



Strategic short-termism: Implications for the management and acquisition of customer relationships[☆]

Topi Miettinen^{*}, Rune Stenbacka

Hanken School of Economics & Helsinki Graduate School of Economics (Helsinki GSE), Helsinki, Finland

ARTICLE INFO

Article history:

Received 8 February 2017

Revised 12 July 2018

Accepted 13 July 2018

Available online 4 August 2018

Keywords:

Short-termism

Switching cost

Duopoly

Customer relationship

Pricing

Delegation

ABSTRACT

We study a duopoly model of history-based price competition with switching costs and demonstrate how strategic history-based pricing induces the owners of the firms to implement managerial short-termism by delegating the pricing decisions to managers with a discount factor lower than that of the owners. Managerial short-termism is a strategic device whereby owners can soften price competition at the stage when customer relationships are established. The degree of short short-termism is shown to depend on the market structure, the intensity of competition and the magnitude of switching costs.

© 2018 The Authors. Published by Elsevier B.V.
This is an open access article under the CC BY-NC-ND license.
(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

1. Introduction

During the past decades the marketing literature has highlighted the importance of strategies focusing on the acquisition and management of customer relationships (see for example, [Dwyer et al., 1987](#)). As exemplified by [Venkatesan and Kumar \(2004\)](#), [Blattberg et al. \(2009\)](#) or [Stahl et al. \(2012\)](#), this approach has emphasized the application of customer lifetime value (CLV) with associated business strategies to maximize the long-term profitability of customer relationships. As [Reinartz et al. \(2005\)](#) emphasize, this typically involves the balancing of resources between acquisition and retention of customers. It seems intuitive that managers operating with a short-term objective would pay insufficient attention to the long-term implications of customer policy and that managerial short-termism therefore would imply reduced profit margins and suboptimal customer lifetime value for the firms. In this study we show analytically that quite the opposite holds true: managerial short-termism promotes profit margins in oligopoly markets with switching costs. We characterize how delegation of pricing decisions to short-sighted managers serves as a strategic instrument to soften competition between firms in oligopoly markets.

In general, short-termism refers to the phenomenon of excessive discounting of future outcomes. In this study we consider the delegation of pricing decisions to short-sighted managers as a strategic instrument. The analysis is conducted within the framework of history-based (or behavior-based) price discrimination with switching costs.

[☆] We gratefully acknowledge valuable discussions with Jaakko Aspara, Helmut Bester, Chaim Fershtman, Bjørn Olav Johansen, Matti Liski, Erik Mohlin, Martin Peitz, Hannu Salonen, Tuomas Takalo, Marko Terviö, Mihkel Tombak, Juuso Välimäki as well as seminar participants at HECER, the NORIO 2016 conference in Reykjavik, the EEA-ESEM 2016 Conference in Geneva, the EARIE 2016 Conference in Lisbon, and the FEA 2018 Conference in Turku.

^{*} Corresponding author.

E-mail addresses: topi.miettinen@hanken.fi (T. Miettinen), rune.stenbacka@hanken.fi (R. Stenbacka).

Due to the switching costs, firms have strong static and dynamic incentives to acquire customers because established customer relationships are a valuable asset generating benefits not only at present but also in the future. Firms can achieve higher market shares by targeting very competitive prices to consumers with whom they have not yet established a customer relationship. The implied tougher competition reduces current profits. To avoid such intensified competition, each firm can commit not to compete as fiercely by delegating the pricing decision to a manager who is more short-sighted than the owner, i.e., a manager with a discount factor lower than that of the owners of the firm.

Our analysis establishes analytically that for arbitrary *exogenously* given initial market shares, the subgame perfect equilibrium configuration is characterized by strategic delegation to myopic agents, i.e., price-setting managers paying less attention to the future than the firm owners. Myopia turns out to be optimal both with a two-period and an infinite horizon. Thus, strategic history-based pricing competition induces the owners of the firms to implement managerial short-termism.

We also extend our analysis to an environment where we *endogenize* the initial market shares and for that purpose we focus on price competition with differentiated products and a two-period horizon. Our main qualitative result is robust to such considerations: in equilibrium, pricing decisions are again delegated to managers operating with discount factors lower than those of the owners. The equilibrium managerial discount factor crucially depends on the parameters of the model – the magnitude of the switching costs, the market power in the initial period, and the discount factor of the owners. Overall, we establish that the degree of short-termism is determined by balancing the incentives to exploit market power in the initial period against the incentives to benefit from switching costs in the second period.

The banking industry and the mutual funds industry are representative examples of industries where switching costs play an important role. For example, [Kiser \(2002\)](#) and [Shy \(2002\)](#) present evidence of significant switching costs in deposit markets and [Brunetti et al. \(2016\)](#) characterize the determinants of switching costs. [Kim et al. \(2003\)](#) establish similar evidence regarding lending markets. [Hortaçsu and Syverson \(2004\)](#) emphasize the empirical significance of switching costs in the mutual funds industry.

A firm's commitment through a short-termist managerial contract is valuable because it raises prices of all firms in the market and thus raises the profit of the firm. A low managerial discount factor may be related to a high personal discount rate, impatience. In principle, firms could use sophisticated methods to elicit managerial discount factors during the job interview and screening process when recruiting managers. In a field experiment ([Burks et al., 2012; 2008; 2009](#)) show that the discount factor can be elicited distinct from present-bias ([Heidhues and Köszegi, 2010; Laibson et al., 2003](#)) and that the two induce different economic behavior. Similar methods can clearly be used when selecting managers.

Alternatively, the firms can implement short-termism with managerial compensation contracts, which are renewed with a probability lower than the discount factor of these firms. A limited probability of managerial contract renewal corresponds to a limited average tenure for the managers in question. For example, [Kaplan and Minton \(2012\)](#) or [Martin \(2002\)](#) report evidence consistent with short-termism in that respect.

As the historical overview of [Haldane and Davies \(2011\)](#) makes clear, short-termism has been deemed a significant economic problem for a long time. Based on their survey of CEOs at Fortune-1000 firms, [Poterba and Summers \(1995\)](#) present a number of observations highly consistent with considerable short-termism in the decision making of the firms. They estimated firms to apply average discount rates at around 12 % to future cash flows, i.e. discount rates much higher than either equity holders' rate of return or the return on debt. Clearly, such a degree of short-termism would severely distort the selection of investment projects by implicating the rejection of positive-NPV projects and the substitution of valuable long duration projects with inferior front-loaded projects.

The academic debate has paid particular attention to managerial short-termism induced by the pressure from the investors and the capital market. This approach, exemplified by [Stein \(1989\)](#) or [Narayanan \(1985a,b\)](#), has emphasized the mechanism whereby professional managers manipulate short-term earnings at the expense of long-term earnings in order to boost stock prices and the inferences regarding managerial ability. Formally, in this type of models with asymmetric information, short-termism is the outcome of signal jamming by professional managers who give priority to short-term projects in an attempt to influence stock prices as well as inferences regarding managerial ability. The market is indeed able to rationally discount the short-term earnings inflation, but if the managers would not inflate the short-term earnings the market would infer the firm to have a lower value.¹ This type of short-termism has recently caused particular concern (see, for example, [Kay, 2012](#) and [Mayer, 2012](#)) in the UK, where companies with dispersed ownership float a high proportion of their stock. In a recent study, [Terry \(2015\)](#) investigates short-termism induced by analyst earnings targets. He finds, using a non-parametric regression discontinuity design, that firms just meeting or beating analysts' earnings targets display discontinuously lower long-term investment growth, whereas managers just failing to meet such targets face lower compensation and abnormally low immediate stock returns. Terry's findings thus suggest a tradeoff between the short-term prospects of firms and their managers versus the level of their long-term investments. Contrary to this approach, in our model short-termism is a consequence of decisions by the owners, not the professional managers.

Short-termism generated by owners, and not by managers, is also a core feature of the model of [Bolton and Scheinkman Xiong \(2006\)](#) who show that short-term speculative returns render shareholders to prefer short-term gains at the expense of long-term value. Also, [Thakor \(2017\)](#) presents a screening model with asymmetric information about manage-

¹ [Darrough \(1987\)](#) argues that the shareholders could, within the context of such a model, design a compensation scheme to managers in order to prevent short-termism.

rial ability where firm owners may prefer short-term projects even though long-term projects have higher first-best values. Thakor's model emphasizes that the selection of short-term projects speeds up learning about the manager's ability and this benefit could dominate if there is only a relatively small gap in value between the short-term and the long-term project. Relatedly, in a model where managers can reduce quality to enhance performance in the short run, Varas (2017) shows that the principal reduces the manager's temptation for myopic behavior by reducing the probability of contract termination and deferring compensation. Also, Marinovic and Varas (2017) study CEO contracts under circumstances where the managers can improve short-term performance at the expense of firm value in the long run. Casamatta and Pouget (2015) design a moral hazard model with the feature that delegation of fund management induces short-termism.

In our model short-termism can be viewed as an equilibrium outcome of a model of strategic delegation. Vickers (1985) and Fershtman and Judd (1987) originally formalized the idea that owners of firms engaged in product market competition will have strategic incentives to delegate the production decisions to managers who are offered contracts which deviate from profit maximization. With Cournot competition the owners have strategic incentives to reward sales so as to make the managers more aggressive. The same reasoning was subsequently applied by Reitman (1993) to provide a strategic justification for the use of option contracts. By focusing on Bertrand instead of Cournot competition, Sklivas (1987) established that the direction and the nature of the bias generated by the strategic delegation equilibrium depends on whether the product market decisions are strategic substitutes or complements.

Barcena-Ruiz and Espinosa (1996) study the intertemporal dimension of managerial incentive contracts in a two-period model. In contrast to us, they explore the effects of contract flexibility by comparing the performance of incentive contracts valid for two periods with that of contracts revised after one period. With a focus on price competition in a differentiated market they establish an asymmetric equilibrium with one firm choosing a two-period contract, whereas the rival selects two one-period contracts. Rather than conditioning managerial compensation on sales and profits, in our model managerial incentives are controlled by expected contract length captured by the managerial discount factor. Unlike Barcena-Ruiz and Espinosa (1996), we can extend our model from two periods to an infinite horizon, and we can also endogenize initial market shares showing that our main results hold also under such circumstances.

Villaneuva et al. (2007) have also developed a model which studies managerial short-termism in a competitive customer relationship management setting. In a two-period framework, these authors compare the regime where fully myopic managers set prices period-by-period with that where managers maximize discounted two-period profits. They find the period-by-period equilibrium to yield higher profits. In contrast, we characterize the subgame perfect degree of short-termism under circumstances with exogenous as well as endogenous initial market shares and we study the robustness of our results to an infinite horizon. However, our study shares with Villaneuva et al. (2007) the feature that the horizon of a firm's manager is observable to its rival.

In general, our model differs qualitatively from all earlier models of strategic delegation as we focus on multi-period history-based pricing with switching costs for customers. Our approach formalizes how discounting is used strategically to affect the accumulation of customer relationships, which significantly affects the net present value of the intertemporal profit stream.

Spagnolo (2000) focuses on the relationship between stock-related compensation schemes and the performance of oligopoly markets and he shows that stock-related compensation schemes promote the ability to sustain tacit collusion when competition is infinitely repeated. Relatedly, Han (2012) explores the effects of short-term CEO contracts, and demonstrates that a series of commonly observed short-term contracts can improve the ability of an oligopoly to sustain tacit collusion compared with a long-term employment contract.² In general, in the models focusing on tacit collusion, trigger strategies allow market parties to sustain above-marginal-cost prices and thus sustain supra-normal profits under the threat of a price-war. This requires, however, both an infinite horizon and a sufficiently high discount factor, i.e. far-sighted managers. Our analysis establishes that neither sufficiently high discount factors nor an infinite horizon are necessary for firms to be able to soften competition. Instead we show that short-termism and low discount factors promote profit margins in an oligopolistic market with switching costs under circumstances where firms strategically acquire and manage customer relationships.

Our analysis is also related to the extensive literature on history-based pricing. Chen (1997), Villas-Boas (1999), Fudenberg and Tirole (2000), Taylor (2003), Gehrig and Stenbacka (2004), Acquisti and Varian (2005), Pazgal and Soberman (2008), Shin and Sudhir (2010), Esteves (2010), Zhang (2011), Caillaud and De Nijs (2014), and Jing (2015) are examples of studies analyzing different important theoretical aspects as well as significant business implications of history-based (behavior-based) price discrimination.

Our study proceeds as follows. In Section 2 we present a model of short-termism and the management of customer relationships. This model is initially presented with a two-period horizon, and it is subsequently extended to an infinite horizon. In Section 3 we endogenize the acquisition of customer relationships in a market with differentiated products. Section 4 offers a discussion of the results and their implications. Finally, in Section 5 we present concluding comments.

² See also Lambertini and Trombetta (2002).

2. Short-termism and the management of customer relationships

2.1. Short-termism in a two-period model

Consider a duopoly, where the two rivals, A and B, offer products that are perfect substitutes. For simplicity, we abstract away from production costs. There is a continuum of customers in a market with size normalized to one. In the beginning of period $t = 1, 2$, the proportion X^{t-1} of the consumers constitutes the customer base of firm A, whereas the residual proportion of consumers $1 - X^{t-1}$ belongs to the inherited market segment of firm B.³ In the beginning of period 1, these market shares are exogenously given. The market interaction in period 1 determines how these market shares evolve into period 2.

The customers bear a switching cost if they change from one supplier to its rival. The switching costs are heterogeneous across customers of each firm and given by $s\sigma_t$ where σ_t is an exogenous parameter and s is uniformly distributed on the unit interval $s \sim U[0, 1]$, identically and independently distributed across customers and periods. The parameter σ_t captures the magnitude of the switching costs, and can be viewed as a measure of the intensity of price competition. We allow for period-specific differences in switching costs so that switching may become more or less costly over time.

The owners of each firm maximize the net present value of profits by applying a discount factor δ common to owners of both firms. The owners hire a manager to run the business. Within our framework this means that the owners delegate pricing decisions to a professional manager. We abstract from informational inefficiencies between the principals and their agents and assume that the principals make use of company stock in a perfect capital market to incentivize their agents.

Each agent makes the pricing decisions subject to the discount factor assigned to her by the owner. For strategic reasons these discount factors may very well differ from the owners' true discount factors. We can interpret strategic delegation in two ways. First, the owners appoint the managers on the basis of the managers' idiosyncratic discount factors. In particular, the owner could delegate the pricing decisions to short-sighted managers, i.e., managers with a lower discount factor. Second, the strategic delegation is a matter of designing the probability of contract renewal, thereby determining the effective discount factor governing the intertemporal pricing decisions by the manager. This interpretation emphasizes the persistence of the managerial contract as the feature which governs the manager's intertemporal tradeoffs and the implied intertemporal price profile selected by the manager. Formally, and independently of which interpretation we apply, the discount factor of the manager employed by firm i is denoted by δ_i .

