Strategy Dynamics through a Demand-Based Lens: The evolution of market boundaries, resource rents, and competitive positions

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Abstract

We adapt formal models of competition with differentiated products to address the evolution of market boundaries, resource rents, and competitive positions. Our model captures the central strategy insight that competitive interactions are governed by superior value creation and competitive advantage. More importantly, it shows how the interplay between improving technologies and consumers’ valuation of the resulting performance improvements affects which market segments new technologies are able to enter, how the rents from different types of resources change over time, and whether or not markets are segmented according to classic generic strategies.

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1. Introduction

In addressing the question of how to achieve superior performance in competitive market settings, the strategy literature offers two alternative approaches. The competitive strategy school (e.g., Porter, 1980) offers insight into how a firm’s industry and its choice of position affects its performance. The resource based school (e.g., Wernerfelt, 1984) explores how a firm’s unique resources and capabilities can be deployed to yield above average returns. While their joint contribution has advanced our understanding of firm performance, there is a sense in the field that more could be done to illuminate how the returns to both industry positions and firm resources evolve over time (Porter, 1991; Foss 1997) – the dynamics of strategy.

In considering these dynamics, we find three questions to be of particular interest: (i) How do industry boundaries change over time? (ii) How do resource rents change over time? (iii) How does optimal positioning within an industry change over time? We address these distinct questions using a formal model adapted from the product differentiation literature. The model allows us to explicitly address consumer choice and value creation in a way that complements the strategy field’s traditional focus on competition and value capture. Just as Lippman and Rumelt (1982) used a simple model to demonstrate the importance of barriers to imitation for explaining firm performance, we seek to demonstrate the importance of these demand-based elements for understanding strategy dynamics. Our approach builds on prior work that has elaborated a demand-based perspective of technology competition (Adner and Zemsky, 2002; Adner, 2002) and technology evolution (Adner and Levinthal, 2001).

The origin of dynamics in our model is that the quality of product and service offers improves over time. We interpret quality improvement broadly (e.g., the increasing speed of microprocessors; the increasing safety of automobiles; the increasing breadth and timeliness of financial information). Beyond the supply-side, we focus on the effect on strategy dynamics of consumers’ taste for quality and the extent to which they have a decreasing willingness to pay for quality improvements. We allow for consumer heterogeneity by grouping consumers into market segments based on their willingness
to pay for quality. To be sure, these demand-side elements are familiar to strategy thinking. They are, however, usually peripheral. By placing them at the center of our analysis, we generate new insights and offer a new angle of attack for understanding how both firm performance and firm strategies changes over time.

The paper proceeds as follows. In Section 2 we introduce a simple model of competition between differentiated duopolists. In Section 3 we formally define competitive advantage and value creation in the context of our model and show how these concepts govern competitive interactions at a point in time. In Section 4, we use the model to examine the evolution of market boundaries over time: whether a new offer enters a market segment; if so, when it enters; and finally, whether this entry is permanent or temporary. In Section 5, we characterize how the rents from different types of resources change over time. The analysis in sections 4 and 5 is for one market segment and a single resource. In section 6, we show how this analysis can be aggregated to look at the evolution of market boundaries and rents when there are multiple market segments and multiple resources. In Section 7, we turn to firms’ choice of competitive positions. We first characterize whether or not the classic generic strategies (Cost Leader and Differentiator) dominate “Generalists” that seek to appeal to both high and low-end segments. We then look at how competitive positioning evolves as technologies improve over time. Section 8 concludes.

2. The Model

We borrow three important elements from traditional models of product differentiation (e.g., Hotelling 1929; Shaked and Sutton, 1987). The first is heterogeneity of both consumers and offers. Specifically, offers differ in their quality levels and consumers differ in their willingness to pay for a given level of quality. Second, we assume a discrete choice setting where each consumer either buys a single unit of one offer or buys nothing at all. Finally, we assume Bertrand (i.e. price) competition. We deviate from standard differentiation models by grouping consumers into discrete market segments and by assuming that technologies improve over time. The specifics of the model are
as follows.

2.1. Supply-Side

There are two firms that each produce a single product or service offer. We index the firms and their offers by $i = 1, 2$. Firm $i$ bears a marginal cost in producing its offer of $c_i > 0$. The quality of an offer at time $t$ depends on the level of a key attribute, which we denote $x_i(t)$ for offer $i$. We make two different assumption about how the quality of offers changes over time. In Sections 4–6, we assume that $x_i(t)$ improves along an exogenously given trajectory. In Section 7, we assume that firms choose quality levels along a cost-quality frontier that is itself shifting out over time. Details are given in subsequent sections.

2.2. Demand-Side

Consumers are divided into market segments based on their willingness to pay for offers (i.e., the benefit they receive from consuming the offer). Through Section 5, we focus on a single segment. We denote by $s$ the number of consumers in this segment. We denote by $w_i$ the segment’s willingness to pay for offer $i$. We decompose willingness to pay into two components. The first is the offer’s quality as perceived by the segment $q(x_i)$, which we assume to be an increasing function of the key attribute.\footnote{For expositional simplicity, we will sometimes drop the explicit reference to time dependence. Here, for example, we write $q(x_i)$ for $q(x_i(t))$.} The second component is the segment’s taste, or ability to pay, for quality, which we parameterize by $a$. Willingness to pay for offer $i$ at time $t$ is then $w_i(t) = aq(x_i)$. We introduce decreasing willingness to pay for quality improvement by assuming that $q(x_i) = x_i^\beta$ where $\beta \in (0, 1)$. That is, we assume that consumers have a decreasing marginal utility (DMU) from the key attribute. For $x_i > 1$, DMU is decreasing in $\beta$, while for $x_i < 1$ DMU is increasing in $\beta$. We restrict attention to $x_i > 1$ so that $\beta$ has an unambiguous effect on DMU.

Denote by $p_i$ the price that firm $i$ quotes to the segment. We assume that consumers
buy one unit of the offer that gives them the greatest surplus (or delivered value), \( w_i - p_i \), unless this is negative for both offers, in which case they make no purchase.\(^2\)

### 2.3. Discussion of Model

Although consumer heterogeneity is usually modeled as a uniform continuous distribution (e.g., most work on Hotelling’s linear city), we find that discrete segmentation is a more realistic description of heterogeneity in many settings.\(^3\) Examples of discrete heterogeneity include personal versus professional users, differences across national markets, and differences across industry sectors (for business-to-business markets). In principle, segments can differ in a variety of ways. In this paper we focus on differences in the parameter \( a \).

