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# Entry Deterrence in Postal Service Markets

Patrick F.E. Beschorner

## ZEW

Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
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# Non-technical Summary

The German postal service market will be completely liberalized in 2008. Currently, the market is already liberalized for parcels and letters exceeding 50 grams. The incumbent Deutsche Post AG (DPAG) has the exclusive right to transport letters up to 50 grams. But competitors can already obtain a license for this reserved segment if they offer a higher service quality. In contrast to DPAG, which provides the universal service, entrants can select the geographical area in which they are active.

The exclusive license of DPAG runs out at the beginning of 2008. Then any firm will be allowed to enter the market for postal service below 50 grams and there will be no minimum quality requirement. The universal service obligation will be upheld and we expect the incumbent DPAG will be responsible for doing so. In the light of the upcoming liberalization we observe that the German postal service started to improve its service quality six months prior to the liberalization. DPAG is testing the delivery of certain items on Sundays. The paper aims to analyze this type of situation based on the theory of vertically differentiated markets.

The model developed shows that a rational strategy for an incumbent is to increase quality to deter entry or to soften quality and price when market entry is anticipated. This behavior may aim at setting up entry barriers to deter or to limit competition in 2008. We find that DPAG's rise in quality is likely to be motivated by the desire to set up entry barriers. However, consumers benefit from higher service quality and lower prices, even if entry does not occur.

# Entry Deterrence in Postal Service Markets

Patrick F.E. Beschorner[*]

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## Abstract

In this paper we analyze the incentive of the German postal service (Deutsche Post AG, DPAG) to increase quality in the light of the upcoming liberalization of the postal services market. Currently, there would be no incentive for DPAG to increase its quality if the market were not to be liberalized in six months. Therefore, we suggest that the current changes in market regulation have motivated this quality improvement. In particular we show that this rise in quality is only profitable to DPAG because it renders entry less profitable or even impossible. However, consumers benefit from higher quality, whether entry is deterred or accommodated.

Keywords: regulation, liberalization, postal services

JEL: L12, L41, L51

# 1 Introduction

In a press release from 9 May 2007, Deutsche Post AG (DPAG) announced its intention to test the delivery of certain items on Sundays.[1] In the light of coming liberalization of the postal service market in Germany this decision is of particular interest because it may reflect the strategic decision to raise the quality level which will be perceived as a standard on 1 January 2008. This is the date when delivery of standard letters will be liberalized.

This observation raises the question of whether the service quality is strategically raised owing to the current regulatory setting. Owing to the incentives created by the liberalization the new quality standard may be inefficiently high.

The universal service obligation (USO) which is codified in § 11 PostG[2] and the §§ 1,2 PUDLV[3] requires a minimum standard quality from the provider of the USO. This consists of a daily delivery of mail on weekdays, i.e. six days per week. Even this level of service has been called into question in the ongoing discussion because still there are other means of delivering urgent physical documents if necessary and information can be distributed easily by E-mail or telefax.

Under the current regulation scheme, DPAG has an exclusive license on standard letters, but competitors can obtain a license to offer specific services. A full service license which is of particular interest in this paper is codified in § 51 (1), No.4 PostG.[4] This type of license allows to offer the entire value chain: collecting, sorting, and delivering mail. Services which do not jeopardize the USO of the incumbent and which have specifics which constitute a higher service quality for the consumers can be licensed. Some

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[1]See
http://www.dpwn.de/dpwn?tab=2&skin=hi&check=no&lang=de_DE&xmlFile=2007865.
[2]Postgesetz.
[3]Post-Universaldienstverordnung.
[4]Postgesetz.

operators have already entered regional markets but, to our knowledge, no service provider yet covers the full area that is covered by the USO. The exclusive license of DPAG runs out by the beginning of 2008. Any operator will be permitted to offer postal services of all categories. There will be no restriction concerning the higher service quality.

The next section gives an overview on related literature. The third section develops the basic model and two applications which are discussed in the fourth section. The final section concludes.

