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Abstract

This paper discusses, from economic and enforcement perspectives, unilateral conduct aimed at foreclosing the entry of generics. We assume, in line with empirical evidence, that before the entry of generics, competition takes place among originators mostly through non price instruments and in particular, promotion. The entry of generics for one molecule introduces head to head price competition for that molecule and changes competitive interactions among the originators that remain patent protected. First, we develop a model in which competition takes place through price and promotion and analyse the consequence of unilateral conduct preventing the entry of generics, thus prolonging the status quo. We find that that the extent to which this conduct reduces consumer welfare (if at all) depends on whether promotion enhances the utility of users and whether promotion also involves business stealing. In order to provide some guidance for enforcement, we characterise the competitive outcome that prevails before entry in terms of consumer welfare. We find that unlike what happens with price competition, common indicators of performance such as the number of firms, the level of concentration (for a given number of firms) and the intensity of rivalry might be negatively associated with consumer welfare. As a consequence, the foreclosure of entrants might lead to welfare losses even when the status quo involves intense non-price competition and low concentration. Finally, we consider how unilateral conduct towards generic entry can be dealt with in the current enforcement framework. In the Servier and Paroxetine cases, the foreclosure of generics has been framed as an abuse of a dominant position held by the originator before entry, in spite of evidence of non-price competition. We show that it would be preferable to frame the conduct as an abuse of the dominant position that the originator holds in the molecule market as a consequence of its patent. In such a framework, the dominant position is instrumental in making exclusion feasible.

JEL Classification: K21, I11, L13

Keywords: foreclosure, Pharmaceutical industry, Non-price competition, Abuse of dominance

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Dominance and the pre-emption of competition following the Servier and Paroxetine GSK judgments[1]

By

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September 2019

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Key words : Foreclosure, pharmaceutical industry, non-price competition, abuse of dominance.

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ABSTRACT

This paper discusses, from economic and enforcement perspectives, unilateral conduct aimed at foreclosing the entry of generics. We assume, in line with empirical evidence, that before the entry of generics, competition takes place among originators mostly through non price instruments and in particular, promotion. The entry of generics for one molecule introduces head to head price competition for that molecule and changes competitive interactions among the originators that remain patent protected. First, we develop a model in which competition takes place through price and promotion and analyse the consequence of unilateral conduct preventing the entry of generics, thus prolonging the status quo. We find that that the extent to which this conduct reduces consumer welfare (if at all) depends on whether promotion enhances the utility of users and whether promotion also involves business stealing. In order to provide some guidance for enforcement, we characterise the competitive outcome that prevails before entry in terms of consumer welfare. We find that unlike what happens with price competition, common indicators of performance such as the number of firms, the level of concentration (for a given number of firms) and the intensity of rivalry might be negatively associated with consumer welfare. As a consequence, the foreclosure of entrants might lead to welfare losses even when the status quo involves intense non-price competition and low concentration. Finally, we consider how unilateral conduct towards generic entry can be dealt with in the current enforcement framework. In the Servier and Paroxetine cases, the foreclosure of generics has been framed as an abuse of a dominant position held by the originator before entry, in spite of evidence of non-price competition. We show that it would be preferable to frame the conduct as an abuse of the dominant position that the originator holds in the molecule market as a consequence of its patent. In such a framework, the dominant position is instrumental in making exclusion feasible.

1. INTRODUCTION

This paper discusses, from economic and enforcement perspectives, the assessment of unilateral conduct which prevents generic entry, when entry changes the nature of competitive interactions among incumbents firms, triggering intense price competition for some products while at the same time softening non price competition for products that remain patent protected. Specifically, we consider a situation, inspired by recent cases in the pharmaceutical industry, in which the status quo, which prevails in the absence of entry, involves competition in promotion among differentiated products and where generic entry leads to intense price competition among near perfect substitutes for one of these products. The assessment of such conduct[5] in terms of consumer welfare requires an explicit comparison of the relative benefits that consumers obtain from price competition (post generic entry) and non-price competition under the status quo.

We develop a model in which competition takes place through price and promotion, and evaluate the consequences in terms of consumer welfare of unilateral conduct that prevents the entry of generics. We find that the extent to which the unilateral conduct harms consumer welfare (if at all) depends on the nature of non-price competition taking place in the status quo. When perceived quality (which is enhanced by promotion) has a weak effect on utility, when firms' promotional efforts tend to annul one another, and horizontal product differentiation is higher, the effect of the unilateral conduct on consumer welfare is stronger.

In order to provide guidance for enforcement, which necessarily relies on proxies, we also characterise the outcome that prevails in the absence of entry in terms of welfare. We find that, unlike what happens with price competition, common indicators of performance, such as the number of firms, concentration levels (for a given number of firms) and the degree of rivalry among firms might be negatively associated with consumer welfare in the presence of non-price competition. Consequently, the foreclosure of entrants might lead to welfare losses even when the status quo involves intense non-price competition and low concentration. This arises because, contrary to what happens with price competition, intense non-price rivalry might lead to competitive efforts which annul one another in terms of their impact on consumers as well as, under some parameter constellations, a reduction in investment in promotion.

Finally, we consider how foreclosure can be dealt with in the current enforcement framework. The analysis is motivated by the Servier[6] and Paroxetine[7]

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[5] The prevention of entry might be achieved by a lump sum payment to entrants (as in the GSK Paroxetine case discussed below) or the acquisition (and subsequent mothballing) of a technology that may greatly facilitate entry (as in the case of Servier discussed below).

[6] Decision of the EU Commission, Case AT 39612, 9/7/2014. The second and third authors worked at European Commission at the time of the investigation into the Servier case, respectively as Chief Economist and member of the Chief Economist team. The views expressed in this paper are strictly their own views and rely solely on the published decision and judgment.

[7] Decision of the Competition and Markets Authority (CMA), Case CE-9531/11, 12/02/2016

cases[8] (involving decisions respectively by the European Commission and the Competition and Markets authority in the UK). Both cases involve pharmaceutical firms (Servier and GSK,) with a valid patent over a molecule (an "originator drug") that compete with other originators but foreclose the entry of generics when the patent expires. These cases reveal a difficulty in dealing with such foreclosure within the existing enforcement framework. In both instances, competition authorities found that the originator was dominant before the Loss of Exclusivity (LoE) and concluded that the foreclosure of generics was an abuse of that dominant position. On appeal, the relevant jurisdictions (respectively the General Court and the Competition Appeals Tribunal) found that because of evidence of non-price competition among originators before LoE, the originator under scrutiny could not be characterized as dominant and hence annulled the finding of dominance under the relevant provisions on unilateral conducts.[9] We argue that the dominant position that is potentially abused is the dominant position conferred by the patent, since it is the temporary exclusivity which enables the originator to pre-empt the entry of generics. However, the competitive constraints exercised on the originator before exclusivity are still relevant to assess the status quo and hence the consequence of the exclusion of generics in the context of the relevant provisions on unilateral conduct.

