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Urban Land Prices and Housing Distribution: Monopolistic Competition and the Myth of the 'Law' of Differential Rent

Dimitris Emmanuel

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Summary. The currently dominant neoclassical models of urban ground rents and housing distribution as well as recent alternatives along neoricardian or Ricardian-Marxian lines display major weaknesses which derive from the problems inherent in the concept of differential rents and its pure competition presuppositions. The paper argues that an effective alternative can be developed on the basis of Chamberlin's theory of monopolistic competition. The formal structure of such a model simplifies greatly the matter of the determination of land prices and incorporates with ease difficult aspects such as the role of public controls. In addition, it offers a much needed theoretically valid integration of land price theory with operationally powerful Lowry-type models. The most interesting implication, however, of a monopolistic competition model is that the venerated 'law' of differential rents must be thoroughly rejected on both theoretical and practical grounds.

1. Introduction

The paper that follows advances a theoretical model of the determination of urban land prices in relation to the spatial distribution of housing demand. The main point of the argument is that a realistic as well as operationally useful theory of urban ground rents must and *can* be developed on the basis of the paradigm of monopolistic competition (Chamberlin, 1933; 1957; 1962). A second, perhaps more important, point is that such a theory can deal with obvious ease with the fundamental problems that *all* currently available theories, be they neoclassical, neoricardian or marxist, cannot face successfully. It is seldom realised that all the major analytical models of the intra-urban pattern of ground rents developed during the last couple of decades despite other differences share a common basis: some variant of the well-known Ricardo-Von Thünen model. It is not surprising then that, as a result, the latter has acquired the status of an unquestioned 'law'. The monopolistic competition paradigm starts from a point of direct antithesis to the fundamentals of perfect competition and its theoretical corollaries such as the concept of differential rents. The present paper therefore may also serve, even by implication, as a systematic critique of current urban economic theory. The critical component is more explicit in the case of the 'law' of differential rents. We will argue in the conclusions that both the theoretical model and its implications for the relationships between urban growth and land prices must be thoroughly rejected.[1]

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An earlier version of parts of this paper has been presented in the Third Postgraduate Seminar of the Polytechnic School of the University of Thessaloniki organised by the second Chair of Town Planning on the subject 'Issues of Spatial Analysis and Planning' in May 1982.

[1]In this paper we will not go into the matter of the validity of our model in terms of empirical research. It should be mentioned, however, that both the cross-sectional pattern of prices as well as their changes over time that the model 'predicts' *have* been corroborated with data for the Athens urban area with, in our opinion, a very satisfactory degree of success, (Emmanuel, 1982). Needless to say, the arguments that follow must be judged on their theoretical and logical merits and are, for this purpose, structured in the way of deductive reasoning.

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2. Perfect vs. Monopolistic Competition

In all formal models of the urban housing market advanced in the context of the currently dominant economic theory (mainly what has been typified as 'New Urban Economics' – in short, NUE) the first and fundamental hypothesis (which is often taken for granted) is that the structure of the urban market is essentially governed by *pure competition*. The statement of this assumption and the ritual response that it provokes have reached such a point of banality that it is considered of bad taste to go over this ancient ground again. Nevertheless, the structure of our argument demands that we start from such essentials. All adherents of pure competition hasten to add that in real conditions there are significant imperfections and deviations from the norm such as state interventions and controls, situations of monopoly, indivisibilities, economies of scale and external economies. These, it is conceded, certainly make for a much more complex pattern. As a rule, however, these complexities are dealt with the help of a grand simplifying assumption, namely that they can be treated as so many *additions* to the basic structure of the model or, as the case demands, as *secondary deviations*. Thus, the core assumptions of pure competition are taken as essentially valid.

The assumptions are (Koutsoyiannis, 1975: 154–155):

(a) There are large numbers of sellers and buyers
(b) There is product homogeneity
(c) There is free entry and exit of firms
(d) Profit maximisation is the sole goal of firms
(e) There are no government regulations

If we add two more specific conditions

(f) There is perfect mobility of the factors of production
(g) Sellers snd buyers have complete knowledge of the conditions of the market

we have the full set of conditions that constitute a market working according to the rules of *perfect* competition. Although the distinction between pure and perfect competition is very seldom made explicitly, most theoretical models adopt for analysis purposes all assumptions (a)–(g).

Criticism of applications of the pure competition paradigm in an urban context have usually been based on the lack of realism of either assumptions (a) and (c) (large number of sellers and conditions of free entry) or the necessary additional assumption of convenient U-shaped cost curves. We think, however, that in the case of the urban land and housing markets the most questionable of these assumptions is (b): the *homogeneity of the product*.[2] Even if we disregard all other qualitative aspects that differentiate housing as a product, there remains the fundamental fact that housing services at different locations differ greatly with respect to their distance from centres of employment. This banal observation constitutes by itself reason enough for the collapse of the whole argument at the core of pure competition models. The introduction, however, of the element of product differentiation does not simply lead to the undermining of pure competition models. Its implications, even in the case we keep *all* other assumptions of the initial paradigm, are so radical that alongside changes in the theory of the behaviour of firms and the mechanism of pricing, we must also, by logical necessity, introduce changes in our fundamental concepts of the theory of demand and the behaviour of households. This completely new paradigm is, of course, the celebrated theory of monopolistic competition (TMC) developed by Chamberlin (1933; 1957). As Chamberlin himself made clear, such an alternative theory does not necessarily impose restrictive assumptions about the form of cost curves or the specific structure of the market: it can easily tackle widely different 'technological' conditions as well as cases of pure monopoly or cases of oligopoly. This crucial theoretical advantage establishes the obvious logical precedence of the matter of the homogeneity of the product in the development of theoretical alternatives to pure competition. This becomes evident in the elaboration of the theoretical implications of even the simpler versions of monopolistic competition.

The essential structure of such a model is indeed built exclusively upon the implications of product differentiation. It is assumed that the type, style, trade mark, advertising and sales conditions that are associated with the product of a particular firm

[2]We should undoubtedly add the one about the lack of government regulations which is equally questionable if not more so. As will become apparent, however, the matter of the homogeneity of the product has logical precedence. We will introduce some counter-assumptions about the role of public controls at a later stage in the argument.