The parameter \( a \) can be interpreted in several ways. If consumers are individuals, \( a \) can be interpreted as a taste for quality, or alternatively as an ability to pay that is (usually) increasing in income level. If consumers are organizations, \( a \) can be interpreted as the importance of the input (e.g., airplane engines for military versus civilian uses) or the scale at which the product can be deployed. Note that the parameters \( a \) and \( \beta \) determine consumer’s marginal willingness to pay for quality (\( \partial w_i / \partial x_i \)).\(^4\)

The parameter \( \beta \) determines the extent to which consumers have decreasing marginal utility (DMU) from quality improvements. For example, the utility from an additional megahertz of processing power was much higher when micro processor speeds were 100mhz than when they were 1000mhz. DMU is of interest because it varies across products and services. For example, while DMU is high for microprocessor speed (relative to the rate of technological advance), DMU seems less pronounced for

\(^2\)For simplicity, we assume that a consumer indifferent between offer 1 and her next best alternative (either buying offer 2 or not purchasing at all), buys offer 1.

\(^3\)Moreover, continuous distributions over consumer heterogeneity can by approximated by a large number of discrete segments.

\(^4\)Specifically,

\[ \frac{\partial w_i}{\partial x_i} = \frac{a \beta}{x_i^{1-\beta}} \]

which is increasing in \( a \) and in \( \beta \) for \( x_i > 1 \).
the resolution of digital cameras, where the latest models still seem to command a significant price premium.\footnote{The functional form $q(x) = x^\beta$ that we use to model DMU is conservative in that consumer utility is unbounded and hence $\lim_{x \to \infty} w_i = \infty$. For example, imposing an upper bound on willingness to pay implies that DMU is even more pronounced than our functional form.}

We assume that price discrimination across segments is possible, in that firms quote prices to each segment. This results in a maximum level of rivalry where the price of a weaker offer is competed down to its marginal cost. As will become clear in the following section, the game theoretic interactions between firms are then greatly simplified.\footnote{In Adner and Zemsky (2001), we study the evolution of market boundaries in a related, but more complex model, where the game theoretic interactions are much more involved. That paper allows for heterogeneity both within and across market segments and characterizes equilibria with and without price discrimination. The results of the simpler model studied here are consistent with those findings. Moreover, the present model allows is to analyze the dynamics of resource rents and competitive positions.}

3. Preliminaries

We begin the analysis by defining two classic strategy concepts—value creation and competitive advantage—in the context of our model. We then show how these concepts determine which firm serves a given segment and the resulting profit at a given point in time. These two concepts and the static analysis provide the necessary foundation for the dynamic analysis in the rest of the paper.

**Definition 3.1.** An offer’s value creation is the difference between the consumer’s willingness to pay and the marginal production cost. That is $v_i(t) = w_i(t) - c_i$.

It is useful to break competitive advantage into two parts, relative costs and relative differentiation. We focus our analysis on offer 1 and define the following:

**Definition 3.2.** The cost (dis)advantage of offer 1 is $A_c = c_2 - c_1$. The differentiation (dis)advantage of offer 1 is $A_d(t) = w_1(t) - w_2(t)$. The net competitive advantage is then $A_d(t) + A_c$.

Note that both value creation and differentiation advantage will vary across segments.
We now characterize the outcome of competition between firm 1 and firm 2 at a
given point in time. Specifically, we take as given the value creation of each firm, \( v_1 \) and
\( v_2 \). We are interested in whether firm 1 sells its offer to the segment and if it does, what
level of profits it achieves. The answer depends on whether or not offer 2 has positive
value creation for the segment. If it does not (\( v_2 < 0 \)), then offer 2 is irrelevant because
consumers are not willing to pay the marginal cost of production (\( w_2 < c_2 \)). Firm 1
serves the market if its price is no greater than consumer’s willingness to pay, \( p_1 \leq w_1 \).
The firm optimally sets the highest possible price \( p_1^* = w_1 \) and this is profitable if
\( w_1 > c_1 \) or equivalently \( v_1 > 0 \). Profit is then \( s(p_1^* - c_1) = sv_1 \). Thus, firm 1’s ability
to serve the segment and its profits depend on its level of value creation.

Now suppose that firm 2 does have positive value creation so that \( v_2 = w_2 - c_2 > 0 \).
Firm 2 will be willing to reduce its price to \( c_2 \) in order to capture the segment, which
results in a delivered value of \( w_2 - c_2 \). For firm 1 to serve the segment it must then set
a price so that \( w_1 - p_1 \geq w_2 - c_2 \). In this case, the optimal price is \( p_1^* = w_1 - w_2 + c_2 \).
Charging this price is only profitable if \( p_1^* - c_1 > 0 \). Note that \( p_1^* - c_1 = w_1 - w_2 + c_2 - c_2 =
A_d + A_c = v_1 - v_2 \). If \( p_1^* - c_1 > 0 \), the profit is \( s(p_1^* - c_1) = s(A_d + A_c) = s(v_1 - v_2) \). Thus,
in the competitive case, firm 1’s ability to serve the segment and its profits depend on
its net competitive advantage over firm 2, which is equivalent to the superiority of firm
1’s value creation. We collect these results in the following proposition.

**Proposition 3.3.** (i) Consider a segment where the alternative offer does not create
value (\( v_2 \leq 0 \)). Consumers buy the focal offer if it has positive value creation (\( v_1 \geq 0 \))
and the profit is then proportional to the size of the segment and the value created: \( sv_1 \).
(ii) Now consider a segment where the alternative does create value (\( v_2 > 0 \)). Con-
sumers buy the focal offer if it has superior value creation (\( v_1 \geq v_2 \)), which is equivalent
to having a net competitive advantage (\( A_d + A_c \geq 0 \)). The profit is proportional to the
size of the segment and the net competitive advantage: \( s(A_d + A_c) \).
4. The Evolution of Market Boundaries

Industry analysis (Porter, 1980) is often criticized as taking too static a view of market boundaries (e.g., Grant, 1998). The importance of understanding shifts in market boundaries is highlighted, for example, by the phenomenon of disruptive technologies (Christensen, 1997). Disruptions occur when existing industry boundaries are redrawn by the entry of firms using new technologies that, as they improve, displace existing technologies from mainstream segments. The recent technology bubble, in which many promising new technologies turned out not to be disruptive, underscores the need to critically assess the threat posed by new technologies.

We consider whether a new technology will displace an established technology from a given segment; if so, when this will occur; and finally, whether displacement will be permanent or transitory. We show how the answers depend on technology trajectories, cost positions, consumer’s taste for quality, and the extent of DMU. Note that one can interpret “technologies” broadly, including competition between different strategies such as discount retailers and department stores.