## 2   Related Literature

There is an established strand of literature on vertical differentiation. The seminal contributions by Shaked and Sutton (1982, 1983) give a rationale for competition in vertical differentiation. They establish that even in the absence of fixed cost, the distribution of firms may not be atomistic when firms differentiate vertically. The number of active firms may be limited because a single firm can cover a whole range of quality levels and thus blockade further entry. In a natural duopoly where the firms first simultaneously set qualities and then prices, the firms differentiate their qualities at equilibrium. However, the degree of differentiation is not maximal, as it is in horizontal differentiation in Neven's (1985) quadratic cost version of the Hotelling (1929) model. The firm with the higher quality earns higher profits. In order to explain how the firms choose their position on the quality ladder, Hung and Schmitt (1988) propose sequential entry where the incumbent firm can credibly set his quality. A potential entrant faces a fixed entry cost. If the firms decide to enter the two firms then compete in prices. The authors show that the incumbent offers higher quality if entry occurs. If a fixed entry cost exceeds a certain threshold entry will be deterred.

Sequential entry with three firms is analyzed by Donnenfeld and Weber

(1992). This paper considers two cases: Either three firms enter the market sequentially, choosing their qualities, or two firms enter simultaneously and a third firm enters afterwards. Price competition follows after all entry decisions have been taken. In both cases the two first firms chose maximal differentiation and the third firm offers intermediate quality. Offering a higher quality implies higher profit. This means that the last entrant is better-off than the low-quality incumbent. We include a similar structure in the present model: the entrant offers a higher quality than the incumbent. In contrast to their 1992 paper, Donnenfeld and Weber (1995) introduce entry cost, with the result that entry can be deterred. They show how the magnitude of entry costs determine the choice of qualities that the two first firms offer. In particular, if the two incumbent firms cooperate they accommodate entry, while under competition they tend to deter entry.

All named papers so far and also other analyses of vertical differentiation like Gabszewicz and Thisse (1986), Choi and Shiin (1992), or Tirole (1988) assume no production cost or no quality-dependent costs. Lutz (1997) introduces entry costs and quality-dependent costs in a setting with two firms. This endogenizes the upper bound on quality choice. He finds that the relation between the two firms' quality-dependent costs determine the incumbent's incentive to deter entry. If these costs are equal the incumbent deters entry by setting a lower quality than he would do under monopoly with no threat of entry. Raising the fixed entry cost reduces this deviation from the monopoly quality until a threshold value where entry is blockaded. If the entrant has higher quality-dependent costs, accommodating entry will be more profitable then deterring entry, because the entrant offers a low quality. This guarantees to the incumbent to serve the high quality segment instead of lowering its quality in order to blockade entry. In turn, if the entrant has lower quality costs accommodating entry and the incumbent offering the lower quality may be the equilibrium outcome. Lutz stresses that cost differentials may result from policy measures like subsidies. This is a relevant

point in the context of regulated industries where access to essential facilities is administered by competition authorities.

Valletti et al. (2002) model an incumbent with a uniform pricing constraint (UP) and (in part) a converage constraint (CC). An entrant offers a horizontally differentiated product and sets its coverage and price. Little (large) coverage induces a soft (tough) price competition. In the present paper, we analyze vertical differentiation in the setting of Shaked and Sutton (1983), combined with UP and CC as in Valletti et al.

Donnenfeld and Weber (1992, 1995) and Lutz (1997) show that an entrant can end up with a higher quality than an incumbent. In a stochastic setting Filippini (1999) assumes that both entrant and incumbent can invest in R&D, the outcome of which is either an enhanced product or a cost reduction. The probability of the two events is identical for both firms. If the entrant succeeds in enhancing quality he can imitate the incumbent's product at lower cost. A cost reduction reduces the marginal cost of production in the subsequent quantity competition. As the incumbent's quality raises the cost of imitation, the incumbent may have an incentive to raise his initial quality above the level when there is no threat of entry. The incumbent's aim in doing so would be to make the entrant's investment in cost reduction more attractive than in quality enhancement.