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make for the attraction of the preferences of a certain section of buyers to this product. By the same token, these factors ensure that the products of other firms in the same industry are not considered perfect substitutes by buyers. As a result, the firm does not, as in the case of pure competition, face a demand curve in the form of a horizontal line, but a *negatively inclined* demand line. An increase in the price of its product will lead to a reduction of sales rather than to the loss of all customers. Each firm, thus, enjoys a certain monopoly power and, consequently, has a certain control over prices. Assuming that the profit maximisation principle applies, the level of production chosen by the firm will reach, as previously, the point where marginal revenue equals marginal cost. In this case, however, the marginal revenue curve will differ from that of the average revenue which is represented by the demand curve. Thus, both equilibrium price and the level of production will systematically differ from those arrived at in the case of pure competition. Equilibrium price will be *higher* while the level of production will be *lower*: firms will systematically tend to operate in conditions of *excess capacity*, a fact that constitutes a fundamental aspect of monopolistic competition whereas it is a clear-cut 'anomaly' from the viewpoint of pure competition.

In the initial formulation of the general model (1933), Chamberlin accepted all the assumptions of perfect competition save for that about product homogeneity. He, moreover, accepted that cost curves do follow the convenient U-shaped forms that are such an integral aspect of all neoclassical marginal analysis. As we will argue immediately below, most of these assumptions are inconsistent with any realistic account of the structure of the urban housing market. They are also clearly inconsistent with the fundamental characteristics of the wider market system in all modern capitalist economies. Chamberlin's radical decision to introduce such unrealistic assumptions was in the nature of a methodological stratagem in the analytical exposition of his theory. In the course of events this methodological approach had the wholly unfortunate result of the dissemination of the theory of monopolistic competition in a version of reduced significance, a model for a special and rather 'anomalous' case of an otherwise purely competitive market where 'irrational' consumers or ones blinded by advertising behave in a way that leads to results that are clearly suboptimal from the point of social welfare.

As Chamberlin himself repeatedly insisted (1957, passim), this narrow and essentially ideological understanding of the significance of product differentiation obscures the main contributions and theoretical innovations of the TMC. To begin with, the latter can account successfully, in contrast to other models, with a very wide spectrum of market conditions ranging from pure competition to cases of oligopoly and pure monopoly. Undoubtedly, the main theoretical strengths of the new approach stem from the ingenious demonstration of the operation of a monopolistic mechanism of price formation under conditions that are essentially competitive, in conditions, that is, where there is a multitude of sellers and buyers and no particular unit among these has any significant control over the market. This socioeconomic configuration has an obvious relevance for urban economics. To a certain extent, this immediate relevance has indeed been recognised namely in the theory of spatial competition in the retail market, a development initiated by Chamberlin himself with his discussion and generalisation of Hotelling's theories (Chamberlin, 1933; Hotelling, 1929). It is unfortunate that such a fruitful starting point has not led to any wider developments. Monopolistic competition in urban economics has degenerated into a special case of retail market theory, a case where there is a very large number of businesses of minimum size, each offering goods to a small local market under highly competitive conditions (Berry, 1967). As we will argue in the following, we strongly believe that the TMC should, for urban economics, constitute the main theoretical base of analysis. The theory's more controversial claims for the status of a general theory of value (Chamberlin, 1957) are not at issue here. We certainly believe that the significance of the theory goes far beyond the urban retail and services market. More specifically we will argue that the theory is especially suited to the housing market and more generally the urban land market. In the process of this argument, we must first review the significance of some of its fundamental theoretical innovations.

3. The Nature of Demand and Competition in the TMC and their Relevance for the Urban Market (and Some Hidden Affinities with Lowry-type Models)

Chamberlin's theory has introduced certain innovatory ideas about the nature of consumer demand and the mechanism of competition that necessitate a radical revision of the basic theoretical and analyti-

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cal tools of modern (mostly neoclassical) microeconomics. Three basic elements of the TMC have strategic importance for the analysis of the urban land and housing market: Chamberlin's demand function, the 'share-of-the-market curve' and the mechanism of non-price competition. Given the relative obscurity of the TMC within present-day urban theory, a short presentation of these concepts is necessary.

Within standard microeconomics, theories of demand are based on an *atomistic* model of household behaviour governed by the familiar utility function and the principle of utility maximisation. Aggregate patterns of demand are derived from the pattern characterising individual households in a state of equilibrium. Households of the same socioeconomic type (usually defined by their income) behave in a perfectly similar way according to a preference or utility function that 'weights' various homogeneous consumer goods, or more generally, various 'utilities', with the aim of maximising their sum within the constraint imposed by income. The familiar demand function for any particular good that is derived from this theoretical construct contains the subjective utility parameters, the price of the good and the composite price of the rest of goods included in the consumption budget. Demand for the good at the aggregate level of the respective 'industry' is the simple sum of similar individual demands. For a certain supply price, the equilibrium level of demand is unique and common to all the theoretically similar households.

In sharp contrast to this paradigm, Chamberlin introduced the radical hypothesis that a theoretically *homogeneous* collectivity of consumers may display a *multiplicity* of preference functions vis-a-vis a certain good in correspondence with his hypothesis of the significance of the differentiation of the product. On this basis he advanced a multivariate function that determines demand for particular products within the wider category of the product of a certain 'industry' or 'group' (in his terminology). His function introduces explicitly, in addition to the standard variables, the *style* of the product and the *advertising* and other *selling efforts* of the firm as well as similar variables for the firm's competitors.

Such a demand function combines two elements: the *amount* demanded by each consumer, the standard explanadum of the neoclassical atomistic paradigm, and the *distribution* of a group of otherwise similar consumers among the different products belonging to the wider category forming the consumer good in question. In the context of this demand theory, the concepts of the unique state of equilibrium and the maximisation of utility for the typical consumer representing the totality of the respective category of households of income Y *are meaningless*. In the case of urban land, Chamberlin's model does not permit the construction of a spatial utility function representing the evaluations of *all* households in a homogeneous group.

