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PREEMPTING THE ENTRY OF NEAR PERFECT SUBSTITUTES

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ABSTRACT

When firms compete on price and quality-enhancing promotion in a market for differentiated products, entry of a nearly perfect substitute to one of such products, for example, a generic version of a pharmaceutical drug, intensifies price competition but softens quality competition. We show that consumers are likely to gain from entry when quality is relatively unimportant for them, when business stealing generated by promotion is substantial, and when products are poor substitutes. We also show that entry may be more attractive for consumers in less concentrated markets, as a smaller number of firms and asymmetric market shares may be associated with higher quality.

I. INTRODUCTION

This paper discusses the consequences of a unilateral conduct that preempts the entry of very close substitutes; we assume that competition among differentiated products takes place over price and promotion and that entry leads to intense price competition among near perfect substitutes for one of these products. The assessment of such conduct in terms of consumer welfare requires an explicit comparison of the relative benefits that consumers obtain from price competition (triggered by entry) and nonprice competition (relaxed as a result of entry).

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This analysis is in part motivated by recent cases in the pharmaceutical industry involving conduct by innovators attempting to foreclose the entry of generics (which, being bio-equivalent, are nearly perfect substitutes for existing products).[1] For instance, the Commission found that Servier[2] had foreclosed the market for perindopril by purchasing from Azad (another pharmaceutical firm) the intellectual property rights pertaining to a production process that might have allowed entry by generic firms without infringing Servier's existing patents. In the Paroxetine case,[3] the Competition and Market Authority found that GSK has paid a lump sum to potential generic entrants to stay out of the market. In the case of the pharmaceutical industry, concerns about the preemption of entry of near perfect substitute products arise naturally when a molecule is expected to lose exclusivity. Our model, however, applies more generally to circumstances in which changes in regulation (like a reduction in import tariffs) or technology would make the entry of very close substitutes imminent.

Nonprice competition in our model takes place through promotion, and it is characterized by two parameters, namely the extent to which promotion affects product quality and the extent to which firms' promotions result in business stealing. We find that the effect of foreclosure on consumer welfare depends on these features. Consumers are more likely to gain from entry when consumers' willingness to pay for quality is low, when promotion results in business stealing, and horizontal product differentiation is higher as, in those circumstances, the reduction in quality induced by entry is more limited. In addition, the quality of the product subject to entry always falls by more than the quality of the products that are not subject to entry. In such an asymmetric outcome, the prices of the products that are not subject to entry might increase. This arises when consumers' willingness to pay for quality is high enough and the effect is more significant when business stealing is weaker and when product differentiation is lower.

We also show that consumer welfare before entry does not necessarily increase with the number of firms and the symmetry of their market shares. Although an increase in the number of firms reduces prices and increases product variety, it will also reduce the equilibrium levels of qualities. Beyond a certain threshold on the number of firms, the second effect dominates and consumer welfare falls as the number of firms increases further. Similarly, asymmetries in market share, for a given number of firms, are associated with a higher level of consumer welfare when they are induced by differences in the effectiveness of promotion across firms. As a result, entry may be more

[1] They are equivalent in terms of efficacy but the packaging and/or the size and color of the pill (or injectable) differ as compared to the originator's product.
[2] Decision of the EU Commission, Case AT 39612, 9/7/2014.
[3] Decision of the Competition and Markets Authority, Case CE-9531/11, 12/02/2016.

attractive (and thus the foreclosure of entry more harmful) in less concentrated markets.

Our analysis is related to the literature on preemption. Gilbert and Newbery (1982) establish that an incumbent monopolist will often have the ability and incentive to preempt entry because his willingness to pay (the difference between a monopolist's and a duopolist's profit) exceeds the compensation that the entrant will require (a duopolist's profit). In a symmetric model, the former exceeds the later simply because aggregate profits fall with entry, whereas consumers are harmed by preemption because prices fall with entry. Gilbert and Newbery's (1982) analysis is motivated by the preemptive acquisition of patents, a situation in which an innovation triggers the possibility of entry (so that preemption involves the acquisition of a patent that is never used or licensed). The analysis, however, extends to the environment in which an incumbent loses exclusivity because its patent expires.