# 3   The Model

The utility function $u(s, p) = \theta \cdot s - p$ describes a consumer of type $\theta$. This demand structure is adopted from Mussa and Rosen (1978) where each consumer purchases one unit of the product or service at most. We consider a continuum of consumers who differ in their preference for postal services according to the parameter $\theta \in [\underline{\theta}; \overline{\theta}]$. $\underline{\theta} > 0$ should be interpreted as the minimum quality/price which is defined by the USO. Consumers are uni-

formly distributed over this interval. The presence of courier services, which could provide similar service, albeit at a much higher price, could serve as an explanation for a strict upper bound for the consumers' valuation $\overline{\theta}$.[5]

Let $s \geq 0$ denote the quality of the product or service, where $u_j(s') > u_k(s'')$ for all consumers $j, k$ and $s' > s''$ which means that the service is vertically differentiated. The price of the service offered by firm $i$ is denoted by $p_i$. Each firm offers at most one product. The cost of providing the quality $s$ by firm $i$ is $c_i(s)$. Assume that $c(s)$ is convex: $c_i'(s) > 0$, $c_i''(s) > 0$, and $c_i(0) = c_i' = 0$.

The consumers' reservation utility is zero. They realize a unit demand if $u = \theta s - p \geq 0$, i.e. all consumers $\theta \geq p_1/s_1$ purchase from firm 1, the incumbent firm. The USO stipulates that a certain quality is to provided at an affordable price. This determines a minimum quality and a maximum price that the incumbent firm sets. These imply a lower bound $\underline{\theta} \equiv p_1/s_1$.



The incumbent firm provides service to all customers $\theta \in [\underline{\theta}, \overline{\theta}]$. The profit is

$$\pi_1 = d\left(\overline{\theta} - \frac{p_1}{s_1}\right) p_1 - c_1(s_1) \tag{1}$$

where for expositional reasons $d$ denotes the density of consumers on the interval $[\underline{\theta}, \overline{\theta}]$.

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[5]Defining the relevant market by a SSNIP of 5-10% for standard mail service without any competitors would probably not render courier services more attractive to a significant extent. Therefore a strict upper bound $\overline{\theta}$ seems to be appropriate.

## 3.1 Status Quo

This subsection provides a benchmark to assess the current market behavior in order to compare it with the behavior of a regulated monopolist who is not facing potential entry. In absence of the regulations set out in the USO, the profit maximizing strategy is given by the first order conditions

$$d\left(\bar{\theta} - \frac{2p_1}{s_1}\right) = 0 \tag{2}$$

$$d\frac{p_1^2}{s_1^2} = c_1'(s_1) \tag{3}$$

which can be combined to

$$d\frac{\bar{\theta}^2}{4} = c_1'(s_1).$$

This immediately implies that rising demand drives the incentive to provide higher quality, either through a rise in demand expressed by the density of consumers $d$ or through a shift of the upper end of the consumer valuation $\bar{\theta}$. (2) holds if $i$ is not constrained in setting $p_1$. Current observation of DPAG indicates that the *foc* is positive. DPAG is willing to raise its price, but the regulatory authority was committed to cut the price for standard mail in a debate on undue cross-subsidization in 2002. Furthermore, the last proposal by DPAG for a reduction of postage for standard mail was the minimum reduction of one cent by 2003.

The incentive of the incumbent monopolist to raise the quality when the density is constant (and normalized to one) is given by the first derivative of (1)

$$d\frac{p_1^2}{s_1^2} - c_1'(s_1) = 0. \tag{4}$$

While the upper bound of consumers $\bar{\theta}$ is invariable, more consumers on the lower bound $\theta > p_1/s_1$ are willing to buy. Since we observe that DPAG

just meets the USO, we can conclude that it has no incentive to increase its quality.

In brief, the USO imposes a higher quality and a lower price on the incumbent than an unconstrained monopolist would choose.

## 3.2 One Entrant

In this section we analyze the incentive of an entrant who considers $p_1, s_1$ as given. In particular, we will focus on the entrant's optimal entry decision and her conditional choice of $p_e, s_e$. Then we can draw conclusions on the incumbent's incentive to deter entry.

Any entrant is required to offer a superior quality: $s_e > s_1$. This holds at least in the perception of the parties involved in each single correspondence: the sender and the recipient.[6] However, there is no requirement that the licensed activity should be perceived as superior within the entire geographical scope of this regulation. The entrant may serve a restricted geographical area. Typically, entrants serve densely populated area or areas where they alrady have specific infrastructure.[7] Consequently, the entrant's standard mail service[8] is still at a disadvantage because of its restricted service area. Therefore, assume that this handicap is denoted by $\delta$. The implicit willingness to pay for the entrant's service if it covered the same service is $p_e = p_2 + \delta$. Also we assume that $\delta < p_1$, i.e. that the discount the entrant must offer is less than the regulated price of the incumbent. Furthermore, the average price of the new competitors for a standard letter is 44 cents.[9] This is below DPAG's

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[6]Bundesnetzagentur 2006, p.44.