We consider a situation where firm 1 is bringing a new offer to market. We assume that firm 2 is using an established technology that has a head-start in the market of $h > 0$. The key attribute of both offers improves over time as follows:

\[
\begin{align*}
x_1(T) &= b_1 t, \\
x_2(T) &= b_2 (t + h).
\end{align*}
\]

We refer to $b_i$ as the trajectory along which offer $i$ is improving. Thus, the firm’s value creation increases over time as follows: $v_1(t) = ab_1^\beta t^\beta - c_1$ and $v_2(t) = ab_2^\beta (t + h)^\beta - c_2$.\(^7\)

\(^7\)While we assume that technology improves linearly over time, it is straightforward to generalize our model to include deceleration of technological progress (Foster, 1986) by simply assuming that $x_1 = b_1 t^\alpha$ and $x_2 = b_2 (t + h)^\alpha$ where $\alpha \in (0, 1)$. In this case, consumers’ marginal willingness to pay for quality (the key driver of dynamics) is

\[
\frac{\partial w_i}{\partial x_i} = \frac{a \alpha \beta}{x_i^{1-\alpha \beta}}.
\]
At time $t = 0$, offer 1 must have a negative value creation since $v_1(0) = -c_1$. Let $t_0 > 0$ be such that $v_1(t_0) = 0$. We assume that at this time firm 2 is already creating value for the segment (i.e., $v_2(t_0) > 0$), which assures that offer 2 is already established. Finally, we assume that $t_0b_1 > 1$ so that DMU is decreasing in $\beta$.

Since offer 2 already has positive value creation, from Proposition 3.3 we have that offer 1 can only enter the segment profitably if it has a net competitive advantage, $A_d(t) + A_c > 0$. The cost advantage $A_c$ is fixed while the differentiation advantage $A_d(t)$ changes over time as follows

$$A_d(t) = w_1(t) - w_2(t) = a(b_1 t)^{\beta} - a(b_2(t + h))^{\beta}.$$  

The timing of entry, which we denote by $t_E$, occurs when $A_d(t_E) + A_c = 0$. We begin by characterizing entry dynamics when the offers have the same trajectories.

**Proposition 4.1.** Suppose the technologies have the same trajectory ($b_1 = b_2$). Without a cost advantage ($A_c \leq 0$), the new firm never enters the segment. With a cost advantage ($A_c > 0$), the new firm displaces the established firm from some time $t_E$ onwards. The greater the extent of DMU and the smaller the segment’s taste for quality, the sooner the new firm enters the segment (i.e., $t_E$ is increasing in $\beta$ and $a$).\(^8\)

The intuition for the Proposition 4.1 is as follows. Due to its later start and identical trajectory, firm 1 always has a differentiation disadvantage (i.e., $A_d(t) < 0$ for all $t$). However, this disadvantage shrinks over time due to DMU; in particular $\lim_{t \to \infty} A_d(t) = 0$. Thus, as long as firm 1 has a cost advantage, it will enter the segment eventually. The lower the marginal utility for quality improvements, which depends on DMU and taste for quality, the faster the differentiation gap erodes and the sooner entry occurs. This proposition highlights the importance of cost advantage and consumers’ willingness to pay for product improvements when identifying disruptive threats.

\(^{8}\)All proofs for Section 4 are in the Appendix.
Now consider entry dynamics when technologies have different trajectories:

**Proposition 4.2.** Suppose the new technology has a better trajectory \((b_1 > b_2)\). The new firm always displaces the established firm from some time \(t_E\) onwards. The effect of DMU and the taste for quality depends on the cost position. Specifically, if \(A_c > 0\) the time of entry is delayed as the taste for quality increases and as DMU decreases; conversely, if \(A_c < 0\) the time of entry is delayed as the taste for quality decreases and as DMU increases.

In this case, firm 1 starts with a differentiation disadvantage \((A_d(0) < 0)\) due to is later entry, but over time it develops a differentiation advantage due to its superior technology trajectory. As the differentiation advantage grows, it eventually overwhelms any cost disadvantage and entry occurs. If \(A_c > 0\) then firm 1 enters while it still has a differentiation disadvantage (since \(A_d(t_E) = -A_c < 0\)) and hence anything that reduces the marginal willingness to pay for quality (i.e. the taste for quality and the extent of DMU) speeds entry. Conversely, if \(A_c < 0\) then firm 1 only enters when it has a differentiation advantage and hence entry timing is decreasing in the taste for quality and increasing in the extent of DMU.

**Proposition 4.3.** Suppose the new technology has a worse trajectory \((b_1 < b_2)\). If the new firm does not have a sufficiently large cost advantage, it never enters the segment. If it does have a sufficiently large cost advantage, it enters the segment, but only for a limited interval of time. The period of entry is decreasing in DMU and in the segment’s taste for quality.

With a worse trajectory and a late entry, firm 1 always has a differentiation disadvantage. At first the differentiation disadvantage falls as the effect of firm 2’s head-start erodes. This allows firm 1 to enter the market if its cost advantage is large enough to offset its remaining differentiation disadvantage. However, firm 1’s net competitive advantage is not sustainable. Over time, firm 2’s superior trajectory causes its differentiation advantage to grow. Eventually, firm 2’s differentiation advantage offsets its cost disadvantage and firm 2 re-enters the segment. Thus, our simple model highlights
a distinction between permanent and temporary threats; an example of the latter is the threat posed to traditional stock brokers by deep-discount brokers who made early market share gains in the mainstream retail segment, but have since receded.9

5. The Evolution of Resource Rents

A fundamental question in strategy is the sustainability of resource rents. A primary focus in the received literature is the threat to resource rents posed by competitor imitation (e.g. Lippman and Rumelt (1982) and Barney (1991)). While imitation is clearly important, it is not the only driver of rent dynamics. We focus on how the value of even inimitable resources can change over time. Although the resource-based view recognizes the importance of resource value, its treatment of value is much less well developed than its treatment of barriers to imitation (Priem and Butler, 2001). In particular, the question of how resource values evolve is largely unexplored. We distinguish among different types of resources based on how they affect a firm’s value creation. Our fundamental question is how resource rents vary over time and by type of resource.

In this section, we assume that firms 1 and 2 and their offers are identical except that firm 1 has a unique and inimitable resource that improves its ability to create value for the segment. But for this unique resource, the firms would have the same costs ($c_1 = c_2$) and their offers would follow the same technology trajectory ($x_1(t) = x_2(t) = bt$). We consider four ways in which the resource might create value. A cost resource gives firm 1 a cost advantage so that $c_1 < c_2$ and hence $A_c > 0$. An attribute resource increases firm 1’s level of the key attribute by $r > 0$. In this case, $x_1(t) = bt + r$ and $x_2(t) = bt$. A timing resource gives firm 1 a head-start of $h$ on developing its offer. In this case, $x_1(t) = b(t + h)$ and $x_2(t) = bt$. An innovation resource gives firm 1 a better trajectory. In this case, $x_1(t) = b_1 t$ and $x_2(t) = b_2 t$ where $b_1 > b_2$.

