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Soldatos, Gerasimos T.

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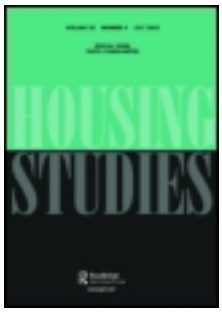

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Information and competitive equilibria in the housing market

Gerasimos T. Soldatos [a]
[a] American College of Greece, Kleovoulis 15, 15773, Zografou, Athens

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Information and Competitive Equilibria in the Housing Market

Gerasimos T. Soldatos

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Abstract

This paper derives necessary and sufficient conditions for the existence and occurrence likelihood of competitive equilibria in urban land and housing markets: (i) when there is imperfect information causing costly search trips and (ii) when land and housing are differentiated according to between-zone and within-zone heterogeneity. Such competitive equilibria are contingent on the possibility that consumers spill over into the markets of less preferred zones. The main conclusions are that markets tend to be partitioned into homogeneous sub-groups and when they do not, heterogeneity may hamper the effectiveness of search and hence work against the existence of competitive equilibria.

Introduction

Urban land and housing issues have been of urgent concern since at least soon after the emergence of capitalism two centuries ago. Indeed, it is not at all strange that an economics discipline specialising in such issues should arise. New Urban Economics is the most recent attempt to explain and predict the relevant phenomena. Its development in the late 1960s brought about almost simultaneously a number of alternative approaches as well as several critiques of the New-Urban-Economics modelling of urban issues as the outcome of an orderly competitive process. The purpose of this paper is to derive conditions under which the results of a competitive process may be realised even though the underlying structure of the model is non-competitive. The specific imperfect information which is of particular interest here is the incomplete information available to prospective purchasers regarding the non-economic characteristics of the commodity under consideration.

Such imperfect information is evident, though not recognised explicitly, in almost every empirical work in housing and renders this good a heterogeneous one. Take, for instance, the December 1985 issue of the journal *Urban Studies*. There, Abelson tries to explain house and land prices in Sydney taking into account that there are differences in accessibility, environmental circumstances, and in the quality of services from house or land although there may be no differences in the price of housing as is the case for existing and new housing in the long run allowing, of course, for depreciation. McDonald underlines the importance of expectations regarding neighbourhood characteristics in an examination of the role of expectations in the formation of urban housing prices in Chicago. And when Mogridge investigates transport, land use and energy interaction in London and Paris, factors pointing to housing heterogeneity are mentioned, too. Landlord input costs, public schooling, local taxes, racial or religious discrimination, and crime are some additional factors that may produce heterogeneity in housing, ceteris paribus. In sum, any empirical work in urban housing and land economics cannot escape reference to the non-economic characteristics of this commodity and these characteristics lead to between-zone and within-zone heterogeneity and hence, to imperfect information, with the consequent information acquisition costs imposed by market search.

Product heterogeneity and incomplete information in the housing sector are simply a 'fact

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of life' even though they are not mentioned explicitly by the empirical literature. The reason for this omission and superficial, if any, empirical treatment of heterogeneity is the absence of theoretical models that would provide a way of thinking about the relevant issues analytically. An effort towards this direction is made here, but it is only the beginning and one should not expect pathbreaking results. More precisely, urban land and housing are assumed to comprise a heterogeneous goods market because of between-zone and within-zone differences. Sellers and consumers know this fact well and act accordingly. Before a consumer can engage in trading, he or she must carry out a search process, since information imperfections are inherent in decision making concerning land and housing. Given that acquisition of information is costly, if one wants to buy an apartment or a house, one would first have to make a few trips to visit different areas, and then decide according to one's budget and preferences. This kind of behaviour is typical and reflects the fact that information is not readily available. So long as information is costly to acquire, the likelihood of competitive behaviour and outcomes becomes even smaller, provided also that there is an imperfectly competitive environment.[1] Put formally, then, this paper's purpose is to work out the possibility of competitive equilibria within such a theoretical framework.