[7]Main-PostLogistik GmbH serves only the Lower Franconia region. Morgenpost-Briefservice GmbH serves the Mannheim area and cooperates with partners in other regions. Both firms are newspaper publishes and they make use of their established network for newspaper delivery.

[8]A letter not exceeding 20 grams.

[9]See Bundesnetzagentur 2006, p.35.

price of 55 cents. Still, we observe that DPAG's market share is overwhelming. This indicates that some consumers still prefer the incumbent's service: $\theta s_1 - p_1 > \max[0; \theta s_e - p_e]$. This is equivalent to $0 < p_1/s_1 < p_e/s_e$ and implies that $p_e > p_1$ as $s_e > s_1$.
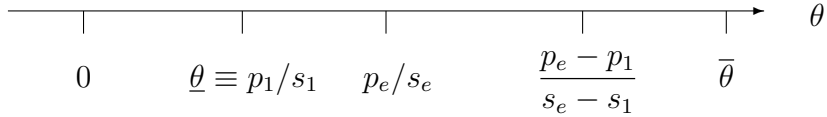


It is obvious that a consumer who is willing to purchase from the entrant would also purchase from the incumbent because $\theta > p_e/s_e$ implies $\theta > \underline{\theta}$. Now, only consumers who fulfil the condition $\theta > p_e/s_e > \overline{\theta}$ can effectively choose between the incumbent and the entrant. The remaining consumers either purchase from the incumbent or not at all, because they have a valuation below $\underline{\theta}$.

Consumers choose between the incumbent and the entrant according to $\theta s_1 - p_1 > \theta s_e - p_e$ which is equivalent to

$$\theta < \frac{p_e - p_1}{s_e - s_1} \tag{5}$$

indicating the consumers who purchase from the incumbent. The incumbent's profit is

$$\pi_1 = \left( \frac{p_e - p_1}{s_e - s_1} - \frac{p_1}{s_1} \right) p_1 - c_1(s_1). \tag{6}$$

In a static analysis, where an entrant would not react by adapting her price, an incumbent's increase in quality would raise his profit by

$$\frac{\partial \pi_1}{\partial s_1} = \frac{(p_e - p_1)p_1}{(s_e - s_1)^2} + \frac{p_1^2}{s_1^2} - c_1'(s_1). \tag{7}$$

Comparing with (4) immediately shows that for a given $s_1$ the incentive to raise quality is higher for the incumbent when an entrant is present. The

reason is that, in addition to attracting new consumers at the lower bound, customers on the upper bound $(p_e - p_1)/s_e - s_1)$ switch to the incumbent. The latter effect adds to the effect described by (4). This implies that $s_1$ would be set at a higher level under competition because of the convexity of $c_1$.

Hitherto, the incumbent has faced a static environment where the entrant does not anticipate or react to a change of quality $s_1$. Now, we shall examine what happens when the entrant can adapt her quality $s_e$ and adjust her price $p_e$. In order to determine the incumbent's incentive to deter or to accommodate entry we derive the entrant's optimal entry strategy given $s_1$ and $p_1$. The effective price of the entrant is $p_2 = p_e - \delta$ and her profit is

$$\pi_e = \left( \overline{\theta} - \frac{p_e - p_1}{s_e - s_1} \right) (p_e - \delta) - c_e(s_e). \tag{8}$$

Combining the first order conditions

$$\frac{\partial \pi_e}{\partial p_e} = -\frac{p_e - \delta}{s_e - s_1} + \overline{\theta} - \frac{p_e - p_1}{s_e - s_1} = 0 \tag{9}$$

$$\frac{\partial \pi_e}{\partial s_e} = \frac{(p_e - p_1)(p_e - \delta)}{(s_e - s_1)^2} - c'_e(s_e) = 0 \tag{10}$$

by inserting (9) into (10) yields

$$\mathcal{L} \equiv \frac{\overline{\theta}^2}{4} - \frac{1}{4} \frac{(p_1 - \delta)^2}{(s_e^* - s_1)^2} = c'_e(s_e^*) \equiv \mathcal{R}. \tag{11}$$