In each period the managers select the loyalty (incumbency) prices offered to the inherited customers and poaching prices offered to the rival's customers. The loyalty price of firm i in period t is denoted by p_i^t and the poaching price of firm i in period t is denoted by q_i^t . A customer of firm i at period t , s_i^t , is indifferent between staying loyal to firm i at the loyalty price, p_i^t , and accepting the poaching price offered by firm j , q_j^t , if the following indifference condition is satisfied: $p_i^t - \eta\psi_i^t = q_j^t + \sigma_t s_i^t - \eta\psi_j^t$. In this indifference condition ψ_i^t denotes the expected future net benefit of buying from i at t and η is the discount factor applied by the consumers. The implied switching cost threshold,

$$s_i^t = \frac{p_i^t - q_j^t + \eta(\psi_j^t - \psi_i^t)}{\sigma_t},$$

captures the fraction of i 's customers, inherited at the beginning of period t and switching to firm j in period t . The proportion $(1 - s_i^t)$ of i 's customers inherited from the past prefers to stay loyal to firm i in period t .

Clearly, by setting a lower poaching price, q_j^t , firm j can induce more consumers to switch from firm i . This will not only influence the poaching revenue in period t , but it also increases the future inherited customer base of firm j . From the perspective of firm A, the effect on the future market share is formally expressed by the law of motion

$$X^t = X^{t-1}(1 - s_A^t) + (1 - X^{t-1})s_B^t, \tag{1}$$

which governs the development of firm A's market share over time. This law of motion illustrates that A's customer base in period t consists of its own inherited customers who stay loyal and the new customers who switch from the rival given the two firms' incumbent and poaching prices at t .

2.1.1. The second-period pricing decisions

We can solve the two-period model by backwards induction. We first notice that at time $t = 2$ there is no future in a two-period model. Therefore we have that $\psi_i^2 = \psi_j^2 = 0$ and, thus, the switching cost threshold is

$$s_i^2 = \frac{p_i^2 - q_j^2}{\sigma_2}. \tag{2}$$

Applying the law of motion (1), the market share inherited by firm A at time $t = 2$ is given by $X^1 = X^0(1 - s_A^1) + (1 - X^0)s_B^1$. The second-period profit of firm A is thus

$$\pi_A^2 = X^1(1 - s_A^2)p_A^2 + (1 - X^1)s_B^2q_A^2.$$

³ We thus assume that the entire market is served.

where market shares depend on the prices as described in Eq. (2). The second-period profit for firm B is analogously given by

$$\pi_B^2 = (1 - X^1)(1 - s_B^2)p_B^2 + X^1s_A^2q_B^2.$$

In the second period firms maximize their profits. The implied price equilibrium in period 2 is characterized by the four reaction functions given by the following system of equations

$$\begin{cases} X^1(1 - s_A^2) - X^1p_A^2 \frac{\partial s_A^2}{\partial p_A^2} = X^1(1 - s_A^2) - \frac{1}{\sigma_2}X^1p_A^2 = 0 \\ (1 - X^1)s_B^2 + (1 - X^1)q_A^2 \frac{\partial s_B^2}{\partial q_A^2} = (1 - X^1)s_B^2 - \frac{1}{\sigma_2}(1 - X^1)q_A^2 = 0 \\ (1 - X^1)(1 - s_B^2) - (1 - X^1)p_B^2 \frac{\partial s_B^2}{\partial p_B^2} = (1 - X^1)(1 - s_B^2) - \frac{1}{\sigma_2}(1 - X^1)p_A^2 = 0 \\ X^1s_A^2 + X^1q_B^2 \frac{\partial s_A^2}{\partial q_B^2} = X^1s_A^2 - \frac{1}{\sigma_2}X^1q_B^2 = 0. \end{cases}$$

Solving for the loyalty and poaching prices yields $p_i^{2*} = (2/3)\sigma_2$ and $q_i^{2*} = (1/3)\sigma_2$ and the associated equilibrium profits in period 2 are

$$\begin{cases} \pi_A^{2*} = X^1(\frac{2}{3})^2\sigma_2 + (1 - X^1)(\frac{1}{3})^2\sigma_2 \\ \pi_B^{2*} = (1 - X^1)(\frac{2}{3})^2\sigma_2 + X^1(\frac{1}{3})^2\sigma_2. \end{cases} \tag{3}$$

Eq. (3) shows that the equilibrium profits in period 2 are determined by the market shares inherited from period 1 and by the period-2 switching cost parameter. The higher is the market share inherited from period 1, the higher is also second period profit. Likewise the higher are the switching costs, the stronger is the profit influence of the market share.

2.1.2. The first-period pricing decisions

We next analyze the optimal pricing policy in the first period given that the firms perfectly anticipate the second-period equilibrium described above. In the first period, the switching cost thresholds, which determine the market shares contingent on the prices p_i^1 and q_j^1 , are characterized by

$$s_i^1 = \frac{p_i^1 - q_j^1 + \eta(\psi_j^1 - \psi_i^1)}{\sigma_1}. \tag{4}$$

Since the equilibrium prices of the two firms coincide in the second period, we have that $\psi_A^1 = \psi_B^1$, and thus the switching cost thresholds are characterized simply by $s_i^1 = (p_i^1 - q_j^1)/\sigma_1$. The pricing decisions are now delegated to the managers operating with discount factors δ_i , and these managers select period-1 prices that maximize the perceived present value of profits

$$\begin{cases} \pi_A^{1+2} = X^0(1 - s_A^1)p_A^1 + (1 - X^0)s_B^1q_A^1 + \delta_A\pi_A^{2*} \\ \pi_B^{1+2} = (1 - X^0)(1 - s_B^1)p_B^1 + X^0s_A^1q_B^1 + \delta_B\pi_B^{2*}, \end{cases} \tag{5}$$

where π_A^{2*} and π_B^{2*} are given by (3) and the second-period market shares depend on first-period prices according to the law of motion $X^2 = X^1(1 - s_A^1) + (1 - X^1)s_B^1$. By substituting the second-period profits (3) and first-period switching cost threshold (4), the managers' period-1 optimization problems can be written as

$$\begin{aligned} & \max_{p_A^1, q_A^1} \{X^0(1 - s_A^1(p_A^1, q_B^1))p_A^1 + (1 - X^0)s_B^1(p_B^1, q_A^1)q_A^1 + \delta_A\pi_A^{2*}(X^1(p^1, q^1))\} \\ & \max_{p_B^1, q_B^1} \{(1 - X^0)(1 - s_B^1(p_B^1, q_A^1))p_B^1 + X^0s_A^1(p_A^1, q_B^1)q_B^1 + \delta_B\pi_B^{2*}(X^1(p^1, q^1))\}, \end{aligned}$$

where $p^1 = (p_A^1, p_B^1)$ is the vector of loyalty prices and $q^1 = (q_A^1, q_B^1)$ is the vector of poaching prices in period 1. Again these expressions highlight the role of period-1 prices in gaining a higher market share in the second period. The higher is the discount factor δ_i , the more valuable it is to acquire customers in the first period (see Eq. (3) above).

The equilibrium prices are determined as the solution to the system of equations defined by the reaction functions

$$\begin{cases} X^0(1 - s_A^1) - X^0[p_A^1 + \delta_A\sigma_2((\frac{2}{3})^2 - (\frac{1}{3})^2)]\frac{\partial s_A^1}{\partial p_A^1} = 0 \\ (1 - X^0)s_B^1 + (1 - X^0)[q_A^1 + \delta_A\sigma_2((\frac{2}{3})^2 - (\frac{1}{3})^2)]\frac{\partial s_B^1}{\partial q_A^1} = 0 \\ (1 - X^0)(1 - s_B^1) - (1 - X^0)[p_B^1 + \delta_B\sigma_2((\frac{2}{3})^2 - (\frac{1}{3})^2)]\frac{\partial s_B^1}{\partial p_B^1} = 0 \\ X^0s_A^1 + X^0[q_B^1 + \delta_B\sigma_2((\frac{2}{3})^2 - (\frac{1}{3})^2)]\frac{\partial s_A^1}{\partial q_B^1} = 0, \end{cases} \tag{6}$$

where $\partial s_i^1 / \partial p_i^1 = 1 / \sigma_i = -\partial s_i^1 / \partial q_i^1$. The price elasticities of the market share will depend directly on first-period switching cost: higher switching costs make it more difficult to attract customers from the rival in the first period.⁴

Solving for equilibrium prices gives

$$p_i^{1*} = \sigma_1 \frac{2}{3} - \delta_i \sigma_2 \frac{2}{9} - \delta_j \sigma_2 \frac{1}{9} \tag{7}$$

and

$$q_i^{1*} = \sigma_1 \frac{1}{3} - \delta_i \sigma_2 \frac{2}{9} - \delta_j \sigma_2 \frac{1}{9}. \tag{8}$$

Eqs. (7) and (8) display an intertemporal pricing structure according to which the period-1 equilibrium prices are characterized by a discount compared with the period two prices. The strategic reason for this discount is that the firms have an incentive to acquire customers in period 1, because loyalty profits are higher than poaching profits in period 2. It is also worthwhile to point out that the period-1 discount in (7) and (8) depends on the delegation parameter of the firm itself as well as on that of the rival: the higher is the discount factor of the manager of the competing firm, the lower are the first-period prices of the firm. Thus, the managerial discount factor applied by the firm has a strategic effect on the rival's pricing. This already anticipates our upcoming results that the owners want to commit themselves to short-termist managerial contracts in order to alleviate competition in the first period.

The period-1 prices also imply that $p_i^{1*} - q_i^{1*} = \sigma_1 / 3$ and

$$s_i^1 = \frac{1}{3} - \frac{1}{9} \frac{\sigma_2}{\sigma_1} (\delta_i - \delta_j). \tag{9}$$

Therefore the market share will be proportional to the difference of the two managers' discount factors. In Appendix A we calculate the discounted two-period equilibrium profit for the two competitors. Since the pricing decisions are delegated to the managers, these equilibrium profits depend on the managers' discount factors δ_i .

2.1.3. The delegation decisions: the strategic reasons for short-termism

We next study the owners' subgame perfect delegation decisions, which are made in anticipation of the subsequent period-1 and period-2 pricing decisions. The owners recruit a manager and design the compensation contract in order to induce discount factors that support the managerial pricing decisions in an optimal way from the owners' perspective.

From the first two equations of system (6), we can infer how the managerial discount factor, δ_A , affects pricing and thereby the discounted profits. In our model the ultimate purpose of the strategic manipulation of the far-sightedness or short-termism of the manager is to influence the loyalty and poaching prices, and thereby the profits. The marginal effects of loyalty and poaching prices of firm A on the intertemporal profits of firm A are captured by the first and second rows of (6), respectively. The effect of a change in the managerial discount factor, δ_A , on the profits accumulating to the owner of firm A with a true discount factor δ , is given by

$$\begin{aligned} & \left\{ X^0(1 - s_A^1) - X^0 \left[p_A^1 + \delta\sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \frac{\partial s_A^1}{\partial p_A^1} \right\} \frac{\partial p_A^1}{\partial \delta_A} \\ & + \left\{ (1 - X^0)s_B^1 + (1 - X^0) \left[q_A^1 + \delta\sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \frac{\partial s_B^1}{\partial q_A^1} \right\} \frac{\partial q_A^1}{\partial \delta_A}, \end{aligned}$$

where the first (second) term corresponds to the first (second) row of (6).

Notice that the discount factor of the manager of firm A does not only influence the pricing decision of firm A. It also effects the pricing decisions of firm B. Firm B's manager observes the contract of firm A, anticipates the effect of that contract on the pricing decisions of firm A and optimally reacts to these. Thus, firm A's contract has the strategic effect of influencing the pricing decisions of firm B, which then again impacts the market shares of firm A. This effect is given by

$$\left\{ -X^0 \left[p_A^1 + \delta\sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \frac{\partial s_A^1}{\partial q_B^1} \right\} \frac{\partial q_B^1}{\partial \delta_A} + \left\{ (1 - X^0) \left[q_A^1 + \delta\sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \frac{\partial s_B^1}{\partial p_B^1} \right\} \frac{\partial p_B^1}{\partial \delta_A}, \tag{10}$$

⁴ In Section 4 we will consider a model where there are no inherited loyal customers, and, thus, both firms make use of introductory offers to attract a customer base.

where $\frac{\partial p_A^1}{\partial \delta_A} = -\sigma_2 \frac{2}{9} = \frac{\partial q_A^1}{\partial \delta_A}$, $\frac{\partial p_B^1}{\partial \delta_A} = -\sigma_2 \frac{1}{9} = \frac{\partial q_B^1}{\partial \delta_A}$, $\partial s_i^1 / \partial p_i^1 = 1 / \sigma_1 = -\partial s_i^1 / \partial q_i^1$ and $p_i^{1*} - q_i^{1*} = \sigma_1 / 3$ so that $s_A^1 + s_B^1 = 2/3$ and the first and second term of the sum in (10) corresponds to the market share effects on A's and B's loyal customers, respectively. In the first term of the decomposition (10), δ_A influences the poaching price of B, q_B , and therefore A's proportion of loyal customers, $1 - s_A$. There is also a similar effect of δ_A on the loyalty price of B, p_B^1 , influencing the proportion of B's loyal customers, $1 - s_B$. This is the latter term of the sum in (10).

We can rearrange all the above effects according to

$$\begin{aligned} & X^0 \left(1 \frac{\partial p_A^1}{\partial \delta_A} - s_A^1 \frac{\partial p_A^1}{\partial \delta_A} - s_B^1 \frac{\partial q_A^1}{\partial \delta_A} \right) + s_B^1 \frac{\partial q_A^1}{\partial \delta_A} \\ & + \left[q_A^1 + \delta \sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \left((1 - X^0) \frac{\partial s_B^1}{\partial q_A^1} \frac{\partial q_A^1}{\partial \delta_A} - X^0 \frac{\partial s_A^1}{\partial p_A^1} \frac{\partial p_A^1}{\partial \delta_A} \right) - X^0 \frac{\sigma_1}{3} \frac{\partial s_A^1}{\partial p_A^1} \frac{\partial p_A^1}{\partial \delta_A} \\ & + \left[q_A^1 + \delta \sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] \left((1 - X^0) \frac{\partial s_B^1}{\partial p_B^1} \frac{\partial p_B^1}{\partial \delta_A} - X^0 \frac{\partial s_A^1}{\partial q_B^1} \frac{\partial q_B^1}{\partial \delta_A} \right) - X^0 \frac{\sigma_1}{3} \frac{\partial s_A^1}{\partial q_B^1} \frac{\partial q_B^1}{\partial \delta_A}. \end{aligned} \tag{11}$$

The first row in (11) captures the negative direct price effect of a higher managerial discount factor on period-1 profits. Since $\frac{\partial p_A^1}{\partial \delta_A} = -\sigma_2 \frac{2}{9} = \frac{\partial q_A^1}{\partial \delta_A}$ and $s_A^1 + s_B^1 = 2/3$, this direct effect of an increased discount factor is negative and equal to $-\sigma_2 \frac{2}{9} \{X^0 (1 - \frac{2}{3}) + s_B^1\} < 0$. Intuitively, this effect is negative because far-sighted managers are willing to invest more and sacrifice current profits to a higher extent in order to acquire a higher future market share, supporting higher profits in the future. This means that a higher managerial discount factor makes period-1 price competition more intense.