"Pay-for-delay" agreements (or "reverse patent settlements") often uncovered in the pharmaceutical industry involve a delay rather than a permanent preemption of entry but rely on the same economic logic. The standard model (Shapiro, 2003) involves probabilistic patents (i.e., patents that are only valid with some probability) and a litigation whereby an originator sues a generic for an alleged patent infringement. In this context, the expected date of entry of the generic is given by the time to the expiry of the patent weighted by the probability that it is found valid by the court (see also Aaron *et al*. 2013). Before the conclusion of legal proceedings, the parties reach an out-of-court settlement involving a resource transfer from the originator to the generic producer together with a negotiated date of entry (so that the compensation flows from the allegedly aggrieved party to the presumed infringer). This set-up assumes that, in the absence of entry, the originator does not face any competition. Shapiro (2003) shows that a settlement that involves a payment exceeding the transaction cost that the settlement saves for the originator must have a later entry date than the expected entry date under litigation.[4] Such an agreement is feasible because the benefit from extending the monopoly beyond its expected time of expiry exceeds the profit of the entrant,[5] and consumers are harmed by the agreement.[6]

[4] This inference, however, needs to be qualified in the presence of risk aversion and asymmetric expectations with respect to the validity of the patent (see Baumann *et al*. 2014).

[5] Note that the even in the absence of a challenge of the validity of a patent, an originator might have the ability and incentive to simply pay a generic entrant to stay out (at least in the absence of a queue of potential entrants)—as illustrated by the Paroxetine case discussed above.

[6] Marxen and Montez (2020) consider agreements that anticipate rather than delay the entry of generics. In their model, two generic firms could enter after patent expiry; if both do, entry would not be profitable, but entry by a single firm is profitable. Equilibrium entry then involves mixed strategies so that the incumbent can remain a monopolist for some time after patent expiry, until one or both generics eventually enter. An early entry agreement guarantees that a single generic enters the market immediately, and it allows the incumbent to extract the entrant's profit. They

These analyses, however, assume that the originator does not face any competition in the absence of entry. This assumption is key to conclude that consumers are harmed by the preemption (or delay) of entrants, which then merely leads to the perpetuation (or extension) of a monopoly. Grabowski *et al*. (2010) relax this assumption in an informal discussion. They observe that when generics are available, promotional effort is no longer attractive as the expansion of sales is less profitable (because of lower margins) and because the benefit of promotion spills over to competitors. They argue that ignoring the free samples that are distributed as part of the promotion leads to an overestimation of the price reductions associated with generic entry. In addition, they argue that faced with near substitutes sold at low prices, originators no longer have an incentive to explore whether the drugs could potentially treat other conditions (phase IV clinical trials that are conducted once the drug is marketed). Finally, they argue that promotion through detailing, which is discontinued following generic entry, has an informational content that improves physicians' prescription decisions.

Grabowski *et al*. (2010) also note that generic entry and the associated reduction in promotional effort weakens competitive rivalry among drugs that are still patent protected. In this respect, they report evidence such that the total quantity of a drug (generic versions plus originator drug) often falls after generic entry, despite lower average prices[7].

Castanheira *et al*. (2019) provide a reduced form model in which generic entry produces both a reduction in price and in promotion for the near perfect substitute and identify the conditions that determine which of the two effect dominates. They also provide empirical support for their theoretical results. They find that, on average, drugs that remain patent protected benefit from the entry of near perfect substitutes for their competitor, despite the reduction in the average price of the drug concerned.

Our model is closest in spirit to that of Castanheira *et al.* (2019). Unlike these authors, who analyze the consequences of entry on originators, we focus on consumer welfare. Our contribution is to allow for an explicit model of competition in promotion and price in which we can identify the circumstances in which entry enhances consumer welfare.[8]

show that these types of agreements do not necessarily reduce total welfare, but generally harm consumers.

[7] For instance, as reported in Jena *et al*. (2009), the sales of generics did not quite offset the fall in sales of Tagamet (a H-2 receptor inhibitor) after loss of exclusivity. A similar pattern is found for proton pump inhibitors (Prilosec) and ACE inhibitors (Capoten). According to Aitken *et al*. (2013), it is "a conventional wisdom that total brand plus generic utilization of a molecule declines following patent expiration" (page 9). These authors also report a different pattern (such that sales increase) in some recent cases.

[8] Our analysis is also related to the literature on the effect of entry on consumer welfare. Perloff *et al.* (2005) find that in a (circle) model of spatial differentiation a duopoly can lead to higher prices and lower consumer welfare than in monopoly. Chen and Riordan (2008) reach the same conclusion in a general discrete choice model of product differentiation. The mechanisms

The paper is organized as follows. Section II develops a model in which firms compete in price and promotion. Section III identifies the circumstances in which entry of near perfect substitutes for one product increases consumer welfare. Section IV concludes.