As we have already stressed, under conditions of monopolistic competition each firm operates with a negatively inclined demand curve relating price with volume of sales. This familiar demand curve is based on a *ceteris paribus* condition: each firm assumes that all other firms will keep their prices constant. In fact, the change of prices by any firm along the curve, with the aim of maximising profits, will be paralleled by similar moves by the other firms proceeding independently but for the very same reasons. As a result of this process of unconcerted price competition, the demand curve based on the 'myopic' behaviour of firms, will shift and the actual increase in sales resulting from a decrease in price will be much lower than the one initially expected. For each firm, then, the actual price-quantity curve will be represented by a different curve that is steeper than the 'myopic' one. Chamberlin called this curve the *actual-sales* or *share-of-the-market* curve for a particular firm. Whereas the first curve represents the influence of demand at the level of the firm under *ceteris paribus* conditions, the second reflects the motion of the market at the level of the 'industry' as a whole. This share-of-the-market curve has a close relationship with Chamberlin's demand function described above which, as we noted, also has a *distributional* structure. If the preferences of buyers are such that demand is equally distributed among firms, then this second curve will be similar for all firms. In the opposite case, we will have a *spectrum* of curves in different positions but with similar steepness (we may assume that price elasticities are similar). The position of each curve will obviously depend on the relative concentration of demand on the product of each firm. It will also depend, however, on the number of firms. The entry or exit of firms will shift all curves to the left or to the right respectively.

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The market structure peculiar to monopolistic competition, in combination with the corresponding theory of demand lead naturally to the importance of non-price forms of competition among firms. In fact, in the context of the TMC non-price competition becomes the *dominant* aspect of business behaviour. Chamberlin himself in his more polemical writings (1957) has insisted that this aspect of his theory should be considered as equally important with his more well-known generalisation of the applications of monopolistic pricing. The idea that in a modern economy firms strive for the attraction of a larger share of the market through the improvement of the product and its image, advertising and an increased sales effort rather than through the decrease of prices, has, of course, become a commonplace by now half a century after Chamberlin first advanced his arguments. Nevertheless, the neoclassical orthodoxy that rules the microeconomics of the urban market has not recognised the fact. From our point of view it is even more important that such an important theoretical element is explicitly *ruled out* as logically inconsistent with the rest of the pure competition assumptions. As a result, in all current models of the urban land and housing market the price mechanism must bear the full weight of the task of determining equilibria in production and consumption. This has led, most especially in the hedonic prices literature to absurd levels of complexity and analytical refinement with doubtful gains in credibility or realism.

An equally important point is that in conditions of relatively competitive markets, non-price competition will *systematically* result in high levels of excess productive capacity. Such excess capacity is quite normal in real situations. It is, however, a clear-cut anomaly from the point of neoclassical theory. In the case of the urban land market, such a configuration of excess capacity and non-price competition may be found in American-type cities where lax urban growth controls and a highly competitive supply of new land and housing in the urban periphery based on the offer of better quality (larger plots and gardens, better environment) lead to the substantial underutilisation of the development capacity of urban land.

All three of these fundamental concepts of the TMC form an integrated whole hinging upon the core ideas of product differentiation and the related theory of demand. Their introduction into the theory of the urban land and housing market obviously demands an analytical apparatus radically different from that offered by current NUE models. At first glance then, it would seem that we completely lack the necessary infrastructure of formal tools and empirical applications for such a major theoretical reorientation. Such an impression, though justifiable, is completely false. There is an immediately relevant rich corpus of research and low-level theorising and formal modelling to be utilised. All is needed is a certain shift of viewpoint for the interconnections to become apparent. I am referring, of course, to the whole family of urban spatial allocation models that derive from Lowry's initial formulation (1964). These Lowry-type models are invariably based on some *distributional* demand function allocating the housing demand of households to the zones of a city according to the zone's size and its characteristics (the equivalent of product differentiation) in comparison to the sizes and characteristics of the totality of zones. In the urban case the most important characteristic is, usually, the zone's location in relation to employment centres. What matters here is that the formalism and the underlying theoretical assumptions of these models have very strong affinities with the structure of the demand model that the TMC implies. This is not fortuitous. In fact, it could be plausibly argued that Lowry-type models are *direct descendants* of the TMC as was initially formulated. It should be remembered that Lowry in his 1964 model extended into the residential sphere the basic structure of a model allocating demand for retail services. As we know, however, spatial competition in urban retail services is the one subject where Chamberlin's theory has been applied systematically especially by geographers.

The failure of the main protagonists in this highly crucial area of urban analysis to realise the significance of Lowry-type models as alternative theories of demand as well as develop their implications for the structure of the urban market which would have automatically led to some variant of the TMC, has paved the way for the general acceptance of the view that Lowry-type models have no basis whatsoever on economic theory proper and that cannot be elevated above the level of a crude empiricism (Richardson 1977;

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181).[3] The fact that the TMC has for some decades now been something of a taboo for official urban economic doctrine has put the seal of authority on this tangle of misguided conceptions and idealogical bias. It is very suggestive that in the effort to provide these models with a measure of theoretical respectability it has been argued by some of the most successful practitioners of the field that a theorisation and analytical enrichment of the models should be sought in the microeconomics of standard urban neoclassical models such as Alonso's (1964) or, preferably, in more disaggregated ones such as the Herbert and Stevens model (1960) (Wilson, 1974; Batty, 1976). We think that our argumentation so far has made sufficiently clear that such a 'synthesis' is clearly misguided. What is more important, it is for obvious theoretical and analytical reasons impossible: it violates the conceptual core and formal structure of both sides in this forced marriage.

As we will argue in the following an urban model based on the TMC can easily tackle a whole array of problems in the area of public regulations and policies concerning the pattern of urban development. Such issues have been a major preoccupation of Lowry-type models while NUE models have shown limited relevance in this re gard. Thus, a theoretical synthesis on the basis of the TMC should be considered highly appealing from the point of policy-oriented urban modelling.[4]

4. A Model of the Urban Land Market Under Conditions of Monopolistic Competition: Basic Assumptions

In the following we will advance a model of the urban land and housing market that essentially derives from the basic framework of concepts and theories that were introduced by Chamberlin in 1933. It must be stressed, however, that this is not in the nature of an *ad hoc* theoretical exercise. As will become apparent from its basic assumptions, the model aims at the realistic representation of a general type of urban political economy within which we can place the system prevailing in large Greek urban centres, most especially Athens. This system displays certain substantial differences in comparison to the political economy of housing production and distribution prevailing in more advanced capitalist societies (Emmanuel, 1981). From the point of this analysis, four especially distinguishing features should be pointed out: the high degree of fragmentation and diffusion of land ownership; the similarly high extent of fragmentation and prevalence of competitive conditions in the sphere of housing production which is dominated by rather primitive small speculative builders but also contains a measurable segment of quasispeculative and purely non-speculative housing production (i.e. owner-building for use); the comparatively fast rates of urban growth and high rates of housebuilding; lastly, the relatively limited extent of public interven-

[3]It is unfortunate that the tremendous resources and research effort spent in Lowry-type models which, even according to highly critical observers has had, in sharp contrast to standard NUE models, a rather successful record (Richardson 1977: 181), has also been plagued by a series of dubious theoretical justifications that discouraged more appropriate approaches. It is highly significant that the reduction of these models to natural physics analogies has been treated by the currently dominant urban economics with a certain degree of sympathy and tolerance since the models *as presented* posed no direct theoretical threat (e.g. Richardson, 1977: 198–200).