The second and third rows measure the positive indirect effect of higher managerial discount factors on profits through higher market shares in the first and second period. Since $\frac{\partial s_A^1}{\partial p_A^1} \frac{\partial p_A^1}{\partial \delta_A} = -\sigma_2 \frac{2}{9} \times \frac{1}{\sigma_1} = -\frac{\partial s_B^1}{\partial q_A^1} \frac{\partial q_A^1}{\partial \delta_A}$ and $\frac{\partial s_A^1}{\partial q_B^1} \frac{\partial q_B^1}{\partial \delta_A} = \sigma_2 \frac{1}{9} \times \frac{1}{\sigma_1} = -\frac{\partial s_B^1}{\partial p_B^1} \frac{\partial p_B^1}{\partial \delta_A}$ a higher managerial discount factor reduces the first-period switching of own customers to the rival and increases the first-period inflow of the rival's customers to the same extent, we can conclude that $-X^0 \frac{\partial s_B^1}{\partial q_A^1} \frac{\partial q_A^1}{\partial \delta_A} - X^0 \frac{\partial s_A^1}{\partial p_A^1} \frac{\partial p_A^1}{\partial \delta_A} = 0$ and $-X^0 \frac{\partial s_B^1}{\partial p_B^1} \frac{\partial p_B^1}{\partial \delta_A} - X^0 \frac{\partial s_A^1}{\partial q_B^1} \frac{\partial q_B^1}{\partial \delta_A} = 0$ in the first term in the second and third rows, respectively, leaving us with a positive effect of magnitude $2[q_A^1 + \delta \sigma_2 ((\frac{2}{3})^2 - (\frac{1}{3})^2)]$. The last term in the second and third rows reflect the fact that loyalty prices are higher than the poaching prices, and thus the reduced switching of the own customers is more beneficial than the increased success of poaching the rival's customers to switch, other things equal.

When looking at the total effect of an increased managerial discount factor, as captured by the three rows in (11), we can conclude that the negative direct price effect in the first period (first row in (11)) is stronger than the positive indirect market share effects in the first and the second periods (second and third rows in (11)) if

$$\sigma_2 \frac{2}{9} \left\{ X^0 \left(1 - \frac{2}{3} \right) + s_B^1 \right\} > \left[q_A^1 + \delta \sigma_2 \left(\left(\frac{2}{3} \right)^2 - \left(\frac{1}{3} \right)^2 \right) \right] + X^0 \frac{\sigma_1}{3} \left\{ \frac{1}{\sigma_1} \sigma_2 \frac{1}{9} \right\},$$

which is equivalent to

$$\delta < \frac{3(2\sigma_1 s_B^1 - q_A^1)}{\sigma_2} + X^0 \frac{\sigma_1}{\sigma_2}.$$

Substituting from (7), (8), and (9) and rearranging yields that the negative direct price effect is stronger if

$$\delta < \frac{4}{3} \delta_A - \frac{1}{3} \delta_B + (1 + X^0) \frac{\sigma_1}{\sigma_2}. \tag{12}$$

To recap, if (12) holds, the expected discounted profit effect of a higher managerial discount factor is negative. We can interpret this condition as follows. When the manager has a sufficiently high discount factor compared with that of the owner, the manager focuses too much on the dynamic market-share effects from the perspective of the owners, and this misalignment of incentives implies that an increase in the managerial discount factor has a negative effect on the present value of profits (from the owners' perspective). Conversely, when the manager has a sufficiently low discount factor compared with that of the owner, the manager pays insufficient attention to the dynamic market-share effects from the perspective of the owner, and this misalignment of incentives implies that an increase in the managerial discount factor has a positive effect on the present value of profits. Taken together these considerations imply that it is optimal to select managerial discount rate such that $\delta = \frac{4}{3} \delta_A - \frac{1}{3} \delta_B + (1 + X^0) \frac{\sigma_1}{\sigma_2}$. Indeed, by writing (12) as an equality and rearranging, we can express the optimal managerial discount factor for firm A as a function of the true discount factor of the owner of firm A:

$$\delta_A = \frac{3}{4} \delta + \frac{1}{4} \delta_B - (1 + X^0) \frac{3\sigma_1}{4\sigma_2}. \tag{13}$$

By symmetry, we must have

$$\delta_B = \frac{3}{4}\delta + \frac{1}{4}\delta_A - (2 - X^0)\frac{3\sigma_1}{4\sigma_2}. \tag{14}$$

The delegation-stage reaction functions are thus given by

$$\begin{cases} \delta_A = \max\{0, \frac{3}{4}\delta + \frac{1}{4}\delta_B - (1 + X^0)\frac{3\sigma_1}{4\sigma_2}\} \\ \delta_B = \max\{0, \frac{3}{4}\delta + \frac{1}{4}\delta_A - (2 - X^0)\frac{3\sigma_1}{4\sigma_2}\} \end{cases} \tag{15}$$

The reaction functions are piecewise linear and upward-sloping, meaning that there is strategic complementarity between the managerial discount factors. The delegation equilibrium is given by

$$\begin{cases} \delta_A = \max\{0, \delta - (2 + X^0)\frac{3\sigma_1}{5\sigma_2}\} \\ \delta_B = \max\{0, \delta - (3 - X^0)\frac{3\sigma_1}{5\sigma_2}\} \end{cases} \tag{16}$$

Each firm has an incentive to implement managerial short-termism to alleviate price competition for market shares in the first period. From the reaction function, and from (7) and (8), it is clear that if firm B for instance hires a fully myopic manager, firm A's best response is to make its manager more myopic in order to achieve higher first-period prices. With symmetric firms, each of the two symmetric firms will have half of the market in the second period in equilibrium. The question is to what extent the second period rents generated by the switching costs will be eliminated by first-period price competition.

The fact that the managerial discount factors (i.e., the managerial contracts) are observed prior to the pricing decisions implies that a short-termist manager has the benefit that the competitor will also apply a more short-sighted managerial contract, inducing softer first-period competition (see Eqs. (7) and (8)). With strategic complementarity and first period market shares protected by switching costs, these effects induce extreme managerial short-termism.

Now that we have clarified the fairly complex strategic effects associated with the delegation decision and understood the various effects, we formally write down the two-period optimization problems of the two competing firms as functions of the managerial discount factors. By substituting the optimal decisions of the managers into the owners' profit functions, the owners' hiring / contract design decisions are captured by the following optimization problems,

$$\begin{cases} \max_{\delta_A} \pi_A^{1+2}(\delta_A, \delta_B) = \max_{\delta_A} \{ [X^0 + \frac{1}{3} - \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) - \frac{2}{3}X^0](\sigma_1\frac{1}{3} - \delta_A\sigma_2\frac{2}{9} - \delta_B\sigma_2\frac{1}{9} + \frac{\delta\sigma_2}{3}) \\ \quad + \frac{\sigma_1}{3}X^0(\frac{2}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_A - \delta_B)) + \frac{\delta\sigma_2}{9} \} \\ \max_{\delta_B} \pi_B^{1+2}(\delta_A, \delta_B) = \max_{\delta_B} \{ [(1 - X^0) - \frac{1}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) + \frac{2}{3}X^0](\sigma_1\frac{1}{3} - \delta_B\sigma_2\frac{2}{9} - \delta_A\sigma_2\frac{1}{9} + \frac{\delta\sigma_2}{3}) \\ \quad + \frac{\sigma_1}{3}(1 - X^0)(\frac{2}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A)) + \frac{\delta\sigma_2}{9} \}, \end{cases} \tag{17}$$

subject to the constraint that $\delta_i \in [0, 1]$ for $i = A, B$. The reaction functions associated with these optimization problems were given by (15). In Appendix B we present the calculations allowing us to formulate the following result.

Proposition 1. *Suppose that the duopolists are engaged in history-based competition with a two-period horizon.*

- (a) *With arbitrary inherited market shares captured by X^0 , the owner will induce extreme short-termism by delegating the pricing decisions to fully myopic managers (with zero discount factors) if $\sigma_1 = \sigma_2$.*
- (b) *In a symmetric industry such that $X^0 = 1/2$ the managers operate with strictly positive discount factors if $\frac{\sigma_1}{\sigma_2} < \frac{2}{3}\delta$.*

Proposition 1 (and its proof in Appendix B) makes a characterization of the strategic delegation incentives. The objective function of the owner is quadratic in the discount factors, implying that the reaction functions are linear with a slope equal to

$$-\frac{\partial^2 \pi_A^{1+2}(\delta_A, \delta_B) / \partial \delta_A \partial \delta_B}{\partial^2 \pi_A^{1+2}(\delta_A, \delta_B) / \partial \delta_A^2} = \frac{1}{4} \tag{18}$$

when strictly in the interior of $[0,1]$ (for calculations, see Appendix B). The application of standard fixed point arguments guarantees the existence of a delegation equilibrium. Furthermore, the second-order derivative in the denominator of (18) is globally negative, meaning that the delegation equilibrium is characterized by the first-order conditions when the solution of the system lies within the interior of $[0, 1]^2$. Also, as (18) shows, the delegation decisions are (weak) strategic complements. The case $X_0 = 1/2$ and $\sigma_1 = \sigma_2$ is illustrated in Fig. 1.

In the present model, an established customer base is valuable, because the switching costs grant some degree of market power to the firm. The poaching price is an important instrument for the firm to increase its customer base. There are dynamic incentives to acquire new customer relationships as these generate benefits not only presently, but also in the future. However, as both firms have incentives to compete for new customers, current competition for future customers is intense due to the identified intertemporal incentives. Formally, these incentives are captured by the first-period loyalty price (7) as well as the poaching price (8), which are decreasing in the discount factors. By delegating the pricing decisions to managers with low discount factors, the owners can limit the period-1 investments to acquire customers.

By delegating the pricing decisions to myopic managers, the owners commit themselves to managers who disregard the future value of an acquired customer when making the pricing decisions. In this respect delegation of pricing decisions

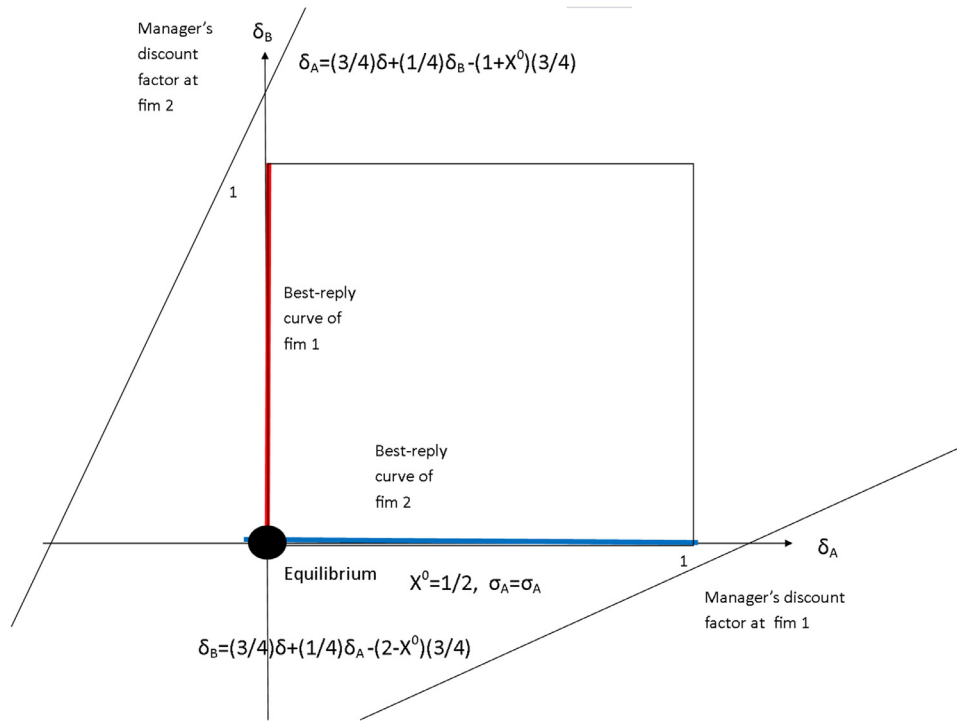


Fig. 1. Owners' best-reaction curves, $X^0 = 1/2, \sigma_1 = \sigma_2$.

to myopic managers is a mechanism to soften price competition. The conclusion is quite the opposite to the relationship between discount factors and price competition suggested by the literature on tacit collusion. According to this literature sufficiently high discount factors make firms capable of sustaining tacit collusion in a non-cooperative way, since they put a lot of emphasis on the lost future profits associated with a deviation from collusion as opposed to short-term gains. However, the tacit collusion mechanism breaks down unless the firms operate with an infinite horizon. Our mechanism shows that the delegation of pricing decisions to short-sighted managers softens competition even with a finite horizon as long as competition focuses on the management of customer relationships in oligopoly markets with switching costs.

