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Competition and Product Choice in Option Demand Markets

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Abstract

This paper provides first analysis of horizontal product differentiation in health care markets with option demand. I show that differentiation choices in option demand market differ from those obtained in spot markets analyzes. This is because option demand induces competition over inclusion under insurance coverage, whereas in spot markets providers are competing over the marginal consumers. In addition providers that are perceived as substitutes in the spot market - after exact medical needs reveal, may be perceived as complements in option market - before actual medical needs emerged. I show that in the model option demand market competition in simultaneous moves yields efficient horizontal differentiation and excessive investment in quality. Moreover I show that sequential moves result in asymmetric equilibrium with first mover-gains to the leading provider, too little horizontal differentiation and yet higher expected utility for consumers (compared with simultaneous moves).

JEL Classification: : I11, I13, L1

Key-words: Insurance, Option Demand, Differentiation

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1 Introduction

This paper provides first analysis of competition through horizontal and vertical differentiation in option demand markets, which are common in the health care sector. I employ Hotelling's spatial setup to show that product choices in option markets may greatly differ from those obtained in spot markets.

Health insurance buys an option to utilize medical products at lower (possibly zero) spot payment upon the emergence of medical need. As consumers buy insurance before knowing which medical product they will eventually need and utilize, they may choose buying an option to utilize multiple differentiated products to which I will refer as "varieties".

However, the incidence of such option demand for multiple varieties is determined by the degree of their horizontal differentiation across varieties. In the absence of horizontal differentiation either all products with equal quality are perfect substitutes, and in case of quality (vertical) differentiation the product with superior quality dominates all others. Nonetheless, to my knowledge, horizontal differentiation choices in option demand market have not yet been studies.

There is a large body of theoretical and empirical research on competition in markets for differentiated medical-products under insurance sales[1]. Horizontal differentiation is interpreted in terms of geographic distance between providers, or differences in product characteristics - hospitals' area of specialization for example or differential effectiveness of alternative pharmaceuticals within therapeutic categories[2].

Beside few exceptions all theoretical works in this literature assumed consumers know their preferred medical product before getting sick (See for example Barros and Martinez-Giralt 2002, Bardey and Bourgeon 2011, and Katz 2011). This assumption is realistic with respect to geographic differentiation, as consumers know their address and distance from each provider before getting sick. In this case, if given the choice, each consumer would prefer including only their *ex-ante* most preferred provider under insurance coverage.

However when thinking of horizontal differentiation in terms of product characteristics it seems plausible that consumers do not know their preferred product before getting sick. This uncertainty that generates option demand for multiple varieties is focal to this paper.

The work by Capps et al. (2003) on competition and market power in option demand markets was followed by a growing empirical research on the topic[3]. Nonetheless, the theoretical literature on competition in option demand market is still scarce and focused on the vertical relations between insurers and providers, see for example Ma (1997), Gal-Or (1997), Lyon (1999) and Douven et al. (2014).

[1] The theoretical literature is reviewed below. The empirical literature was recently summarized and reviewed by Gaynor and Town (2012, Ch. 9.3) and Gaynor et al. (2015).

[2] These interpretations are commonly used in the literature. See Bardey et al. (2012) for more detailed examples on horizontal differentiation in health care markets.

[3] See Gaynor et al. (2015) for a comprehensive review.

All aforementioned studies assumed exogenous differentiation. In particular, those who employed Hotelling's setup assumed maximal differentiation, with prviders located at the two ends of the market[4]. This assumption may have been inspired by the maximal-differentiation principles established for spot market competition (d'Aspremont et al., 1979, and Economides 1989), as proposed by Gaynor and Town (2012):

"If one takes the kind of model .... where firms locate on a line, it seems evident that firms will have an incentive to locate as far apart from each other as possible (at the ends of the line), rather than nearby (in the middle). If they locate in the middle, the products are identical, so the one that produces the highest product quality will take the entire market. Thus firms will engage in fierce product quality competition, up until the point that pro products are dissipated. If firms are located at the ends of the line, then each firm will be considerably more attractive to consumers located very close to it. This will dampen quality competition"(p.575).

The present paper shows that this conjecture fails to hold in general in option demand markets. This is because option demand induces competition over marginal inclusion under insurance coverage, whereas in spot markets providers typically compete over the marginal consumer[5]. This type of competition has two distinctive properties that drive our novel results. First, when providers are competing over inclusion under insurance coverage they are aim to maximize the *option value* of their products to consumers. Second, products that are perceived as substitutes by sick consumers who already know their exact medical need, may be perceived by them as complements when buying insurance - before getting sick.