The plausibility of this framework derives from the fact that the relevant market structure with imperfect information is not perfect competition but rather monopolistic competition, (Salop, 1976, p240). That seems to be the case in urban land and housing indeed because monopolies and oligopolies in these markets are expected, intuitively at least, to be a rare phenomenon. This is something the present analytical environment reflects, thus offering an alternative to the approaches of Emmanuel (1985) and Berry (1967). These approaches are applications of the Chamberlin and Joan Robinson versions of monopolistic competition, respectively, on urban land and housing markets, but both Berry and Emmanuel assume away imperfect information and information acquisition costs. Courant (1978) and Yinger (1981) do recognise the importance of information and proceed to characterise the consequent imperfectly competitive equilibria. This may be theoretically interesting but of limited usefulness to the policymaker, since the relevant issue is the possibility of perfectly competitive outcomes in an imperfectly competitive environment, rather than the theoretical characterisation of imperfectly competitive equilibria. Although such an environment can be taken for granted, its outcomes cannot, and it is these outcomes which are of concern to the policymaker.

These considerations provide not only an explanation of why the possibility and implications of imperfect competition as well as imperfect information in urban land and housing markets have not received the theoretically and empirically appropriate attention in the literature, but also the grounds upon which the present work has merit. Apart from this work's novel mental approach vis-à-vis the existing literature in the modelling of the markets under consideration, it addresses what is for the policymaker an interesting possibility, within an analytical framework which tries to be as close as possible to reality, allowing, of course, for the necessary mathematical tractability. 'Close to reality' means that the model recognises both between-zone and within-zone heterogeneity, and this in a manner avoiding the presuppositions of the 'hedonic price' (or 'indices') models that Blomquist and Worley (1981), for example, mention. This is achieved through the use of the economics of information and brings the model closer to Chamberlin without simultaneously neglecting the benefits one might get out of Joan Robinson's neo-classicism'.[2]

In what follows, the next section develops the formal model and characterises the nature of competition and competitive equilibria. A third section formulates, in terms of market structure, conduct, and seller deviations from the competitive price, the necessary and sufficient conditions for the existence of competition in all markets. The occurrence likelihood of a competitive equilibrium is then investigated through changes of customer numbers. The paper concludes with an overview and some general remarks.

The urban land and housing market

The decisive factors in the analytical framework are prices and zones 1 and 2 of the region under examination.[3] There are $S_1+S_2=S$ landowners who are assumed to be the decision-makers concerning urban development and the price of residential capital. They maximise expected profits on the basis of price variations that, in turn, depend only on purchases. There is no

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advertising whatsoever, and between-zone heterogeneity emerges due to differences in inherent zone characteristics, whereas within-zone heterogeneity arises in connection with consumer preferences regardless of these characteristics. As soon as preferences are independent of economic factors, within-zone heterogeneity is not such as to result in within-zone market-price differentials and hence prices reflect only the between-zone heterogeneity.[4] Letting L_i be a minimum land price cost playing the role of firm's (landowner's) fixed cost in the ith zone, i= 1, 2, l_i be a constant marginal cost, and R_i designate, for analytical convenience, a capacity constraint on firm size as a substitute of U-shaped unit construction costs,[5] 'competitive' prices $\bar{q}_1$ and $\bar{q}_2$ per housing unit are assumed to satisfy the relations

$$(L_1/R_1) + l_1 = \bar{q}_1 < \bar{q}_2 = (L_2/R_2) + l_2$$

in the way Emmanuel (1985), for instance, describes. These prices are also assumed to be related to rents according to some empirical formula.[6]