Strategic short-termism does not rely on the fact that the magnitude of the switching costs is invariant over time. However, as Proposition 1 (b) shows for symmetric inherited market shares, if the magnitude of the switching cost is sufficiently increasing so that $\sigma_2 > \frac{3}{2\delta}\sigma_1$ the degree of short-termism will not be so drastic as to imply completely myopic managers. This result has important real-world relevance. For example, a firm that builds its IT infrastructure around Microsoft Windows will likely face higher switching costs over time to switch to a Mac OS, since it will have an expanding number of processes put in place that rely on the basic infrastructure.⁵

Notice that by imposing $\delta_A = \delta_B = \delta_M$ and differentiating w.r.t. δ_M the intertemporal profit of each firm is decreasing in δ_M . Thus, delegation to myopic managers enables the owners of the duopoly firms to achieve an allocation which maximizes industry profits. Formally when $X^0 = 1/2$ and $\sigma_2 \leq \frac{3}{2\delta}\sigma_1$, the delegation of the pricing decisions to completely myopic managers constitutes the unique subgame perfect equilibrium and it allows for the firms to implement an allocation which maximizes industry profits in a non-cooperative way. This feature is consistent with a general result established by Fershtman et al. (1991), namely that principals can always implement any Pareto efficient outcome as a non-cooperative equilibrium by signing contracts with agents to choose actions on their behalf as long as these contracts are fully observable by all agents.⁶

We can also substitute the equilibrium price and market share expressions into the profit function and quantify the profit-effect of the delegation of pricing decisions to short-termist managers. When the owners of the two firms with discount factors δ delegate the pricing decisions to managers with discount factor δ_M and when the two firms have identical market shares, the discounted equilibrium profits of the two firms equal

$$\begin{cases} \pi_A^{1+2} = \frac{1}{6}(\sigma_1 \frac{5}{3} - \delta_M \sigma_2) + \delta \frac{\sigma_2}{2} \frac{5}{9}, \\ \pi_B^{1+2} = \frac{1}{6}(\sigma_1 \frac{5}{3} - \delta_M \sigma_2) + \delta \frac{\sigma_2}{2} \frac{5}{9}. \end{cases} \quad (19)$$

⁵ We thank an anonymous referee for making this point.

⁶ However, it should be remarked that in Fershtman et al. (1991) the implementation of the Pareto efficient outcome builds on the feature that the principals observe the actions of the agents, whereas in our model only the profit outcomes, but not the actions of the managers, are observed.

This means that the benefit to firms of delegating the pricing decisions to myopic managers ($\delta_M = 0$) rather than making the pricing decisions contingent on the firm's discount factor ($\delta_M = \delta$) equals $\frac{1}{6}\delta\sigma_2$ for each firm.

Having established the basic mechanism behind strategic short-termism in this subsection, we will next explore the robustness of this result. In the next subsection we will extend the analysis to an infinite horizon. Thereafter, in Section 3, we will relax the assumption with exogenously given initial market shares and focus on the configuration where firms compete for unattached customers with introductory offers in the first period.

2.2. Short-termism with an infinite horizon

In this subsection we extend the analysis to allow for an infinite horizon capturing the essentials of an environment where at each period managers determine prices without really knowing when the interaction between the two managers/firms comes to an end. We focus on a stationary population of consumers, each of whom lives for an infinite horizon. We also only consider the stationary equilibria of the game. In line with the repeated game literature and our alternative interpretation, the discount factor δ_i can be thought of as capturing the probability that manager i survives and that the firms continue to operate in the next period. With such an interpretation the strategic delegation parameter essentially captures the expected duration of the managerial contact. The key difference between the infinite horizon model and the two-period model is the fact that there is never any certain final period where the firms or managers would know that there will no longer be any future period to take into account when making the pricing decisions.

With an infinite horizon the managers maximize the perceived sum of discounted profits by choosing poaching and incumbent prices in each period in order to solve the following optimization problems

$$\begin{aligned} & \max_{\{p_A^t, q_A^t\}_{t=1}^{\infty}} \left\{ \sum_{t=1}^{\infty} \delta_A^{t-1} [X^{t-1} (1 - s_A^t) p_A^t + (1 - X^{t-1}) s_B^t q_A^t] \right\} \\ & \max_{\{p_B^t, q_B^t\}_{t=1}^{\infty}} \left\{ \sum_{t=1}^{\infty} \delta_B^{t-1} [X^{t-1} s_A^t q_B^t + (1 - X^{t-1}) (1 - s_B^t) p_B^t] \right\} \end{aligned}$$

For simplicity, we now assume that the magnitude of the switching costs is constant over time, i.e. formally $\sigma_t = \sigma_{t'} = \sigma$ for any t and t' . Furthermore, we assume that the idiosyncratic switching cost realization for a representative consumer evolves as an identically and independently distributed (i.i.d.) process over time.⁷ In such a stationary environment the solution to these optimization problems has to satisfy the Bellman equations

$$\begin{aligned} v_A(X) &= \max_{p_A, q_A} [X(1 - s_A(p_A, q_B)) p_A + (1 - X) s_B(p_B, q_A) q_A + \delta_A v_A(X')] \\ v_B(X) &= \max_{p_B, q_B} [(1 - X)(1 - s_B(p_B, q_A)) p_B + X s_A(p_A, q_B) q_B + \delta_B v_B(X')] \end{aligned}$$

subject to the law of motion $X' = X(1 - s_A(p_A, q_B)) + (1 - X) s_B(p_B, q_A)$. In each period, each firm accumulates loyalty profits and poaching profits (the first two terms, respectively) and takes into account the dynamic effects of how the current pricing is transmitted through the effect of the current market prices on the future market share. In the Bellman equations, this latter effect is captured by the discounted continuation payoff term which has the future market share X' as an argument.

The first-order conditions associated with these optimization problems are given by

$$\begin{cases} X \{ (1 - s_A(p_A, q_B)) - [p_A + \delta_A v'_A(X')] \frac{1}{\sigma} \} = 0 \\ (1 - X) \{ s_B(p_B, q_A) - [q_A + \delta_A v'_A(X')] \frac{1}{\sigma} \} = 0 \\ (1 - X) \{ (1 - s_B(p_B, q_A)) - [p_B + \delta_B v'_B(X')] \frac{1}{\sigma} \} = 0 \\ X \{ s_A(p_A, q_B) - [q_B + \delta_B v'_B(X')] \frac{1}{\sigma} \} = 0, \end{cases}$$

where the first equation captures the effect of increasing p_A on A's profit, the second equation captures the effect of increasing q_A on A's profit, and the remaining two equations characterize analogous pricing effects associated with the profit-maximization problem of firm B. In each first-order condition the first term is the direct positive effect of higher price on the revenue from customers that decide to buy, the second term is the negative effect of a higher price on the current revenue from a marginal customer, who decides to switch to the competing firm instead, and the third effect is the negative effect of a higher current price on future market share. In these expressions we assume that

$$\frac{\partial \psi_i}{\partial p_i} = \frac{\partial \psi_j}{\partial p_i}$$

so that

$$\frac{\partial s_i}{\partial p_i} = s_i^1 = \frac{1 + \frac{\partial \eta(\psi_j - \psi_i)}{\partial p_i}}{\sigma} = \frac{1}{\sigma}.$$

⁷ Of course, there could be many reasons for serial correlation with respect to the switching costs. For example, the switching costs could be increasing if there is an extensive process of learning by doing for the consumer regarding how to best take advantage of the product/service of the firm. Under such circumstances the perceived costs of switching would tend to increase over time. Yet, we leave such extensions for future research.

In Appendix C, we present a solution to this system of equations. The equilibrium loyalty and poaching prices are characterized as functions of the managers' discount factors and firms' market shares according to

$$p_i^* = \frac{2}{3}\sigma - \frac{2}{3}\delta_i v'_i(X') - \frac{1}{3}\delta_j v'_j(X')$$

and

$$q_j^* = \frac{1}{3}\sigma - \frac{2}{3}\delta_j v'_j(X') - \frac{1}{3}\delta_i v'_i(X').$$

This re-establishes a similar dependence of the strategic pricing decisions on the managerial discount factors as in the two-period model. First, a higher managerial discount factor of one's own manager leads to more aggressive pricing and the extent of this depends on the dynamic effects of pricing on future profits. Second, the higher is the discount factor of the manager, the lower is equilibrium poaching price of the competing firm. Therefore, each firm can reduce the price pressures by designing a short-termist managerial contract.

Since we are interested in a stationary equilibrium, we have $X' = X(1 - s_A) + (1 - X)s_B = X$ and thus the market shares in a stationary equilibrium satisfy

$$1 - X = \frac{s_A}{s_A + s_B} = \frac{p_A - q_B}{p_A - q_B + p_B - q_A}$$

and

$$X = \frac{s_B}{s_A + s_B} = \frac{p_B - q_A}{p_A - q_B + p_B - q_A}.$$

Thus, the stationary market shares depend on the loyalty and poaching price differences in various market segments. Quite intuitively, the higher the price difference, the higher is the stationary market share of the poaching firm. Moreover, given the equilibrium price expressions above, these stationary market shares are increasing in the discount factor of the firm's own manager and decreasing in that of the rival's manager. Formally, $\frac{\partial X}{\partial \delta_A} > 0$ and $\frac{\partial X}{\partial \delta_B} < 0$.

Substituting the expressions for stationary market shares into the profit functions yields

$$\begin{cases} \pi_A = X(1 - s_A)p_A + (1 - X)s_Bq_A \\ = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left(1 - \frac{p_A - q_B}{\sigma}\right) p_A + \frac{p_A - q_B}{p_A - q_B + p_B - q_A} \frac{p_B - q_A}{\sigma} q_A \\ \pi_B = Xs_Ap_A + (1 - X)(1 - s_B)p_B \\ = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left(\frac{p_A - q_B}{\sigma}\right) q_B + \frac{p_A - q_B}{p_A - q_B + p_B - q_A} \left(1 - \frac{p_B - q_A}{\sigma}\right) p_B, \end{cases}$$

where all prices depend on the discount factors. Substituting the equilibrium prices and rearranging yields the net present value of the profit flows in a stationary equilibrium,

$$\begin{cases} \frac{1}{1-\delta} \pi_A = \frac{1}{1-\delta} \frac{1}{18\sigma} (\sigma - \delta_B v'_B(X') + \delta_A v'_A(X')) (5\sigma - 5\delta_A v'_A(X') - 4\delta_B v'_B(X')) \\ \frac{1}{1-\delta} \pi_B = \frac{1}{1-\delta} \frac{1}{18\sigma} (\sigma - \delta_A v'_A(X') + \delta_B v'_B(X')) (5\sigma - 5\delta_B v'_B(X') - 4\delta_A v'_A(X')). \end{cases}$$

The owners maximize profits with respect to the discount factors δ_i . The reaction functions are given by the following first-order conditions:

$$\begin{cases} \frac{\partial \frac{1}{1-\delta} \pi_A}{\partial \delta_A} = \frac{1}{1-\delta} \frac{1}{18\sigma} v'_A(X') [-10\delta_A v'_A(X') + \delta_B v'_B(X')] = 0 \\ \frac{\partial \frac{1}{1-\delta} \pi_B}{\partial \delta_B} = \frac{1}{1-\delta} \frac{1}{18\sigma} v'_B(X') [-10\delta_B v'_B(X') + \delta_A v'_A(X')] = 0 \end{cases}.$$

These reaction functions can be characterized according to

$$\delta_A = \delta_B \frac{v'_B(X')}{10v'_A(X')}$$

and

$$\delta_B = \delta_A \frac{v'_A(X')}{10v'_B(X')}.$$

In a stationary equilibrium it holds true that $v'_B(X') = v'_A(X')$, implying that $\delta_A = \delta_B = 0$ is the unique symmetric equilibrium. We have thereby established the following Proposition under the circumstances of constant switching costs.

Proposition 2. *Suppose that two duopolists inherit exogenously given market shares and that they are engaged in history-based pricing with an infinite horizon. Such firms have strategic incentives to induce extreme short-termism by delegating the pricing decisions to myopic managers (with zero discount factors).*

These findings confirm that the basic forces inducing short-termism in managerial pricing decisions carry over from the simple two-period setting to an infinite horizon one.

Throughout this section we have focused on an environment with exogenously given initial market shares. We have shown that under such circumstances firms have unilateral incentives to delegate pricing decisions to myopic managers. With prices determined by myopic managers the firms avoid intense competition that would arise if prices were set in recognition of the fact that switching costs make a customer acquired today very valuable, as the switching costs allow for the extraction of future rents on such a customer. With switching costs invariant over time, the extreme result with completely myopic managers follows from the fact that with exogenously given initial market shares there is no force to counteract this mechanism. As we will see in the next section, the introduction of competition for initial market shares changes the picture in this respect.

3. Short-termism and the acquisition of customer relationships

We now modify our model in such a way that firms compete without any established customer relationships in the first period. For that purpose we assume that the first-period competition is captured by a standard Hotelling model with firm A located at $y = 0$ and firm B at $y = 1$. We assume that consumers have locations uniformly distributed on the unit interval and that they face linear transportation costs with the cost parameter $t > 0$ per unit travelled. Further, the consumers have a common reservation price $v > t$, which is sufficiently high to guarantee that the market is covered, i.e. that all consumers find it worthwhile to buy from either A or B. We assume that transportation costs are only borne in the first period. In the second period the consumers face a switching cost if they decide to change the supplier. These switching costs have identical properties as in Section 2.

We can think of the transportation costs in period 1 as adjustment costs. Consumers without experience have to bear these costs in order to reap the benefits associated with their first-period consumption of A or B. The parameter t measures the intensity of these differentiated adjustment costs. The adjustment costs captured by t do not apply for switching customers with experience with either firm A or B. We could interpret the switching costs in such a way that they include also any potential adjustment costs.

To summarize, the consumers in this section have idiosyncratic preferences between two horizontally differentiated products in period 1 and select their preferred product given the introductory prices. Consumers who switch from one supplier to another in the second period, must bear a switching cost.

In line with Section 2, we denote the market share for firm A (B) generated by the pricing and product selection decisions in period 1 by X^1 ($1 - X^1$). As shown in Section 2, the equilibrium prices in period 2 are given by $p_i^2 = 2\sigma/3$ and $q_i^2 = \sigma/3$ for $i = 1, 2$, and the second-period profits are given by

$$\begin{cases} \pi_A^2 = \sigma \frac{1}{3} X^1 + \frac{\sigma}{9} \\ \pi_B^2 = \sigma \frac{1}{3} (1 - X^1) + \frac{\sigma}{9} \end{cases} \quad (20)$$

Let us now shift our attention to the price competition with introductory offers in period 1 where now there are no inherited customer relationships. At this stage, rational and forward-looking consumers understand that the switching costs will limit their options in period 2. The precise level of individual switching costs in period 2 are not known in period 1, as the idiosyncratic switching costs have not yet been revealed to unexperienced customers. This means that first-period market shares will depend only on first-period prices and not on individual switching cost realizations.

The location, $\hat{y} \in [0, 1]$, of the consumer that is indifferent between product A (located at $y = 0$) offered at price p_A^1 , and product B (located at $y = 1$) offered at price p_B^1 , satisfies the following equation

$$p_A^1 + t\hat{y} + \delta \left[\int_{s_A^2}^{\sigma} p_A^2 ds + \int_0^{s_A^2} (q_B^2 + \sigma s) ds \right] = p_B^1 + t(1 - \hat{y}) + \delta \left[\int_{s_B^2}^{\sigma} p_B^2 ds + \int_0^{s_B^2} (q_A^2 + \sigma s) ds \right],$$

where $s_i^2 = (p_i^2 - q_j^2)/\sigma$ is the indifferent consumer in the second period that bought from firm i in the first period. Substitution and simplification yields

$$X^1 = \hat{y} = 1/2 + \frac{p_B^1 - p_A^1}{2t},$$

which gives the fraction of customers buying from firm A in the first period as a function of introductory prices p_A^1 and p_B^1 .