[4]Given these points and the previous more general arguments, why was there no effort (with the major exception of Wendt, 1957) for the utilisation of the TMC by mainstream urban theory? The fact makes for a very interesting and educative footnote in the historical sociology of scientific thought. We may list some of the more important negative factors. First, the heated polemic against the TMC (mainly from the University of Chicago) which was combined with a more widely effected conspiracy of silence (Chamberlin, 1957: 296–306, Bain, 1967). It is highly relevant in this respect that the University of Chicago (by now the Chicago School of economic theory), the main adversary of the TMC, has had a major formative influence on NUE through Friedman and his followers and the massive work of Richard Muth. Second, the 'loyal opposition', the neo-keynesians, the neoricardians and the marxists have essentially cooperated in the marginalisation of the TMC. The authority of Ricardo and Marx (who agreed with Ricardo in this point) did not make easy a frontal attack on the theory of differential rent and its presuppositions. Third, Marxists, which lead in the critique of NUE, are very averse to using models based on demand and, more generally, on *subjective* elements. The TMC is to a very large extent such a case. Lastly, an important negative role must have been played, especially in British economics, by the widely held belief that Chamberlin's theory and that of Joan Robinson (both about 'imperfect competition') are essentially one and the same thing (e.g. Dobb, 1973: 211–212). This is quite wrong as Chamberlin has convincingly shown (1962: Ch. 9). It is only natural, however, that the economic 'left' would follow in these matters the lead of Joan Robinson. I have great respect for her work but I have become positive that her analysis in 'Imperfect Competition' (1933, 1969) does not lead anywhere in the case of urban rent save in situations of pure monopoly – a point that applies to Kalecki also (1975).

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tion which is restricted to the sphere of land use and building controls and does not extend into more large-scale, organised interventions with or without the cooperation of private capital. To these, one could add the fact that the institutions and influence of the capital market as well as its interconnection with the real estate market are very undeveloped with the consequence that factors like interest rates and yields of securities and the associated capitalistic considerations do not have a very strenuous relationship, if any, with rents and real estate prices (Emmanuel, 1981, Ch. 6). I have great doubts, however, if these factors are as significant for the housing market as a whole as they are purported to be in modern urban economics, even in the most developed of capitalist societies.

These specificities of the Greek postwar urban scene make for a political economy of land and housing that is governed by relative unfettered competition (though building and urban development are controlled), limited financial-monopolistic elements, and strong speculative interests over the development value of urban land. I believe, however, that such primitive-capitalist market structures are very important, if not predominant, in the case of land and housing in *most* capitalist cities: the persistence of fragmentation and speculative forms in the economy of housing is a well-known fact. Admittedly, the Greek case is more akin to the conditions prevailing, say, to American cities during the first third of this century. This should make it *more* congenial to believers in the competitive urban economy cherished by most economists (and planners following Jacobs). From a logical point, therefore, the specificities of the Greek evidence present no problem to the more general arguments advanced here. On the contrary, they offer a case especially suited to the needs of a critical discussion of perfect competition theory.

As we noted above, Chamberlin in his initial formulation of the TMC accepted all the basic assumptions of perfect competition save for that about the homogeneity of the product. This is clearly inadequate for the urban land market. In addition to product heterogeneity, we will also assume that the prevailing economic structure differs from the ideal case of perfect competition in a number of other important aspects. These differences mainly stem from the effects of extensive public controls over building and the use of urban land. We will also introduce a number of assumptions of specific character that are essential to the analysis of the peculiar character of the urban land and housing market. Lastly, the following analysis will be restricted to the workings of the housing market: land and land rents will be considered in so far as they interact with the housing market. We will make the following basic assumptions:

1. The housing market is formed by the actions of three classes of economic agents: *investors* in residential capital, who, in this context, are assumed to be identical with the household sector (we make no distinction between owners and renters and the role of pure business investment in housing is considered of limited importance); housing *builders*, and, lastly, *landowners*. Decisions over urban development and the price of new residential capital are, in the last instance, controlled by landowners.
2. The building industry as a distinct sphere functions, from the point of this model, under conditions of perfect competition. More specifically, there is perfect mobility of factors of production and technology is homogeneous throughout the urban area. Profits and wages as well as the price of materials are exogenously determined and common for all areas and housing types. Discontinuities in production such as different modes of production, or systematic differences in organisation and labour relations that have determinate influence on the production price of housing are assumed to be integral aspects of specific types of housing and are taken into account by households (as consumers) in the formation of their preferences for the corresponding housing types. Thus, such discontinuities need not be considered in the context of this analysis.
3. The housing units offered at any time within a certain urban area constitute the total of the product of the housing 'industry'. This product is clearly distinct from other commodities but differentiated, from the viewpoint of demand, into a great number of relatively distinct products that are close but not perfect substitutes. The basis and the extent of this differentiation is an empirical problem. For the purpose of the present analysis, however, we will only consider differences of housing units that are associated and, in turn, characterise particular zones of the urban area.