The paper is organised as follows. Section 2 reviews empirical evidence regarding competition between molecules before the entry of generics and the nature of competition that materializes after entry. This section highlights the significance of non-price competition between different active ingredients prior to generic entry, and how the entry of generics for one of them affects competition. Section 3 develops a model in which firms compete in price and promotion and identifies the circumstances in which entry of generics increases consumer welfare. Section 4 uses this model to discuss the evaluation of consumer welfare in a market where competitive interactions involve mostly non-price instruments like promotion. One of the striking results is that the usual relationship between concentration and welfare does not obtain, in particular when promotion has a business stealing effect instead of a market expansion effect. Section 5 discusses, in light of these findings, how conduct aimed at excluding generics before Loss of Exclusivity is best evaluated in the context of relevant provisions on unilateral conduct. Section 6 concludes.

[8] See Appendix 1 for a detailed discussion of these cases.

[9] Art 102 TFEU for Servier and Chapter II of the Competition Act for GSK.

2. COMPETITON BEFORE AND AFTER GENERIC ENTRY

This section reviews empirical evidence with respect to competitive interactions before and after LoE.

2.1. Non-price competition before Loss of Exclusivity

Once a drug receives marketing authorization, a "reference" price is set. In Continental Europe, this results from negotiations between pharmaceutical companies and social security systems that enjoy substantial bargaining power. The resulting price acts as a binding, fixed price cap.

When determining the reimbursement price, health authorities/social security factor in the availability of existing drugs. All else equal, the re-imbursement price is likely to be lower the greater the availability of therapeutic substitutes. By contrast, the maximum price is likely to be set at a high level for drugs that represent a genuine therapeutic breakthrough. The fact that public authorities establish a maximum price (and the originators typically do not set prices below this maximum) is compatible with the conjecture that firms would have chosen higher prices had they been free to do so. The mechanism to establish a re-imbursement price clearly indicates that drugs that are therapeutic substitute compete with each other, even before product launch.

Once the drug has received regulatory approval and a reference price is established, firms compete for patients. To a significant extent, the nature of the competitive interaction depends on the characteristics of demand.

The vast majority of patients are uninformed about the intrinsic characteristics of a particular drug (e.g. its side-effects) and medical expertise is required to determine, ex-ante, the optimal drug choice. This information asymmetry means that patient's choice is largely controlled by doctors who generally do not bear the direct cost of their choices. In the majority of Continental European countries, the greater part of the cost associated with prescription choices is borne by social security systems (depending on the country, patients may have to bear part of the costs in the form of a co-payment). In short, the consumer (patient) does not choose the product nor bears the cost of purchase, the decision taker (prescribing physician) does not consume the drug nor pays, while the payer (social security) does not consume nor makes the choice, but bears the cost. These characteristics suggest that the scope for price competition is very limited prior to LoE. The fact that, in Europe, prices barely move prior to Loss of Exclusivity is direct evidence of the limited role played by price in determining consumption decisions.

Prior to generic entry, promotional spend aimed at influencing practitioners' prescribing behaviour drives competitive inter-action between drugs. According to figures in 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 specialised journals. Gagnon and Lexchin (2008) report even higher figures for 2004. Detailing consists of individual visits by sales agents to

provide information to practitioners. The amounts spent on promotion are slightly above R&D expenditure, which confirm its strategic role.[10]

The role played by promotional effort in short-run competition is also highlighted by the work of Castanheira, Ornaghi and Siotis (2019). These authors estimate market share equations for prescription drugs in the US. Market shares are not evaluated by value (revenue) but by quantity (i.e. a drug's market share is measured as mg or ml over the total mg or ml consumed in a given therapeutic market). In the US, pricing is free and patients are principally covered by private insurance and/or pay out of pocket. Social security coverage is essentially limited to Medicare, Medicaid and the Veterans Administration. In such an environment, price competition is likely to be more prominent as compared to Europe. The data they have at their disposal is granular, and encompasses price and quantity, and promotional effort at the product (drug/package) level. They estimate own and cross price elasticities as well as the corresponding elasticities for promotion. The own price elasticity they report is in the -1.5, -2.3 range, while the cross term goes from 0.2 to 0.9. The elasticity with respect to own promotion is large and significant: 1.7 to 1.9. Interestingly, as compared to the cross-price estimates, the coefficient for the cross-promotion elasticity is both larger (-1.2 to -1.5) and more precisely estimated.[11]

2.2. Price competition after generic entry

Following generic entry, the competitive environment changes drastically. There is overwhelming evidence that generics are typically sold at half the price of their branded equivalent and exert strong competitive pressure on the original branded product: Grabowski et al. (2014) show that, for branded drugs that faced generic entry in 2011-2012, brands retained, on average, only 16% of the molecule market after one year. This is not surprising, as a generic is a bioequivalent product that has been explicitly recognised as such by health authorities.

Among generics, differences are residual (different excipient, packaging or colours); hence, it is reasonable to expect intra-molecule competition to converge to the Bertrand outcome in the absence of capacity constraints. In that context, promoting a drug does not make much sense. On the one hand, marginal cost pricing after LoE (Bertrand outcome) implies that (narrow or non-existent) margins cannot support

[10] Lowe (2013) provides more recent figures to the same effect. The accounting category where advertising, promotion, and marketing end up is now called "SG&A" (Sales, General and Administrative). This is a broader group as it also includes executive salaries. Lowe (2013) reports "that Merck's [SG&A] are at 27% of revenues [R&D: 17.3%], Pfizer is at 33% [R&D: 14.2%], AstraZeneca is just over 31% [R&D: 15.1%], Bristol-Myers Squibb is at 28% [R&D: 22%], and Novartis is at 34% [R&D: 22%]". For comparison, SG&A represents 21.5% of IBM's sales, 20% of 3M's and 6.5% of Apple's. Promotion intensity in pharma appears to be large by these standards.

[11] Ornaghi, Siotis and Castanheira (2019) also report that, in the US, short run variations in price are much more subdued than those of promotion. This reinforces the conjecture that, prior to loss of exclusivity, non-price competition in the form of promotional effort is the main driver of short-run competition, despite the fact that pricing is free. A fortiori, non-price competition can be expected to play an even more important role in Europe where prices are capped prior to loss of exclusivity.

promotional effort. On the other hand, promotional spend in the presence of (near) perfect substitutes would be ineffective, as it is likely to spill over to competitors.

The entry of generic with respect to one molecule also affects the interactions between the other molecules that retain exclusivity. This is considered in Castanheira et al. (2019) who develop a simple model where two molecules, A and B, initially compete in price and promotion. A and B are differentiated both horizontally and vertically. Promotion does not change product features or consumer utility but merely shifts market shares across the two molecules in an autonomous fashion. In the equilibrium with entry of generics for molecule A, drugs based on molecule A are priced at marginal cost and promotion for that molecule drops to zero. They derive conditions under which B benefits (in the form of market share gains) from the "genericisation" of its competitor, despite the fact that A's price is much lower (at the level of marginal cost). The intuition behind this result is that while B faces a much lower priced rival, the latter stops promotional spending. B benefits when the effect of the price drop is more than compensated by the drop in promotion. Castanheira et al. (2019) take the model's predictions to the data (comprising price, quantities and promotional effort at the product level) and report strong empirical support for the model's predictions. More precisely, they find that, on average, on patent molecules experience a gain in market share each time a rival molecule is genericised.