Next, consumers either buy in the ith zone (but not in both) once in their lifetime, or they do not buy at all. Consequently, they may be classified as follows. Letting $C_N > 0$ be the number of non-buyers, $C_B > 0$ the number of buyers, C_N^i the number of non-buyers that prefer zone i, and C_B^i the number of buyers that prefer zone i too, one obtains

$$C^1 = C_N^1 + C_B^1, \qquad C^2 = C_N^2 + C_B^2,$$
$$C_N = C_N^1 + C_N^2, \qquad C_B = C_B^1 + C_B^2,$$
$$\text{and} \quad C_N + C_B = C = C^1 + C^2$$

Consumers are aware of the inherent characteristics of each zone and are concerned only with the within-zone heterogeneity prevailing in each zone.[7] Before a consumer commits himself to a purchase he makes some search trips to various firms in order to identify what he is able and willing to buy. For the sake of mathematical convenience and simplicity, but without loss of generality, it is assumed that the number of 'search-trips' or sample size for a non-buyer is one, ie (1/S), and for a buyer two, ie (2/S). Serious cost considerations involved in searching may be a good reason justifying this assumption. Also, it has often been shown that consumer search in the housing market is very short.

Now, suppose that at competitive prices, $\bar{q}_i$, members of C^i buy in zone i and suddenly, q_2 goes up while the price in zone 1 remains at the $\bar{q}_1$ level. For some members of C^2, there will clearly be a shift from buying in zone 2 to buying in zone 1, whereas there will be no change in the behaviour of the members of C^1. Of course, there is a price $\hat{q}_2 > \bar{q}_2$ which is an 'indifference' price in the sense that the members of C^2 who switched would be simply indifferent in doing so. By the same token, there is a price $\hat{q}_1 > \bar{q}_1$ where members of C^1 will buy in zone 1 if $q_1 \leq \hat{q}_1$ while some of them will switch to buying in zone 2 if $q_1 > \hat{q}_1$. On the other hand, if there were no zone differences and all regions had the characteristics of zone i, the maximum price that members of C^i and C^j would pay are q_i' and q_j, i, j = 1, 2, $i \neq j$, respectively. To contrast these price levels with their 'competitive' and 'indifference' levels, they might be called 'maximum' prices. Their difference with any other level gives a measure of consumer surplus, thus reflecting consumers' tastes. More precisely, it is realistic to postulate that $\hat{q}_i$ belongs to the following semi-closed interval: $\hat{q}_i \in (\bar{q}_i, q_i']$.

Finally, defining $s_1 = S_1/S$ and $s_2 = S_2/S$, equilibrium in this model can be characterised by a market structure or a firm distribution across the two zones (s_1, s_2), a total consumer–firm ratio, C/S, and a zone-specific price distribution such that (i) all consumers follow specified buying policies, (ii) given the equilibrium market structure, all firms earn zero expected profits, and (iii) no firm can earn positive profits by changing its price offer or the zone within which it operates. These are the conditions for the classical competitive equilibrium when information is perfect. Here, however, information is not readily available and consumers can spill over into the market of the less preferred zone. Given the effectiveness of search, it is this 'spillover effect' of imperfect information that requires costly search trips and the consequent firm behaviour that finally permit the emergence of a competitive equilibrium (henceforward to be abbreviated as CE). Such an environment of uncertainty favours the existence of an excessive number of firms which, in turn, implies an increased likelihood for zero profits and transactions at competitive prices ($\bar{q}_1$, $\bar{q}_2$).

Indeed, the desire to own a home or land is more or less general while speculation in urban land and housing markets is not unusual. Furthermore, it is not rare to find people who want to buy a house or land in some area which they cannot afford and who follow a second-best strategy. In contrast, there are people who do not like an 'expensive' area but because they can afford it they buy even for the simple reason

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of snobbishness.[8] Phenomena, then, such as spillovers and excessive number of firms trading at competitive prices and realising zero profits are logical consequences of attitudes. Intuitively, it should not be strange that under certain conditions the outcome may be a CE. Next we proceed to an examination of the conditions under which an equilibrium of this sort may occur.