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4. Households as investors in and consumers of housing (roles which are considered indistinguishable in this model) behave according to a demand function similar to a typical Chamberlin demand function (see above). We assume that, as a rule, household preferences are such that housing demand is not equally distributed among producers. (An assumption that is essentially the reciprocal of the previous one.)
5. The concept of the 'firm' that produces a product of particular characteristics is assumed to apply, in this context, to the landowners of each specific urban zone with characteristics that differ from these of other zones but is homogeneous within its boundaries. The relevant characteristics in this case are those that are significant in terms of the differentiation of housing as a 'consumption' good (e.g. proximity to employment centres, environmental quality, density, building type, etc.).
6. There are large numbers of sellers ('firms' developing land for housing) and buyers (households). Thus, no particular producer or consumer can, by himself, influence in a significant way the operation of the market as a whole with respect to prices and levels of production.
7. There are substantial public controls in the sphere of production and the 'movement' of 'firms'. More specifically, the State imposes restrictions on the supply of urban land for residential development that in the short run forbid the entry of new 'firms' (new zones for development). There are also zoning regulations and building regulations, most especially a legally set density or floorspace maximum (usually a maximum floorspace ratio), that strictly determine the maximum productive capacity of each zone (the potential supply of housing floorspace).
8. While in the short run public controls do not permit the entry of new 'firms', such entry (the expansion of developable land) *is* permitted in the long run. It is moreover permitted at such levels that the total supply of urban land systematically exceeds the level of total demand. This assumption is a hypothesis about real conditions rather than one of theoretical character. In theory, the opposite may also be true. Such a case of absolute land scarcity, however, would pose the problem of production and prices in very specific terms that are of little interest.
9. Housing producing firms operate according to the rules of price competition in the 'myopic' way that results in the two demand curves that Chamberlin introduced: the *ceteris paribus* curve and the 'actual-sales' or 'share-of-the-market' curve. Firms also enter into non-price competition by determining the type and quality of housing and urban development. They do so, however, in a spatially homogeneous manner in such a way that the effects are similar and proportional in all zones. Non-price competition, thus, in our model has effects at the aggregate level only by shifting all demand curves.
10. Building in the plots of the various zones utilises to the full the maximum development level (floorspace ratio or density level) permitted by current zoning and building regulations. Building additions, although often an important facet of housing production (especially in Greece), are ruled out in our model for reasons of simplicity. Thus, the decision to develop a particular plot involves two things: the choice between building and no building and the type, quality and number of housing units within the constraint of the maximum floorspace ratio or density permitted for the respective zone. In this paper, we will not consider aspects of zoning and building controls that constrain or influence these development decisions in other ways than simple quantitative controls do. Such additional controls, beside adding serious complexities to the argument, would have anyway been superfluous since, in this paper, we will only examine the case of homogeneous population.
11. Landowners aim at the maximisation of total ground rent derived from their plot or the maximisation of the plot's price, i.e. its market value made realisable with its development. Some definitions and conceptual clarifications are necessary at this point. 'Land price' is defined as that part of the total supply price of a unit of housing floorspace that is claimed by the landowner. 'Ground price' or 'ground va-

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lue' refers to the more common usage of the concept of land price which in this case is equal to the magnitude resulting from the multiplication of 'land price' (as used here) by the floorspace ratio. Thus, ground values by our definition are equivalent to 'development values', the price of the ground determined by the full development potential of a particular plot. We must insist on this seemingly unconventional use of 'land prices' as that attached to the unit of housing product. As will become clear in the following argument, we conceive the price of land as a *claim* on part of the product, as a mark-up similar to monopolistic profits. We strongly disagree with its conceptualisation as reward to a 'factor of production' or even the price of a certain commodity. Thus, the *ground* price of land does not have an autonomous conceptual status. It is a purely derivative magnitude, depending on such factors as land use zoning, density, building regulations etc. Land prices should be conceived as those peculiar prices that are imposed on the product of other activities as payment for the use of a certain quantity of land at a certain location. It is *these* prices per unit and their spatial variation that are of interest to the theory of the land market. The variation of ground prices is mostly attributable to variations in densities and, therefore, does not constitute a 'pure' variable in a strict model of production and distribution. The concept of 'ground rent' represents quite adequately the essence of 'land price' used here and, though we will avoid its use, it will treated as interchangeable with 'land price' per unit of product. It is well-known, of course, that the concept of 'rent' refers to a flow of payments while 'price' in the present context refers to a once-and-for-all payment for the exchange of a certain piece of property. Nevertheless, despite the dangers of adding to confusion, we will assume that land prices and the corresponding land rents are related in a definite proportional way and thus will be treated as equivalents. This requires an additional bit of clarification. In urban economics land prices are nearly always assumed to be *capitalisations* of land rents. This seemingly innocent accounting formula however, in order to have the force of a determination, requires that some very special conditions apply. First, that the housing and land markets function according to the rules of pure capitalist-rentierist rationality. Secondly, that there is a perfectly integrated and competitive capital market. None of these conditions necessarily, or even normally, applies to housing markets. They certainly do not apply in the Greek case (Emmanuel, 1981, Ch. 6). Thus, the problem of the relationship between rents and prices is an empirical one. In our analysis we will treat the real estate market as distinct from the rental market. The concept of land price will refer to the price system of the real estate market. We will simply make the additional assumption that there is a certain constant proportional relationship between housing prices and housing rents throughout the urban market. Strictly speaking, this assumption is not really necessary for we have also assumed that for the purposes of this analysis we will not make any distinction between renters and owners or between investment and consumption in the sphere of household behaviour (Assumption 1). This last assumption however, is certainly a bold one. The proportionality and interchangeability of rents and prices provides it with logical strength and empirical relevance.

12. The 'firms' producing housing (the landowners of each zone) operate under the constraint of a certain 'cost curve'. 'Cost' is composed by unit construction costs and a minimum land price (always measured per unit of product) below which the development of a plot will be considered uneconomic. Given the assumption that construction technology and costs are uniform, the 'cost curve' is, for the purposes of this analysis, composed solely by this minimum land price. This minimum price demanded by landowners depends on a complex set of historical and sociostructural-institutional factors: the historical experience of urban growth and speculative activities and expectations, the price of agricultural land, the pattern of land ownership and the pattern of public policy towards land and its taxation. We will not go into these issues in this paper. We will make the fundamental hypothesis that

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this minimum price is common in all areas regardless of the level of urban development. Thus, the average cost curve for housing production from the determinant perspective of landowners is a horizontal line identical to the marginal cost curve.