II. A MODEL OF COMPETITON IN PRICE AND PROMOTION

This section develops a model of competition through price and promotion. We use the demand formulation of Symeonidis (2000), where (N) firms sell products that are differentiated according to their quality (each firm sells a single differentiated product). It is written as follows:

$$q_i = \frac{u_i^{2\gamma}\,(1-p_i)}{(2-\sigma)} - \frac{u_i^{\gamma}\,\sigma\,\sum_j u_j^{\gamma}\,\left(1-p_j\right)}{(2-\sigma)\,(2+\sigma\,(N-1))}, i \in \{1,\ldots,n\},$$

where q_i , p_i, and u_i, respectively, denote quantity, price, and quality of product i. In this formulation, for a given vector of prices and qualities, an increase in the quality of a firm's product will increase its demand and reduce the demand for other products. An increase in the quality for one product will increase the aggregate demand starting from any symmetric set of prices (see Appendix). Conversely, as revealed by the inverse demand,[9] an increase in quality, while not changing the choke price, will increase consumers' willingness to pay for any quantity sold by the firm and its competitors. It can also be checked (see Appendix) that demand becomes less elastic as quality increases.

The model also allows for a parameter (γ) that captures the extent to which utility is affected by quality. A larger value of this parameter will make own demand more sensitive to quality (and the quality of competitors) so that nonprice competition through quality becomes relatively more significant as a competitive instrument.

The demand formulation also allows for horizontal differentiation. Horizontal differentiation across firms is symmetric and is measured by the parameter(σ).[10] This parameter takes values between zero (complete product differentiation, so that the demand for each product is independent of the price and perceived quality of the other products) and two (such that all varieties are perfect substitutes when they have the same quality). Less product

through which entry affect consumer welfare in these models differ from those found in our model. In their model, a greater diversity of products leads potentially to a better match between product and consumer preferences. This effect is absent in our model in which entry takes place with a near perfect substitute. In our model, entry also affects the choice of promotion whereas in their model products characteristics are exogenous.

[9] The inverse demand is written $p_i = 1 - \frac{2q_i}{u_i^{2\gamma}} - \frac{\sigma}{u_i^{\gamma}} \sum_{j \neq i} \frac{q_j}{u_j^{\gamma}}$, see also Symeonidis (2000).

[10] In the context of the pharmaceutical industry, differentiation may stem from the different side effects across patients.

differentiation makes the demand more sensitive to own price and to the price of competitors.

We assume that promotion affects the level of quality through "persuasion" to the extent that, like in other models of persuasive advertising,[11] demand becomes less elastic as quality increases in response to promotion. Within this class of models, it matters for the competitive outcome whether promotion has a demand expansion or business stealing effect (see Bellflamme and Peitz, 2015). When promotion is characterized by business stealing, firms may be caught in an arm's race in which their attempts to differentiate from each another will tend to cancel out.

We parameterize the significance of this effect in our model by allowing the investment in advertising/promotion to reduce the quality of the other products. Specifically, the quality of product (i), u_i is given by: $u_i = x_i - \alpha \sum_{j \neq i} x_j$, where x_i denotes the investment by firm i. The parameter α represents the degree of demand shift or "business stealing"[12] (with $\alpha < \frac{1}{N-1}$ to ensure that equal investment by all firms together has a positive effect on quality). A high value of this parameter corresponds to a situation in which promotion takes demand away from competitors to a larger extent than it expands overall market size (at given prices).

This formulation, in which own promotion reduces the quality of competing products, captures circumstances in which the perception of quality, which drives consumer choices, is relative; for instance, an improvement of quality for a product (involving, say, an increase in reliability or effectiveness) might have consequences for the perception that consumers have of competing products (because the new quality has established a new standard in terms of reliability or effectiveness). Alternatively, the development of a strong brand image for a product will deteriorate the perception of quality of the other products.

We assume that the cost of increasing quality is quadratic. We introduce a shift parameter (k) in the cost of increasing quality, which represents the costliness of investment.

We consider a two-stage game in which firms invest in the level of their product's perceived quality in the first stage and compete in price in the second stage.

In this framework, the effect of nonprice competition is determined by two parameters. As γ increases, nonprice competition becomes more significant. As α increases, nonprice competition induces more business stealing, as an increase in the perceived quality of a product has a greater (negative) impact on

[11] See Bagwell (2007) or Bellflamme and Peitz (2015).

[12] The term "business stealing" is normally used to describe the extent to which a competitive strategy affects the profit of competitors (see Bellflamme and Peitz, (2015), p 84). In what follows, we refer to "business stealing" at the level of demand.

the perceived quality of other products. Different markets will be characterized by different parameters constellations[13].