These insights are further explored in Ornaghi, Siotis and Castnaheira (2019). Using the same type of data, they estimate the determinants of a molecule's market share throughout its lifecycle, encompassing periods pre and post LoE. They report that, while benefitting from exclusivity, a drug is only constrained by other on patent drugs, a finding mirroring Castanheira et al. (2019). By contrast, molecules belonging to the same therapeutic class and that have been genericised do not put competitive pressure on patent protected drugs.

2.3. Consequences for market definition

Overall, these findings imply that competitive constraints change markedly with generic entry. This may have implications for market definition. Concretely, a product that was exercising a competitive constraint on rival products before LoE may suddenly "drop out" of the (antitrust) market as it stops exercising significant competitive pressure on products that were rivals before loss of exclusivity.[12] This is because A stops being promoted, and hence the competitive constraint exercised by A on B is weakened, possibly fading into (economic) irrelevance.

At the same time, the entry of generics may imply that the molecule becomes a relevant antitrust market, such that for instance, a hypothetical monopolist over the supply of the originator and generics would profitably increase the price above the competitive level.

[12] Abstracting from the question of market definition when competition takes place through non-price instruments, which is discussed in the next section.

In this respect, Ornaghi et. al (2019) estimate the relative strength of competitive constraints post generic entry. As expected, they find that competition becomes primarily intramolecular after the loss of exclusivity. They also report evidence of asymmetric constraints: while the price of genericised molecules does not exert an influence on patent protected drugs, the latter do exercise a mild constraint on off patent drugs. However, the point estimates for cross price elasticities indicate that this constraint is dwarfed by intra-molecular competition.

3. THE WELFARE CONSEQUENCES OF PREVENTING THE ENTRY OF GENERICS

This section develops a model on competition through price and promotion and considers the welfare consequences of a unilateral conduct preventing the entry of generics.

3.1. A model of non-price competition

We model the effect of advertising/promotion on demand for heterogeneous goods in a reduced form. A brief review of the effect of promotion on demand and competitive interactions is provided in Appendix 2. Our model of promotion is one in which promotion is persuasive rather than informative. As discussed below, our model also allows for an explicit parametrization of the extent to which promotion leads to a "business stealing" effect, as it is one of the main determinants of the effect of promotion on competitive outcomes. In addition, "business stealing" is an important feature of promotional effort the pharmaceutical industry (see Appendix 2).

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:

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

Where q_i , p_i and u_i respectively denote quantity, price and perceived quality[13] of product i. In this formulation, for a given set of prices and perceived qualities, an increase in the perceived quality of a firm's product will increase its demand and reduce the demand for other products. An increase in the perceived quality for one product will increase the aggregate demand starting from any symmetric set of prices (see Appendix 3). Conversely, as revealed by the inverse demand,[14] an increase in perceived

[13] In what follows, we refer to perceived quality, rather than quality, as reminder that quality induced by advertising may be spurious, unlike what may happen for instance when a change in quality is induced by research and development (see Sutton, (1991), chapter 14, for a discussion).

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

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 3) that demand becomes less elastic as perceived quality increases. This feature reflects the persuasive nature of advertising which increases perceived quality (as discussed above in Appendix 2).

The model also allows for a parameter (γ) that represents the significance of customers' response to perceived quality. The larger this parameter, the more important are perceived qualities for consumer choices. In particular, a larger value of this parameter will make own demand more sensitive to quality (and the quality of competitors) so that non-price competition becomes relatively more important as a competitive tool.

The demand formulation also allows for horizontal differentiation. Horizontal differentiation across firms is symmetric and is measured by the parameter (σ). 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 2, such that all varieties are perfect substitutes (when they have the same perceived quality). Less product differentiation makes demand more sensitive to own and competitors' prices.

As mentioned above (see Appendix 2), the extent to which demand is taken away from competitors when perceived quality increases is an important determinant of the effect of advertising/promotion on competition. Hence, we further parametrize the significance of this effect by allowing the investment in advertising/promotion to reduce the perceived quality of the other products.[15] This increases the extent to which an investment in perceived quality takes demand away from competitors. Specifically, the perceived 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"[16] (with $\alpha < \frac{1}{N-1}$ to ensure that investment has an overall effect on the quality of other firms that does not exceed the effect of own quality). A high value of this parameter is thus associated with an environment is which advertising involves an "arms' race" among firms such that its main effect is to dissipate rents.

We assume that the cost of raising quality is quadratic. We introduce a shift parameter (k) in the cost of raising 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. As a

[15] The same effect is modelled in von der Fehr and Stevik (1998), as discussed in Appendix 2.

[16] The term "business stealing" is normally used to describe the extent to which a competitive strategy affects the profit of competitors (see Belleflamme and Peitz, (2014), p 84). In what follows, we refer to "business stealing" at the level of demand.

benchmark, we will also consider a model in which competition only takes place through non-price instruments.

In this framework, non-price competition is thus captured by two parameters. As γ increases, non-price competition becomes more significant as a competitive tool. As α increases, non-price competition induces more rivalry, as an increase in the perceived quality of a product has a greater (negative) impact on the perceived quality of other products.

There is one feature of the equilibrium prices that should be emphasized. For a given number of firms and degree of horizontal differentiation, the equilibrium prices in this model are determined by relative qualities and marginal costs (see Appendix 2). That is also to say that in a fully symmetric setting (which yield identical qualities in equilibrium), the prices are independent of the degree of non-price rivalry (the parameter α).[17]

3.2. The effect of generic 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 ($N = 4, \sigma = 0.5,$). We compute the level of consumer welfare in the absence of entry (the status quo that would prevail with foreclosure) and the level of welfare with entry of generics that would bring the price down to marginal cost for one of the differentiated products. 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).

[17] The same property holds in the Hotelling model discussed in Appendix 2 when advertising increases the willingness to pay of all customers.

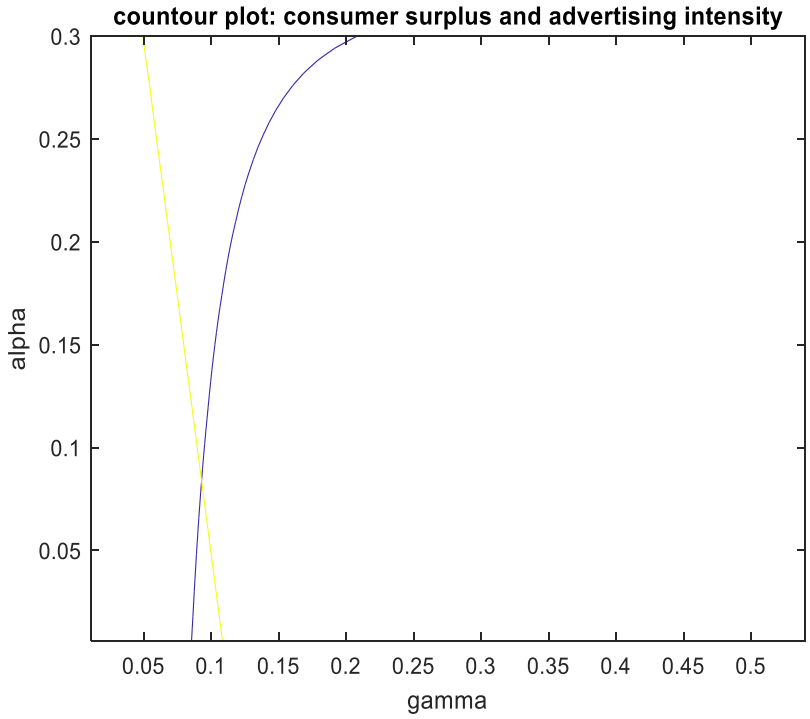

Figure 1. The effect of entry on consumer welfare

We observe that as γ increases the gains 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 perceived quality of all products falls and the quality of the product that is genericized falls by more (as the innovators of the products that is genericized stops investing). The change in perceived product quality increases as γ increases and, as γ increases, consumers also attach more value to perceived quality so that they surplus falls by more for any given change in quality. We also observe that the price of the three products that are not genericized increase as a response to entry (as a consequence of the asymmetry in a quality with the product that is genericized) and this effect is stronger with a larger γ, so that entry become relatively less attractive.[18]