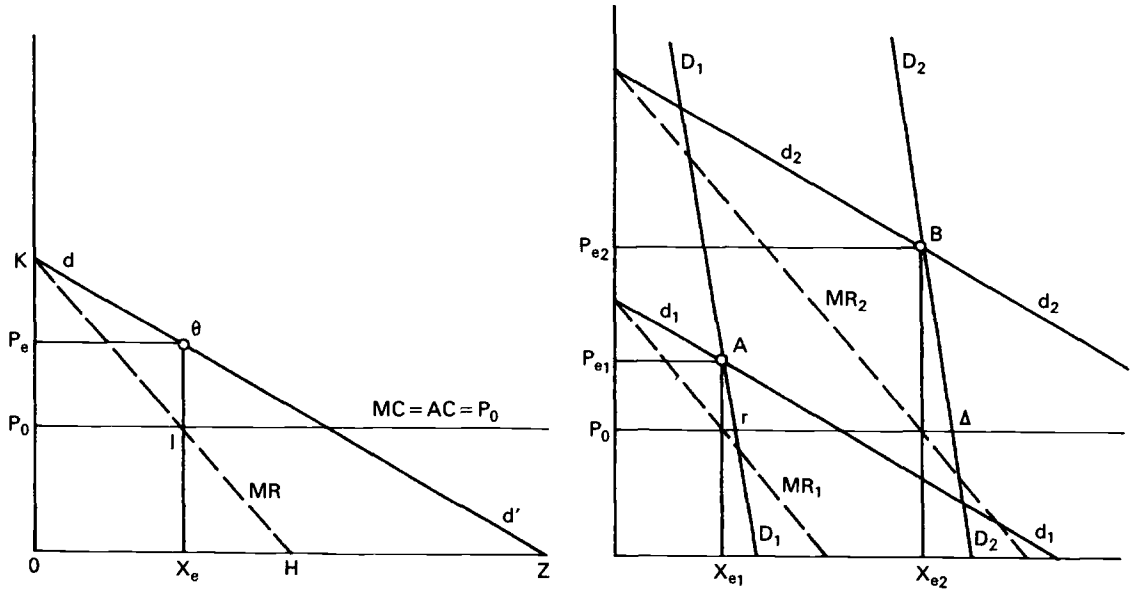
13. 'Firms' have perfect and instant knowledge of cost and demand curves. Buyers have perfect and instant knowledge of market conditions.
14. For the purposes of the argument advanced in the present paper we will make three additional simplifying assumptions. First, the population (households) is socioeconomically homogeneous. Second, the stock of residential capital adjusts to the demand of each period in a perfectly elastic manner. Thus, no influences stemming from housing stock formed in previous periods and possessing relatively fixed characteristics will be considered. Lastly, the long-run movement of the system is the simple sum of its short-run equilibrium states which are, moreover, independent of past states or predictions about future states. These, are, admittedly, drastic assumptions. They do not affect, however, the essence of our present argument which is offered as an alternative to models of equal levels of generality. The relaxation of these assumptions has, indeed, highly interesting theoretical implications about the structure of housing production and its allocation to social classes under conditions of monopolistic competition (Emmanuel, 1982). These, however, must be examined in a future paper.

5. Formal Structure and Results of the Model

Let us first examine with the help of some simple diagrams how equilibrium is reached in a system based on the previous assumptions and how prices and supply levels are determined. The two diagrams in Figure 1 show the equilibrium conditions for each separate urban zone, first, when each zone is treated in isolation (under *ceteris paribus* conditions) and, second, when the system of the urban market is considered as a whole (Figures 1a and b respectively).

In the case of Fig. 1a each zone faces a negatively inclined demand line dd′ along which short-run levels of product (X) and price (P) move. It also faces, as assumed, a horizontal line of average and marginal cost (AC, MC) which are equal to the minimum land price (P_0). We have:

$$AC = MC = P_0$$



1. Equilibrium of the zone

2. Equilibrium of the system

Fig. 1. Equilibrium of the urban housing and land market under conditions of monopolistic competition.

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In order to maximise land rents the plots in each zone will be developed to the maximum of their capacity permitted by regulations until the point when the plot developed last has reached the minimum land price P_0. Thus, each zone will reach the equilibrium level of supply at the point where marginal revenue equals marginal cost (MC = MR). In Figure 1a average revenue is represented by KZ whereas marginal revenue is represented by KH (the line intersecting OZ at the middle). Thus, the equilibrium point is represented by the intersection of line KH (the MR line) and the horizontal MC line. Equilibrium levels for price and product will be P_e and X_e respectively.

Let us now consider the system as a whole. Each zone will face, in addition to the short-run *ceteris paribus* demand line, an 'actual sales' or 'share-of-the-market' demand line represented by lines DD′ in Figure 1b. These demand curves take into account the parallel (though 'myopic') behaviour of other zones in the process of price competition. Let us reasonably assume that preferences for the various zones are unequal but the behaviour of demand vis-a-vis prices is similar in all zones. Thus, considering two zones, the respective share-of-the-market lines will be at different positions but have similar slopes as lines D_1D_1' and D_2D_2' in Figure 1b. It will be remembered that we assumed that, in the short run at least, the entry of new producers (new urban land) is not allowed by strict public controls. This in conjunction with the constant various level of aggregate housing demand in the short run makes so that the DD lines have *fixed positions* as well as fixed relationship with each other. (We assume that all processes of non-price competition at the level of the industry that may have caused shifts of the DD′ lines have taken place in the past.) At first glance, it would appear that price competition between zones would lead to points of equilibrium that are determined by the intersection of DD′ lines and the minimum land price P_0 (points Γ and Δ) which are the points of maximum supply for the given constraints of marginal cost. This seems, to some extent, to be the solution also suggested by Chamberlin's analysis of the equivalent general case. In our opinion this clearly violates the principle of profit (in this case land rent) maximisation. Thus, the actual points of equilibrium will be A and B which are determined by the intersection of DD′ lines and the dd′ lines as these shift downwards in the process of price competition but at the point where we also have the equation $MC = MR = P_0$. Let us recapitulate these arguments in formal terms.

We will define as productive *capacity* of a zone (C_i) the exogenously determined maximum amount of housing floorspace that can be supplied to buyers. Housing *demand* for the zone (D_i) measured in real terms will be the product of the housing floorspace demanded (F_i) by the average *construction value* per floorspace unit in zone i (K_i). By definition:

$$D_i = F_i \cdot K_i \tag{1}$$

The various zones will in general have different sizes. In order to abstract from size we will measure demand in terms of its concentration per unit of capacity or, in other words, in terms of the *density* of demand for each zone (Q_i). Thus, by definition:

$$Q_i = F_i \cdot K_i / C_i \cdot K_i = F_i / C_i \tag{2}$$

As assumed, the landowners of each zone face a certain shortrun demand curve when other zones do not alter their prices and product (the *ceteris paribus* curve). We assume this to be linear of the following form:

$$Q_i = a_i - b \cdot P_i \text{ (b is a fixed parameter)} \tag{3}$$

P_i is the land price in zone i (per unit of floorspace). Owners in all zones face, in addition, average and marginal cost equal to a 'minimum monopoly land price' P_0. In order to maximise land prices owners develop plots in their zone up to the point when marginal revenue equals P_0. Given the linear form of the demand curve, marginal revenue is given by

$$MR = \frac{d(Q_i \cdot P_i)}{d(Q_i)} = 2P_i - \frac{a_i}{b} \quad \text{(where 'd' signifies the derivative)}$$

Equation $MR = P_0$ in conjunction with (3) gives the following fundamental results for the case of equilibrium:

$$Q_i = \frac{a_i - bP_0}{2} \tag{4}$$

$$P_i = P_0 + \frac{1}{b} \cdot Q_i \tag{5}$$

The *ground* price of land (R_i) will be given by

$$R_i = L_i \cdot P_i \tag{6}$$

The coefficient L_i is a fixed parameter measuring the amount of floorspace per unit of plot area i.e. is essentially the familiar floorspace ratio.