In the context of the pharmaceutical industry, one can also wonder whether promotion leads to an increase in quality or simply a change in the perception of this quality. As observed by Sutton (1991), the underlying reason as to why advertising/promotion affects consumer choices is a question at the interface between economics and psychology. In terms of standard economic modeling, in order to affect choices, advertising needs to affect utility from the consumption of the advertised products. Still, as argued by Sutton (1991), while formulating advertising as (indirectly) affecting utility, one should be cautions in drawing welfare implications when there is a concern that advertising involves some spurious differentiation that has no "real value" to consumers. The pharmaceutical industry may be such an instance. In this industry, one would expect promotion to affect perceived quality in different ways (see also Grabowski *et al.* 2010). Promotion in the form of personalized visits to physicians may provide them with better information on the nature and extent of side effects. In turn, this is likely to lead to a better match between a patient and a particular drug, generating higher utility for the patient/doctor pair: increased therapeutic benefits for the patient and greater confidence in having made the correct choice for the prescribing physician. Promotion may also inform physicians of the results of Phase IV clinical trials (i.e., carried out after a drugs market launch) that have revealed a drug's efficacy for medical conditions not covered by the marketing authorization ("off label" use of the drug).

Finally, promotion might alter physicians' perception of a drug's intrinsic quality. Under such a scenario, promotion does not alter therapeutic efficacy, but the physician is led to perceive the drug as superior as compared with his initial prior. The patient/doctor pair's utility increases as both upgrade their perception of the treatment's value, which may actually lead to superior health outcomes. For instance, in a controlled trial, patients have been found to report superior efficacy of the branded drug as compared with its bio-equivalent generic version.[14] An alternative interpretation is simply to think of promotion with investment yielding quality improvements that enhance consumer utility.

[13] Our model could also be interpreted as one in which research and development, instead of promotion, leads to changes in quality (see Sutton, 1991). In such circumstances, one would expect the willingness to pay for quality to be significant and the business stealing to be limited. However, other issues like the stochastic nature of research results will also become important.

[14] For instance, in a controlled clinical trial, where subjects were informed of the brand versus no-brand status of the given preparation (but not whether it contained a placebo), Branthwaite and Cooper (1981) find that mean pain relief of acetylsalicylic acid, commonly known as Aspirin, was significantly higher with a branded preparation. Waber *et al*. (2008) show that consumers report greater pain relief for an opioid analgesic when they are informed that the price is the regular price rather than a discounted one (the actual dispensed product to all participants was an inactive preparation). See Marxen and Montez (2020) for a discussion.

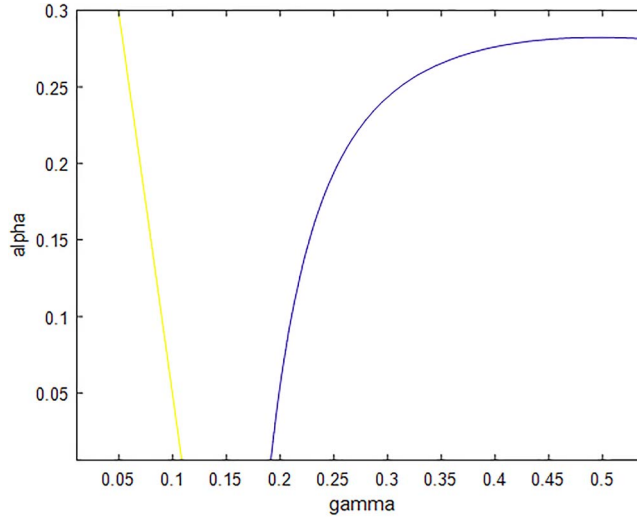

Figure 1. The effect of entry on consumer welfare.

For instance, this could take the form of a slow release formulation requiring less frequent drug ingestion.[15]

III. THE EFFECT OF ENTRY ON CONSUMER WELFARE

In what follows, we consider a benchmark constellation of parameters, with four firms and an intermediate degree of horizontal product differentiation ($N = 4, \sigma = 0.5$).[16] We compute the level of consumer welfare[17] in the absence of entry (the status quo that would prevail with foreclosure) and the level of welfare with entry that would bring the price down to marginal cost for one of the differentiated products. Entry thus leads to zero profit for both the incumbent and the seller of the near perfect substitute. In those circumstances, preemption is thus always feasible and attractive for the incumbent. The only question is whether it leads to a fall in consumer welfare.