Next we focus on price competition in period 1 when the pricing decisions are delegated to managers operating with discount factors δ_A and δ_B . These managers select introductory offers to maximize the present value of profits

$$\max_{p_A^1} [p_A^1 X^1 + \delta_A \pi_A^2] \quad (21)$$

$$\max_{p_B^1} [p_B^1 (1 - X^1) + \delta_B \pi_B^2], \quad (22)$$

where the second-period profits are given by (20).

Solving the system of equations determined by the reaction functions associated with (21) and (22), we find that the price equilibrium in period 1 is given by

$$p_i^1 = t - \frac{\sigma}{9} (2\delta_i + \delta_j) \quad (23)$$

where $i, j \in \{1, 2\}$ and $i \neq j$.⁸

Recalling that with static Hotelling competition the equilibrium price coincides with the transportation cost parameter, we can conclude from (3) that in the present model the period-1 price exhibits an introductory discount compared with the static benchmark. The introductory discount is proportional to the magnitude of the switching costs, σ , and to the discount factors, δ_i and δ_j .

As the final analytical step we shift our attention to the delegation stage. At this stage, the owners appoint the managers on the basis of their discount factors. We proceed by substituting the period-1 equilibrium prices (23) and the period-2 equilibrium profits (20) into the discounted two-period profits of the firm and by evaluating this objective function according to the firms' true discount factor. Further, with delegated pricing the period-1 equilibrium implies the period-1 market share

$$X^1 = \frac{1}{2} + \frac{\sigma}{18t}(\delta_A - \delta_B)$$

for firm A. Formally,

$$\max_{\delta_A} \Gamma_A = \max_{\delta_A} \left\{ \left[t - \frac{\sigma}{9}(2\delta_A + \delta_B) \right] \left[\frac{1}{2} + \frac{\sigma}{18t}(\delta_A - \delta_B) \right] + \delta \frac{\sigma}{3} \left[\frac{1}{2} + \frac{\sigma}{18t}(\delta_A - \delta_B) + \frac{\sigma}{3} \right] \right\} \quad (24)$$

$$\max_{\delta_B} \Gamma_B = \max_{\delta_B} \left\{ \left[t - \frac{\sigma}{9}(2\delta_B + \delta_A) \right] \left[\frac{1}{2} + \frac{\sigma}{18t}(\delta_B - \delta_A) \right] + \delta \frac{\sigma}{3} \left[\frac{1}{2} + \frac{\sigma}{18t}(\delta_B - \delta_A) + \frac{\sigma}{3} \right] \right\}. \quad (25)$$

The reaction functions associated with (24) and (25) can be shown to satisfy

$$\frac{\sigma}{18t} \left[-t + \frac{\sigma}{9}(4\delta_A - \delta_B) + \frac{\delta\sigma}{3} \right] = 0 \quad (26)$$

$$\frac{\sigma}{18t} \left[-t + \frac{\sigma}{9}(4\delta_B - \delta_A) + \frac{\delta\sigma}{3} \right] = 0. \quad (27)$$

Solving the system of equations defined by the reaction functions (26) and (27) we find that the subgame perfect delegation parameters satisfy

$$\delta_A = \delta_B = \delta - 3 \frac{t}{\sigma}. \quad (28)$$

From (28) we can draw the conclusion that the owners have strategic incentives to induce short-termism by delegating the pricing decisions to managers operating with a lower discount factor than those of the owners, irrespectively of the owners' true time preferences. The expression (28) characterizes the subgame-perfect discount rates if and only if $\sigma \geq 3t/\delta$. On the contrary, if $\sigma < 3t/\delta$ then $\delta_A = \delta_B = 0$. This means that if $\sigma \leq 3t/\delta$, the delegation equilibrium is characterized by fully myopic managers. We formulate these findings in the following result.

Proposition 3. *Owners engaged in Hotelling competition always have strategic incentives to induce short-termism by delegating the pricing decisions to managers operating with lower discount factors than those of the owners. More precisely, the delegation equilibrium is characterized by $\delta_A = \delta_B = \delta - 3 \frac{t}{\sigma}$ if $\sigma > 3t/\delta$, whereas it involves delegation of the pricing decisions to fully myopic managers if $\sigma \leq 3t/\delta$. Further, according to (28) intensified competition reduces the degree of short-termism, if t is used as the measure of competition intensity.*

In the presence of switching costs, firms have an incentive to establish customer relationships in the first period, because they can extract more profit from their own customers than from switching customers in period 2. A higher value of the parameter σ means that consumers' switching costs are at higher levels. This raises the value of establishing customer relationships early in period 1. Thus, a higher value of σ induces more aggressive pricing in period 1, i.e., lower introductory offers. On the other hand, the firms' products are differentiated in period 1, and parameter t is a measure of the market power created by this product differentiation. Result 3 states that firms have a strategic incentive to induce short-termism. Yet, the degree of short-termism is determined by the ratio t/σ . This can be viewed as a measure of how to balance the first-period gains associated with product differentiation, t , against the second period gains from lock-in, σ .

Substituting the delegation equilibrium (28) into the period-1 price given by (23) we can see that $p_i^1 = 2t - \delta\sigma/3$. Recalling that the equilibrium price of a static Hotelling model is t , it follows that there is an introductory discount precisely when $\sigma > 3t/\delta$. In particular, this introductory discount would be so strong as to induce a negative first-period price (pricing below marginal costs) if $\sigma > 6t/\delta$. Conversely if $\sigma \leq 3t/\delta$, the period-2 gains from locked-in consumers would not be sufficient to distort the first-period price downwards from the static equilibrium $p_i^1 = t$.

In general, the Hotelling model captures competition in markets of fixed size, implying that price changes represent redistributions between consumers and producers without effects on total welfare. In our particular symmetric model the

⁸ In models of history-based pricing the introductory discount is typically increasing as a function of a common and exogenous discount factor (see for example Chen, 1997). Compared with that literature, we contribute by focusing on firm-specific discount factors, which are made endogenous through the characterization of strategic delegation equilibrium.

effects of short-termism induced through delegation will not affect the equilibrium degree of switching. This means that also total welfare will be invariant to the short-termism induced by delegation. Consequently, as (23) shows short-termism raises the period-1 price, whereas it does not affect the period-2 price. For that reason the short-termism predicted by our model has well-defined welfare implications. It increases equilibrium profits, whereas it decreases consumer surplus. And, with the symmetric Hotelling model these opposite effects are of equal magnitude.

There are reasons to comment on the role of the market imperfection associated with product differentiation in period 1, captured by t . In light of (28), the equilibrium degree of short-termism diminishes as t diminishes. In other words with endogenous formation of customer relationships in the Hotelling model, the equilibrium degree of short-termism diminishes in response to intensified competition.⁹ In particular, the short-termism tends to disappear, as t approaches zero. In the model of Section 2, there is always market power in the first period due to exogenously inherited market shares that are protected by switching costs, and firms can afford to relax competition by delegating pricing to short-sighted managers. This leads to higher profits in the protected markets in the first period. With endogenous first-period competition and with weak period-1 market power (low t), competition is very tough in the first period, and almost all the rents are accrued in the second period when customer relationships are protected by switching costs. Thus, with endogenous period-1 competition firms cannot exploit market power in the first period without limits as they run the risk of losing the valuable period-2 customer relationships. Thus, there is less value associated with strategic reductions of the managerial discount factors. In fact, the equilibrium managerial discount factors may be strictly positive instead of zero (as in Section 2), and these managerial discount factors approach those of the owners as the period-1 market power approaches zero.

So far we have evaluated the equilibrium incentives for short-termism in a two-period model where customer relationships are established in Hotelling competition. To illustrate the robustness of our results, we briefly consider a specification where customer acquisition in the first period is modeled by means of the Salop model on the unit circle. In the Salop model we use of the number of firms on the unit circle as a measure of the intensity of competition at the stage when customer relationships are formed.

Based on our detailed analysis reported in Appendix D we find that the symmetric subgame perfect delegation equilibrium is given by

$$\delta_i = \delta - \frac{4}{3\sigma n}, \quad (29)$$

where $i = 1, \dots, n$ for a Salop model with n firms. Thus, we can formulate the following conclusion.

Proposition 4. *Owners engaged in Salop competition always induce short-termism by delegating the pricing decisions to managers with lower discount factor than those of the owners. More precisely, the delegation equilibrium is characterized by*

$$\delta_i = \delta - \frac{4}{3\sigma n} \text{ if } \sigma > \frac{4}{3\delta n},$$

whereas it involves delegation to fully myopic managers if $\sigma \leq \frac{4}{3\delta n}$. Further, according to (29), intensified competition decreases the degree of short-termism if n is used to measure the intensity of competition.

Based on a comparison between Propositions 3 and 4 we can conclude that the equilibrium with strategic short-termism is a robust feature independently of whether the competition to establish customer relationships is based on the Hotelling or Salop model. Moreover, we find that in both models, intensified competition reduces the equilibrium degree of short-termism. Furthermore, independently of whether we focus on the Hotelling or Salop model we find that short-termism tends to disappear as we approach perfect competition.

The number of firms in an industry is typically seen as a characterization of the market structure. From such a perspective, Proposition 4 also offers a delineation of the relationship between market structure and the degree of short-termism.

As our comments above make clear, short-termism tends to disappear if we approach perfect competition in the product market at the stage when customer relationships are formed. This feature distinguishes our model of strategic short-termism from the incentive-based mechanisms for short-termism developed by Thakor (2017) or Varas (2017). In these latter mechanisms the arguments for short-termism apply also to product markets with perfect competition.

The mechanism inducing strategic short-termism with endogenous initial market shares is different from that in a model with an exogenously given initial shares. As we have seen, with endogenous initial market shares, the degree of short-termism is determined by trading off the incentives to exploit market power in the initial period against the incentives to benefit from switching costs. On the contrary, with exogenous market shares that trade off does not exist and there is no countervailing force balancing the tendency for short-termism. Thus the firms implement completely myopic pricing with exogenously inherited market shares.

4. Discussion and implications

Overall, our model could be viewed as an explicit representation of a more general mechanism. Our model captures the idea that strategic commitments to short-termism, via observable delegation to managers with a discount factor lower

⁹ It should be emphasized that this insight is contingent on the way in which we measure competition as we will demonstrate in the end of this section.

than that of the owners, reduce the investments to acquire current market shares under circumstances where future profits are essentially determined by these current market shares. In our model the current, or early-phase, pricing decisions formally capture the investments to acquire customer relationships, but short-termism could equally well serve as a strategic device to soften competition with respect to general investment decisions, for example, advertising, intended to accumulate valuable customer relationships. Indeed, [Blattberg et al. \(2009\)](#), reviewing the management of customer lifetime value, collect evidence of a number of marketing actions that firms can exploit in order to boost customer profitability, relationship duration, and overall firm profitability. Relatedly, [Stahl et al. \(2012\)](#) study investments in brand value and their effects on customer acquisition and retention as well as on the profit margin. The fundamental mechanism we identify could be formalized also within the framework of a more abstract reduced-form investment model.

Typically, a higher interest rate tends to reduce investments. This is equivalent with the feature that delegation of pricing decisions to managers with a lower discount factor than that of the owners reduces investments. Within our framework, owners benefit from this effect, because short-termism relaxes competition at the investment stage.

It is standard to criticize models of strategic delegation by questioning the extent to which the contracts to the agents are observable.¹⁰ In light of this criticism, a number of studies (in particular, [Katz, 1991](#); [Kockesen and Ok, 2004](#), and [Kockesen, 2007](#)) have asked to which extent the insights from the models of strategic delegation generalize to configurations where the specific parameters of the delegation contract are not observable to rivals (and outsiders). By and large, this literature suggests that the strategic aspects of delegation play an important role in contract design independently of whether the contracts are completely or only partially observable. In particular, in the framework of two-sided delegation games, for example, [Kockesen \(2007\)](#) demonstrates that strategic delegation tends to serve as a cooperative device also with unobservable contracts. In our view, these insights provide support for the robustness of our analysis.

The adoption of uniform pricing would be an alternative mechanism for firms to soften price competition vis-à-vis a regime with history-based pricing (see, [Chen, 1997](#), for instance). However, in a world where firms have access to knowledge regarding the purchase histories of consumers, it does not seem realistic that firms could commit not to use this information. Clearly, under such a collusive agreement, each firm would have an incentive to deviate and adopt history-based pricing instead. When firms soften price competition by delegating pricing decisions to short-termist managers, softer price competition is an equilibrium outcome and there is no incentive to deviate from the short-termist contractual arrangements.

In our model, the equilibrium discount factors formally capture the short-termism phenomenon. A challenge for a firm wishing to hire a high-capacity manager is that a higher discount factor is correlated with lower IQ, numeracy and schooling (see, [Burks et al., 2009](#), Table 3; [Burks et al., 2012](#), Table 3)). The discount factor is also negatively correlated with risk aversion. Yet, by eliciting such all measures correlated with discount factor, firms can hand-pick precisely those managers who have low discount factors¹¹ without compromising on cognitive capacities. Recently some recruitment agencies and consultants have started to apply experimental economic methods to elicit such preference parameters from candidates as part of managerial recruitment processes.¹²

Empirically it might nevertheless be hard to directly observe the applied discount factors. But, the discount factor can be interpreted as the probability that there is a next period in the interaction, i.e. a contract renewal. As far as incentive contracts for managers are concerned this seems to empirically match management turnover very well. Namely, a high degree of managerial turnover would mean a low probability of contract renewal, and thereby a lower managerial discount factor. Thus, a high degree of manager turnover would be an empirical manifestation of the theoretical predictions of our model.

Our model theoretically predicts managerial turnover to be determined by three factors: the degree of lock-in created by established customer relationships, market power created by product differentiation (adjustment cost t) and the discount factor of the owners. It is, in principle, possible to construct empirically observable measures of these factors. Therefore, our results are empirically testable. However, in a strict sense we are not aware of any empirical study with such a particular focus. Furthermore, according to our model with endogenous customer acquisition, relaxed competition in the product market (higher adjustment cost t) enhances the equilibrium degree of short-termism, thereby generating the empirically testable prediction that managerial turnover increases. Such a prediction can be compared with some existing empirical studies, for example ([Dasgupta et al., 2017](#)), regarding the relationship between intensified product market competition and CEO turnover. However, to a large extent this category of studies have focused on CEO turnover as a mechanism to induce efficiency and productivity growth, not as a mechanism to relax competition at the stage when customer relationships are established.