We also observe that as the significance of business stealing increases, entry becomes relatively more attractive. The difference in perceived quality between pre and post entry is reduced and the prices of the three firms that are not genericized increase by less. Consumers gain more from entry when entry disrupts the arm's race in promotion between the originators that still benefit from patent protection.

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 to sales ratio of 20% (which is commonly reported in the pharmaceutical industry). This is the yellow curve. We see that for most combinations of parameters which yield such promotion to sales

[18] The fall in the price of the product that is genericized is independent of γ. Indeed 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.

ratio, generic entry would actually increase welfare (the yellow line is mostly to the left of the blue line). It is only when business stealing is limited (α is low) and the value attached to quality increment γ is sufficiently high that entry could actually lead to a fall in welfare. The combination of parameters which yield a lower (higher) level of promotion to sales ratio would involve a shift (not shown) of the yellow curve to the left (right). As result the combination of parameters for which entry reduces welfare would shrink when the ratio of promotion to sales is lower.

Finally, one can consider how the degree of horizontal product differentiation affects the benefit from entry. We observe that as products are less differentiated, entry becomes less attractive. This arises because quality drops by more when product differentiation is less significant. As products are closer substitutes, the price of the product that is genericized falls by less, as the price before entry is already closer to marginal cost. The price of the three products that are not genericized also increase more when products are closer substitute. These results are reminiscent of those reported by Castanheira et al. (2019).

4. THE ASSESSMENT OF COMPETITIVE CONSTRAINTS ARISING FROM NON-PRICE INSTRUMENTS

In actual enforcement cases, data is usually unavailable to undertake an explicit comparison of consumer welfare, and the analysis will have to rely on proxies and in particular, on proxies capturing welfare before entry. In a paradigm of price (or quantity) competition, there is a strong link between the competitive constraints, as measured for instance by the firm own-price elasticity, and consumer welfare. A small own-price elasticity (in absolute value) reflects the ability of the firm to exercise market power to the detriment of customers. In this paradigm, there is also a robust link between concentration and consumer welfare.

It is worth considering whether there is a similar correspondence between competitive constraints and consumer welfare in a paradigm in which competition takes place through non-price instruments, and whether there is also a robust link between concentration and consumer welfare.

In what follows, we consider a benchmark constellation of parameters, with four firms and an intermediate degree of horizontal product differentiation ($N = 4, \sigma = 0.5, \alpha = 0.1, c = 0, k = 0.01, \gamma = 0.5$). We compute the level of consumer welfare varying one parameter at the time to assess how it is affected by concentration and proxies for rivalry.[19]

4.1. Non-price competition, rivalry and consumer welfare

[19] We have explored a range of values for the benchmark parameters that did not lead to qualitative changes.

We first consider the extent to which a change in the importance of non-price competition as well as rivalry (measured respectively by an increase in γ or α) affects consumer welfare.

Figure 2 shows that an increase in non-price competition triggered by a greater sensitivity of customers to perceived quality increases consumer welfare. As non-price competition becomes more significant, firms invest more in promotion leading to higher perceived quality, leading to an increase in perceived quality in equilibrium. As mentioned above, in a fully symmetric setting the prices do not increase (they are determined by relative qualities only). Hence, as perceived quality increases, there is no countervailing effect on consumer welfare through higher prices so that consumer welfare increases. Firms profit increases as well because of larger sales.

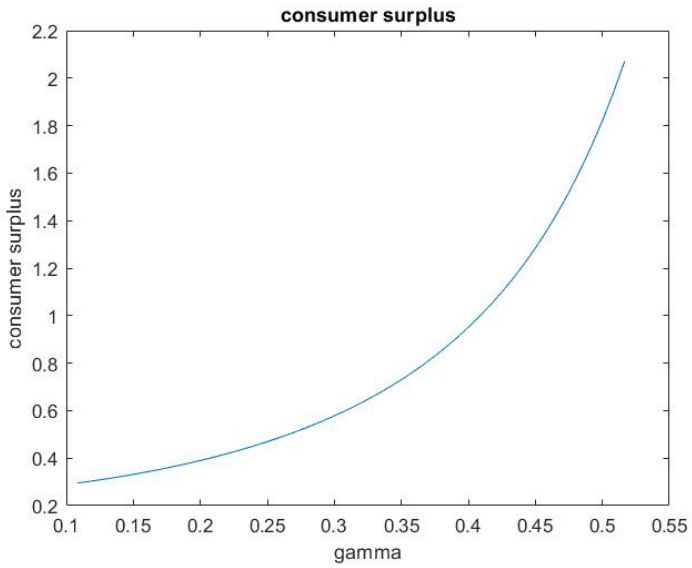

Figure 2. Consumer surplus as a function of non-price competition

Figure 3 shows that consumer surplus falls as the intensity of rivalry in non-price competition increases. This arises because, as rivalry increases, perceived quality falls. Firms tend to invest more in trying to enhance the perceived quality of their product but with greater rivalry, their efforts increasingly annul one another.[20] The overall effect is to reduce the perceived quality of all products. As mentioned above, in a fully symmetric setting the prices are unaffected by the degree of rivalry. The reduction in consumer surplus comes about solely through the reduction in perceived quality that is triggered by firms' attempting to establish the superiority of their brand which cancel one another. This increase in rivalry not only reduces consumer surplus, but also reduces profits.

[20] Note that when there are only two firms an increase in α reduces firm's investment in perceived qualities. However, when the number of firms increases beyond two, an increase in α actually leads to an increase in investment. This arises presumably because the business stealing effect is stronger with a larger number of firms. Each firm has to neutralise the negative effect of the investment of other firms on its perceived quality and this negative effect is larger when there are more competitors.