Market conduct and the existence of a CE

Consider a firm that finds if profitable to deviate from the competitive price. Then, clearly, an equilibrium cannot exist and finding the necessary conditions for its existence is now translated to characterising the conditions under which deviations from the competitive price are not profitable. On the other hand, there may be circumstances where expected demand is not equal to capacity and entry, and losses or even bankruptcies become possible. This state of affairs is again inconsistent with an equilibrium situation and one is able to derive the sufficient conditions required to ensure a CE by ruling out such possibilities.[9] In this manner, it can be shown that the necessary condition for the CE is:[10]

$$R_i = \frac{C_B^i}{S_i}\left[1-\left(\frac{S_j}{S}\right)^2\right]+\frac{C_B^j}{S_i}\left(\frac{S_i}{S}\right)^2+\frac{C_N}{S} \qquad (1)$$

Solving for S_i and noting that $S_i \geq 0$, one may obtain

$$R_1(C_B^1-C_B^2) \geq C(R_1-R_2) \geq R_2(C_B^1-C_B^2), \qquad (2)$$

$$\text{and} \quad S=(C_B^1-C_B^2)/(R_1-R_2) \qquad (3)$$

The interval given by the above inequality contains all possible buyer–non-buyer combinations consistent with a competitive distribution of firms at equilibrium. Of course, it does not follow that this will always be the case, but the inequality is indeed the condition for a CE to occur. Also, the ratio given by (3) shows that the existence of a CE in both markets requires an excess of C_B^i over C_B^j which has the same sign as the difference between firm capacities at zones i and j. No matter how big the difference between $|C_B^1 - C_B^2|$ and $|R_1-R_2|$ may be, an equilibrium could still occur through adjustments in s_1 and s_2 provided the constraints of (2) are fulfilled. For instance, if $C_B^2-C_B^1>0$ is much larger than $R_2-R_1>0$, then s_1 will decline and s_2 will increase. Intuitively, this means that in equilibrium, the larger the capacity the higher the number of customers needed. Note, however, that in each market, inherent zone advantages in attracting consumers who prefer that zone, render impossible a complete reversal of capacity constraint direction via adjustments in s_1 and s_2. Put differently, if $C_B^i-C_B^j>0$ and $R_i-R_j<0$, firms at the jth zone would face a persistent excess capacity.

Next, depending on the relationships between indifference and maximum prices, a firm may find it profitable to deviate from the CE. A deviant firm has several pricing options that would certainly impose additional constraints on the occurrence probability of such an equilibrium. Suppose that all firms are charging the competitive price $\bar{q}_i$ except one at the ith zone that charges either $\hat{q}_i$ or q_i' or $\dot{q}_i$. That is, deviant pricing policies are summarised by the end or middle values of the price sets generated in the previous section. The reasoning governing this simplification is that what is true for a member of a convex set is also true for the entire set. In this manner, the relationships between the three prices just mentioned can be used to determine the profitability of each pricing policy and hence, the conditions under which a firm at the ith zone would have no incentive to depart from the competitive price. These conditions are given by Figure 1 and constitute the additional constraints on the occurrence probability of the CE. They provide along with (2) a set of necessary and sufficient conditions for the competitive distribution of firms at $\bar{q}_1$ and $\bar{q}_2$ to be an equilibrium.