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9We note that all the results in this section generalize to there being any $n_i \geq 1$ firms producing offer $i$. With $n_i > 1$, Bertrand competition among firms producing an offer reduces price to marginal cost and the segment still buys based on value creation, which is the key result from Sedction 3 used in the proofs of this section.
Because of its unique resource, firm 1 has a net competitive advantage over firm 2 at all times, $A_d(t) + A_c > 0$. Therefore, firm 1 will be the first to enter the segment and is never displaced. Let $t_1$ be the time of entry for firm 1. Let $t_2 > t_1$ be the time at which firm 2’s offer creates positive value in the segment. Although firm 1 is always dominant, its rents change over time:

**Proposition 5.1.** From the time of firm 1’s entry into the segment (i) the rents from cost-resources increase over time and then stabilize; (ii) the rents from both attribute-resources and timing-resources first increase and then decrease over time; (iii) the rents from innovation resources increase over time.

**Proof** For all four resource types, $A_d(t) + A_c > 0$ for all $t > 0$ and hence firm 1 enters the segment first and is never displaced. We have that $t_i$ is defined by $v_i(t_i) = 0$. From Proposition 3.3, we have that firm 1’s rent (profit) from its resource is

$$\pi_1(t) = \begin{cases} 
0 & \text{if } t \leq t_1, \\
sv_1(t) & \text{if } t \in (t_1, t_2], \\
sv_1(t) - v_2(t)) & \text{otherwise}. 
\end{cases}$$

For all resource types, $v'_1(t) > 0$ as the key attribute is increases in $t$ and hence rents are always increasing for $t \in (t_1, t_2)$. For a cost resource, $v_1(t) - v_2(t) = A_c$ and rents are flat for $t > t_2$. For all other resources, $v_1(t) - v_2(t) = A_d(t)$ varies with time. For attribute and timing resources, $A'_d(t) < 0$ and rents decline for $t > t_2$. For innovation resources, $A'_d(t) > 0$ and rents increase over time.

The general intuition for the results is as follows. From time $t_1$ to $t_2$, firm 1 is alone in the market because firm 2 does not create value ($0 > v_2(t)$) and hence from Proposition 3.3 (i), we have that firm 1’s rents are proportional to the size of the segment and to firm 1’s value creation ($sv_1(t)$). Over time, as the quality of firm 1’s offer improves, its value creation and its rents increase (but at a decreasing rate due to DMU). Starting at time $t_2$, firm 2’s offer has improved sufficiently that it too has positive value creation in the segment and hence Proposition 3.3 (ii) applies.
time $t_2$ firm 1’s rents are proportional to the size of the segment and the extent to which it offers superior value creation: $s(v_1 - v_2) = s(A_d(t) + A_c)$. The evolution of rents from this time on depends on the type of resource.

For cost resources, there is no differentiation advantage ($A_d(t) = 0$ for all $t$) and hence the net competitive advantage is a constant ($v_1 - v_2 = A_c > 0$), which implies that rents stabilize at $sA_c$. Figure 5.1 illustrates. Until time $t_1$, neither firm has positive value creation. From time $t_1$ to time $t_2$ only firm 1 has positive value creation and during this interval firm 1’s rent ($sv_1(t)$) increases with its value creation. After time $t_2$ both firms have positive value creation and hence rents stabilize.

For both time resources and attribute resources, firm 1 has a differentiation advantage ($A_d(t) > 0$), but this advantage erodes over time ($A'_d(t) < 0$) due to DMU. Hence, firm 1’s rents decay starting at time $t_2$. Figure 5.2 illustrates. Thus, we show that even when a resource is not imitated, and hence offers remain different

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Figure 5.1: The evolution of value creation and rents when firm 1 has a cost resource (for $c_1 = 2$, $c_2 = 3$, $\beta = .5$, and $b = 1$).

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10 Note that attribute and time resources are formally equivalent, differing only by a factor $b$. In particular, the dynamics are identical for $r = bh$ since $x_1(t) = bt + r$ for an attribute resource and $x_1(t) = b(t + h)$ for a timing resource.
(i.e., \(x_1(T) - x_2(T)\) is a constant over time), resource rents may decay as DMU erodes consumers willingness to pay for those differences.

With innovation resources, firm 1 again has a differentiation advantage, but in this case the advantage grows over time \((A'_d(t) > 0)\). Hence, firm 1’s rent continues to increase even after firm 2 has positive value creation, although the rate of profit growth decelerate. Figure 5.3 illustrates.

We close by considering the effect of consumers’ willingness to pay for quality on the net present value of resource rent streams.

**Proposition 5.2.** For all resource types, the net present value of the resource rent stream is decreasing in the extent of DMU and increasing in the taste for quality.

**Proof** We have that \(v_1(t)\) is increasing and \(v_1(t) - v_2(t)\) is nondecreasing in \(a\). Hence, we have that \(\pi_1(t)\) is nondecreasing in \(a\) for all \(t\) and increasing for some \(t\), which implies that the net present value of resource rents is increasing in \(a\). An analogous argument holds for \(\beta\). ■

As the taste for quality increases, both \(v_1(t)\) and \(v_2(t)\) shift up proportionally, which speeds firm 1’s entry \((\partial t_1/\partial a < 0)\) and increases rent prior to time \(t_2\). For attribute, timing and innovation resources, the taste for quality also increases subsequent rents by magnifying the differentiation advantage \((\partial A_d/\partial a > 0)\). Conversely, the extent of DMU decreases both \(v_1(t)\) and \(v_2(t)\), which delays firm 1’s entry and (weakly) reduces rent at any point in time.

Our objective in this section was to demonstrate a novel, demand-based approach to understanding the evolution of resource rents. Obviously, the particular setting we study is highly stylized. However, it is relatively straightforward to extend the model to consider more complex and realistic rent dynamics, as we show in the following section.
Figure 5.2: The evolution of value creation and rents when firm 1 has an attribute resource or a timing resource (for $c_1 = c_2 = 2$, $\beta = .4$, $b = 1$, $r = h = 4$).

Figure 5.3: The evolution of value creation and rents when firm 1 has an innovation resource (for $b_1 = 2$, $b_2 = 1$, $c_1 = c_2 = 2$, $\beta = .5$).
Figure 6.1: The evolution of firm rents when firm 1 has an attribute resource and firm 2 has a cost resource in a two segment setting.

6. A Two-Resource, Two-Segment Example

To this point we have restricted ourselves to a single segment and to studying one resource at a time. These analyses provide building blocks that can be assembled to examine more complex settings. Most industries have multiple market segments and many resources. In this section, we consider an industry with two segments and two competitors, each possessing a different resource. We are interested in how competition and firm rents evolve.

Consider the following setting: There is a high-end segment with a taste for quality \( a_H = 2 \) and a low-end segment with a taste for quality \( a_L = 1.4 \). In a loose analogy to Sony and Matsushita in consumer electronics, firm 1 has an attribute resource \((r = 3)\) and firm 2 has a cost resource \((A_c = 0.7)\).\(^{11}\) Figure 6.1 shows how each firm’s rents change over time.