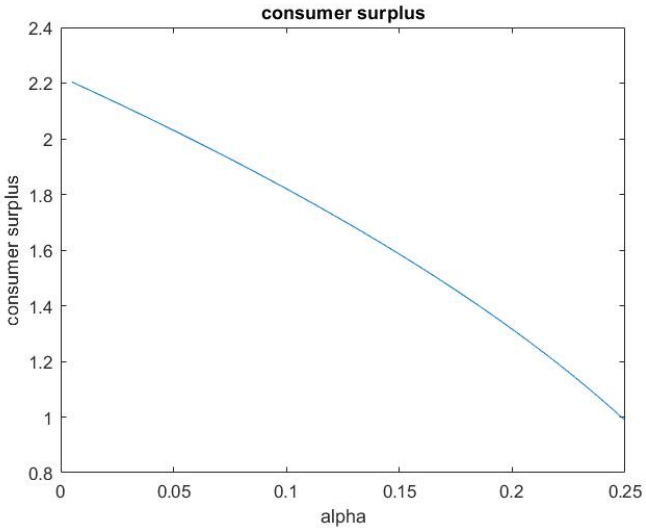

Figure 3. Consumer surplus as a function of rivalry

This observation stands in contrast with the usual findings in paradigms of price competition in which rivalry benefits consumers. This can be easily illustrated in the by considering the effect of a reduction in horizontal product differentiation. A fall in horizontal differentiation leads to greater rivalry and lower prices and hence higher consumer welfare. With price competition and horizontal differentiation, a lower price for one product, while attracting customers away from competitors, does not reduce the benefit that customers who do not switch obtain by purchasing from competitors. In the context of our model, with non-price competition and "business stealing", an increase in investment not only attracts new customer as result of higher perceived quality, but also reduces rivals' perceived quality and the utility that customer obtain when they do not switch. An increase in rivalry thus has a negative effect on consumer welfare that is absent from the usual paradigm of price competition and horizontal differentiation.

4.2. Concentration and welfare with non-price competition

We now consider how changes in concentration affect consumer welfare. We first consider a change in concentration for a given number of firms. In the usual paradigm of price, or quantity, competition, a change in concentration (for a given number of firms) 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 (HHI) index increases, but consumers tend to be worse off. This is easy to illustrate in the context of our model. We consider an increase in the dispersion in marginal cost (around $c = 0.1$) across firms that preserves the mean, such that two firms have a reduction in marginal cost and the other two incur an increase in cost of the same magnitude. Figure 4 presents consumer welfare as a function of the market share of (one of) the most efficient firms. This figure confirms that an asymmetry which leads to a higher concentration reduces consumer welfare.

The intuition is that less efficient firms pass on the increase in marginal cost while more efficient firms take advantage of the lower competitive pressure to increase margins.

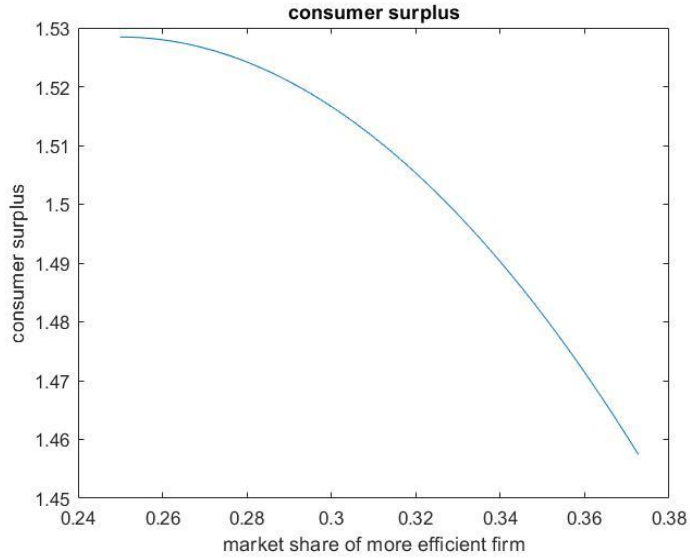

Figure 4. Consumer surplus as a function of cost asymmetries

Next, we consider a change in concentration that is associated with a change in the dispersion in the ability to enhance the perceived quality of products across firms, that is to say a dispersion in the ability to compete through non-price instruments. Specifically, we consider a mean preserving change in the shift parameter of the cost of investment in perceived quality (k). We assume that two firms become more efficient and the other two become less efficient. Figure 5 presents consumer welfare as a function of the market share of (one of) the more efficient firms.

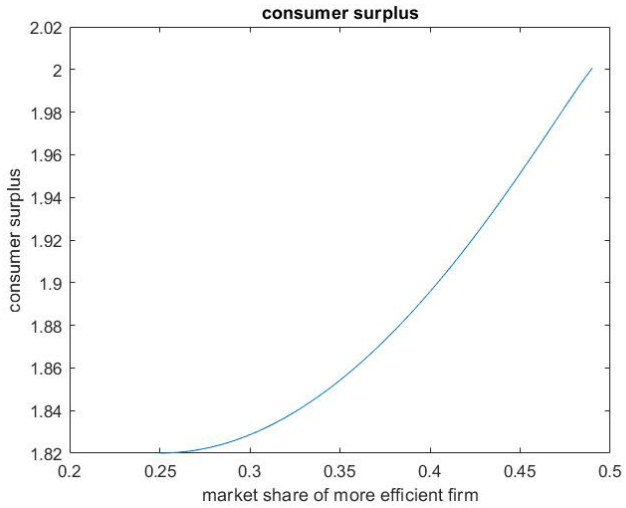

Figure 5. Consumer welfare as a function of asymmetries in the effectiveness of investment in raising perceived quality

We observe that unlike what happens with cost asymmetries, welfare increases when the asymmetry is induced by a difference in firms' ability to enhance perceived quality through investments in promotion. This observation also suggests that concentration should not necessarily be a concern in situations where non-price competition plays a prominent role. Unlike what happens when concentration is induced by cost differences, concentration induced by differences in the ability to raise perceived quality through investments instruments may not be a symptom that consumers are harmed by a relaxation of competitive constraints (but rather that consumer benefits as non-price competition better serves their interest). Conversely, one should not conclude that a market with low concentration is necessarily more conducive to consumer welfare than a comparable market characterized by higher concentration. [21]

It is also worth considering the position of firms that enjoy high market share. In the traditional paradigm where differences in market shares are induced by cost asymmetries, larger 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. When market share differences are induced by a difference in the ability to improve perceived quality, 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 from the observation of high margins is inappropriate in the presence of non-price competition.

We next consider changes in concentration that are induced by an increase in the number of firms in a symmetric equilibrium. In the usual paradigm of price competition, an increase in the number of independent competitors increases consumer welfare as it enhances rivalry and reduce prices. In the current setting, the relationship between consumer welfare and the number of firms follows an inverted U-shape. For our benchmark configuration of parameters, maximum consumer welfare is reached for 6 firms. This arises because, while an increase in the number of firms reduces prices and increases products variety, it will also reduce the equilibrium levels of perceived qualities. For a number of firms beyond six, the second effect dominates and consumer welfare falls.

4.3. Competition with exogenous prices

So far, we have discussed the effect of non-price competition in combination with price competition. Yet, in the European pharmaceutical sector, prices before Loss of Exclusivity is at best subdued and may thus be regarded as exogenously determined by regulation.

[21] The change in consumer surplus triggered by asymmetries in the ability to enhance perceived product qualities seems however to be affected by the number of competitors. In our simulation, consumer surplus increases with asymmetries when the number of competitors does not exceed 6. With a larger number of competitors, the effect is reversed. This is further discussed below.