[15] There is a fourth possibility, namely that promotion is a conditional payment. For instance, pharmaceutical firms are allowed to pay speaking fees to physicians to promote the benefits of a particular drug. The amount of fees could be made conditional on quantitative prescription targets. This type of commercial strategy is believed to have exacerbated the severity of the opioids epidemic in the United States (see "Wall Street, bribery and an opioid epidemic: the inside story of a disgraced drug maker", *Financial Times*, June 19, 2020). Our model does not capture such mechanisms, which clearly have very different welfare implications.

[16] Our benchmark constellation of parameters is such that $N = 4, \sigma = 0.5, \alpha = 0.1, c = 0, k = 0.01$, and $\gamma = 0.5$. We have explored a range of values for the benchmark parameters that did not lead to qualitative changes.

[17] Consumer welfare can be computed directly from the indirect utility function, see also Symeonidis (2000).

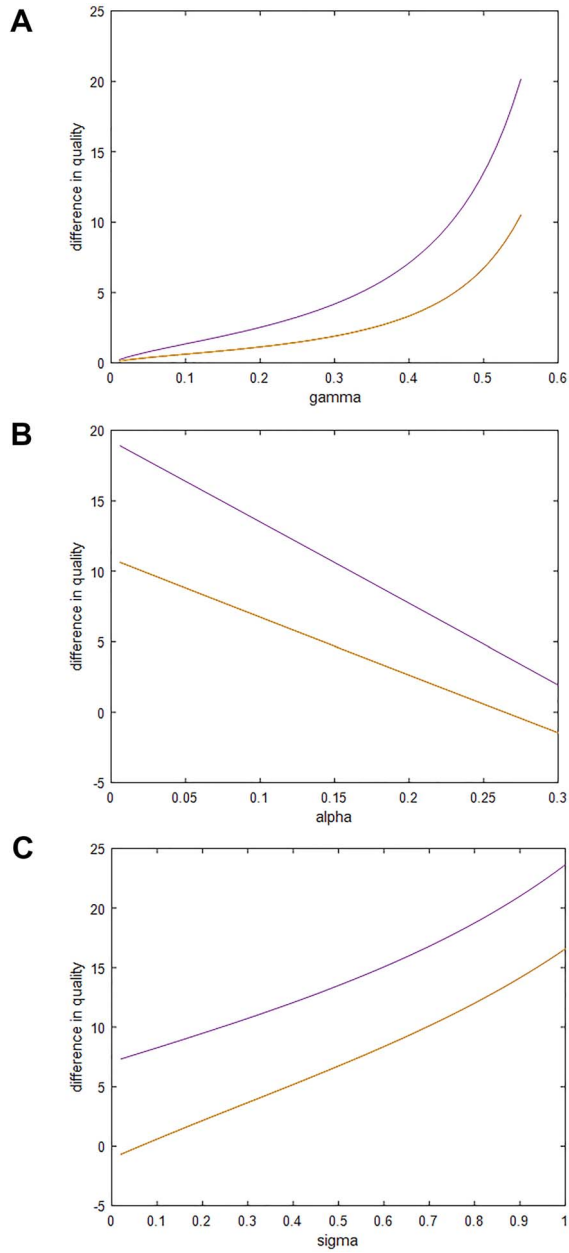

Figure 2. (a) Changes in quality following entry as a function of the willingness to pay for quality. (b) Changes in quality following entry as a function of the intensity of business stealing. (c) Changes in quality following entry as a function of the degree of product differentiation.