The standalone option value of each provider depends on its expected effectiveness in treating all possible medical needs. By contrary, its spot market value for a given consumer, and particularly the marginal consumer, depends on its effectiveness in treating her specific realized medical need. If the two products are differentiated enough, their joint option value may justify including them both under insurance coverage, although only one will be in fact utilized for each realized medical need. Hence they may be perceived as *ex-ante* complement although being *ex-post* substitutes.

To focus on product choice considerations I will simplify the insurance market structure to abstract realistic informational imperfections and elaborated vertical relations between insurers and providers. Namely, I will consider a perfectly competitive insurance market in which insurers sell separated insurance policies that cover each single product. In this set up offering insurance plan that includes both product is redundant because consumers can equivalently by two separated policies if they wish.

Nonetheless, the formal presentation of the insurance market here is isomorphic to the following alternative interpretations (a) a single insurer decides on behalf of consumers which products are included under insurance coverage. This could be a public insurer or employer[6](b) Each provider

[4]Brekke et al. (2006) and Bardey et al. (2012) study both horizontal and vertical differentiation in spot health care market within Hotelling's setup. So there is no insurance nor option demand the.

[5]Brekke (2006) and Bardey et al. (2012) show how price regulation and prospective payments that are common in health care markets, can alter the maximal differentiation principle in spot markets as well.

[6]As pointed out by Gaynor and Town (2012): "Employers, through whom most private insurance is acquired,

is perfectly integrated with one insurer, selling insurance that covers its own product only, with no exclusivity requirement - i.e. consumers can buy insurance from both providers. The interesting implications of alternative insurance market structures to product choices and other performance measures in option demand markets are left for future research[7]. On demand side I assume the same preferences as in d'Aspremont et al. (1979), that is quadratic mismatch ("tansporation") costs.

In this framework assuming the same preferences as in I find that competition in simultaneous moves over inclusion under insurance coverage results in efficient horizontal differentiation. Hence the principle of maximal and excessive differentiation obtained in the corrsponding spot market model fails to hold in the presented option market model. The basic intuition behind this result is the following: here each provider chooses variety as to maximize its option value which corresponds with consumers' expected utility from the product, thereby promoting efficiency.

When adding costly quality choice to the analysis (i.e. vertical differentiation) I find that efficient horizontal differentiation remains, but quality provision in equilibrium is excessive compared with social optimum. By comparison Ma Burgass (1993) finds insufficient investment in quality for spot market spatial competition, Lyon (1999) finds that indemnity yields excessive investment in quality, and Katz (2011) finds efficient quality provision under indemnity insurance.

In both Lyon (1999) and Katz (2011) however, indemnity insurance relaxes price competition and thereby by spurs investment in quality: when both providers are prices under a single insurance premium demand becomes less responsive to price increase of each provides. This leads to higher equilibrium markups that justify higher investment in quality. By contrast, in the present work each product is price and sold under separated insurance policy hence the bundling effect on prices does not exist.

Finally, I also show that competition in sequential moves results in asymmetric equilibrium: the leader locates at the middle and the follower located close to the market end. Sequential entry yields lower differentiation, first-mover gains, and utility gains to consumers - compared with simultaneous moves equilibrium. In comparison, the maximal-differentiation principle holds under sequential entry in spot markets, see Tabuchi and Thisse (1995).

This result may be of special relevance to the debate on the welfare implications of follow-on drugs, considered also as "me-too" drugs, as phrased recently on "Forbes" magazine:

"They may have some unique niche in the market, but they are fairly redundant with other therapies that are already available. Many of these you could call me-too drugs."[8]

Unlike generic drugs, "me-too" drugs are patented drugs developed by following innovators in a given therapeutic category, meaning they are differentiated from the drug provided by the incumbent. Current theoretical works studied the implications of different price regulations ("reference

have preferences over hospitals which are an aggregation of their employees' preferences, and select the set of health plans they offer to their workers based on expected costs, benefit structure, and provider networks" (p.524).

[7] I will shortly discuss this issue in Section 5.

[8] See full article at http://www.forbes.com/sites/johnlamattina/2015/01/19/impact-of-me-too-drugs-on-health-care-costs/ . See DiMasi and Paquette (2004) for review.

prices") to competition in pharmaceuticals markets. See for example Brekke et al. (2007), Miraldo (2009) and Bardey et al. (2010). These works assumed symmetric horizontal differentiation and focuses on vertical differentiation choices, whereas the present work confines attention to horizontal differentiation. The analysis here suggests that sequential entry under insurance sales indeed implies insufficient differentiation, but yet higher gains for consumers compared to simultaneous moves due to more intense price competition.