We can show

**Lemma 1** *If $s_e^*$ satisfying (11) exists, then $s_e^* > \underline{s_e}$ where $\underline{s_e} > s_1$.*

The left hand side ($\mathcal{L}$) of (11) has the following properties: $\lim_{s_e \to \infty} \mathcal{L} = \overline{\theta}^2/4$, $\lim_{s_e > s_1, s_e \to s_1} \mathcal{L} = -\infty$, and $\mathcal{L}$ is concave. The right hand side $\mathcal{R}$ has the following properties: $\lim_{s_e \to \infty} \mathcal{R} = \infty$, $c'_e(0) = 0$, and $\mathcal{R}$ is convex. Consequently, $\mathcal{L}$ and $\mathcal{R}$ either intersect twice, have an osculation point $\underline{s_e}$,

or have no point in common. In the first case $s_e^* = \max[s_e', s_e'']$ where $s_e'$, $s_e''$ denote the two intersection points. In the third case no $s_e^*$ in the relevant range $s_e > s_1$ exists. $\underline{s_e}$ is the smallest value for $s_e$ that can meet (9) and (10). □
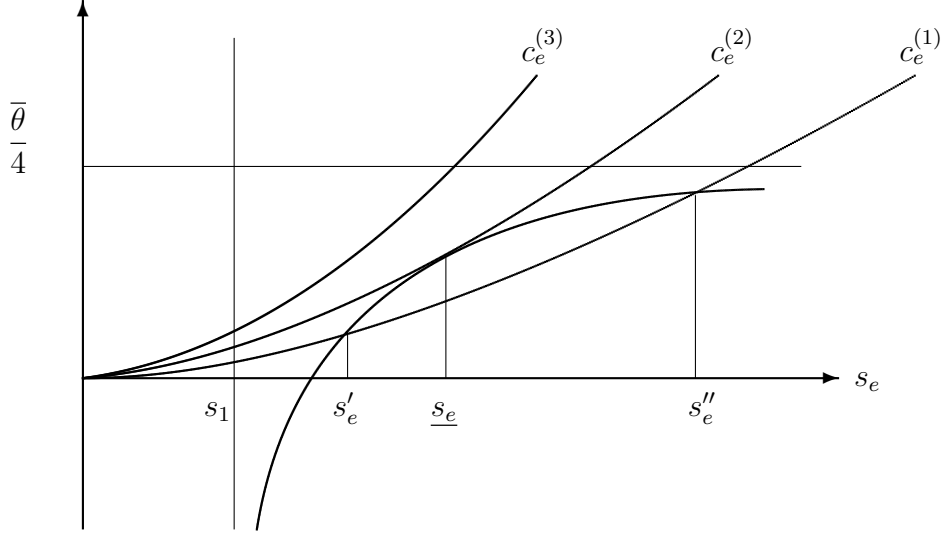


Lemma 1 is a first order condition. This does not guarantee that the entrant's profit is positive for all $s_e^* > \underline{s_e}$. For the entrant's profit to be positive a necessary condition is that her demand $\overline{\theta} - (p_e - p_1)(s_e - s_1)$ is positive. This is equivalent to

$$s_e^* > \frac{p_e - p_1}{\overline{\theta}} - s_1$$

and inserting $p_e$ from (9) yields

$$s_e^* > s_1 - \frac{p_1 - \delta}{\overline{\theta}}.$$

From Lemma 1, $s_e^* > s_1$ is satisfied and $p_1 > \delta$ holds by assumption. This condition is not sufficient because the inframarginal costs $c_e$ are not considered in the marginal analysis. Actual entry in this market indicates that (expected) profit is positive. This means that the cost of quality must be

sufficiently low to render entry a profitable strategy. Otherwise, we would observe no entry.

Now we turn to the incumbent's strategic behavior in the light of a possible deterrence strategy in the pre-liberalization period. First we will argue that the monopolist is better-off if entry does not take place. Subsequently, we will show that deterrence is possible and what strategy the incumbent has to choose in order to keep an entrant out of the market.

Comparing (1) and (6), it quickly becomes clear that a monopolist who sticks to $p_1, s_1$ is harmed by an entrant because $(p_e - p_1)/(s_e - s_1) < \overline{\theta}$. This means that a monopolist may have an incentive to impede entry. Under the regulatory regime, the monopolist can raise his quality but the maximum price is fixed by the regulatory authority. Consequently, the only choice variable of the monopolist is his quality $s_1$ which can be raised without the consent of the regulatory authority.