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Consider now the 'actual sales' or 'share-of-the-market' curve D_iD_i' for each zone i:

$$Q_i = k_i - \lambda \cdot P_i \ (\lambda \text{ is a fixed parameter}) \qquad (7)$$

Parameter k_i in equation (7) is the point at which the D_iD_i' intersects the X-axis. In the short run these points will have a fixed position signifying the pattern of the distribution of housing demand among zones according to the demand function peculiar to a model of monopolistic competition discussed in the previous parts. In contrast, 'parameter' a_i in equation (3) has not fixed value but changes as the dd' line shifts along the determinant DD' demand line.

At the point of equilibrium both equation (7) and equation (4) that results from land rent maximisation will apply. These in combination with equation (5) give the following:

$$Q_i = k_i - \lambda P_0 - \lambda \frac{Q_i}{b} \text{ which gives}$$

$$Q_i = \frac{b}{b+\lambda}(k_i - \lambda P_0) \qquad (8)$$

or, in a simpler expression,

$$Q_i = \frac{b}{b+\lambda} \cdot Q_i^* \qquad (8a)$$

Q_i^* is the supply level for zone i that equals demand under equilibrium conditions in the hypothetical case where land prices in i are equal to the minimum price P_0. Equation (8) and its simpler equivalent (8a) demonstrate one major result of our model. Equilibrium demand and supply for each zone are functions of the relative concentration of preferences, (expressed by k_i), of parameters b and λ and of the minimum monopolistic price P_0. Thus, they are *independent* of the equilibrium land price for the zone P_i. We will expand on this point in the conclusions of our formal analysis.

Integrating equation (8) for the city as a whole and dividing by total capacity C which is the sum of C_i we get:

$$\bar{Q} = \frac{b}{b+\lambda}(\bar{k} - \lambda P_0) \qquad (9)$$

or

$$\bar{Q} = \frac{b}{b+\lambda}\bar{Q}^* \qquad (9a)$$

where $\bar{k} = \sum_i C_i k_i / C$, $\bar{Q} = \sum_i C_i Q_i / C = D/C$

and $\bar{Q}^* = D^*/C$

D is the aggregate effective housing demand for the city as a whole and D^* is the effective demand when $P_i = P_0$ for all i.

Equations (9) and (9a) show that in our model the aggregate level and average density of housing production are directly determined by the *exogenously* given level and density of housing demand (D^*, $\bar{Q}^*$) when *no* price differentials exist. Thus, actual housing supply and demand are directly proportional to D^* and the latter must enter the argument as the product of independent variables which *do not* include land price save for the fundamental influence of P_0. Thus, equation (9a) determines housing production in a way that is *completely independent* from the phenomenon of 'differential rent'. We can express this in the following manner:

Let us define $D^* = H$ where

H = f(Y, N, P_b, P_m, t*) is a function for the aggregate demand for housing at the level of the city as a whole and

Y = income

N = population

P_b = minimum housing production price, i.e. building cost plus P_0

P_m = price of goods other than housing

t* = other factors such as preferences, credit availability etc. depending on trends and the particular conjuncture

Then actually realised housing demand (equals production) is given by

$$D = \frac{b}{b+\lambda} H \qquad (9a')$$

An equally important major result of the previous analysis is that the average land price $\bar{P}$ (average weighted by capacities C_i) is, in a manner similar to aggregate production, determined at the macro-level independently from the intra-urban pattern of land prices. This can be easily demonstrated. By integrating equation (7) for the city as a whole we have

$$\bar{Q} = \bar{k} - \lambda \bar{P} \qquad (10)$$

This in conjunction with (9) and (9a) gives the following highly simple determination of $\bar{P}$.

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$$\bar{P} = \frac{1}{b+\lambda} \cdot \frac{H}{C} + P_0 \qquad (11)$$

Thus, the average land price for the city as a whole is a negative function of total available capacity (C), a positive function of aggregate housing demand as formed by exogenous factors (H) and a positive function of the minimum monopolistic land price P_0. The intra-urban pattern of ground rents does not enter the argument as a determining factor, a sharp contrast with the usual urban economic models based on the theory of 'differential rents'. A point of clarification, however, is necessary here. The average urban land price $\bar{P}$ determined by equation (11) is based on the supply prices of the various zones (it is averaged by capacities C_i). Thus, the average land price that households actually pay which depends on the distribution of population may and will normally differ from $\bar{P}$. This different measure of average land price will normally involve the intra-urban pattern of land rent differentiation. This, however, is a purely derivative and secondary phenomenon and has no causal significance from the viewpoint of the structure of the system we examine.

Let us now consider the formation of the intra-urban pattern of land prices. Combining equations (8), (10) and (5) we can easily derive the following fundamental relationship:

$$P_i = P_0 + (\bar{P} - P_0)\frac{Q_i}{\bar{Q}} \qquad (12)$$

By definition $Q_i = F_i \cdot K_i/C_i \cdot K_i$ where F_i is floorspace demand for housing for zone i and K_i is the real value per floorspace unit. Given the assumption of homogeneous population, K_i will be similar in all zones. Floorspace demand, moreover, can be expressed by the following identity:

$$F_i = N_i \cdot B$$

where N_i is the number of households preferring housing in zone i and B is the floorspace per housing unit (common to all households). Thus, equation (12) may be transformed into the more simple

$$P_i = P_0 + (\bar{P} - P_0)\frac{N_i/C_i}{N/C} \qquad (13)$$

Equations (12) and (13) present a simple and powerful model of the inter-urban pattern of land prices under conditions of monopolistic competition. These formal results show that land prices in the various urban zones are simple functions of the minimum monopolistic land price imposed on the urban land market as a whole, of the *average* land price which results from the equilibrium of demand for and supply of space at the level of the system as a whole independently from intra-urban price differentials and, lastly, of the density of exogenously determined demand for each zone as compared to the average density of demand. Let us expand on these findings a little more.