The remainder of the paper develops as follows: Section 2 introduces the detailed setup. Section 3 studies Duopolistic location-price competition, under simultaneous and sequential entry. Section 4 incorporates quality choice, and Section 5 concludes this study.

2 The Model

I study Hoteling's linear market for differentiated medical products. The market is populated with a unit mass of consumers, indexed i, who are *ex-ante* identical with respect to their medical needs (as in Gal-Or 1997 and Douven et al. 2014): each consumer faces the probability π to become sick with a medical need x_i that is drown from a uniform distribution over the unit interval : $x \sim U[0,1]$. The distribution x is a common knowledge. Upon the emeregence of medical condition a sick consumer is being correctly diagnosed at no cost and her medical need becomes a common knowledge.

There are two medical providers indexed $j = \{1,2\}$. Each provider privately chooses variety on the unit interval $y_j \in (0,1)$. Then each provider chooses price p_j. I assume zero marginal cost of provision, and $\frac{4v}{5\theta} > 1$.[9]

Perfectly competitive insurers price and sell separated insurance policies for the option utilization of each product[10]. I assume full reimbursement (as in Gal-Or 1997, Lyon 1999 and Katz 2011 for example) implying that the price p_j translates into an actuarially fair premium denoted $op_j \equiv \pi_j p_j$, where π_j is consumers' probability to utilize product j. When buying insurance for product j only $\pi_j = \pi$. When buying insurance policies for both products π_j is the probability that product j will be utilized buy an *ex-ante* healthy consumer. Then π_j depends on the locations on the two products on the varieties interval and the distribution of medical needs (assumed to be uniform here). To simplify exposition I will describe provider's pricing choice already in terms of the insurance premiums - that is the option price op.[11]

A healthy consumer enjoys a reservation utility v. When sick consumer's utility drops to zero if not treated and once treated it depends on the effectiveness of the utilized medical product. The effectiveness of a medical product is decreasing with horizontal distance from the treated medical need. Hence the expected utility from using product y_j for treating medical need x_i is

$$E\left[u\left(x_i, y_j\right)\right] = (1-\pi)\, v + \pi \left[v - \theta \left(x_i - y_j\right)^2\right]$$

[9] To assure a fully served market and that all product utilizations are beneficial to consumers at zero price.

[10] Hence a single health-plan policy that includes both products under coverage is redundant because consumers can buy a separated policies for the two product if they wish.

[11] The competition through insurance market modeled here is equivalent to the case were each providers sells a non-exclusive option to use her product directly to consumers.

and the expected utility from buying insurance for utilizing product y_j only is

$$E\left[u\left(x,y_j\right)\right]=\left(1-\pi\right)v+\pi\int_0^1\left[v-\theta\left(x-y_j\right)^2\right]dx-op_j \tag{1}$$

The expected utility function (1) is conventional to the reference literature[12]. It implies neutrality with respect to the financial risk associated with medical expenses. Abstracting from risk aversion greatly simplifies the analysis but adding risk-aversion should not alter our main results. The parameter θ measures the degree of differentiation over medical conditions, or the cost of mismatch between medical needs and treatments, which is non-insurable.

Finally, the analysis proceeds along the following four-stage time line:

1) Each provider chooses variety on the unit products interval.

2) Providers choose prices for their products.

3) Consumers decide whether to buy one insurance policy for one preferred product only, or buying two policies - to have both products under insurance coverege.

4) Medical conditions are realized, consumers utilize preferred insured medical product and providers are fully reimbursed.

3 Equilibrium

3.1 Simultaneous Entry

In this subsection I study vartiey-price choices in simultanuous moves, confining attnetion to symmetric equilbieium assume $y_1 \in \left[0, \frac{1}{2}\right]$ and $y_2 \in \left[\frac{1}{2}, 1\right]$. I denote consumer's expected utility from having only one variety under insurance coverage - O_j , with $j = \{1, 2\}$, and consumer's expected utility from having both varieties under coverage - O_{1+2}.

To build up intuition for the formal analysis that follows, consider a case where both varieties are equally priced and symmetrically located on the products line. Consumers would like buying insruance for both varieties only if the additional premium payment justifies the increase in expected therapeutic effectiveness. If the products are only slightly differentiated, only a correspondingly low price shall justify buying insurance for both.