We can show that raising $s_1$ induces the entrant to reduce her price and quality and this reduces the prospective profit of an entrant. If the entrant's prospective profit drops below zero entry is deterred.

In order to show this effect, we assume that (11) holds and that (8) is positive. This means that a firm can profitably enter if the monopolist sticks to $p_1, s_1$. In (11) we see that raising $s_1$ to $s_1' > s_1$ reduces $\mathcal{L}$. In order to compensate for this effect on $\mathcal{L}$ $s_e$ would have to be raised. However, increasing $s_e$ would raise both $\mathcal{L}$ and $\mathcal{R}$ and the overall effect would be ambiguous. As we know from profit maximization in Lemma 1 that $\mathcal{L}$ crosses $\mathcal{R}$ from above, the slope of $\mathcal{L}$ must be smaller than that of $\mathcal{R}$ in $s_e = s_e^*$. Thus, lessening the quality $s_e$ reduces $\mathcal{R}$ to a larger extent than $\mathcal{L}$, such that $s_e^{**} < s_e^*$ satisfies (11) for $s_1' > s_1$. The effect on the prices can be inferred from (9) which transforms into

$$p_e = \frac{\overline{\theta}}{2}(s_e - s_1) + \frac{p_1}{2} + \frac{\delta}{2}. \tag{12}$$

We see that reducing $s_e$ in combination with a rise in $s_1$ implies a price

cut by the entrant. Overall this reduces the entrant's profit. This follows immediately from (11) because $s_1$ reduces the marginal revenue for each level of $s_e$. As the profit is the integral of marginal revenue minus marginal cost over the interval $[0; s_e^{**}]$ a rise in $s_1$ reduces the entrants profit. Therefore we can state

**Proposition 1** *If the incumbent can commit to a higher quality $s_1' > s_1$ this renders the entrant's entry strategy less profitable. If $s_1$ exceeds a threshold value $\bar{s}_1$ then entry is deterred.*

The reduction in profit has been inferred above. It remains to be shown that the profit is monotone in $s_1$. This is the case because the marginal revenue $\mathcal{L}$ is monotone and so is the total revenue. Since $\lim_{s_e > s_1, \, s_e \to s_1} \pi_e = -\infty$ and $\pi_e(s_e^*, s_1) > 0$ and the profit is monotone in $s_1$ a threshold value $\bar{s}_1$ exists such that $\pi_e > (<)0$ for $s_1 < (>)\bar{s}_1$. $\qquad\qquad\square$

If an incumbent can set a level of quality that an entrant has to react upon he is in the situation of a Stackelberg leader. We have shown that the incumbent would not be willing to raise his quality unless an entrant is present. This means that $s_1$ exceeds the profit maximizing quality as a monopolist. However, deviating even further from the optimal quality level reduces the incumbent's profit $\pi_1$. Consequently, the incumbent has the choice of accommodating entry or deterring entry. Both strategies are less profitable than staying as a regulated monopolist, but the incumbent has to opt for one of them.

## 3.3 Welfare Analysis

Shaked and Sutton (1983) state that a market with vertical differentiation may result in a natural oligopoly. This analogous to the situation of a natural monopolist, where the subadditivity of the cost function implies that welfare

is highest, if the good is provided by the sole (regulated) firm. In this section we analyze the effects of the incumbent's strategic behavior on welfare.

We start with the case of the regulated monopolist as a benchmark case. The Universal Service Obligation assures that there is an affordable postal service with a well-defined quality. This means that all consumers with a valuation parameter $\theta > p_1/s_1 = \underline{\theta}$ will demand one unit. Thus, the Consumer surplus is

$$\int\limits_{\underline{\theta}=p_1/s_1}^{\overline{\theta}} (\theta s_1 - p_1) \ d\theta = \frac{1}{2} s_1 (\overline{\theta}^2 - \underline{\theta}^2) - p_1 (\overline{\theta} - \underline{\theta}). \tag{13}$$

When the incumbent raises his quality $s_1' > s_1$ in order to deter entry by a potential competitor, more consumers purchase the product because the quality is improved, raising the consumers' willingness to pay. Then consumers with a valuation $p_1/s_1' < \underline{\theta}$ are indifferent between purchasing the product or not doing so.