For this reason, we have also considered the outcome of the model when rivalry is limited to non-price competition. We find that an increase in γ (which measures the significance of non-price competition) increases welfare as in the case in which price competition takes place at a later stage. We also find that an increase in α, which measures the significance of "business stealing", tends to reduce consumer welfare as in the case in which price competition takes place at a later stage.[22] However, we observe that in the absence of price competition, consumer welfare is much less sensitive to changes in those parameters. This accords with intuition given that, in the context of our model, the unilateral incentive to increase promotion is enhanced by the prospect that price (and hence margins) will increase as a consequence of the increase in perceived quality (relative to others). What remains, in the absence of this price effect, is the incentive to increase perceived quality to attract customers independently of the price.[23]

We have also assessed to what extent asymmetries in cost and asymmetries in the ability to enhance perceived qualities affect consumer welfare. We find that, similarly to what we found with price competition, consumer welfare increases with asymmetries in the ability to enhance perceived qualities. However, unlike what happens with price competition, consumer welfare also increases with asymmetries in marginal cost. This accords with intuition, as with fixed margins, a cost advantage translates into a greater ability to benefit from an investment in perceived qualities.

To sum up, our main findings regarding non-price competition are robust to considering such rivalry in isolation (i.e., in the absence of price competition).

3.6 Discussion

As discussed above, the evaluation of the consequences of the exclusion of generics involves the comparison between the situation that prevails after entry and the status quo. The analysis in this section has found that non-price rivalry does not have the same consequences on consumer welfare as when rivalry is limited to price. First, even if non-price competition brings consumer benefits in the form of higher perceived qualities, an increase in non-price rivalry that leads to promotional efforts that tend to annul one another does not increase consumer welfare. Second, the observation that concentration is low before loss of exclusivity is not a reliable indication that customers enjoy high benefits. Third, the observation that a firm that commands a high margin is

[22] These results do not come as a surprise in the context of our model in which equilibrium prices are independent of the willingness to pay for quality and of the significance of the business stealing effect in a fully symmetric setting. The results are however not immediate as equilibrium prices associated with deviation strategies in quality in the first stage are affected, so that the profitability of a deviation is affected by price competition in the second stage.

[23] Interestingly, we find that in the presence of price competition, consumer welfare increases as horizontal product differentiation falls but that in the absence of price competition, there is U-shaped relationship between lower horizontal product differentiation and consumer welfare. This arises presumably because of the interaction between horizontal differentiation and the incentives to increases perceived qualities, which are affected the scope for appropriating increases in quality through prices.

not reliable indicator of the existence of consumer harm, as the perceived quality of the product sold in the counterfactual would be lower.

5. ENFORCEMENT TOWARDS CONDUCT AIMED AT EXCLUDING GENERICS UNDER ART 102

From the perspective of enforcement, the foreclosure of generics should be assessed by comparing the outcome resulting from entry with the status quo. However, a difficulty arises in framing this analysis in the context of the existing provisions on unilateral conduct. Both enforcement agencies in the Servier and Paroxetine cases have framed the exclusion of generics as an abuse of a dominant position that the originator held before loss of exclusivity. The Courts, on appeal, concluded that the originators could not be characterised as dominant as they competed through non-price instruments with other originators.

The CAT however questioned the way in which the relevant market was defined and considered an alternative approach in which the (future) entry of generics would be factored in.[24] The CAT observed that the degree of competition between alternative molecules before loss of exclusivity "pales into insignificance compared to the effect of generic paroxetine". The CAT further observed that "It is the competitive effect of generic entry which was the incentive for GSK to conclude the Agreements here at issue." In those circumstances, "we think it is not illogical to find that as a pharmaceutical product approaches the stage when generic entry becomes a realistic possibility, the generic product is then taken into account in determination of competitive constraints and thus market definition, although years beforehand when there was no realistic prospect of a challenge to the patent on the active pharmaceutical ingredient, generic companies would not be regarded as relevant to market definition". Accordingly, the CAT endorsed the view that once paroxetine would become "genericised", the relevant market would be paroxetine itself, since the generic paroxetine would then become the prime constraint on the pricing of GSK (see § 395).

The CAT further reasoned that that the competitive constraints that are taken into account for market definition should not independent of the conduct under scrutiny. In this instance, since the conduct concern the exclusion of generics, the CAT reasoned that the relevant market should naturally include them. Specifically, the CAT found that "if, as here, the issue concerns conduct directed specifically at excluding independent generic paroxetine from the market, then it would be inappropriate and misleading to leave generic companies out of consideration when seeking to define the market just because they were not on the market".

However, since this approach would be rather novel, the CAT decided to seek guidance from the European Court of Justice. As part of its request for a preliminary

[24] Suggested by Prof. Shapiro, who was an expert witness for the CMA but took a different perspective from the CMA on the issue

ruling, the CAT thus asked: "Where a patented pharmaceutical drug is therapeutically substitutable with a number of other drugs in a class, and the alleged abuse for the purpose of Article 102 is a conduct by the patent holder that effectively excludes generic versions of that drug from the market, are those generic products to be taken into account for the purpose of defining the relevant product market, although they could not lawfully enter the market before expiry of the patent if (which is uncertain) the patent is valid and infringed by those generic products?"

If the European Court were to respond positively, the CAT is likely to find that a market including GSK and the generics is a relevant market, as a hypothetical monopolist in that market would find it profitable to increase price above the competitive level. The CAT will thus likely find GSK dominant and the exclusion of generics would be seen as an abuse of the dominant position that GSK holds in a (hypothetical) market that would materialise if entry occurred (following the CAT's reasoning for factoring in the competitive constraint exercised by the generics). From this perspective, the link between the dominant position and the abuse remains unclear; in particular, the market power that GSK enjoys in the hypothetical market in which exclusion does not take place *is not instrumental* in making the exclusion feasible.

However, what is instrumental in making the exclusion feasible is the first mover advantage of the originator, which is itself a consequence of the patent it holds. Hence, if the exclusion is regarded as an abuse of the dominant position that the originator holds in the molecule market, it would seem more appropriate to deduce this dominance by reference to a market in which entry has not been allowed to take place (because of Intellectual Property Rights), rather than by reference to a market in which entry would take place. With the former perspective, there is a clear link between the dominant position and the ability to exclude.

The exclusion is indeed made possible by the fact that the originator has a first mover advantage: unlike generics, the originator has already paid all sunk costs of entry. Given that intense price competition would take place after entry, generic suppliers will have a limited willingness to pay for any asset that may be required to enter (as in the Servier case), or can be easily paid off to stay out (as in the Paroxetine case). While the willingness to pay of the originator is a function of the amount that she has to lose (which is determined by the status quo), the asymmetry arises from the fact that the originator is already established. This, in turn, is a consequence of the intellectual property right of the originator.

A couple of final observations may be appropriate. The first concerns the approach followed by the Commission and the CMA, where the exclusion of generics was characterised as an abuse of the dominant position that the originator would *actually* hold before loss of exclusivity. The market power enjoyed by the originator before loss of exclusivity is not instrumental in any way for the ability to exclude generics and, from that perspective, may not be relevant. This market power might still however provide a measure of the incentive to exclude to the extent that exclusion perpetuates the status quo. By requiring that the originator actually enjoys a degree of market power that is so high as to justify a finding of dominance, the approach of the CMA/Commission is thus conservative. This approach would only object to the most

harmful exclusions in which a status quo involving a high degree of market power is substituting for entry and intense price competition. Other circumstances, in which the market power in the status quo falls short of dominance but still yields a level of consumer welfare much below the welfare that accrues with the entry of generics would escape prohibition.

