability increases with the percentage of liquidable assets and decreases with income. What may look surprising is that default probability decreases with fuel cost; however, this is due to the subsequent, simultaneous effect that feeds through prices, as prices increase with a firm's fuel cost. Lastly, we see similar effects in column III for bankruptcy.

Table G2 presents our second stage regressions for quality and price. These equations correspond to equations (61) for both measures of quality and (62) for prices. To incorporate the potential error correlation structure we estimate the three equations simultaneously using seemingly unrelated equations (SURE). To get consistent standard errors we use 50 bootstrap repetitions given that the first and second stage were estimated separately.

Table G.1

First Stage Regressions for TEP, Default Probability and Bankruptcy

This table reports the first stage regressions of Total Enplaned Passengers (TEP), Default Probability and Bankruptcy on all the exogenous variables available. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Total Emplaned Passengers	(II) Deafult Probability	(III) Bankruptcy
Decongestion	4.1140	-0.7845	-2.3065***
	(3.4055)	(0.4796)	(0.5061)
Average Miles per Flight	-0.0035**	-0.0003	-0.0002
	(0.0016)	(0.0002)	(0.0002)
ln(Oil Fuel Cost)	-3.9059***	-0.1821**	-0.0455
	(0.6288)	(0.0774)	(0.0934)
ln(Efficiency)	1.8311**	-0.0731	0.0492
	(0.8777)	(0.1124)	(0.1304)
Competition	-1.9412***	0.0589	0.0530
	(0.2635)	(0.0365)	(0.0392)
ln(Income)	24.6908***	-2.0843**	-2.4048**
	(7.7126)	(1.0325)	(1.1463)
Unemployment	-62.7373**	-5.1595	2.8508
	(31.9349)	(4.2027)	(4.7463)
% Liquidable Assets	0.8212	1.0972***	1.5883***
	(1.3155)	(0.1914)	(0.1955)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
R-squared within	0.3273	0.573	0.268
N	647	586	647

Table G.2

Second Stage on Quality and Prices

This table estimates a SURE using inverse of mishandled baggage, on-time performance and price as dependent variables. The variables Predicted Total Enplaned Passengers, Predicted Default Probability and Predicted Bankruptcy are instrumented values obtained from Table G.1. Decongestion is average on-time performance by airport excluding an airline's own flights, weighted by the airline's lagged number of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. The statistical significance are *10%, **5% and ***1%.

Variables	(I) Quality: Inv. of Mishandled Baggage	(II) Quality: On time Performance	(III) ln(Price)
Default Probability	-0.0507***	-0.0341*	0.0132
	(0.0190)	(0.0198)	(0.0309)
Bankruptcy	0.0453***	0.0014	-0.1690***
	(0.0168)	(0.0141)	(0.0459)
Total Enplaned Passengers	0.0030**	-0.0015	0.0082*
	(0.0015)	(0.0019)	(0.0050)
Decongestion	0.4903***	0.0508	-0.5874***
	(0.1072)	(0.1679)	(0.1619)
Average Miles per Flight			-0.0005***
			(0.0001)
ln(Oil Fuel Cost)			0.2155***
			(0.0624)
ln(Efficiency)			-0.2080***
			(0.0435)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
"R-squared"	0.8401	0.7707	0.9516
N	647	647	647

The results in Table G2 show that financial distress, as reflected in an increase in the firm's default probability, decreases the provision of quality. This result reinforces the previous result in Table IV.5. The estimated coefficient on bankruptcy now has to be interpreted relative to a healthy firm. We see firms in bankruptcy increase the quality of their baggage handling and on time performance, but this effect is only statistically significant for baggage handling. The equality of the coefficients of financial distress and bankruptcy is rejected using a t-test at the 5% level of significance. Thus, the results of this estimation method are in agreement with our previous findings: quality decreases with financial distress and increases in bankruptcy relative to financial distress. In addition, we find that quality of baggage handling is higher in bankruptcy than in the pre-distress period, which was also the case in our previous set of results. Nevertheless, now we cannot asses that on-time performance is higher in bankruptcy than in the pre-distress situation, but at least we can assure it is not lower.

Imposing a zero value for the predicted default probability when the firm is bankrupt is innocuous if we expect a change in supply behavior before and after bankruptcy. But, if the supply behavior of a firm does not change in bankruptcy relative to a distress situation this procedure is somewhat problematic, as in the case of prices. The predicted default probability and the predicted bankruptcy are highly collinear when there is no value imposition. So, if we expect prices to stay as low in bankruptcy as they were in the distress period, by setting the default probability equal to zero this method assigns the price reduction to bankruptcy even if it is due to financial distress. Now bankruptcy is the variable that matches best the inverse behavior of prices as predicted bankruptcy stays high in bankruptcy while prices stay low. Default probability, on the other hand does not stay high while in bankruptcy: it is set equal to zero. This explains why in Table G2 we observe that prices are unaffected by default probability while they are negatively affected by bankruptcy.

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