However, so long as prices are not that low, the two providers are engaged in fierce price competition, *a-la* Bertrand. This is because they have the same stand along option value: symmetrically located and equally priced the two products are perceived as perfect substitutes by the *ex-ante* identical consumers. Hence, under insurance sales demand faced by each provider is extremely elastic for high prices: each provider can "steal" the entire market by cutting her rival's price marginally.

Eventually, demand becomes perfectly inelastic once both products are included under insurance coverage. Then demand cannot increase with further price cut as the market is saturated. As all

[12] See for example Gal-Or (1997) Lyon (1999) Brekke et al. (2007) and Bardey et al. (2012).

consumers on the option market are identical this implies that in equilibrium they all buy insurance for both products. This equilibrium condition is formally presented the following theorem.

Theorem 1 *Equilibrium prices must satisfy* $O_{1+2} = O_2 = O_1$.

Proof. $\forall\ O_1 \geq O_2 > O_{1+2},\ \ \exists\ op_2\prime \equiv op_1 - \varepsilon$ such that $O_2 > O_1 > O_{1+2}$ where ε is arbitrarily small. Thus in equilibrium it must be that $O_{1+2} \geq O_1$ and $O_{1+2} \geq O_2$. Profit maximization implies that providers will set their prices as to satisfy both conditions with equality. ■

The theorem implies that in equilibrium consumers are indifferent between having either product only under insurance coverage or both under insurance coverage. I will assume they buy both out of indifference. The equilibrium is solved backward, starting with the price sub-game competition. The Theorem implies that as long as $O_1 \geq O_2 > O_{1+2}$ or $O_1 \geq O_2 > O_{1+2}$ providers are engaged in fierce price competition cutting each other's price down. Provider 1 has no further incentive to lower the price op_1 once $O_2 \leq O_{1+2}$, that consumers prefer having both product under coverage than having insurance for product 2 only. This condition can be written explicitly as

$$\underbrace{\pi \int_0^1 \left[v - \theta\left(y_2 - x\right)^2\right] dx - op_2}_{O_2} \leq \underbrace{\pi \left\{ \int_0^{\widetilde{x}} \left[v - \theta\left(x - y_1\right)^2\right] dx + \int_{\widetilde{x}}^1 \left[v - \theta\left(y_2 - x\right)^2\right] dx \right\} - op_1 - op_2}_{O_{1+2}} \tag{2}$$

The integral limit $\widetilde{x} = \frac{y_1+y_2}{2}$ is the fraction of sick consumers who would prefer being treated by provider 1 *ex-post*, when both providers are under insurance coverage. Rearranging and elaborating (2) yields the following upper bound for op_1 in equilibrium

$$op_1 \leq \pi\theta \left\{ \int_0^{\frac{y_1+y_2}{2}} \left[y_2^2 - y_1^2 - 2x\left(y_2 - y_1\right)\right] dx \right\} = \pi\theta \left[\frac{1}{4}\left(y_1 + y_2\right)^2 \left(y_2 - y_1\right)\right] \tag{2a}$$

When holding with equality condition (2a) defines the equilibrium limit option price op_1, given the location of both providers on the products line. In the first stage of the game, provider 1 chooses her optimal variety - denoted y_1^* - as to maximize (2a) following the first order condition

$$y_1^* = \frac{y_2}{3} \tag{3}$$

Proposition 1 *The simultaneous game has unique equilibrium symmetric with efficient horizontal differentiation:*$y_1^* = \frac{1}{4}$, $y_2^* = \frac{3}{4}$.

Proof. Following the symmetry of problem, I impose symmetry in (3) to obtain $y_1^* = \frac{1}{4}$, $y_2^* = \frac{3}{4}$. ■

In equilibrium the option price and profit for each provider is $op^* = \frac{\pi\theta}{8}$, and consumers' expected utility is $E\left\{U\right\} \approx v - \pi\theta \cdot \frac{13}{48} \approx 0.27$. I turn now to explore products choices in option demand market under sequential entry.

3.2 Sequential Entry

Suppose that provider 2 has the opportunity to choose variety first. Next, provider 1 enters the market by choosing variety and then they both compete in prices as in the previous subsection. Tabuchi and Thisse (1995) showed that under such a Stakelberg-Location competition in *spot* markets the maximal differentiation principle remain, when location is bounded within the preference interval[13]. I still assume, without loss of generality, that in equilibrium $y_2 \geq y_1$.