Fig. 1 ***Conditions under which a firm has no incentive to depart from CE***

Pricing policy		Condition*	
$\hat{q}_j<\hat{q}_i<q_i'$	$\hat{q}_j$	$L_i/[\bar{R}(\hat{q}_j-l_j)] \geq 2c_B^i s_j+c_N$	(4)
	$\hat{q}_i>\hat{q}_j$	$L_i/[\bar{R}(\hat{q}_i-l_j)] \geq 2c_B^i s_j+c_N^i$	(5)
	$q_i'>\hat{q}_j$	$L_i/[\bar{R}(q_i'-l_j)] \geq c_N^i$	(6)
$\hat{q}_i<\hat{q}_j<q_i'$	$\hat{q}_i$	$L_i/[\bar{R}(\hat{q}_i-l_j)] \geq 2c_B^i s_j+c_N^i$	(7)
	$\hat{q}_j>\hat{q}_i$	$L_i/[\bar{R}(\hat{q}_j-l_j)] \geq c_N$	(8)
	$q_i'>\hat{q}_i$	$L_i/[\bar{R}(q_i'-l_j)] \geq c_N^i$	(9)
$\hat{q}_i<q_i'<\hat{q}_j$	$\hat{q}_i$	$L_i/[\bar{R}(\hat{q}_i-l_j)] \geq 2c_B^i s_j+c_N$	(10)
	$q_i'<\hat{q}_i$	$L_i/[\bar{R}(q_i'-l_j)] \geq c_N$	(11)
	$\hat{q}_j>q_i'$	$L_i/[\bar{R}(\hat{q}_j-l_j)] \geq c_N^i$	(12)

*$\bar{R}=s_1R_1+s_2R_2$: Average capacity under competitive firm distribution.

$c_N=C_N/C$ and $c_B^i=C_B^i/C$.

The relevance of spillovers and search effectiveness

There are many instances that, for various reasons, a member of C_B^i may make both search trips to one zone and finally buy in the other zone. This means that there is a complete spillover in the market of the jth zone. Also, a member of C_B^i may pay one visit to the ith and the other visit to the jth zone and thus it is possible that the effectiveness of search may be hampered: the consumer may buy in either zone or not buy at all. Obviously such circumstances affect equilibrium. To see how, let first C_B increase vis-à-vis C_N, keeping market structure constant. The impact on equilibrium would be different if C_B remained constant and shifts between C_B^1 and C_B^2 were allowed. Below we examine each of these cases in turn.

Suppose that C_B increases relative to C_N and that there is a redistribution between C_B^1 and C_B^2 so that $c_B^1 - c_B^2$ remains constant and neither c_N^1 nor c_N^2 rises. Then, it can be shown that

$$\left.\frac{\partial s_i}{\partial c_B^i}\right|_{c_B^1 - c_B^2} = 0 = \left.\frac{\partial s_j}{\partial c_B^i}\right|_{c_B^1 - c_B^2}$$

Consequently, even though there are shifts between C_B^1 and C_B^2, and C_B increases, $\bar{R}$ remains constant. Also the right-hand sides of conditions (6), (8), (9), (11) and (12) will decrease because there is no term associated with buyers and because an increase in c_B is at the expense of c_N. This suggests that an increase in the number of buyers increases the likelihood for CE occurrence in both zones. Note that there is no c_B^i term because the profit maximising price of a deviant firm eliminates all buyers and the firm sells only to non-buyers. A reduced number of non-buyers enlarges the discrepancy between the two sides of the relevant conditions and makes deviation more unprofitable.

Conditions (4), (5), (7) and (10) contain terms associated with buyers. The term $2c_B^i s_j$ captures the dilution in the effectiveness of search, since the pricing strategy is $\hat{q}_i$. As soon as the price of a deviant firm lies somewhere between the competitive and indifference levels, this firm retains those members of c_B^i whose effectiveness of search has been hampered. The simultaneous existence of increasing C_B^i and decreasing c_N affects the incentives of a firm to deviate in two opposing directions: the first makes such a motivation more likely whereas the latter makes it less likely. Given that s_1 and s_2 remain unchanged, weighing c_B^i by s_j implies that the decrease in c_N dominates, thus making deviation unprofitable. This, of course, presumes that there is no redistribution between C_N^1 and C_N^2. In any other case, the net effect of the workings of c_B and c_N is ambiguous for all but (8) and (11) conditions. Competition in both markets now becomes less likely.