Empirical studies support the view that manager turnover is an important feature that managers should take into account. For example, [Kaplan and Minton \(2012\)](#) report that total CEO turnover for a sample of large US companies during

¹⁰ The same comment applies for a wide range of influential models of strategic delegation in economics: international organization ([Fershtman and Judd, 1987](#); [Vickers, 1985](#)), international trade ([Brander and Spencer, 1985](#)), financial economics ([Brander and Lewis, 1986](#)), and monetary policy ([Persson and Tabellini, 1990](#); [Rogoff, 1985](#), chapter 2).

¹¹ High risk-aversion coefficients may also promote the short-termism target (see e.g., [Holden and Subrahmanyam, 1996](#)), though in many industries, this may come with greater cost of inducing effort if moral hazard is important.

¹² Time-inconsistency in the form of hyperbolic discounting does not fully associate with short-sightedness since time inconsistent sophisticated managers, in an infinite horizon model, would use all means possible to commit to a far-sighted future pricing strategy. And such managers, if successful in their commitment, are not ideal from the perspective of the owners.

the period 2000–2007 is 16.8%, implying an average tenure of less than 6 years. Relevant from the perspective of our study, internal CEO turnover exceeds 12%. Furthermore, Kaplan and Minton (2012) detect a rising trend in CEO turnovers, and they find that these turnovers are significantly related to stock performance. Of course, the ability of our model to explain CEO turnover is restricted to industries characterized by significant switching costs.

The empirical study by Davies et al. (2014) calculates the difference in the investment performance between private firms and quoted firms in order to approximate the magnitude of the short-termism problem. Based on a comparison across sectors they find the highest degree of short-termism in the financial intermediation sector. In light of the evidence according to which the banking and mutual fund industries are characterized by significant switching costs (see our discussion in Section 2) our model could be seen to present one mechanism of importance to explain such evidence. However, it should be emphasized that we have not presented a model of financial intermediation as many relevant features of that sector are absent from our model. Furthermore, there could be many mechanisms outside of our model that explain short CEO-tenures in banking. For example, Boot and Ratnovski (2016) emphasize the effects of a shift in business model from relationship banking towards short-term trading activities.

Barcena-Ruiz and Espinosa (1996) study a closely related two-period Bertrand model with differentiated products and find that firms have an incentive to use contract length as an instrument to alleviate price competition. Our model shares their testable implication that there should be a negative correlation between profits and the length of managerial contracts, as well as between sales and the length of contracts. Their model, unlike ours, predicts considerable intra-industry heterogeneity in contract lengths: some firms have longer-term contracts than others. In the light of our model, the variation across industries is higher than the variation within industries, and the variation between industries should be driven by the magnitude of switching costs.

In recent years, there has been an active academic debate in behavioral economics about overconsumption and lack of sufficient savings. In the US, high-interest credit-card loans are soaring and households are highly indebted and use sub-optimal instruments to finance their consumption. The arguably irrational behavior that brings about overconsumption, for instance, has been attributed to the so called present-bias, where consumers or households have non-stationary preferences characterized by a short-run incentive or temptation to spend and a long-run incentive to attempt committing to curb down spending (Heidhues and Köszegi, 2010; Laibson et al., 2003). Lack of full understanding of one's short-run temptation can be theoretically shown to predict problems with over-debtedness. The present-bias phenomenon requires non-stationary time preferences whereas in our model the short-termism induced by strategic delegation requires neither behavioral biases nor non-stationary preferences at all. Patterns of lack of far-sightedness and patience are generated by fully rational owners and managers. In our model short-termism is a mechanism to relax competition for customer relationships in the presence of switching costs.

5. Concluding comments

In this study we have designed a duopoly model of history-based price competition with switching costs. We have demonstrated how strategic history-based pricing competition induces the owners of the firms to implement short-termism by delegating the pricing decisions to managers with a discount factor lower than that of the owners. This delegation equilibrium can also be interpreted as an equilibrium where managers are offered contracts with a probability of renewal lower than the discount factors of the owners. Our analysis establishes analytically that for an arbitrary exogenous initial market share allocation, the subgame perfect equilibrium configuration is characterized by strategic delegation to completely myopic agents independently of whether the firms compete with a horizon of two or infinitely many periods unless switching costs are strongly increasing over time. Our analysis also covers an environment where we endogenize the initial market shares by focusing on price competition with differentiated products and a two-period horizon. The feature with delegation to managers operating with lower discount rates than those of the owners is robust to such an extension. However, whether the extreme myopia is optimal or whether the managers are offered contracts with a strictly positive discount factor lower than that of the owners crucially depends on the parameters of the model – the magnitude of the switching costs, the measure capturing market power in the initial period and the discount factor of the owners. Overall, we establish that the degree of short-termism is determined by balancing the incentives to exploit market power in the initial period against the incentives to benefit from switching costs in the second period.

Switching costs induce firms to engage in intense competition in order to acquire customer relationships, which yield payoffs in the future. Delegation of the pricing decisions to managers with short-term incentives is a strategic device for owners to soften price competition and thereby increase profits in oligopoly competition. This mechanism is specific for the oligopoly market structure. With oligopoly competition the gains from short-termism are associated with softer competition at the stage when customer relationships are formed, which means that short-termism tends to prevent value-destroying processes with excessively fast accumulation of customer bases.

Overall, with endogenous customer acquisition our model predicts short-termism as an equilibrium phenomenon, the importance of which is magnified by imperfections in the product markets. Our mechanism behind short-termism emphasizes switching costs as a source of friction to competition between firms. This mechanism is complementary to intra-organizational frictions (Thakor, 2017; Varas, 2017) or financing frictions (Thakor, 1990) as an explanation for short-termism.

From a theoretical perspective our analysis can be extended to a number of directions. Strictly speaking, our analysis focuses on a pool of consumers with no entry or exit, which means that firms can apply either the loyalty price or the

poaching price to each consumer. However, entering consumers would have no purchase history, and the therefore firms would have no basis to distinguish between a loyalty price and a poaching price as far as the pricing targeted to this category of consumers is concerned. Thus, in effect, the presence of entry of new consumers would extend the number of price instruments applied by each firm from two to three. Gehrig et al. (2011) have explored the implications of such an extension in number of consumer categories within the framework of history-based pricing with a different focus.

Overall, our analysis is conducted within a model with full market coverage. Within such a framework the result that short-termism induces relaxed competition at the stage when customer relationships are formed means that short-termism also induces a distributional conflict between consumers and firms. More precisely, firm owners benefit from the application of strategic short-termism at the expense of consumers. If we relaxed the assumption of full market coverage the effects of short-termism would be to expand the segment of consumers excluded at the stage when customer relationships are formed. It would be an interesting challenge for future research to compare this welfare loss induced by short-termism to the welfare loss associated with strategic delegation within the framework of sales-based incentive contracts characterized in the model by Sklivas (1987).

Furthermore, our analysis is also conducted under the assumption that the firms engage in symmetric competition, characterized by, for example, identical discount factors and no inherited market share asymmetries. It could yield many valuable insights if one extended our analysis to allow for these types of asymmetries. For example, Gehrig et al. (2012) explore the effects on profits and welfare of history-based price competition with inherited market dominance, but they do not consider business strategies associated with the acquisition and retention of customer relationships. However, as documented both theoretically and empirically by McGahan and Ghemawat (1994), firm size matters for customer retention, and those findings would justify a hypothesis that firm asymmetries could very well lead to interesting and systematic relationships between firm size and the degree of short-termism in the context of our model. This could be an interesting topic for future research.

Appendix A

Substituting $X^1 = X^0(1 - s_A^1) + (1 - X^0)s_B^1$ into (5) and rearranging yields

$$\begin{cases} \pi_A^{1+2} = X^0(1 - s_A^1)p_A^1 + (1 - X^0)s_B^1q_A^1 + \frac{\delta\sigma_2}{3}(X^0(1 - s_A^1) + s_B^1(1 - X^0) + \frac{1}{3}) \\ \pi_B^{1+2} = (1 - X^0)(1 - s_B^1)p_B^1 + X^0s_A^1q_B^1 + \frac{\delta\sigma_2}{3}((1 - X^0)(1 - s_B^1) + s_A^1X^0 + \frac{1}{3}) \end{cases} \tag{30}$$

or simply

$$\begin{cases} \pi_A^{1+2} = X^0(1 - s_A^1)(q_A^1 + \frac{\sigma_1}{3} + \frac{\delta\sigma_2}{3}) + (1 - X^0)s_B^1(q_A^1 + \frac{\delta\sigma_2}{3}) + \frac{\delta\sigma_2}{9} \\ \pi_B^{1+2} = (1 - X^0)(1 - s_B^1)(q_B^1 + \frac{\sigma_1}{3} + \frac{\delta\sigma_2}{3}) + X^0s_A^1(q_B^1 + \frac{\delta\sigma_2}{3}) + \frac{\delta\sigma_2}{9} \end{cases} \tag{31}$$

where we have exploited the fact that $p_i^1 = q_i^1 + \frac{\sigma_1}{3}$. Notice that the owners' discount factors are used when calculating the present value of profits since owners hire managers. Collecting the $(q_A^1 + \frac{\delta\sigma_2}{3})$ terms and rearranging yields

$$\begin{cases} \pi_A^{1+2} = [X^0 + s_B^1 - (s_A^1 + s_B^1)X^0](q_A^1 + \frac{\delta\sigma_2}{3}) + \frac{\sigma_1}{3}X^0(1 - s_A^1) + \frac{\delta\sigma_2}{9} \\ \pi_B^{1+2} = [(1 - X^0) - s_B^1 + X^0(s_A^1 + s_B^1)](q_B^1 + \frac{\delta\sigma_2}{3}) + \frac{\sigma_1}{3}(1 - X^0)(1 - s_B^1) + \frac{\delta\sigma_2}{9} \end{cases} \tag{32}$$

Finally substituting the expressions for equilibrium poaching prices, q_i^1 (with managers' discount factors), and market shares, s_A^1 and s_B^1 (with managers' discount factors), exploiting the fact that $s_A^1 + s_B^1 = 2/3$, and rearranging yields

$$\begin{cases} \pi_A^{1+2} = [X^0 + \frac{1}{3} - \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) - \frac{2}{3}X^0](\sigma_1\frac{1}{3} - \delta_A\sigma_2\frac{2}{9} - \delta_B\sigma_2\frac{1}{9} + \frac{\delta\sigma_2}{3}) \\ \quad + \frac{\sigma_1}{3}X^0(\frac{2}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_A - \delta_B)) + \frac{\delta\sigma_2}{9} \\ \pi_B^{1+2} = [(1 - X^0) - \frac{1}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) + \frac{2}{3}X^0](\sigma_1\frac{1}{3} - \delta_B\sigma_2\frac{2}{9} - \delta_A\sigma_2\frac{1}{9} + \frac{\delta\sigma_2}{3}) \\ \quad + \frac{\sigma_1}{3}(1 - X^0)(\frac{2}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A)) + \frac{\delta\sigma_2}{9} \end{cases} \tag{33}$$

Appendix B

In equilibrium, what level of managerial patience is optimal for the owners? Maximize profits w.r.t. the manager's discount rate. First order conditions:

$$\begin{cases} \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\sigma_1\frac{1}{3} - \delta_A\sigma_2\frac{2}{9} - \delta_B\sigma_2\frac{1}{9} + \frac{\delta\sigma_2}{3}) \\ \quad - \frac{2}{9}\sigma_2[X^0 + \frac{1}{3} - \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) - \frac{2}{3}X^0] + \sigma_1\frac{1}{9}\frac{1}{3}X^0\frac{\sigma_2}{\sigma_1} = 0 \\ \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\sigma_1\frac{1}{3} - \frac{2}{9}\delta_B\sigma_2 - \frac{1}{9}\delta_A\sigma_2 + \frac{\delta\sigma_2}{3}) \\ \quad - \frac{2}{9}\sigma_2[(1 - X^0) - \frac{1}{3} + \frac{1}{9}\frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) + \frac{2}{3}X^0] + \sigma_1\frac{1}{9}\frac{1}{3}(1 - X^0)\frac{\sigma_2}{\sigma_1} = 0 \end{cases} \tag{34}$$

Notice that the second derivatives are globally negative so that we have global maxima. Moreover the first order conditions are linear in discount factors so that reaction functions have a constant slope. Simple calculations reveal that the slope of the reaction functions is equal to 1/4. It is also easy to check that the first derivative is negative when $\delta_A = \delta_B = 0$ if $\sigma_1 = \sigma_2$, suggesting a symmetric equilibrium with fully myopic managers.

Multiplying by 9 yields

$$\begin{cases} \frac{\sigma_2}{\sigma_1}(\sigma_1 \frac{1}{3} - \delta_A \sigma_2 \frac{2}{9} - \delta_B \sigma_2 \frac{1}{9} + \frac{\delta \sigma_2}{3}) \\ -2\sigma_2[X^0 + \frac{1}{3} - \frac{1}{9} \frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) - \frac{2}{3}X^0] + \sigma_1 \frac{1}{3}X^0 \frac{\sigma_2}{\sigma_1} = 0 \\ \frac{\sigma_2}{\sigma_1}(\sigma_1 \frac{1}{3} - \frac{2}{9}\delta_B \sigma_2 - \frac{1}{9}\delta_A \sigma_2 + \frac{\delta \sigma_2}{3}) \\ -2\sigma_2[(1 - X^0) - \frac{1}{3} + \frac{1}{9} \frac{\sigma_2}{\sigma_1}(\delta_B - \delta_A) + \frac{2}{3}X^0] + \sigma_1 \frac{1}{3}(1 - X^0) \frac{\sigma_2}{\sigma_1} = 0 \end{cases} ,$$

Rearranging yields

$$\begin{cases} \delta_A \sigma_2 \frac{1}{\sigma_1} \frac{4}{9} = \frac{1}{\sigma_1}(\sigma_1 \frac{1}{3} + \delta_B \sigma_2 \frac{1}{9} + \frac{\delta \sigma_2}{3}) - 2[X^0 + \frac{1}{3} - \frac{2}{3}X^0] + \frac{1}{3}X^0 \\ \delta_B \sigma_2 \frac{1}{\sigma_1} \frac{4}{9} = \frac{1}{\sigma_1}(\sigma_1 \frac{1}{3} + \frac{1}{9}\delta_A \sigma_2 + \frac{\delta \sigma_2}{3}) - 2[(1 - X^0) - \frac{1}{3} + \frac{2}{3}X^0] + \frac{1}{3}(1 - X^0) \end{cases} ,$$

Solving the system for δ_A and δ_B yields

$$\begin{cases} \delta_A = \delta - \frac{\sigma_1}{\sigma_2} \frac{6}{5}(1 + \frac{X^0}{2}) \\ \delta_B = \delta - \frac{\sigma_1}{\sigma_2} \frac{6}{5}(1 + \frac{1-X^0}{2}) \end{cases}$$

Furthermore if $\sigma_1 = \sigma_2$ then

$$\begin{cases} \delta_A = \delta - \frac{6}{5} - \frac{3}{5}X^0 \\ \delta_B = \delta - \frac{6}{5} - \frac{3}{5}(1 - X^0), \end{cases}$$

and thus the solution is not interior but in fact $\delta_B = \delta_A = 0$. If $X^0 = 1 - X^0 = 1/2$ then $\delta_B = \delta_A > 0$ iff $\frac{\sigma_1}{\sigma_2} < \frac{2}{3}\delta$ which requires that $\sigma_2 > \frac{3}{2\delta}\sigma_1$.