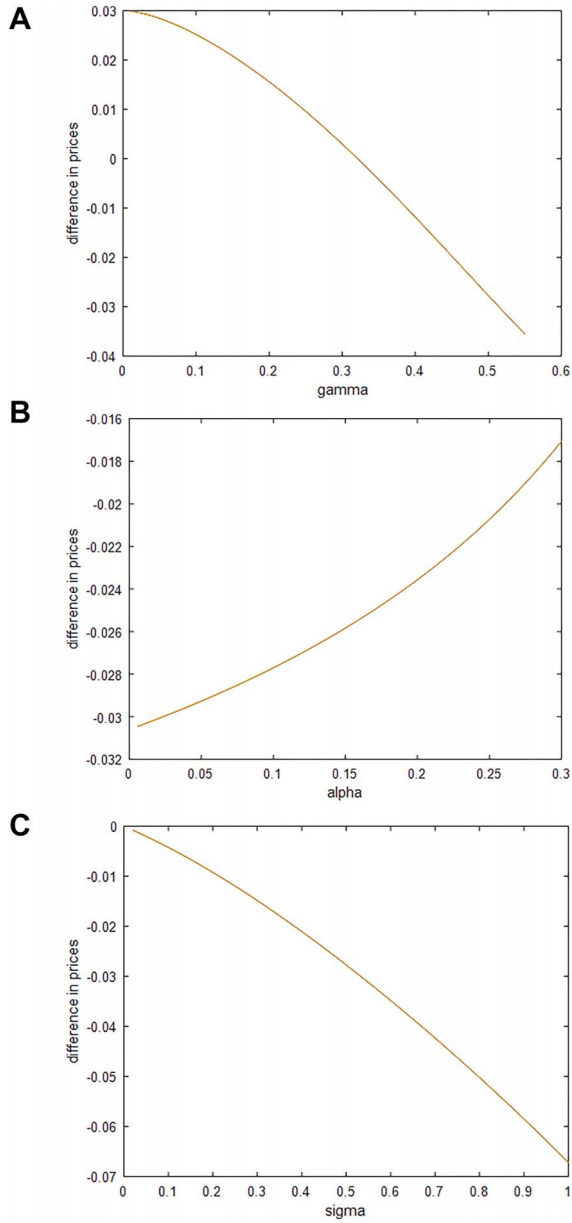

Figure 3. (a) Change in the price of competing differentiated products as a function of the willingness to pay for quality. (b) Change in the price of competing differentiated products as a function of the intensity of business stealing. (c) Change in the price of competing differentiated products as a function of the degree of product differentiation.

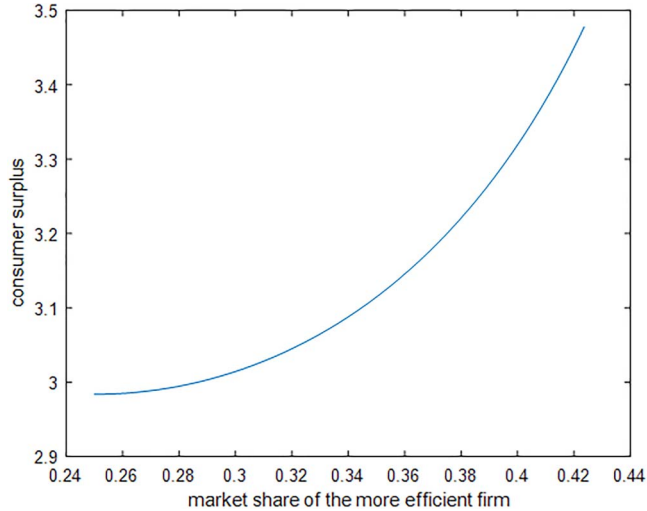

Figure 4. Consumer welfare as a function of asymmetries in the effectiveness of investment in raising quality.

In order to interpret the results, there is also one feature of the equilibrium prices in this model that should be noted. For a given number of firms and degree of horizontal differentiation, equilibrium prices are determined by relative qualities and marginal costs (see Appendix). That is also to say that in a fully symmetric setting (which yields identical qualities in equilibrium), the prices are independent of customers' response to quality (the parameter γ) and independent of the degree of nonprice rivalry (the parameter α).[18]

We compute the difference in welfare for different values of the parameters γ and α. Figure 1 presents the frontier (in blue) between parameters constellations for which entry increases welfare (to the left of the blue curve) and the parameter constellations for which entry decreases welfare (to the right of the blue curve).[19]

We observe that, as γ increases, the gain in welfare induced by entry decreases. This arises because a higher γ implies that consumers attach more value to qualities and the quality of the products is higher before entry. Following entry, the quality of all products falls and the quality of the product

[18] Intuitively, this arises because in Symeonidis' specification, the own-price elasticity of demand only depends on the relative quality of the product. Under symmetry, the relative quality can be normalized to unity for each good and is therefore independent of parameters γ and α. The elasticity is then also independent of these parameters. Because price–cost margins are equal to inverse demand elasticities in oligopoly equilibrium, prices must be independent of parameters γ and α as well.

[19] As further discussed below, the yellow line identifies the combinations of parameters that yield a promotion to sales ratio of 20% before entry.

that is affected by entry falls by more (as investment in its promotion is stopped).

The magnitude of the reduction in product quality also increases as γ increases. This is shown in Figure 2a, which present the quality before entry less the quality after entry (so that a positive value is associated with a fall in quality), respectively, for the firm that is subject to entry (in violet) and for the other innovators (in brown).

In addition, as γ increases, consumers also attach more value to quality so that their surplus falls by more for any given change in quality.

We also observe that whether the price of the three products that are not subject to entry falls after entry depends on γ.