By theorem 1, for a given variety choice and option price set by the leader, the option value of the follower's product must still satisfy equation (2). Therefore the optimal variety choice for the follower should still satisfy condition (3): $y_1^* = \frac{y_2}{3}$. Then, the equilibrium condition $O_{1+2} \geq O_2$ from Theorem 1 implies the following option-value for the leader, accounting for the follower's response function

$$\pi \left\{ \int_0^{\widetilde{x}} \left[v - \theta \left(x - \frac{y_2}{3} \right)^2 \right] dx + \int_{\widetilde{x}}^1 \left[v - \theta \left(y_2 - x \right)^2 \right] dx \right\} - op_1 - op_2 \geq \pi \int_0^1 \left[v - \theta \left(x - \frac{y_2}{3} \right)^2 \right] dx - op_1 \tag{4}$$

Where $\widetilde{x} = \frac{y_2+y_1}{2} = \frac{1}{2}\left(y_2 + \frac{y_2}{3}\right) = \frac{2}{3}y_2$. Rearranging and elaborating condition (4) yields the following explicit form

$$op_2 \leq \pi\theta \left[\left(\frac{2y_2}{3} \right)^3 - 2\left(\frac{2y_2}{3} \right)^2 + \frac{2y_2}{3} \right] \tag{4a}$$

Proposition 2 *Sequential entry results in asymmetric equilibrium: the leader is at the market center and the follower is close to the market end.*

Proof. Maximizing (4a) with respect to y_1, yields the quadratic equation $4y_2^2 - 8y + 3 = 0$ with the single feasible root $y_2^* = \frac{1}{2}$ hence $y_1^* = \frac{1}{6}$. ■

Note that the horizontal differentiation here is inefficient: it is lower than under simultaneous moves and asymmetric. However, the equilibrium option prices and profits are $op_2^* = \frac{4\pi\theta}{27}, op_2^* = \frac{\pi\theta}{27}$, and consumer expected utility $E\{U\} = v - \pi\theta\frac{7}{27} \approx 0.26$. Comparing these values with the corresponding ones from the previous subsection shows that sequential entry yields first-mover gains to the leader and increase in consumers expected utility.

4 Quality choice

In this section I add vertical differentiation, through costly product-quality choice, to the analysis. Denoting product quality q_j I conventionally modify the expected utility function (1)[14]

[13] Nonetheless, for sequential entry with unbounded location they show that the leader locates in the middle of preferences range, and the follower locates outside the range.

[14] See for example Lyon (1999) and Katz (2011) and Bardey et al. (2012).

$$E\{U\} = (1-\pi)\, v + \pi \int_0^1 \left[v + q_j - p_j - \theta\,(y_j - x)^2 \right] dx \tag{5}$$

I assume the provision of quality is subject to quadratic cost function, which is fix with respect to output level[15]

$$C(q_j) = \frac{\mu}{2} q_j^2 \tag{6}$$

I also assume $\theta > \frac{\pi}{\mu}$ to ensure non-negative profit in equilibrium. I solve a two-stage game in simultaneous moves: product variety and quality are chosen in the first stage, and in the second stage price competition prevails[16]. The equilibrium prices are still subject to Theorem 1. Accommodated for utility from quality condition (2) becomes

$$\pi \left\{ \int_0^{\widetilde{x}} \left[v + q_1 - \theta\,(x - y_1)^2 \right] dx + \int_{\tilde{x}}^1 \left[v + q_2 - \theta\,(y_2 - x)^2 \right] dx \right\} - op_1 - op_2 \quad \geq \tag{7}$$

$$\geq \pi \int_0^1 \left[v + q_2 - \theta\,(y_2 - x)^2 \right] dx - op_2$$

Where $\widetilde{x} = \frac{1}{2}\left[\frac{q_1 - q_2}{\theta(y_2 - y_1)} + y_1 + y_2 \right]$, is still the fraction of consumers who would choose treated by provider one when both providers are under insurance coverage. Elaborating and rearranging (7) yields the simplified expression

$$op_1 \leq \pi \left\{ \int_0^{\widetilde{x}} \left[\left(v + q_1 - \theta\,(x - y_1)^2 \right) - \left(v + q_2 - \theta\,(y_2 - x)^2 \right) \right] dx \right\} \tag{7a}$$

Then by integrating (7a) and subtracting the quality cost I obtain the expected profit expression

$$\pi \left\{ \left[q_1 - q_2 + \theta\left(y_2^2 - y_1^2\right) \right] \widetilde{x} - \theta \widetilde{x}^2 (y_2 - y_1) \right\} - \frac{\mu}{2} q_1^2 \tag{8}$$