Next, suppose that $R_i > R_j$ and consider an increase in c_B^i that comes entirely at the expense of c_B^j. Put differently, there are shifts between C_B^1 and C_B^2 while C_B, c_N^1, and c_N^2 are held constant. In this manner, one may obtain that

$$\left.\frac{\partial s_i}{\partial c_B^i}\right|_{c_B} < 0 \text{ and } \left.\frac{\partial s_j}{\partial c_B^i}\right|_{c_B} > 0$$

That is, $R_i > R_j$ implies that $\bar{R}$ must decrease. These derivatives also imply a disequilibrium where there exists excess demand in the ith zone and excess supply in the jth zone. Such a disequilibrium could be eliminated by spillovers which, in turn, means that the number of firms in the jth zone must increase. The equilibrium consumer–firm ratio is thus lowered and each firm has fewer expected customers. The likelihood of CE occurrence is now higher because expectations for fewer customers and hence, fewer non-buyers implies that the difference given by (6), (8), (9), (11) and (12) get larger. In other words, when there is no term associated with buyers, the motivation to deviate is less likely.

In sum, the essence of the results is that in view of the possibility of less-preferred choices induced by inadequate information regarding urban land and housing, a volume of transactions which in practice is equivalent to an excess number of firms arises, profit margins fall, and the probability of pricing at cost levels and hence, the likelihood of the emergence of purely competitive conditions increases.[11]

Concluding remarks

This paper presented a theoretical model in which urban land and housing differ from zone to zone in two aspects: between-zone and within-zone heterogeneity. The objective was to examine the conditions for and likelihood of competitive equilibrium occurrence. Consumers were assumed to be aware of the existence of land and housing differences among zones,

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but they do not know what these differences are. In order to obtain more precise information, 'search trips' have to be made. Prohibitive costs and/or other reasons may force a consumer to search and even buy in a less preferred zone. Such spillovers, as well as dilution of the effectiveness of search, bring about competitive-like conditions in a basically imperfectly competitive market.

But while these phenomena are realistic, the results depend also on the assumption that there are only two zones and two search trips. A CE would become less likely if the number of zones were to increase provided sample size remained constant. On the contrary, increased search intensity could provide enough observations and competition would become more likely. Furthermore, entry and exit have been assumed away, but allowing changes in market structures would also guarantee an increased likelihood of CE occurrence. However, these changes in the model's results are quantitative in nature. That is, although the introduction of a richer information process and/or entry and exit would enhance the real-world relevance of the model, the paper's thesis would remain unaltered, since all that this extension of the theoretical framework could achieve is to complicate the mathematics. Similar remarks can be made insofar as the assumptions regarding advertising, the number of times consumers buy, and the possibility of buying in more than one zone, are concerned. Moreover, the factor of distance has been completely ignored, though it might be argued that the extent of market search does reflect such considerations implicitly, since it is influenced by transportation matters (eg car ownership and usage, travel speeds and time budgets, etc); on the other hand, distance considerations might be thought of as being incorporated in the assumption of product heterogeneity per se. In other words, the assumptions this paragraph evaluates are theoretically convenient but empirically restrictive: methodologically, the analysis advanced herein is as useful as any other theoretical construction pinpointing in abstract terms a possibility of what reality might look like.

Indeed, the model as it currently stands is of little empirical value in the sense that the mathematical background of the economics of information is inappropriate for the application of quantitative techniques. Yet, as soon as intuition suggests that reality is characterised by q and, hence, by conditions (7) and (10), thus indicating that *market structures and outcomes in urban land and housing are more competitive than it actually seems – perhaps as competitive as is the case with farm products* – this is of great empirical and policy significance. It provides also a major defence for the utilisation of New Urban Economics, given again that, intuitively, monopolies and oligopolies in urban housing can hardly exist in reality. More importantly, although the empirically restrictive but theoretically convenient production technology occupied by the analysis cannot form the basis for the empirical verification of these assertions through the quantification of (7) and (10), information as to whether $\hat{q}_i$ (including search-related real estate broker fees and transportation costs) is the case is obtainable via appropriately designed questionnaires. One could then know, though in this indirect manner, whether reality conforms with the environment conditions (7) and (10) imply, provided that the inequality $\dot{q}_j < \hat{q}_i < q_i'$ has merit only on theoretical grounds. Of course, such a possibility enhances the model's attractiveness, but one should always bear in mind that the issue of market structures and outcomes in urban land and housing is both theoretically and empirically quite complicated.