First note that offers have positive value creation in the high-end segment before

\(^{11}\)Other parameters are as follows: \( \beta = 0.5, b = 1, s = 100, c_1 = 3.5, c_2 = 2.8. \)
the low-end segment, because of the former’s higher taste for quality \( (a_H > a_L) \). In this example, firm 1 is first to create value in the high-end, starting at \( t_1 \). Until time \( t_2 \), only firm 1 creates value in the high-end segment. Firm 1’s rents, which are equal to its value creation for the segment, increase as its offer improves over time. At time \( t_2 \), firm 2’s offer begins to create value in the high-end segment as well. At this point firm 1’s rents, which are now its net competitive advantage, begin to decay as DMU erodes its differentiation advantage. (To this point, the dynamics are the same as those illustrated in Figure 5.2.)

At time \( t_3 \), firm 1 returns to a period of profit growth as its offer begins to deliver sufficient value to serve the low-end segment. Hence, firm 1 starts earning rents from the low-end segment, which increase as its offer improves over time. The increasing rents from the low-end segment more than offset the continued decay in rents from the high-end.

At time \( t_4 \), firm 2 begins to create value in the low-end, triggering a permanent decline in firm 1’s fortunes. Now, firm 1’s rents from both segments are decaying over time.

Note that until time \( t_5 \), firm 2 does not sell to either segment. It is the increasing threat of entry by firm 2 that limits firm 1’s rents. At time \( t_5 \), the threat is realized: DMU has eroded firm 1’s differentiation advantage sufficiently that firm 2’s cost advantage gives it superior value creation in the low-end segment. Consequently, at time \( t_5 \) firm 1 is displaced from the low-end segment. Then, at time \( t_6 \), the differentiation advantage has eroded so much that firm 2 displaces firm 1 from the high-end segment as well. After time \( t_6 \), firm 2’s rents continue to increase as firm 1’s differentiation advantage further decays, reaching a final profit level of \( sA_c = 70 \) in each segment.

In this section, we examined how firms’ competitive advantage varies over time and across market segments given exogenous resource endowments. Below we examine competitive advantage as an endogenous outcome when firms choose their competitive positions.
7. Competitive Positioning

The classic approach to competitive positioning is that of Porter’s generic strategies. Porter (1980) argues that firms face a choice between positioning as Cost Leaders or Differentiators, where the latter have higher quality offers and higher costs than the former. Those firms that do not choose one of these positions risk being “stuck in the middle” and being out competed.\footnote{We do not address the generic strategy of Focus in this paper. To do so would require introducing horizontal differentiation to characterize niche segments, which we leave for future work.}

One limitation of the generic strategy perspective is the observation that firms that pursue both cost and differentiation advantage simultaneously are sometimes very successful (e.g., Besanko et al. 2000; Barney, 1997). More generally, a weakness with the received literature on positioning is that “our understanding of the dynamic processes by which firms perceive and ultimately attain superior market positions is far less developed [than our understanding of advantage at a point in time]” (Porter, 1991, p. 95; see also Rumelt, 1987). Motivated by these critiques, we focus on three questions: When do firms follow generic strategies? When do firms position in the middle? What causes new market positions to arise over time?

Following Porter (1980), we assume a trade-off between product quality and production costs. Specifically, firms choose $d$, a level of differentiation, that determines both the quality of their offer and their costs. As elaborated below, the precise effect of $d$ depends on the nature of the technology that the firm uses. Consumer heterogeneity is important for positioning. We consider the case of two market segments that vary in their ability to pay. Specifically, there is a low-end segment with an ability to pay of $a_L$ and a high-end segment with an ability to pay of $a_H > a_L$. We suppose that there can be as many as three firms active in the market.

Our analysis proceeds in three steps. In Section 7.1 we characterize the static choice of positioning in a Porterian world where firms that do not follow cost leadership or differentiation strategies are indeed stuck in the middle. In Section 7.2, we show how classic generic strategies breakdown in the presence of a sufficiently scale intensive...
technology. Having characterized the statics, in Section 7.3 we show how new positions arise over time as technologies improve.

### 7.1. Segmentation and Generic Strategies

In this section show formally how a market can be segmented by firms using generic strategies. The results provide a benchmark for comparison with the more complex analysis that follows.

We assume that firms have access to a single production technology $M$. The quality of a firm’s offer is given by $x = bd$ and the marginal cost of production is $d + c$. Thus, cost and quality are both increasing in $d$ and hence there exist production possibility frontiers along which production cost and willingness to pay are traded off (Porter 1996; Saloner, et al, 2001), with a different frontier for each segment.\(^\text{13}\) Figure 7.1 illustrates.

\(^\text{13}\)The familiar depiction of a single cost-willingness to pay frontier ignores consumer heterogeneity. We show two different frontiers because our segments differ in their taste for quality, and hence in their willingness to pay for a given quality level.
We define \( d^*_H \) as the level of differentiation that maximizes value creation, and hence competitive advantage, for the high-end segment. Similarly, we define \( d^*_L \) as the level of differentiation that maximizes value creation for the low-end segment. \(^{14}\) Because the optimal level of differentiation is increasing in the segment’s taste for quality, we have \( d^*_H > d^*_L \).

**Proposition 7.1.** Suppose an entrant faces a single Generalist incumbent serving both segments from a middle position \( d_I \) (i.e., \( d^*_L < d_I < d^*_H \)). (i) The optimal position for the entrant is either as a Cost Leader serving only the low-end segment from the position \( d^*_L \) or as a Differentiator serving only the high-end segment from the position \( d^*_H \). (ii) The relative attractiveness of being a Cost Leader is increasing in the quality level of the incumbent \( (d_I) \) and the extent of DMU. The attractiveness of being a Differentiator is increasing in the trajectory \( (b) \) and consumers’ taste for quality (\( a_L \) and \( a_H \)).

With the incumbent in the middle, there is room to enter by exclusively targeting either segment. Recall from Proposition 3.3 that entry into a segment requires a net competitive advantage for that segment. A Cost Leader has a net competitive advantage in the low-end segment because its position \( d = d^*_L < d_I \) gives it a cost advantage \( (A_c = d_I - d^*_L) \) that more than offsets its differentiation disadvantage in the low-end \( (A_d = a_L(bd^*_L)^\beta - a_L(bd_I)^\beta) \). However, it cannot enter the high-end because those consumers’ greater taste for quality magnifies its differentiation disadvantage. In contrast, a Differentiator has a net competitive advantage in the high-end because its position \( d = d^*_H > d_I \) gives it a differentiation advantage that more than offsets its cost disadvantage, but only in the high-end segment.