Finally, plugging $\widetilde{x} = \frac{1}{2}\left[\frac{q_1 - q_2}{\theta(y_2 - y_1)} + y_1 + y_2 \right]$ in (8) yields the following profit function

$$\frac{\pi}{4} \frac{\left[(q_1 - q_2) + \theta\left(y_2^2 - y_1^2\right) \right]^2}{\theta\,(y_2 - y_1)} - \frac{\mu}{2} q_1^2 \tag{8a}$$

Proposition 3 *There exists unique symmetric equilibrium with efficient horizontal differentiation and excessive investment in quality.*

[15] This tractable fromulation is common in this literature-see for example Brekke et al. (2007) and Bardey et al. (2012).

[16] It can be shown the a three stage game - variety→quality →price - yields the same result, though with less tractable derivations.

Proof. Differentiating (8a) for q_1 and y_1 yields the following first order conditions

$$\begin{aligned} \frac{\mu}{\pi} q_1^* &= \frac{1}{2}\left[\frac{(q_1^* - q_2)}{\theta(y_2 - y_1)} + y_2 + y_1\right] \\ y_1^* &= \frac{1}{4}\left[\frac{(q_1^* - q_2)}{\theta(y_2 - y_1)} + y_2 + y_1\right] \end{aligned} \tag{9}$$

Imposing symmetry on both conditions yields $q_{1,2} = \frac{\pi}{2\mu}$, $y_1 = \frac{1}{4}, y_2 = \frac{3}{4}$.

The expected market welfare, denoted W, with symmetric varieties is

$$W = 2\left[\frac{\pi}{2}\int_0^{\frac{1}{2}}\left[v + q_1 - \theta(x - y_1)^2\right]dx - \frac{\mu}{2}q_1^2\right]$$

Maximizing this expression with respect to y_1 and q_1 yields the first order conditions $y_1 = \frac{1}{4}$ and $q_{1,2} = \frac{\pi}{\mu 4}$. Hence the socially optimal quality level is half the equilibrium level. ■

5 Concluding remarks

This work presented first analysis of competition through horizontal and vertical differentiation in option demand markets, which commonly prevails in the health care sector. It shows that product choices in option demand markets may greatly differ from those of spot markets. In particularly, it showed that the maximal differentiation assumed in current spatial models of option demand market (Gal-Or 1997, Lyon 1999 and Douven et al. 2014) may be inconsistent with optimal product choices.

Horizontal product differentiation in the analyzed model-market is efficient, and the provision of quality is excessive compared to social optimum. Both quality and variety choices made by providers, aim to maximize the option vale of their product to consumers. However, whereas the option value from horizontal differentiation is bounded the option value form improved quality is unlimited. Realizing that, it may not be surprising the duopolistic option demand market provides efficient horizontal differentiation but too much quality.

The results in this work are derived while abstracting from some key realistic characteristics of health insurance markets. Those include bargaining over prices or surplus-shares between multiple insures and providers (as in Gal-Or 1997 and Douven et al. 2014), and alternative degrees of vertical integration between providers and insurers (as in Lyon 1999).

Nonetheless, first intuition suggests that under these alternative market structures providers will still be motivated to maximize the option value of their products. Then however the results in this paper imply that the maximal differentiation assumed in previous works is not a necessary outcome, and maybe even not the plausible one. However, the formal exploration of this conjecture and its implication to providers' networks formation, and consumer welfare is calling for future research[17].

Another strong assumption employed in this work is that all consumers are *ex-ante* identical with respect to expected medical needs. This assumption sharpens the analysis by imposing fierce (Bertrand) competition in option prices. Gal-Or (1997) and Douven et al. (2014) employed the same assumption with respect to expected medical needs, but allowed ex-ante consumers differentiation with respect to their preferred insurer with prices being set trough multi-lateral negotiations. In a following paper (Sorek 2015) I let consumers be *ex-ante* identical with respect to their expected medical needs but differentiated with respect to their geographic address. There providers choose both geographic location and horizontal product differentiation. I find that the efficient differentiation in the product space obtained in the present paper remains in that elaborated set-up, where consumers are ex-ante heterogenous.

Finally, the analysis yielded asymmetric inefficient differentiation under sequential entry into option demand markets. Yet the excessive concentration yields utility gains to consumers (compared with the efficient differentiation under simultaneous moves) due to lower prices, and first mover gains to market leader. This result seems of special relevance to the debate on the efficiency gains from "me-too" drugs.

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