Although the price falls for low values of γ, the price actually *increases* (as a consequence of the asymmetry in quality with the product that is subject to entry) when γ is large enough so that entry become relatively less attractive.[20] This is shown in Figure 3a (which presents the price before entry less the price after entry, so that a positive value is associated with a reduction in price).

As the significance of business stealing increases, entry becomes relatively more attractive. First, the difference in quality between pre- and postentry is reduced (as shown in Figure 2b).

Second, although the prices of the products that are not subject to entry increase after entry, the magnitude of the effect is less significant (as shown in Figure 3b) for higher values of α. Consumers thus gain more from entry when entry disrupts an arm's race in promotion between the differentiated products.

In order to get a sense of what may be appropriate parameter values, Figure 1 also reports the combination of parameters that yield a promotion expenditure to sales ratio of 20%. This promotion intensity is commonly reported in the pharmaceutical industry.[21] This is the yellow line. We see that for all combinations of parameters, which yield such promotion to sales ratio, generic entry would actually increase welfare (the yellow line is entirely to the left of the blue line). The combination of parameters that yield an even higher level of promotion expenditure to sales ratio would involve a shift of the yellow curve to the right. We find that for parameters, which yield a promotion intensity of 30% (not shown), entry would still always increase welfare.

Furthermore, one can consider how the degree of horizontal product differentiation affects consumer benefit from entry.

We observe that as products become less differentiated (σ increases), entry becomes less attractive for consumers. This arises because quality drops

[20] The fall in the price of the product that is subject to entry is independent of γ. This obtains because the price at the pre-entry equilibrium involves symmetric qualities and is thus independent of γ. The price post-entry is equal to marginal cost, whatever the value of γ.

[21] According to Donohue *et al.* (2007, p. 497), in 2005, originator firms spent, on average, 18% of the revenues on promotion in its various forms: detailing, distribution of free samples, and adverts in specialized journals. Gagnon and Lexchin (2008) report even higher figures for 2004. Detailing consists of individual visits by sales agents to provide information to practitioners.

by more when product differentiation is less significant (see Figure 2c). As products become closer substitutes, the price of the product that is subject to entry falls by less (as the price before entry is already closer to marginal cost). The price of the three products that are not subject to entry also increases more as products become closer substitute (as shown in Figure 3c). These results are reminiscent of those reported by Castanheira *et al.* (2019).

Finally, we consider how the number of firms before entry affects the results. We find that as the number of firms increases, the benefit from entry initially falls, which reflects the diminishing importance of the market segment affected by entry. However, beyond a certain level, the consumer benefit stemming from entry increases with the number of firms. Consequently, the foreclosure of near perfect substitutes may paradoxically be more likely to reduce consumer welfare when there is large number of competing differentiated products. This arises because beyond a certain point, a larger number of firms actually decrease the equilibrium level of qualities in the preentry equilibrium (and this reduces the relative value of nonprice competition for consumers). For our benchmark configuration of parameters, maximum preentry consumer welfare is reached for six firms; although an increase in the number of firms reduces prices and increases products variety, it will also reduce the equilibrium levels of qualities. For a number of firms beyond six, the second effect dominates and consumer welfare falls.

Hence, the observation that there is a large number of competitors in the absence of foreclosure should not be interpreted as suggesting that the foreclosure of near perfect substitutes is unlikely to harm consumers because competition in the absence of foreclosure ensures a high level of consumer welfare.

Similar considerations apply with respect to the symmetry of market shares. The usual inference is that symmetries in market share, other thing equal, are more likely to reflect intense competition and thus yield a high level of consumer welfare.

In the usual paradigm of price, or quantity, competition, a change in concentration is induced by a dispersion of marginal cost. More efficient firms become larger and their margin increases. Concentration measured by the market share of the largest firms or the Herfindahl–Hirschman index increases, but consumers tend to be worse off. The intuition is that less efficient firms pass on the increase in marginal cost, whereas more efficient firms take advantage of the lower competitive pressure to increase margins.

In our model, asymmetries can, however, lead to increases in consumer welfare. Consider first a change in concentration that is associated with a change in the dispersion in the ability to enhance the quality of products across firms, that is to say a dispersion in the ability to compete through nonprice instruments. Specifically, we consider a mean preserving change in the shift parameter of the cost of investment in quality (k). We assume that two firms become more efficient and the other two become less efficient. Figure 4

presents consumer welfare as a function of the market share of (one of) the more efficient firms.