The second observation relates to the possible requirement under EU law for the abuse to be contemporaneous with the dominant position. If there is indeed such a requirement, it would be satisfied under our proposed approach to the extent that the exclusion is taking place when the originator has a dominant position in the molecule market as a consequence of its right to exclude (prior to LoE).

This market is not the one where the originator is actually competing at the time of the abuse, but it is nonetheless dominant in this hypothetical market at the time of the abuse. If the requirement under EU law is for the abuse to be contemporaneous with an *actual* dominant position, then the only feasible approach would be that followed by the Commission and the CMA. This state of affairs would be highly unsatisfactory: this approach would require a dominant position with respect to a conduct that does not derive from the dominant position and, as discussed above, would result in under-enforcement.

6. CONCLUSION

This paper has discussed the circumstances under which the foreclosure of generic entry is likely to reduce consumer welfare. We find that that the extent to which this conduct reduces consumer welfare (if at all) depends on the extent to which promotion enhances the utility of users and the extent to which promotion involves business stealing. In order to provide some guidance for enforcement, we have characterized the competitive outcome that prevails before entry in terms of consumer welfare. We find that unlike what happens with price competition, common indicators of performance like the number of firms, the level of concentration (for a given number of firms) and the level of rivalry among firms might be negatively associated with consumer welfare. As a consequence, the foreclosure of entrants might lead to welfare losses even when the status quo involves intense non-price competition and low concentration.

While the paper was initially motivated by recent cases where an originator was found to have foreclosed the entry of generics, the analysis has wider implications in two respects. First, our observations regarding the extent to which the foreclosure of generic entry affects consumer welfare is also relevant for agreements between originators and generics that have the same effect as a unilateral conduct. For instance, 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 IPRs involves consumer harm (see Aaron et al (2013)). Our analysis indicates that that this is not necessarily the case. Our results serve to

highlight that the delay of generic entry will be particularly harmful when competition among originators involves extensive business stealing and promotion does not affect perceived quality.

Second, our observations regarding the interpretation of indicators of market performance in the presence of non-price competition apply more generally beyond the pharmaceutical industry. The usual links between concentration and consumer welfare and between rivalry and consumer welfare may not apply depending on the significance of the extent to which competition in promotion involves business stealing and consumer's willingness to pay for perceived quality.

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APPENDIX 1 : Background on the Servier and Paroxetine cases

In the Servier decision (case AT 39612, 9/7/2014), the European Commission found that Servier had infringed Art 101 and Art 102 TFEU[25]. The product concerned was a prescription drug, perindopril, which is an ACE inhibitor used to treat high blood pressure. The 101 infringement concerned "pay for delay" or "reverse patent settlements" between generic companies and Servier. These settlements involved a transfer from Servier to these generic companies in exchange for not launching a generic version of perindopril. These agreements were deemed to be restrictions by object.

Regarding Art. 102, Servier was found to have foreclosed the market for perindopril by purchasing from Azad (another pharmaceutical firm) the IP rights pertaining to a production processes that might have allowed entry by generic firms without infringing Servier's existing patents. The Commission found that the acquisition of the technology from Azad and the reverse payment settlements were abusive behaviours under Art 102 (§ 2961 and that these practices constituted a single and continuous exclusionary strategy infringing Art 102 (Section 8.4, §2961 and ff). The Commission found that Servier was dominant at the time of the acquisition and patent settlements, i.e. before the expiration of Servier's process patents and thus before the loss of exclusivity.

The Commission analysed the competitive constraints faced by Servier before loss of exclusivity and, concluded that since competitive constraints from other prescription drugs were limited, the relevant market was confined to Servier' perindopril and its generic version. In other words, the market was deemed to be limited to the active ingredient (molecule). With the relevant market defined in this manner, Servier enjoyed a 90%-100% market at the time when the alleged abuse was committed.

Servier and the generic companies appealed the Decision, and the General Court (GC) issued its ruling on 12/12/2018. The GC found that the Commission had committed a series of errors in its analysis of the relevant market (§ 1589). In particular, the Court found that there was evidence in the file showing that perindopril was subject to significant non price competitive constraints (§ 1590). Naturally, the GC then found that the Commission had not established that Servier was dominant and annulled the Art 102 part of the decision[26].

The Commission had based its assessment on three fundamental arguments. First, perindopril faced few therapeutic substitutes, as ACE inhibitors were allegedly heterogeneous and perindopril had unique characteristics that made it stand out within

[25] The second and third authors worked at European Commission at the time of the investigation into the Servier case, respectively as Chief Economist and member of the Chief Economist team. The views expressed in this paper are strictly their own views and rely solely on the published decision and judgment.

[26] Some of the fines associated with the ART 101 infringements were reduced, but the Commission's finding that these agreements represented a restriction by object was upheld by the General Court.

that group. Second, the decision of prescribing doctors was characterized by "inertia". Third, that patients were "locked in" perindopril once they started treatment with that drug, as evidenced by the low switching rate to alternative blood pressure control drugs. In order to support its conclusions, the Commission used past episodes of generic entry into other ACE inhibitors, which it labelled as "natural events". The Commission noted that the launch of generic versions of ACE inhibitors that had experienced loss of exclusivity (i.e., generic could legally come to market) led to dramatic price drops. Since these failed to dent perindopril's sales, the Commission concluded that they were not substitutes and hence did not exercise a competitive constraint on perindopril[27].

During the proceedings, it emerged there was ample evidence of therapeutic substitution between perindopril and other ACE inhibitors and that it was by no means a product of superior quality. Servier also argued that non-price competition was pervasive and that the Commission's almost exclusive focus on price was misguided. According to Servier, the Commission had failed to appreciate the significance of promotional effort undertaken by originator companies in understanding competitive interaction in the pharmaceutical industry. Last, the industry's idiosyncrasies, such as the fact that prescribing doctors are not driven by cost considerations, had not been factored in. The GC sided with these arguments and concluded that Commission had made errors in its analysis that could be grouped under five broad headings (§1589).

A similar development has taken place with respect to the Paroxetine GSK decision (Case CE-9531/11, 12/02/2016) by the Competition and Markets Authority (CMA). Paroxetine is an antidepressant medicine on which GSK held a patent. A number of generic companies anticipated that they could enter the market without infringing GSK's Intellectual Property Rights (IPRs). The decision relates to a number of agreements between GSK and generic companies for the distribution by those companies of restricted quantities of GSK products. The CMA found that these agreements infringed Chapter I of the Competition Act 1998 (the provision equivalent to Art 101 under UK law) as they had the object and effect of restricting competition. With respect to one generic company (IVAX), there was no patent litigation, and hence no settlement, at the time of the agreement. Under the terms of this agreement, IVAX would distribute limited quantities of GSK products. According to the CMA, the agreement still involved a transfer of value from GSK to IVAX that did not reflect the payment for a service but provided IVAX with incentives not to enter the market with its own generic product. This agreement however fell outside the scope of Chapter I of the Competition act (by virtue of the Vertical agreement Exclusion Order).