$$\int\limits_{p_1/s_1'<\underline{\theta}}^{\overline{\theta}} (\theta s_1' - p_1) \ d\theta = \frac{1}{2} s_1' \left( \overline{\theta}^2 - \frac{p_1}{s_1'} \right)^2 - p_1 (\overline{\theta} - \frac{p_1}{s_1'}). \tag{14}$$

Finally, if the incumbent does not increase his quality and accommodates entry, then there are two qualities available on the market: the lower from the incumbent $s_1$ and the higher from the entrant $s_e$. Then the consumer surplus is

$$\int\limits_{\underline{\theta}}^{\frac{p_e-p_1}{s_e-s_1}} (\theta s_1 - p_1) \ d\theta + \int\limits_{\frac{p_e-p_1}{s_e-s_1}}^{\overline{\theta}} (\theta s_e - p_e) \ d\theta =$$

$$\frac{1}{2} \left( \overline{\theta}^2 - \left( \frac{p_e - p_1}{s_e - s_1} \right)^2 \right) s_e + \frac{1}{2} \left( \left( \frac{p_e - p_1}{s_e - s_1} \right)^2 - \underline{\theta}^2 \right) s_1$$

$$-\left(\overline{\theta} - \frac{p_e - p_1}{s_e - s_1}\right) p_e - \left(\frac{p_e - p_1}{s_e - s_1} - \underline{\theta}\right) p_1 \tag{15}$$

A comparison of the three consumer surpluses allows us to infer that

**Proposition 2** *Consumers are unambiguously better-off when entry is possible.*

Comparing the consumer surpluses immediately indicates that consumers benefit from both potential entry and actual entry. In the first case, the incumbent raises his quality. This benefits all present consumers and those who become customers because their willingness to pay exceeds the price. In the second case, consumers can now choose which product they want to purchase. Therefore they are clearly better off.

A comparison of the welfare effects would require us to specify the quality cost function. Conversely, the entrant's price affects the choice of customers among the two suppliers. pThe distribution of income is irrelevant for efficiency considerations.

# 4   Discussion

We have seen from (12) that the incumbent increases his quality if he anticipates that a rival may enter the market. This effect occurs whether entry is deterred or accommodated. In the latter case the entrant offers a lower quality at a lower price compared to the situation where the incumbent does not anticipate entry and sticks to the regulated price and quality. The intuition for entrant's reaction is that the firms have two dimensions in which they compete. Now as the incumbent is only free to raise his quality but not his price, the entrant has one more instrument available, in the form of her price. If the incumbent raises his quality this means that he competes in the quality dimension. This limits the entrant's profit opportunities and

therefore the entrant is no longer willing to bear the cost of such a high quality level. However, in order to avoid competition she will compete in the remaining dimension, namely the price. To sum up, the entrant's quality decreases because the market volume shrinks and her price drops because it is her principal strategic variable.

We have shown that if entry is deterred (14) or entry occurs without a reaction by the incumbent (15) the consumers benefit compared to the situation where no entry is possible. However, there are two countervailing effects which make it impossible to formulate a clear preference between the two scenarios. In (14) more customers are served and they receive a higher quality $s_1'$ while in (15) only a share of the initial group of customers receives an even higher quality than $s_1'$.

Comparing (4) and (7) has shown that the incumbent has a higher incentive to raise his quality when an entrant is present than when there is no entry. The reason is that he can attract additional customers not only among those who have not purchased yet but also from customers who might opt for the entrant's product. This means that if entry is possible and the incumbent can raise his quality while still accommodating entry, then the total number of customers will increase. However, as the entrant lowers his quality and his price, those customers who would opt for the high quality service are harmed. Therefore the overall effect compared to the situation with the incumbent sticking to $p_1, s_1$ is not clear a priori.

We have argued that a comparison between deterrence and accommodation is ambiguous. However, the explanatory power of such a comparison would be limited because quality costs are not yet considered. Our modeling does not specify the quality cost function. Therefore we cannot formulate statements about inframarginal costs and, thus, total costs. Since the consumers' payments are pure redistribution of income, only the quality costs matter for a welfare comparison. Furthermore, we have disregarded the quality cost which may differ significantly between the entrant and the incumbent.