We observe that welfare increases when the asymmetry is induced by a difference in firms' ability to enhance quality through investments in promotion. Welfare increases because firms with a stronger ability to raise quality increase their investment and firms with inferior qualities are forced to charge lower prices. Interestingly, we obtain the same result when asymmetries are triggered by differences in marginal cost. Firms that have lower marginal cost will have an incentive to invest more in quality leading again to an asymmetric outcome with some firms selling higher qualities to the benefit of consumers.

This observation also suggests that concentration should not necessarily be a concern when nonprice competition plays a central role. Unlike what happens in a model without quality investment, concentration may not be a symptom that consumers are harmed by a relaxation of competitive constraints, but rather that consumers benefit as nonprice competition better serves their interest. Conversely, one should not conclude that a market with low concentration is necessarily more attractive in terms of consumer welfare than a comparable market characterized by higher concentration.[22] Entry in a less concentrated market may thus be more beneficial for consumers.

IV. CONCLUSION

This paper has discussed the circumstances in which the foreclosure of near perfect substitutes is likely to reduce consumer welfare. We find that this conduct is more likely to reduce consumer welfare when consumers' utility is less sensitive to quality, when product differentiation is high and when business stealing is strong. In addition, we show that consumer welfare before entry does not necessarily increase with the number of firms and the symmetry of their market shares, so that, paradoxically, entry may be more attractive for consumers in less concentrated market. The foreclosure of entrants might thus lead to welfare losses even when the status quo involves intense nonprice competition and low concentration.

[22] From this perspective, it is also worth considering the position of firms that enjoy a high market share. In the standard paradigm where differences in market shares are induced by cost asymmetries in the absence of quality investment, larger firms enjoy higher margins and thus exercise greater market power than smaller, less efficient ones. The margin is then a good indicator of the rent that firm extract relative to a competitive counterfactual in which prices would be equal to marginal cost. In the presence of quality investments, larger firms will also enjoy higher margins. The margin in this case is, however, not a good indicator of the rent that firms extract relative to a competitive counterfactual, as the counterfactual would involve a product of different perceived quality. Hence, drawing inferences in terms of competitive harm solely based on the observation of high margins is inappropriate in the presence of non-price competition.

Our observations regarding the extent to which the foreclosure of entry affects consumer welfare are also relevant for agreements between the incumbent and the entrant that have the same effect as a unilateral conduct, like "pay for delay" agreements. As discussed above, it is commonly assumed that a delay in the entry of generics beyond what can be expected from the outcome of the proceedings in which the originator challenge entry as involving a violation of his IP rights involves consumer harm (see Aaron *et al*. (2013)). Our analysis indicates that this is not necessarily the case, but more generally emphasizes that the delay of generic entry will be particularly harmful when competition among originators involves extensive business stealing, when horizontal product differentiation is high and consumers' willingness to pay for quality is limited.

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APPENDIX

This appendix collects a number of derivations discussed in the text.

The elasticity of own demand with respect to quality can be written as

$$\frac{\partial \varepsilon_i}{\partial u_i} = \frac{\sigma\gamma\left(N\sigma - 2\sigma + 2\right)\sum_{j\neq i}\left(1-p_j\right)u_j^{\gamma}}{u_i^{\gamma+1}\left(\left(1-p_i\right)\left(N\sigma-\sigma+2\right) - \sigma u_i^{\gamma}\sum_{j\neq i}\left(1-p_j\right)u_j^{\gamma}\right)^2} p_i.$$

This expression is positive so that the demand becomes less elastic as quality increases.

The derivative of the aggregate demand with respect to the u_i^{γ} can be written as

$$\frac{\partial \sum_i q_i}{\partial u_i^{\gamma}} = \frac{1}{u_i^{\gamma}}\left(q_i\right) + \frac{1}{u_i^{\gamma}}\left(\frac{\left(1-p_i\right)u_i^{2\gamma}}{\left(2-\sigma\right)} - \frac{\sigma\left(1-p_i\right)u_i^{\gamma}\sum_{j\neq i}u_j^{\gamma}}{\left(2-\sigma\right)\left(2+\sigma\left(N-1\right)\right)}\right).$$

This expression is positive if $p_i = p_j$ as in this case the second term of the equation is equal to q_i.

The equilibrium prices at the second stage can be written as

$$p_i^* = \frac{2+\sigma\left(N-1\right) + \left(2+\sigma\left(N-2\right)c_i - \frac{\sigma}{u_i^{\gamma}}\frac{2+\sigma(N-2)}{4+\sigma(N-3)}\sum_i u_i^{\gamma}\left(1-c_i\right)\right.}{4+\sigma\left(2N-3\right)}.$$