Appendix C

In the infinite period problem the firms maximize discounted profits by choosing poaching and incumbent prices in each period

$$\begin{aligned} \max_{\{p_A, q_A\}_{t=1}^{\infty}} & \sum_{t=1}^{\infty} \delta_A^{t-1} [X^{t-1}(1 - s_A^t)p_A^t + (1 - X^{t-1})s_B^t q_A^t] \\ \max_{\{p_B, q_B\}_{t=1}^{\infty}} & \sum_{t=1}^{\infty} \delta_B^{t-1} [X^{t-1}s_A^t q_B^t + (1 - X^{t-1})(1 - s_B^t)p_B^t]. \end{aligned}$$

subject to the law of motion $X' = X(1 - s_A(p_A, q_B)) + (1 - X)s_B(p_B, q_A)$. Let's assume now for simplicity that $\sigma_t = \sigma_{t'} = \sigma$ for any t and t' . The problem can be written in equivalent terms as

$$\begin{aligned} v_A(X) &= \max_{p_A, q_A} [X(1 - s_A)p_A + (1 - X)s_B q_A + \delta_A v_A(X')] \\ v_B(X) &= \max_{p_B, q_B} [Xs_A q_B + (1 - X)(1 - s_B)p_B + \delta_B v_B(X')], \end{aligned}$$

subject to $X' = X(1 - s_A(p_A, q_B)) + (1 - X)s_B(p_B, q_A)$. The first-order conditions are given by

$$\begin{cases} X\{(1 - s_A) - [p_A + \delta_A v'_A(X')] \frac{\partial s_A}{\partial p_A}\} = 0 & (p_A) \\ (1 - X)\{s_B + [q_A + \delta_A v'_A(X')] \frac{\partial s_B}{\partial q_A}\} & (q_A) \\ (1 - X)\{(1 - s_B) - [p_B + \delta_B v'_B(X')] \frac{\partial s_B}{\partial p_B}\} = 0 & (p_B) \\ X\{s_A + [q_B + \delta_B v'_B(X')] \frac{\partial s_A}{\partial q_B}\} = 0, & (q_B) \end{cases}$$

where

$$\frac{\partial s_i}{\partial p_i} = s_i^1 = \frac{1 + \frac{\partial \eta(\psi_i - \psi_j)}{\partial p_i}}{\sigma}$$

so if

$$\frac{\partial \psi_i}{\partial p_i} = \frac{\partial \psi_j}{\partial p_i}$$

we have

$$\begin{cases} X\{(1-s_A) - [p_A + \delta_A v'_A(X')]\frac{1}{\sigma}\} = 0 & (p_A) \\ (1-X)\{s_B - [q_A + \delta_A v'_A(X')]\frac{1}{\sigma}\} = 0 & (q_A) \\ (1-X)\{(1-s_B) - [p_B + \delta_B v'_B(X')]\frac{1}{\sigma}\} = 0 & (p_B) \\ X\{s_A - [q_B + \delta_B v'_B(X')]\frac{1}{\sigma}\} = 0. & (q_B) \end{cases}$$

This implies that $p_i - q_j = \sigma(1 - 2s_A) + [\delta_i v'_i(X') - \delta_j v'_j(X')]$ and thus

$$s_i = \frac{p_i - q_j}{\sigma} \Leftrightarrow \frac{1}{3} + \frac{\delta_i v'_i(X') - \delta_j v'_j(X')}{3\sigma},$$

where

$$v'_A(X') = (1 - s_{A,t+1})p_{A,t+1} - s_{B,t+1}q_{A,t+1}$$

and

$$v'_B(X') = -(1 - s_{B,t+1})p_{B,t+1} - s_{A,t+1}q_{B,t+1},$$

and stationarity of the equilibrium implies that $v'_A(X') = (1 - s_A)p_A - s_B q_A$ and $v'_B(X') = -(1 - s_B)p_B - s_A q_B$.

Let us solve for the equilibrium prices. From the four first order conditions, we get

$$\begin{cases} p_A = \sigma(1 - s_A) - \delta_A v'_A(X') \\ q_A = \sigma s_B - \delta_A v'_A(X') \\ p_B = \sigma(1 - s_B) - \delta_B v'_B(X') \\ q_B = \sigma s_A - \delta_B v'_B(X'). \end{cases}$$

Substituting from $s_i = \frac{p_i - q_j}{\sigma}$ yields

$$\begin{cases} p_A = \sigma - p_A + q_B - \delta_A v'_A(X') \\ q_A = p_B - q_A - \delta_A v'_A(X') \\ p_B = \sigma - p_B + q_A - \delta_B v'_B(X') \\ q_B = p_A - q_B - \delta_B v'_B(X'). \end{cases}$$

This implies that

$$p_i = \frac{2}{3}\sigma - \frac{2}{3}\delta_i v'_i(X') - \frac{1}{3}\delta_j v'_j(X')$$

and

$$q_j = \frac{1}{3}\sigma - \frac{2}{3}\delta_j v'_j(X') - \frac{1}{3}\delta_i v'_i(X').$$

Since we are interested in a stationary equilibrium, we have $X' = X(1 - s_A) + (1 - X)s_B = X$ and thus the stationary market shares equal

$$1 - X = \frac{s_A}{s_A + s_B} = \frac{p_A - q_B}{p_A - q_B + p_B - q_A}$$

and

$$X = \frac{s_B}{s_A + s_B} = \frac{p_B - q_A}{p_A - q_B + p_B - q_A}$$

Given the equilibrium price expressions above, this implies that

$$\frac{\partial X}{\partial \delta_A} > 0$$

and

$$\frac{\partial X}{\partial \delta_B} < 0.$$

Stationary periodic profits are thus equal to

$$\begin{cases} \pi_A = X(1 - s_A)p_A + (1 - X)s_B q_A \\ = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left(1 - \frac{p_A - q_B}{\sigma}\right) p_A + \frac{p_A - q_B}{p_A - q_B + p_B - q_A} \frac{p_B - q_A}{\sigma} q_A \\ \pi_B = X s_A p_A + (1 - X)(1 - s_B)p_B \\ = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left(\frac{p_A - q_B}{\sigma}\right) q_B + \frac{p_A - q_B}{p_A - q_B + p_B - q_A} \left(1 - \frac{p_B - q_A}{\sigma}\right) p_B, \end{cases}$$

where all prices depend on the discount factors. These expressions are equivalent with

$$\begin{cases} \pi_A = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left(1 - \frac{p_A - q_B}{\sigma}\right) p_A + \left(1 - \frac{p_B - q_A}{p_A - q_B + p_B - q_A}\right) \frac{p_B - q_A}{\sigma} q_A \\ \pi_B = \left(1 - \frac{p_A - q_B}{p_A - q_B + p_B - q_A}\right) \left(\frac{p_A - q_B}{\sigma}\right) q_B + \left(\frac{p_A - q_B}{p_A - q_B + p_B - q_A}\right) \left(1 - \frac{p_B - q_A}{\sigma}\right) p_B. \end{cases}$$

Thus

$$\begin{cases} \pi_A = \frac{p_B - q_A}{p_A - q_B + p_B - q_A} \left[\left(1 - \frac{p_A - q_B}{\sigma}\right) p_A - \frac{p_B - q_A}{\sigma} q_A \right] + \frac{p_B - q_A}{\sigma} q_A \\ \pi_B = \left(\frac{p_A - q_B}{\sigma}\right) q_B + \left(\frac{p_A - q_B}{p_A - q_B + p_B - q_A}\right) \left[\left(1 - \frac{p_B - q_A}{\sigma}\right) p_B - \left(\frac{p_A - q_B}{\sigma}\right) q_B \right]. \end{cases}$$

Notice that $p_j - q_i = -(p_i - q_j) + \frac{2}{3}\sigma$. Thus $1 - \frac{p_i - q_j}{\sigma} = 1 + \frac{p_j - q_i - \frac{2}{3}\sigma}{\sigma} = \frac{1}{3} + \frac{p_j - q_i}{\sigma}$. Substituting into the two equations above and collecting the $\frac{p_B - q_A}{\sigma}$ terms yields

$$\begin{cases} \pi_A = (p_B - q_A) \left(\frac{\frac{1}{3} p_A}{p_A - q_B + p_B - q_A} + \frac{1}{\sigma} \left(\frac{p_B - q_A}{p_A - q_B + p_B - q_A} (p_A - q_A) + q_A \right) \right) \\ \pi_B = (p_A - q_B) \left(\frac{\frac{1}{3} p_B}{p_A - q_B + p_B - q_A} + \frac{1}{\sigma} \left(\frac{p_A - q_B}{p_A - q_B + p_B - q_A} (p_B - q_B) + q_B \right) \right). \end{cases}$$

Notice also that $p_A - q_B + p_B - q_A = \frac{1}{3}\sigma - \frac{1}{3}\delta_A v'_A(X') + \frac{1}{3}\delta_B v'_B(X') + \frac{1}{3}\sigma - \frac{1}{3}\delta_B v'_B(X') + \frac{1}{3}\delta_A v'_A(X') = \frac{2}{3}\sigma$ and $p_A - q_A = \frac{1}{3}\sigma$. Thus

$$\begin{cases} \pi_A = (p_B - q_A) \left(\frac{\frac{1}{3} p_A}{\frac{2}{3}\sigma} + \frac{1}{\sigma} \frac{p_B - q_A}{\frac{2}{3}\sigma} \frac{1}{3}\sigma + \frac{q_A}{\sigma} \right) \\ \pi_B = (p_A - q_B) \left(\frac{\frac{1}{3} p_B}{\frac{2}{3}\sigma} + \left(\frac{1}{\sigma} \frac{p_A - q_B}{\frac{2}{3}\sigma} \frac{1}{3}\sigma + \frac{q_B}{\sigma} \right) \right), \end{cases}$$

which is equivalent with

$$\begin{cases} \pi_A = \frac{1}{2\sigma} (p_B - q_A) (p_A + p_B + q_A) \\ \pi_B = \frac{1}{2\sigma} (p_A - q_B) (p_A + p_B + q_B) \end{cases},$$

where $(p_i + q_j) = \sigma - \delta_A v'_A(X') - \delta_B v'_B(X')$ and $p_i - q_j = \frac{1}{3}\sigma - \frac{1}{3}\delta_i v'_i(X') + \frac{1}{3}\delta_j v'_j(X')$ and $p_i = \frac{2}{3}\sigma - \frac{2}{3}\delta_i v'_i(X') - \frac{1}{3}\delta_j v'_j(X')$. Substituting these into the two equations above yields

$$\begin{cases} \pi_A = \frac{1}{18\sigma} (\sigma - \delta_B v'_B(X') + \delta_A v'_A(X')) (5\sigma - 5\delta_A v'_A(X') - 4\delta_B v'_B(X')) \\ \pi_B = \frac{1}{18\sigma} (\sigma - \delta_A v'_A(X') + \delta_B v'_B(X')) (5\sigma - 5\delta_B v'_B(X') - 4\delta_A v'_A(X')). \end{cases}$$

The net present value of profit flows in stationary equilibrium are thus

$$\begin{cases} \frac{1}{1-\delta} \pi_A = \frac{1}{1-\delta} \frac{1}{18\sigma} (\sigma - \delta_B v'_B(X') + \delta_A v'_A(X')) (5\sigma - 5\delta_A v'_A(X') - 4\delta_B v'_B(X')) \\ \frac{1}{1-\delta} \pi_B = \frac{1}{1-\delta} \frac{1}{18\sigma} (\sigma - \delta_A v'_A(X') + \delta_B v'_B(X')) (5\sigma - 5\delta_B v'_B(X') - 4\delta_A v'_A(X')). \end{cases}$$

The owners maximize profits by hiring managers who differ when it comes to their patience δ_i . The reaction functions can be solved from the first order conditions:

$$\begin{cases} \frac{\partial \frac{1}{1-\delta} \pi_A}{\partial \delta_A} = \frac{1}{1-\delta} \frac{1}{18\sigma} v'_A(X') [-10\delta_A v'_A(X') + \delta_B v'_B(X')] = 0 \\ \frac{\partial \frac{1}{1-\delta} \pi_B}{\partial \delta_B} = \frac{1}{1-\delta} \frac{1}{18\sigma} v'_B(X') [-10\delta_B v'_B(X') + \delta_A v'_A(X')] = 0. \end{cases}$$

Thus optimal reactions are characterized by

$$\delta_A = \delta_B \frac{v'_B(X')}{10v'_A(X')}$$

and

$$\delta_B = \delta_A \frac{v'_A(X')}{10v'_B(X')}.$$

In a stationary equilibrium $v'_B(X') = v'_A(X')$ and thus $\delta_A = 0 = \delta_B$ is the unique symmetric equilibrium.

Appendix D

This appendix presents the details of an analysis of a model where there are n firms along a Salop-circle competing for market shares and, in the second period, each firm has a customer relationship with a fraction of customers with idiosyncratic switching costs and the other $n - 1$ firms can make poaching offers to these customers.

In the second period, for each firm i 's customers, the other $n - 1$ firms can make poaching offers to these customers. They compete with zero production costs and thus Bertrand competition leads to zero poaching price, $q_j = 0$ for $j \neq i$. The incumbent price can be solved as before from

$$X_i^1 (1 - s_i^2) - \frac{1}{\sigma_2} X_i^1 p_i^2 = 0,$$

where

$$s_i^2 = \frac{p_i - \min_{j \neq i} \{q_j\}}{\sigma_2},$$

and $\min_{j \neq i} \{q_j\} = 0$. Solving for the loyalty and poaching prices yields $p_i^{2*} = \sigma_2/2$ and $q_i^{2*} = 0$ and the associated equilibrium profits in period 2 are

$$\pi_i^{2*} = X^1 \sigma_2 / 4. \quad (35)$$

In the first period, the n firms compete à la Salop. We focus on the case where $t = 1$. This is particularly well justified as we want to distinguish the effects of the number of firms from those of an increase in the transportation cost parameter that was analyzed in the Hotelling model.