The CMA found that GSK infringed Chapter II of the competition act (the provision equivalent to Art 102 in UK law) by making cash payments and other value transfers to induce potential competitors (including IVAX) to delay their potential independent entry in the UK paroxetine market (§1.17). The CMA considered that GSK was dominant prior to the entry of generics (at the time in which it made these payments). The CMA observed competitive interactions between Paroxetine and other

[27] As discussed in section 2, this inference is however mistaken because the entry of generics also leads to a drastic reduction in the promotion of the originator's drug.

anti-depressants but concluded that other molecules were not sufficiently close competitors that they should be regarded as belonging to the same relevant market, so that GSK has substantial market power prior to generic entry (see § 1.18). The CMA observed that GSK was earning substantial profits prior to generic entry. In addition, it noted that a SSNIP test applied at the molecular level with post entry prices would have pointed to a narrow market.

GSK appealed. In its judgment (rendered on 8/3/2018, Case Nos 1251-1255/1/12/16), the Competition Appeals Tribunal (CAT) considered whether GSK was dominant prior to generic entry and was not convinced by the CMA's analysis. The CAT (§ 402) found that: "There was a large degree of therapeutic equivalence between paroxetine and other SSRIs. They provided some competitive constraint in that they stimulated GSK's promotional efforts to persuade doctors to prescribe paroxetine. Thus we accept that before generic companies became potential entrants, paroxetine probably did not constitute a separate market".

APPENDIX 2: Modelling non-price competition. A short review

A.2.a Promotion, and in particular advertising, are generally seen as the main form of non-price competition (see Bagwell (2007) and Belleflamme and Peitz, (2014) for a textbook including a discussion of non-price competition).[28] The effects of advertising/promotion are often discussed in terms of two polar cases.

First, advertising may inform consumers about the existence of particular products or their features. The effect of such "informative" advertising is then to enlarge the set of potential customers for the product concerned and it is expected to make demand more elastic. When several firms advertise at the same time, advertising also increases the probability that any given customer will be aware of the existence of several products, inducing greater competition and lower prices (see Grossman and Shapiro, (1984)). The elasticity of demand faced by each firm increases as the share of customers who know only one product decreases with advertising.

Second, the effect of advertising/promotion may be to change customer preferences in favor of the product concerned.[29] Such "persuasive" advertising affects customers' utility, and associated derived demand, for the product concerned. Considering a single product, advertising is typically shifting demand outward and it reduces the elasticity of demand. When there are several products, the effect of advertising on competition then depends on how preferences are shifted by advertising. One of the important features resulting from the shift of preference is whether the advertising reduces the demand of other products.[30] Any given utility function, and associated demand system,

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[28] 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 modelling, in order to affect choices, advertising needs to affect utility from the consumption of the advertised products. Some authors, like Sutton (1991), while formulating advertising as affecting utility, are still reluctant to draw welfare implications from their models. The underlying concern is that advertising involves some spurious differentiation that has no "real value" to consumers. As the purpose of our analysis is to draw conclusions on the significance of non-price competition for consumer welfare, a normative analysis is unavoidable. Consequently, the significance of the effect of an increase in perceived quality on utility that can be triggered by advertising is parametrised in our model.

[29] There is a third view on advertising/promotion, such that it does not affect preferences but enters directly in the preferences. Advertising is then a complement to the consumption of the advertised product. For instance, social prestige may be valued by customers and advertising may contribute towards this prestige (see Bagwell, 2004).

[30] Consider for instance the canonical model of a representative consumer with a quadratic utility (see Motta, 2004), which yield a linear demand systems for differentiated products ($U(q_1, q_2) = \alpha_1 q_1 + \alpha_2 q_2 - \frac{1}{2}(\beta q_1^2 + \beta q_2^2 + 2\gamma q_1 q_2)$). An increase in advertising/promotion which increases utility from the product by increasing the parameter in front on the linear term of the product concerned (say α_1 in the utility function) will shift the resulting inverse demand for that product outward in a parallel fashion. (The inverse demand for product 1 is written $p_1 = \alpha_1 - \beta q_1 - \gamma q_2$). Demand for the advertised product will increase (at given prices) and the demand for the competing products (at given prices) will fall (the demand for product 1 is written as $q_1 = \frac{(\beta a_1 - \gamma \alpha_2)}{(\beta^2 - \gamma^2)} - \frac{\beta}{(\beta^2 - \gamma^2)} p_1 + \frac{\gamma}{(\beta^2 - \gamma^2)} p_2$). Hence, even if the advertising increases utility and willingness to pay for a product, it will reduce the demand for other products (at given prices). In this formulation, the aggregate demand (at given prices) will however increase. The own elasticity of demand falls with own advertising but increases with the advertising of the competitor.
Similarly, consider a Hotelling model with products located at the ends of a line segment. Promotion/advertising might increase the willingness to pay of all customers (see Bloch and Manceau

will determine to what extent the increase in utility for a given product increases demand at the expense of other products.

Finally, it is worth observing that the effects of advertising on consumer welfare could be highly dependent on the interaction between advertising and price competition. As price competition tends to be relatively unimportant in the pharmaceutical industry (before loss of exclusivity), it will be useful to consider the effect of advertising without price competition. This is an issue that not been considered extensively in the literature so far.

A.2.b Promotion in the pharmaceutical industry can also be characterized in this framework. The promotional effort of pharmaceutical companies involves detailing (personal contacts of physicians by sales representatives), support to physician meetings, the distribution of free samples and advertising in medical journals. Detailing appears to account for the bulk of promotion efforts (see for instance Manchanda and Honka (2005)). There is an important literature assessing whether such promotion enhances information. In light of this literature, it seems reasonable to conjecture that detailing involves relatively little additional information towards the end of a drug's exclusivity. As the drug has been available for a number of years, its intrinsic properties are likely to be well known by practitioners. (see for instance, Naranaya and Manchada (2009)). From this perspective, one would expect that effect of promotion will be mostly persuasive and thus likely to reduce demand elasticity[31].

Whether persuasive advertising can be expected to increase aggregate demand or merely redistribute demand among competitors depends on particular circumstances. Manchanda and Honka (2015) conclude from a review of the literature that detailing affects prescription behavior, towards the end of life cycle of the product, because it creates "goodwill" between the detailer and the physician. This interpretation is consistent with the view that promotion has limited market expansion effect.

The model developed in the paper is one in which (i) advertising increases utility of the advertised products and, (ii) the extent to which demand is obtained at the expense of competing products is explicitly parametrized.

(1999). The demand for each product at given prices is then also increased by own advertising and decreased by competitors' advertising, advertising reduces the elasticity of own demand, the advertising of the competitor increases own elasticity (as in the model above with a representative consumer) but in this case, aggregate demand is constant. Firms may then be locked in a prisoner dilemma; they will advertise and obtain lower profits as a result, with no effect on prices, while consumer will benefit (when advertising increases customers' willingness to pay, in equilibrium prices are unaffected by advertising but firms advertise, so that consumers' surplus increases). Alternatively, promotion/advertising might increase perceived differences. In the context of Hotelling's model, this can be formulated as an increase in the transport cost, which *reduces* customers' utility for all products but their most preferred one (see von der Fehr and Stevik (1998)). This reduces the own elasticity of demand for both products. Advertising then leads to a relaxation of price competition and consumers are harmed.

[31] See Rizzo (1999) for evidence that advertising/promotion makes the demand less elastic in the market for antihypertensive drugs.

APPENDIX 3

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

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

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

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

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

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

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