Part (ii) of Proposition 7.1 addresses the relative attractiveness of the two generic strategies. On the supply-side, one consideration in choosing a generic strategy is to move away from existing competition, a familiar result from Industrial Organization models. Thus, the higher the incumbent’s quality \( (d_I) \) the more attractive it is to be

\(^{14}\)That is \( d^*_\theta = \arg\max_d(a_\theta(bd)^\beta - (c + d)) = \left[ a_\theta/b^\beta \right]^{1/\beta} \) for \( \theta = H, L \).
a Cost Leader. In addition, the easier it is to deliver increased quality \((b)\) the more attractive it is to be a Differentiator. On the demand-side, as consumers’ marginal utility from additional quality increases (either due to increases in \(a_L\) and \(a_H\) or due to decreases in the extent of DMU), the more attractive it is to be a Differentiator.

**Corollary 7.2.** Suppose multiple entrants face a single Generalist incumbent positioned at some \(d_L^* < d_I < d_H^*\). The Generalist is “stuck in the middle” in that firms will enter as both Cost Leaders and Differentiators, which leaves the Generalist with a competitive disadvantage in both segments. Further, with firms positioned at both \(d_L^*\) and \(d_H^*\) there is no position at which a new firm can profitably enter using technology \(M\).

Thus, we offer a formal characterization of generic strategies and the condition of being stuck in the middle.

**7.2. De-segmentation and Positioning in the Middle**

We now formalize the argument that firms can enter an industry with an offer that de-segments the market (Kim and Mauborgne, 1997). We suppose that in addition to technology \(M\), firms have access to a “fixed-cost” technology \(F\). For both technologies, the quality of a firm’s offer is \(x = bd\), as before. Recall that for technology \(M\) all of the costs associated with differentiation increase marginal costs, which take the form \(c + d\). An example of this sort of differentiation is adding leather to a car’s interior, which increases the production cost for each car.

With technology \(F\), a fraction \(f\) of the costs associated with differentiation are fixed. An example is adding a fuel cell engine to a car where the fixed component represents the required R&D investment. The parameter \(f \in (0, 1)\), which we refer to as the “scalability” of the technology, splits the effect of differentiation into a fraction \(fd\) that increases fixed costs and a fraction \((1 - f)d\) that increases marginal costs. The marginal cost is then \(c + d(1 - f)\) and the fixed cost is \(dfK\). Note that the more scalable the technology, the lower the variable costs. The fixed cost parameter \(K\) affects the
level of fixed costs required for differentiation. We restrict attention to $s < K$.\textsuperscript{15}

**Proposition 7.3.** Consider a potential entrant facing incumbents at $d^*_L$ and $d^*_H$ using technology $M$. There exists a critical value $\bar{K} < 2s$ such that for $K \geq \bar{K}$, entry is never profitable. For $K < \bar{K}$ we have: (i) for low levels of scalability ($0 < f < f_1$), profitable entry is not possible and the market remains segmented by firms pursuing Cost Leadership and Differentiation; (ii) for intermediate levels of scalability ($f_1 < f < f_2$), entry as a Generalist (using technology $F$) is profitable and the entrant’s optimal position $d^*_E$ allows it to dominate both segments from the middle (i.e., $d^*_L < d^*_E < d^*_H$); (iii) for high levels of scalability ($f_2 < f$), entry as a Generalist (using technology $F$) is profitable and the entrant dominates both segments with a quality level higher than the Differentiator’s (i.e., $d^*_E > d^*_H$).

Strategies of Cost Leadership and Differentiation allow firms to respond to consumer heterogeneity by optimally trading-off marginal cost and quality. However, these strategies limit a firm’s ability to exploit scale economies that arise from appealing to a broader base of consumers. Thus, these strategies can be out competed by a Generalist that has access to a sufficiently scalable technology. It was precisely this logic that lead many firms to attempt Generalist strategies in emerging internet-based markets. For example, internet retailers such as Amazon.com explicitly set out to offer high quality service from a low cost position while targeting a broad set of consumers.

We note that the finding that Generalists may locate either in the middle or above the differentiator depends on our assumption that fixed costs relate to innovation (i.e., by having the parameters $d$ and $K$ interact). Examples of Generalists leveraging high fixed costs to target the mass of the market with offers superior to incumbent differentiators include book superstores like Borders and Barnes and Noble as well as Monsanto’s genetically modified “Roundup Ready” soybeans.\textsuperscript{16}

\textsuperscript{15}The restriction means that technology $F$ is unattractive to a firm that serves a single segment but potentially attractive to a firm serving both segments. Specifically, the difference between the cost of serving a single segment with technology $F$ and the cost with technology $M$ is $s(c + d(1 - f) + dfK - s(c + d) = df(K - s) > 0$.

\textsuperscript{16}A somewhat simpler modeling approach is to assume that marginal costs are $c+d$ and that there is
7.3. The Evolution of Competitive Positions

Thus far, we have identified three generic strategies that can be viable at any point in time: Cost Leader, Differentiator and Generalist. We now consider the use of these strategies in a dynamic setting where technologies are improving over time. Specifically, let $b = b(t)$, where $b(t)$ is any increasing and unbounded function with $b(0) = 0$.\textsuperscript{17} This implies that the cost-willingness to pay frontiers are shifting outward over time.

At first, with $b(0) = 0$, consumers have a zero willingness to pay for offers, while the marginal cost of production is always at least $c$. Hence, no firm can profitably enter the market. We are interested in which strategy pioneers the market and how positioning evolves as technology improves.

\textbf{Proposition 7.4.} Suppose there is pool of potential entrants with access to technologies $M$ and $F$ and $K < \bar{K}$. For low levels of scalability ($0 < f < f_1$), a Differentiator pioneers the market and is later joined by a Cost Leader. For intermediate levels of scalability ($f_1 < f < f_3$), a Differentiator pioneers the market and is later displaced by a Generalist; for $f_1 < f < f_2$, the Generalist has lower quality than the Differentiator and for $f_2 < f < f_3$ the Generalist has higher quality. For high levels of scalability ($f_3 < f$), a Generalist is the first and only firm to enter the market.

Consider first the case where technology $F$ is not very scalable ($f < f_1$). From Proposition 7.3, we know that a Generalist strategy is never used. Because the willingness to pay for any given quality level is always greater in the high-end segment, a Differentiator, whose offer is targeted at the high-end segment, will be able to enter the market while a Cost Leader’s offer still has negative value creation. As the technology improves further, the Cost Leader strategy becomes viable as well and the two strategies coexist in the market.