The market share of firm i equals

$$\frac{1}{n} + \frac{(p_{i+1}^1 - p_i^1) - (p_i^1 - p_{i-1}^1)}{2}.$$

In period 1, the firms' managers maximize discounted profits using the contracted discount factor δ_i

$$\max_{p_i^1} \{X_i^1 p_i^1 + \delta_i \pi_i^2\} = \max_{p_i^1} X_i^1 \left\{ p_i^1 + \delta_i \frac{\sigma}{4} \right\}$$

The first-order condition is given by

$$\frac{\partial X_i^1}{\partial p_i^1} \left\{ p_i^1 + \delta_i \frac{\sigma}{4} \right\} + X_i^1 = 0,$$

and, thus, the optimal price is characterized by the system

$$p_i^1 = A - \delta_i B + \frac{(p_{i+1}^1 + p_{i-1}^1)}{4},$$

where $A = 1/2n$ och $B = \sigma/8$.

In a symmetric equilibrium with identical managerial discount factors δ_M the symmetric equilibrium price equals

$$p_i^{1*} = 2A - 2B\delta_M$$

so that price depends on n only through A and this dependence is negative.

The profit function can be written as

$$\Gamma_i = \left(p_i^1 + \delta \frac{\sigma}{4} \right) X_i^1,$$

where δ is the owner's discount factor (equal across firms). The first-order condition w.r.t. firm i 's managerial discount factor equals

$$\frac{\partial \Gamma_i}{\partial \delta_i} = \frac{\partial p_i^1}{\partial \delta_i} X_i^1 + \left(p_i^1 + \delta \frac{\sigma}{4} \right) \frac{\partial X_i^1}{\partial \delta_i} = 0.$$

In a symmetric equilibrium we have $p_{i-1}^1 = p_{i+1}^1 = p_i^1 = p^* = 2A - 2B\delta_M$ and $X_i^1 = 1/n$. Moreover

$$\frac{\partial p_i^1}{\partial \delta_i} = \frac{\partial \left(A - \delta_i B + \frac{(p_{i+1}^1 + p_{i-1}^1)}{4} \right)}{\partial \delta_i} = -B + \frac{2}{4} \frac{\partial p_{i+1}^1}{\partial p_i} \frac{\partial p_i}{\partial \delta_i} = -B + \frac{1}{2} \frac{1}{4} \frac{\partial p_i}{\partial \delta_i}.$$

Solving for $\partial p_i^1 / \partial \delta_i$ gives

$$\frac{\partial p_i^1}{\partial \delta_i} = -\frac{8}{7} B.$$

Moreover,

$$\begin{aligned} \frac{\partial X_i^1}{\partial \delta_i} &= \frac{\partial \left(\frac{1}{n} + \frac{p_{i+1}^1 + p_{i-1}^1 - 2p_i^1}{2} \right)}{\partial \delta_i} = \frac{1}{2} \frac{\partial (p_{i+1}^1 + p_{i-1}^1 - 2p_i^1)}{\partial \delta_i} = \frac{\left(\frac{\partial p_{i+1}^1}{\partial p_i} + \frac{\partial p_{i-1}^1}{\partial p_i} - 2 \right)}{2} \frac{\partial p_i^1}{\partial \delta_i} \\ &= \frac{\left(\frac{1}{4} + \frac{1}{4} - 2 \right)}{2} \frac{\partial p_i^1}{\partial \delta_i} = -\frac{3}{4} \frac{\partial p_i^1}{\partial \delta_i} = \frac{6}{7} B. \end{aligned}$$

Thus

$$\frac{\partial p_i^1}{\partial \delta_i} X_i^1 + \left(p_i^1 + \delta \frac{\sigma}{4} \right) \frac{\partial X_i^1}{\partial \delta_i} = -\frac{8}{7n} B + \left(2A - 2B\delta_M + \delta \frac{\sigma}{4} \right) \frac{6}{7} B = 0,$$

which is equivalent to

$$\delta_M = \delta - \frac{4}{3\sigma n}.$$

Clearly, δ_M is always smaller than δ , meaning that the equilibrium is characterized by short-termism. Further $\delta_M > 0$ if $\sigma > \frac{4}{3\delta n}$.

References

- Acquisti, A., Varian, H.R., 2005. Conditioning prices on purchase history. *Mark. Sci.* 24, 367–381.
- Barcelona-Ruiz, J.C., Espinosa, M.P., 1996. Long-term or short-term managerial incentive contracts. *J. Econ. Manag. Strateg.* 5, 343–359.
- Blattberg, R.C., Malthouse, E.C., Neslin, S.A., 2009. Customer lifetime value: empirical generalizations and some conceptual questions. *J. Interact. Mark.* 23, 157–168.
- Bolton, P.J., Scheinkman Xiong, W., 2006. Executive compensation and short-termist behavior in speculative markets. *Rev. Econ. Stud.* 73, 577–610.
- Boot, A., Ratnovski, L., 2016. Banking and trading. *Rev. Financ.* 20, 2219–2246.
- Brander, J., Lewis, T., 1986. Oligopoly and financial structure: the limited liability effect. *Am. Econ. Rev.* 76, 956–970.
- Brander, J., Spencer, B., 1985. Export subsidies and international market share rivalry. *J. Int. Econ.* 18, 83–100.
- Brunetti, M., Ciciretti, R., Djordjevic, L., 2016. The determinants of household's bank switching. *J. Financ. Stud.* 26, 175–189.
- Burks, S., Carpenter, J., Götte, L., Rustichini, A., 2012. Which measures of time preference best predict outcomes: evidence from a large-scale field experiment. *J. Econ. Behav. Organ.* 84, 308–320.
- Burks, S.V., Carpenter, J., Götte, L., Monaco, K., Porter, K., Rustichini, A., 2008. Using behavioral economic field experiments at a firm: the context and design of the truckers and turnover project. In: *The Analysis of Firms and Employees: Quantitative and Qualitative Approaches*. University of Chicago Press, pp. 45–106.
- Burks, S.V., Carpenter, J.P., Goette, L., Rustichini, A., 2009. Cognitive skills affect economic preferences, strategic behavior, and job attachment. *Proc. Natl. Acad. Sci.* 106, 7745–7750.
- Caillaud, B., De Nijs, R., 2014. Strategic loyalty reward in dynamic price discrimination. *Mark. Sci.* 33, 725–742.
- Casamatta, C., Pouget, S., 2015. Fund Managers' Contracts and Financial Markets' Short-Termism'. Toulouse School of Economics. Working Paper.
- Chen, Y., 1997. Paying customers to switch. *J. Econ. Manag. Strat.* 6, 877–897.
- Darrough, M., 1987. Managerial incentives for short-term results: a comment. *J. Finance.* 42, 1097–1102.
- Dasgupta, S., Li, X., Wang, A., 2017. Product market competition shocks, firm performance, and forced CEO turnover. *Rev. Financ. Stud.* doi:10.1093/rfs/hhx129. Forthcoming.
- Davies, R., Haldane, A.G., Nielsen, M., Pezzini, S., 2014. Measuring the costs of short-termism. *J. Financ. Stud.* 12, 16–25.
- Dwyer, R., Schurr, P., Oh, S., 1987. Developing buyer-seller relationships. *J. Mark.* 51, 11–27.
- Esteves, R.B., 2010. Pricing with customer recognition. *Int. J. Ind. Organ.* 28, 669–681.
- Fershtman, C., Judd, K., 1987. Equilibrium incentives in oligopoly. *Am. Econ. Rev.* 77, 927–940.
- Fershtman, C., Judd, K., Kalai, E., 1991. Observable contracts: strategic delegation and cooperation. *Int. Econ. Rev.* 32, 551–559.
- Fudenberg, D., Tirole, J., 2000. Customer poaching and brand switching. *RAND J. Econ.* 31, 634–657.
- Gehrig, T., Shy, O., Stenbacka, R., 2011. History-based price discrimination and entry in markets with switching costs: a welfare analysis. *Eur. Econ. Rev.* 55, 732–739.
- Gehrig, T., Shy, O., Stenbacka, R., 2012. A welfare evaluation of history-based price discrimination. *J. Ind. Compet. Trade.* 12, 373–393.
- Gehrig, T., Stenbacka, R., 2004. Differentiation-induced switching costs and poaching. *J. Econ. Manag. Strat.* 13, 635–655.
- Haldane, A., Davies, R., 2011. *The Short Long*. Bank of England.
- Han, M., 2012. Short-Term Managerial Contracts and Cartels. SFB discussion paper 2012-057. Humboldt-Universität zu Berlin, Berlin.
- Heidhues, P., Köszegi, B., 2010. Exploiting naivete about self-control in the credit market. *Am. Econ. Rev.* 100, 2279–2303.
- Holden, C.W., Subrahmanyam, A., 1996. Risk aversion, liquidity, and endogenous short horizons. *Rev. Financ. Stud.* 9, 691–722.
- Hortaçsu, A., Syverson, C., 2004. Product differentiation, search costs, and competition in the mutual fund industry: a case study of S&P 500 index funds. *Q. J. Econ.* 119, 403–456.
- Jing, B., 2015. Customer recognition in experience vs. inspection good markets. *Manag. Sci.* 62, 216–224.
- Kaplan, S., Minton, B., 2012. How has CEO turnover changed? *Int. Rev. Finance* 12, 57–81.
- Katz, M., 1991. Game-playing agents: unobservable contracts as precommitments. *RAND J. Econ.* 22, 307–322.
- Kay, J., 2012. The Kay Review of UK Equity Markets and Long-Term Decision Making. Final Report. July 2012, London.
- Kim, M., Kliger, D., Vale, B., 2003. Estimating switching costs and oligopolistic behavior. *J. Financ. Intermed.* 12, 25–56.
- Kiser, E.K., 2002. Predicting household switching behavior and switching costs at depository institutions. *Rev. Ind. Organ.* 20, 349–365.
- Kockesen, L., 2007. Unobservable contracts as pre commitments. *Econ. Theory* 31, 539–552.
- Kockesen, L., Ok, E., 2004. Strategic delegation by unobservable incentive contracts. *Rev. Econ. Stud.* 71, 397–424.
- Laibson, D., Repetto, A., Tobacman, J., 2003. A debt puzzle. In: Aghion, P., Frydman, R., Stiglitz, J., Woodford, M. (Eds.), *Knowledge, Information, and Expectations in Modern Economics: In Honor of Edmund S. Phelps*. Princeton University Press, Princeton, pp. 228–266.
- Lambertini, L., Trombetta, M., 2002. Delegation and firms' ability to collude. *J. Econ. Behav. Organ.* 47, 359–373.
- Marinovic, I., Varas, F., 2017. CEO Horizon, Optimal Pay Duration and the Escalation of Short-Termism. Duke University. Working Paper July 2017.
- Martin, C., 2002. Managing for the Short-term: The New Rules for Running a Business in a Day-to-day World. Doubleday, New York, USA.
- Mayer, C., 2012. Short-termism is a very british problem. *Financ. Times*. 19 July 2012.
- McGahan, A.M., Ghemawat, P., 1994. Competition to retain customers. *Market. Sci.* 13, 165–176.
- Narayanan, M., 1985a. Managerial incentives for short-term results. *J. Finance* 40, 1469–1484.
- Narayanan, M., 1985b. Observability and the payback criterion. *J. Bus.* 58, 309–323.
- Pazgal, A., Soberman, D., 2008. Behavior-based discrimination: is it a winning play, and if so, when? *Mark. Sci.* 27, 977–994.
- Persson, T., Tabellini, G., 1990. Macroeconomic Policy, Credibility and Politics. Harwood Academic Publishers. Chur, London, Paris, New York.
- Poterba, J., Summers, L., 1995. A CEO survey of U.S. companies' time horizons and hurdle rates. *Sloan Manag. Rev.* 37, 43–53.
- Reinartz, J., Thomas, J., Kumar, V., 2005. Balancing acquisition and retention resources to maximize customer profitability. *J. Mark.* 69, 63–79.
- Reitman, D., 1993. Stock options and the strategic use of managerial incentives. *Am. Econ. Rev.* 83, 513–524.
- Rogoff, K., 1985. The optimal degree of commitment to an intermediate monetary target. *Q. J. Econ.* 100, 1169–1190.
- Shin, J., Sudhir, K., 2010. A customer management dilemma: when is it profitable to reward one's own customers? *Mark. Sci.* 29, 671–689.
- Shy, O., 2002. A quick-and-easy method for estimating switching costs. *Int. J. Ind. Organ.* 20, 71–87.
- Sklivas, S., 1987. The strategic choice of managerial incentives. *RAND J. Econ.* 18, 452–458.

- Spagnolo, G., 2000. Stock-related compensation and product-market competition. *RAND J. Econ.* 31, 22–42.
- Stahl, F., Heitmann, M., Lehmann, D.R., Neslin, S.A., 2012. The impact of brand equity on customer acquisition, retention, and profit margin. *J. Mark.* 76, 44–63.
- Stein, J., 1989. Efficient capital markets, inefficient firms: a model of myopic corporate behavior. *Q. J. Econ.* 104, 655–669.
- Taylor, C.R., 2003. Supplier surfing: competition and consumer behavior in subscription markets. *RAND J. Econ.* 34, 223–246.
- Terry, S. (2015). *The Macro Impact of Short-Termism*. Boston University Working Paper, July 2015.
- Thakor, A.V., 1990. Investment myopia and the internal organization of capital allocation decisions. *J. Law Econ. Organ.* 6, 129–154.
- Thakor, R., 2017. *A Theory of Efficient Short-Termism*. Working Paper. University of Minnesota.
- Varas, F., 2017. Managerial short-termism, turnover policy, and the dynamics of incentives. *Rev. Financ. Stud.* doi:10.1093/rfs/hhx088. Forthcoming.
- Venkatesan, R., Kumar, V., 2004. A customer lifetime value framework for customer selection and resource allocation strategy. *J. Mark.* 68, 106–125.
- Vickers, J., 1985. Delegation and the theory of the firm. *Econ. J.* 95, 138–147.
- Villaneuva, J., Bhardwaj, P., Balasubramanian, S., Chen, Y., 2007. Customer relationship management in competitive environments: the positive implications of a short-term focus. *Quant. Market. Econ.* 5, 99–129.
- Villas-Boas, J.M., 1999. Dynamic competition with customer recognition. *RAND J. Econ.* 30, 604–631.
- Zhang, J., 2011. The perils of behavior-based personalization. *Market. Sci.* 30, 170–186.