Notes

1 The market structure of sellers is assumed to be irrelevant in so far as information acquisition is concerned.

2 The mentality governing and modelling of monopolistic competition is that of Chamberlin, but the economics of information enable a Robinson-type analysis.

3 The term 'region' denotes the totality of zones.

4 It has been assumed that there is no advertising. This does not necessarily imply conditions of perfect competition. Inherent zone differences justify 'product differentiation' and hence, a monopolistically competitive environment even in the absence of advertising. That is, such an environment is relevant to the between-zone but not the within-zone heterogeneity. This can be explained in relation to the following remark. First, note that buying alternatives are ranked in the preferences of consumers according to the reality of both between-zone and within-zone heterogeneity. Also note that the sheer presence of preference for something or 'willingness' to buy it, cannot influence its market and hence, market variables such as prices, unless 'willingness' is accompanied by economic 'ability'. Now, matters of economic ability arise only with reference to inherent zone characteristics, since within a particular zone, residing, eg half a mile closer to or further from job location does not justify different prices. There is

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simply another seller waiting a few blocks down the road. Therefore it is the between-zone differences that make monopolistic competition possible and that are reflected by market prices. This remark explains, in addition, the meaning of the phrase 'preferences are independent of economic factors' and the fact that the coexistence of both kinds of heterogeneity does not imply the presence of more than two markets.

5 The terms 'firms', 'landowners' and 'sellers' are used interchangeably. The term 'firm' will be used throughout the text.

6 The manner according to which rent relates to price is immaterial for the analysis, but for the sake of the presentation's completeness, it should be mentioned that an empirical formula preserves the distinction between rents, as a flow of payments, and price, as a once-and-for-all payment. The restrictive theoretical assumption that prices are capitalised rents is thus relaxed and the whole issue becomes empirical in nature.

7 This is what happens in reality. People have always a rough idea concerning pollution, schooling, etc, differences among areas. Although they may have to make a site visit to evaluate the extent of the difference(s), consumers are mainly concerned with within-zone differences because given the general characteristics of an area, the most difficult task of consumer search is to locate the most suitable buying alternative in terms of distance from schools, view, etc. That is, within-zone heterogeneity is viewed by consumers as being in practice greater than between-zone heterogeneity. Footnote 4 explains why sellers cannot take advantage of this fact. If they did, each housing unit would have its own market and conditions of pure monopoly and a 'take it or leave it' option would emerge. While realistic, such a possibility is uncommon.

8 Leibenstein's X-inefficiency refers precisely to such situations.

9 Note that these considerations recognise explicitly that the seller can control the price and that there can be disequilibria between capacity and demand. Theoretically, however, the possibility of disequilibrium has to be ruled out if the imperfectly competitive environment is to give rise to perfectly competitive outcomes. These outcomes can occur by chance and this is why the analysis refers to the likelihood of their occurrence. In other words, we try to identify theoretically a particular subset of all possible states of the world: the subset complying with perfect competition. This is the essence of this work.

10 Mathematical proofs can be offered upon request. The particular mathematical mode of the economics of information followed here is that of Schwartz and Wilde (1982).

11 Nonetheless, consumers are still subject to welfare losses due to less-preferred choices.

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Prof. Gerasimos T. Soldatos, American College of Greece, Kleovoulis 15, 15773 Zografou, Athens.

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