\textsuperscript{17}For example, it could be that $b(t) = rt$ for any $r > 0$. Recall that for both technology $M$ and $F$, offer quality is $x = bd$. Hence, shifts in $b$ have the same effect on each technology.
For intermediate levels of scalability \( f_1 < f < f_3 \) the Generalist strategy dominates in the long-run. However, early on the willingness to pay of the low-end segment is too low to justify the broad market deployment that is the hallmark of a Generalist. The Differentiator, unencumbered by fixed costs and focused only on the high-end, is then the first to create value and therefore pioneers the market. Over time, with further technology improvements, the willingness to pay of the low-end segment increases sufficiently that the Generalist strategy becomes viable and it follows from Proposition 7.3 that it displaces the Differentiator.

For high levels of scalability \( f_3 < f \), the Generalist’s marginal costs are so low that serving both segments is profitably early on, leaving no room for other strategies.

Now consider the factors that affect the boundaries between the different regimes.

**Corollary 7.5.** The critical thresholds \( f_1 < f_2 < f_3 \) from Propositions 7.3 and 7.4 are increasing in consumer heterogeneity \( \frac{a_H - a_L}{a_H} \) and the extent of fixed costs \( K \) and they are decreasing in the size of the segments \( s \). The extent of DMU decreases \( f_1 \), increases \( f_3 \) and does not affect \( f_2 \).

Consumer heterogeneity \( \frac{a_H - a_L}{a_H} \) reflects the extent to which the segments differ in their taste for quality. As heterogeneity increases the returns to targeting individual segments increase and so the Generalist strategy becomes less attractive. Thus, as Figure 7.2 illustrates, the thresholds \( f_1 \) and \( f_3 \) both increase in consumer heterogeneity.

Now consider the effects of DMU. On the one hand, DMU acts to mask heterogeneity between segments by reducing the difference in optimal quality levels \( d_H^* - d_L^* \), which shrinks region I in which the Differentiator is joined by a Cost Leader (i.e., \( f_1 \) falls in DMU). On the other hand, DMU acts to lower overall willingness to pay, which makes it less attractive to serve both segments early on, which shrinks region III in which the market is pioneered by a Generalist (i.e., \( f_3 \) increasing in DMU). The dashed lines Figure 7.2 show the effects of an increase in DMU (moving from \( \beta = .5 \) to \( \beta = .4 \)).

Finally, consider the effects of market size \( s \) and fixed costs \( K \). The larger the size of the market, the more attractive is the Generalist strategy due to its scale.
Figure 7.2: The evolution of competitive positions for different levels of scalability and consumer heterogeneity for $\beta = .5$ (solid lines) and $\beta = .4$ (dashed lines) and $K = 1.25s$.

economies. Hence, growing market size can trigger a shift to a Generalist strategy.\textsuperscript{18} Conversely, the larger the fixed costs, the less attractive is the Generalist strategy. The spectacular failure of many internet companies highlights the importance of these factors. For example, the large fixed costs in advertising and warehouses required for firms such as Etoys and WebVan were too large relative to the size of their markets.

8. Conclusion

Our approach to strategy dynamics starts with product market competition and improving technologies. The novelty is that we introduce an explicit treatment of how technology improvements affect consumer choice among competing offers. This leads us to focus on demand-side drivers: consumer taste for quality, the degree to which

\textsuperscript{18}This is to be contrasted to a simple, exogenous fixed cost story (see footnote 16), where increasing market size makes segmentation more likely. This relates to Sutton’s (1991) results on endogenous fixed costs and industry concentration.
utility from quality improvements decreases as offers improve, and the extent of consumer heterogeneity. We combine these elements in a simple model that we use to address a wide range of issues.

Our analysis generates new insights and formalizes old truths. Here we highlight some of the new insights. We characterize the critical role played by cost advantage in the dynamics of technology competition, for example, in determining when taste for quality and the extent of decreasing marginal utility serve to speed up or slow down the onset of disruption. Further, our theory identifies factors that affect whether or not the threat posed by a new technology is permanent or merely temporary. In terms of resource strategy, we show how the rents from some resources decay over time even when the underlying resource is unique (i.e., inimitable). This result highlights how differentiation advantage can erode, not because the absolute levels of performance converge, but because consumer valuation of the differences declines due to decreasing marginal utility. In terms of competitive positioning, we show that Generalists are not necessarily stuck in the middle. Rather, being a Generalist can be a viable generic strategy when technologies are sufficiently scalable. Our explicit treatment of consumer heterogeneity is critical to clarifying the existence of different competitive positions. Moreover, consumer heterogeneity is an important determinant of the sequence in which these positions arise over time.

We see competitive interactions, the firm’s internal resources and the demand environment as being intimately connected. Among the three, however, we think that the demand-side is underdeveloped in the received strategy literature.

Our model and propositions suggest new ways to approach longitudinal studies of business strategy. At the very least, they suggest the need to control for demand-side variables. More ambitiously, many of our propositions are potentially testable. Consider, for example, a new technology with a superior trajectory displacing an incumbent technology—which segment does it enter first? An implication of Proposition 4.2 is that if the technology has a cost advantage it will start in the low-end segment and move up into segments with greater and greater quality; conversely, if it has a
cost disadvantage it will start in the high-end and then move down market (See Adner and Levinthal (2001) for additional results on entry sequencing). Beyond large sample testing, many of our more nuanced results might be better addressed through case-based longitudinal studies at the industry and firm level (e.g., Sutton 1991). In terms of theory, we think that an elaboration of the effects of horizontal differentiation and multiple product attributes is a valuable next step that would open up new research questions. For example, one could develop propositions about the mix of attributes that allow Generalists to de-segment a market. Moreover, by including the possibility that different resources impact different product attributes, one could address the question of which resources a firm should develop and how resource strategy changes over time.

References


9. Appendix

Proof of Proposition 4.1 Suppose $b_1 = b_2$. We have $A_d(t) = ab_1^\beta(t^\beta - (t + h)^\beta)$ and hence $A_d(t) < 0$ and $A'_d(t) > 0$ for all $t > 0$ and $\lim_{t \to \infty} A_d(t) = 0$. If $A_c \leq 0$, then $A_d(t) + A_c < 0$ for all $t > 0$ and entry does not occur. Conversely, if $A_c > 0$, then there exists a $t_E$ such that $A_d(t) + A_c > 0$ iff $t > t_E$ where $t_E$ satisfies $a(b_1 t_E)^\beta - a(b_2(t_E + h))^\beta + A_c = 0$. Using this equality and the implicit function theorem,

$$\frac{\partial t_E}{\partial a} = -\frac{(b_1 t_E)^\beta - (b_2(t_E + h))^\beta}{A'_d(t)} = \frac{A_c/a}{A'_d(t)},$$

(9.1)

which is positive since $A_c > 0$. Similarly, we have

$$\frac{\partial t_E}{\partial \beta} = -\frac{a(b_1 t_E)^\beta \ln(b_1 t_E) - (a(b_1 t_E)^\beta + A_c) \ln(b_2(t_E + h))}{A'_d(t)},$$

(9.2)

which is positive since $A_c > 0$ and $\ln(b_2(t_E + h)) > \ln(b_1 t_E) > 0$ as $b_1 t_E > b_1 t_0 > 1$. ■

Proof of Proposition 4.2 Suppose $b_1 > b_2$. Since $A_d(0) + A_c < 0$, $A'_d(t) > 0$ and $\lim_{t \to \infty} A_d(t) = \infty$, there exists a $t_E > t_0$ such that $A_d(t) + A_c > 0$ iff $t > t_E$ where
exists a $t$ such that $\pi$ maximizes value creation and rents from the high-end segment, which is in this case both equalities are positive since $\pi$ is defined as $d$. Similarly, if $A$ is greater than those of the incumbent for any level of $A$. Hence, the optimal positioning for $A$ segment. If $A$ serves all customers (in both segments), or it stays out of the market altogether.