In the case of DPAG we know for at least two reasons that competitors have significantly lower cost. First, the latter do not have the burden of taking over the workforce of the former state post administration. Secondly, DPAG does not charge sales tax, while entrants do for private customers. This is at least relevant for business with private customers–even though this makes up only a small share of total business.

Throughout the paper we have presumed that quality can be set by the firms in a credible way. This would allow DPAG to deter entry. The credibility is essential for rendering deterrence possible at all. However, it seems that providing a quality level once is a commitment for later periods. The directives 97/67/EC and 2002/39/EC specify minimum standards for the universal postal service in Europe. DPAG is free to offer a higher quality and they do so because of the German Regulation on the Universal Service[10] in delivering mail on Saturdays. However, now in the light of entry, they are testing an increase in quality. That signals to competitors that, if they should choose to enter, DPAG knows whether it can easily offer a higher quality. Therefore potential entrants will have to consider to competing with a seven-day delivery.

The model setting is highly stylized and does not cover all important aspect of this changing market. Therefore there are some limitations to the model. We know that the entrants do not cover the same territory as the incumbent who fulfills the universal service obligation, and certainly will continue to do so after 2008 as the only firm holding a dominant position. We have tried to consider this effect by introducing a discount on the realized price of the entrant. Therefore defining the relevant market as the reserved area (letters below 50g) may not be appropriate. Instead a market could be defined as a city-pair.

A further limitation is that consumers face switching costs. Similarly to call-by-call telephone services where the incumbent DTAG is obliged to

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[10]Post-Universaldienstverordnung (PUDLV).

provide invoicing services to competitors because customers would not accept to receive and pay several invoices, customers may not be willing to buy different sets of stamps or set up lines of credit with several companies. This would mean that for each correspondence there is a particular set of firms who offer this origin-destination combination. This creates switching costs which protects the incumbent to some extent from competition.

# 5    Conclusion

In this paper we have analyzed the incentives of DPAG or increase there quality in the light of the upcoming liberalization of the postal services market in 2008. We have modeled the market as a vertical differentiation setting where firms compete on quality and price. The incumbent can commit to a quality and this allows him to deter entry, if not yet blocked.

As demand in Germany is virtually constant, there would be no incentive for DPAG to increase its quality at this particular moment, if the market were not to be liberalized in six months. Therefore, we suggest that the current changes in market regulation have motivated this quality progression. In particular, we have shown that this raise in quality is only profitable to DPAG because it renders entry less profitable or maybe even impossible. However, consumers benefit from the higher quality, regardless of whether entry is deterred or accommodated.

# References

Bundesnetzagentur (2006), Neunte Marktuntersuchung für den Bereich der lizenzpflichtigen Postdienstleistungen.

Choi, Chong Ju, Hyun Song Shin (1992), A Comment on a Model of Vertical Product Differentiation, in: Journal of Industrial Economics **40**, 229-231.

Donnenfeld, Shabtai, Shlomo Weber (1992), Vertical Product Differentiation with Entry, in: International Journal of Industrial Organization **10**, 449-472.

Donnenfeld, Shabtai, Shlomo Weber (1995), Duopoly and Quality Standards, in: European Economic Review **39**, 71-82.

Filippini, Luigi (1999), Leapfrogging in a Vertical Product Differentiation Model, in: International Journal of the Economics of Business **6**, 2, 245-256.

Hotelling, Harold (1929), Stability in Competition, in: Economic Journal **39**, 153, 41-57.

Hung, N.M., Nicolas Schmitt (1988), Quality Competition and Threat of Entry in Duopoly, in: Economics Letters **27**, 287-292.

Neven, Damien (1985), Two-Stage (Perfect) Equilibrium in Hotelling's Model, in: Journal of Industrial Economics **33**, 317-325.

Shaked, Avner, John Sutton (1982), Relaxing Price Competition Through Product Differentiation, in: Review of Economic Studies **49**, 3-13.

Shaked, Avner, John Sutton (1983), Natural Oligopolies, in: Econometrica **51**, 5, 1469-1483.

Valletti, Tommaso M., Steffen Hoernig, Pedro P. Barros (2002), Universal Service and Entry: The Role of Uniform Pricing and Coverage Constraints, in: Journal of Regulatory Economics **21**, 2, 169-190.