Proof of Proposition 7.1 (i) Denote by $d_E$ the position of the entrant. For all $d_E > d_I$ we have that $v_L(d_E) < v_L(d_I)$, by Proposition 3.3, the entrant does not serve the low-end segment. Hence, the optimal positioning for $d_E > d_I$ is the one which maximizes value creation and rents from the high-end segment, which is $d_E = d^*_H$. Similarly, if $d_E < d_I$ the entrant does not have superior value creation in the high-end segment and hence the optimal positioning is $d_E = d^*_L$. (ii) The profit from being a Differentiator is $\pi_H = s(v_H(d^*_H) - v_H(d_I))$ and the profit from being a Cost Leader is $\pi_L = s(v_L(d^*_L) - v_L(d_I))$. The relative attractiveness of being a Cost Leader is then $\pi_L - \pi_H$. The results then follow from evaluating the partial derivatives (e.g., $\partial \pi_L/\partial d_I > 0 > \partial \pi_H/\partial d_I$).

Proof of Proposition 7.3 Given Corollary 7.2, the entrant must use technology $F$. It cannot be that the entrant serves only one of the segments since its costs would be greater than those of the incumbent for any level of $d$: $s(c + df) + fdK > s(c + d)$ for $K > s$. Moreover, given the scale economies in technology $F$, either the potential entrant serves all customers (in both segments), or it stays out of the market altogether.

We proceed by assuming that the entrant is serving both segments using technology $F$ and check whether or not this is profitable.
Incumbents reduce their prices to marginal cost in an effort to fight off entry. Following the logic used to derive Proposition 3.3, the profits of the entrant for any given \( d \) are

\[
\pi_E(d) = s(v^*_H(d) + v^*_L(d) - \max\{v^*_H, 0\} - \max\{v^*_L, 0\}),
\]

where \( v^*_H = v_H(d^*_H) \) is the value creation of the Differentiator in the high-end and \( v^*_L \) is the value created by the Cost Leader in the low-end and where \( v^*_\theta(d) = a_\theta(bd)^\beta - [c + df + dfK/(2s)] \) for \( \theta = H, L \) is the value created by the entrant when it serves a customer in segment \( \theta \). The level of differentiation which maximizes the entrant’s profits is then

\[
d^*_E(f) = \left[ \frac{a_H + a_L}{2 - f(2 - K/s)} \right]^{\frac{1}{1-\beta}}.
\]

Let \( v^*_E(f) = v^*_H(d^*_E(f)) + v^*_L(d^*_E(f)) \) be the entrants maximum possible value creation for one customer from each segment. We have

\[
\begin{align*}
v^*_E(f) &= \gamma \left( \frac{a_H + a_L}{(2 - 2f + fK)^\beta} \right)^{\frac{1}{1-\beta}} - 2c, \\
v^*_H &= \gamma(a_H)^{\frac{1}{1-\beta}} - c, \\
v^*_L &= \gamma(a_L)^{\frac{1}{1-\beta}} - c,
\end{align*}
\]

where \( \gamma = (1 - \beta)(b\beta)^{\frac{1}{1-\beta}} \). Note that \( d^*_E/\partial f > 0 \) and \( \partial v^*_E/\partial f > 0 \).

Given that there are incumbents at \( d^*_L \) and \( d^*_H \) we assume that \( v^*_L, v^*_H \geq 0 \). Then \( \pi_E(d^*_E) = s(v^*_E(f) - v^*_L - v^*_H) \). Let \( f_1 \) be such that \( v^*_E(f_1) = v^*_L + v^*_H \), which yields

\[
f_1 = \left( 1 - \frac{1}{2}\left( \frac{a_L + a_H}{((a_L)^{1/(1-\beta)} + (a_H)^{1/(1-\beta)})^{1-\beta}} \right)^{1/\beta} \right) / \left( 1 - \frac{K}{2s} \right).
\]

Let \( f_2 \) be such that \( d^*_E(f_2) = d^*_H \), which yields

\[
f_2 = \frac{1}{2} \left( \frac{a_H - a_L}{a_H} \right) / \left( 1 - \frac{K}{2s} \right).
\]

It follows that \( f_1 < f_2 \) and that there exists a \( K \in (s, 2s) \) such that \( f_1 < 1 \) iff \( K < K \).
Proof of Proposition 7.4 This proof builds closely on the arguments and definitions in the proof of Proposition 7.3. The strategies that exist in the market at any point in time are those that have positive and superior value creation. Recall that \( v_\theta^* = \gamma(a_\theta)^{1/\beta} - c \) for \( \theta = H, L \) where \( \gamma = (1 - \beta)(\beta b)^{1/\beta} \). Hence, \( v_H^* > v_L^* \) and both are increasing over time with \( b(t) \) from an initial value of \( v_L^* = v_H^* = -c \). Let \( t_H \) be the critical time at which \( v_H^* = 0 \) and a Differentiator becomes willing to enter the market. At this time, \( \gamma = c/(a_\theta)^{1/\beta} \) and hence \( v_E^*(f) > 0 \) is equivalent to

\[
f > f_3 = \left( 1 - \left( \frac{a_L + a_H}{2a_H} \right)^{1/\beta} \right) \left( 1 - \frac{K}{2s} \right)
\]

where \( f_3 > f_2 \). Thus, for \( f > f_3 \) the market is pioneered by a Generalist, otherwise by a Differentiator.

We have that \( v_E^*(f) > v_L^* + v_H^* \) is equivalent to \( f > f_1 \) where \( f_1 \) is independent of \( b \). For \( f < f_1 \), the Generalist never enters and the Differentiator is joined by a Cost Leader. For \( f > f_1 \), the Differentiator is displaced by the Generalist before the Cost Leader would have entered.

Proof of Proposition 7.5 The comparative statics follow from the expressions for \( f_1, f_2 \) and \( f_3 \) in Propositions 7.3 and 7.4.