As we have already stressed in the set of basic assumptions of the model, the demand function consistent with the paradigm of monopolistic competition is essentially a non-atomistic, distributional model based on the significance of the differentiation of the product among the various urban zones. Such a general model may be expressed in concrete terms by a function that allocates households as buyers to specific zones according to their preference for the particular type of housing offered in these zones relative to the types of housing offered in all other zones expressed as an average type. We can formulate this general hypothesis thus:

$$Q_i/\bar{Q} = w_i/\bar{w} \qquad (14)$$

where w_i is a measure of the attractiveness of zone i, itself a complex function of the characteristics of housing in that zone and $\bar{w}$ is the average of attractiveness indices for all zones of the city averaged by supply capacities, i.e.

$$\bar{w} = \frac{1}{C} \cdot \sum_i C_i . w_i$$

Given the assumption of homogeneous population, equation (14) can be easily transformed into the following fundamental demand allocation function:

$$N_i = N\frac{C_i . w_i}{\sum_i C_i . w_i} \qquad (15)$$

It is obvious that equation (15) has a strong similarity with the usual allocation function found in Lowry-type models. We already have pointed out the underlying theoretical reasons that make such a similarity quite understandable. Some further comments, however, are necessary at this point. Most Lowry-type household allocation functions are of the following form:

$$N_{ji} = N_j \frac{w_i . t_{ji}^{-c}}{\sum_i w_i . t_{ji}^{-c}}$$

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where the subscript j signifies the zone of employment, i the zone of residence, w_i is a measure of attractiveness and t_{ji}, measures the trip time between zones j and i. A comparison of this model with equation (15) indicates some important differences as well as some necessary correctives to both formulations. Lowry-type models are biased towards transportation analysis. Thus the explicit special treatment of trip times and transport costs. Our model suggests that from the point of housing demand such factors should be subsumed under the more general variable of 'attractiveness' (w_i). For similar reasons as well as due to a more general theoretical weakness, Lowry-type models include 'capacity', usually in the prosaic form of the amount of available land, in the 'attractiveness' variable. This is clearly misconceived. Supply capacity should be clearly distinguished as in our model. Lastly, the Lowry-type formulation makes clear that equation (15) presupposes, in addition to a socioeconomically homogeneous population, a *single* point of employment (unless we, unrealistically, disregard work-residence trips as factors of housing demand).

The formal and substantive affinities of equation (15) with the whole family of well-substantiated Lowry-type models adds greatly to its inherent theoretical merits. On the basis of such a general demand function our fundamental equation for the determination of intra-urban land prices may be transformed into the following more general one:

$$P_i = P_0 + (\bar{P} - P_0)\frac{w_i}{\bar{w}} \qquad (16)$$

Equation (16) shows that, leaving aside the fundamental influence of P_0 and $\bar{P}$, land prices in the various urban zones are directly determined by the distribution of household preferences. At first glance this seems to imply that our model justifies the well-known neoclassical theory of the ground rent curve as a direct product of the spatial distribution of household 'utility'. Land prices P_i in our model could be superficially considered as the prices that households are prepared to offer for residence in each zone according to their preference schedules in a manner equivalent to Alonso's bid-rents. It requires no stressing, however, that such similarities are purely morphological in nature and hide radical theoretical differences. The concept of 'demand' and 'preferences' in our model differs radically from the atomistic model of demand, utility and utility maximisation no neoclassical models. The first set of concepts relates to the level of *group* behaviour and to the underlying concept of product differentiation and its relativistic corollaries whereas the latter set is based on the atomistic concepts of the 'typical' household and household utility as an absolute value. As a result, intra-urban land prices in the neoclassical model (disregarding P_0) are determined by households irrespectively of actual supply conditions and have absolute rather than relative place in the system (save for their relationship with prices in the urban margin). In contrast, intra-urban prices in our model are determined relationally in a process of monopolistic competition that differs sharply from the conditions commonly assumed by current neoclassical models. In essence, land prices in the various urban zones are, in our model, the direct product of the distribution of an aggregate land value that has been determined at the level of the urban system as a whole.

It could be said, of course, that our model reproduces in its entirety the set of formal elements comprising most current models of urban land rents. We have shown that there is an intraurban pattern of gradually decreasing land rents (since relative demand density will obviously show such a decreasing pattern) which is equivalent to the differential rent gradient. We also assumed that there exists an exogenously determined minimum level of prices P_0 which obviously corresponds to the concept of 'absolute' rent. Lastly, since some areas in our model will show the lowest level of demand density, we have some equivalent of the concept of the urban 'margin'. As we noted, however, these similarities are entirely *morphological*. Even in such superficial and morphological terms our model differs radically from current models based on the theory of differential rents. This can be easily seen in the matter of the role of the 'urban margin'. In our analysis this has no privileged role whatsoever. In all models that derive from Ricardo and Von Thünnen prices in the margin are fundamental determinants of prices in the rest of the market. In such a model land prices in a certain zone it will be determined by the following function:

$$P_i = P_0 + f(w_i - w_m)$$

where w_m is the 'utility' derived (for the typical household) by residing in the urban 'margin' (essentially the worst zone). In our model we have a

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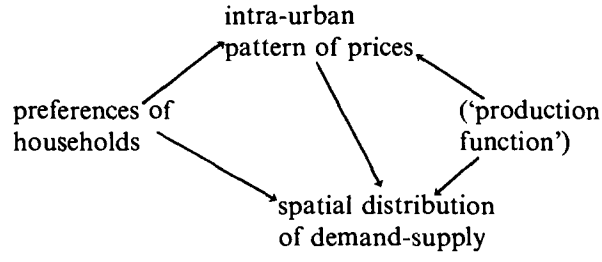
completely different mechanism of determination expressed in equivalent terms by:

$$P_i = P_0 + f(w_i/\bar{w})$$

where $\bar{w}$ is the *average* 'utility' of the areas of the city. We may summarise the main conclusions of our analysis:

1. The price of land in each urban zone under conditions of short-run equilibrium of the market will be the sum of the minimum monopolistic land price which is similar for all zones and a varying component which is, in the case of homogeneous population, directly proportional to the relative density of demand in the zone, i.e. the ratio of demand to capacity in the zone compared to the same ratio for the city as a whole.
2. The concentration of demand in a zone in the case of homogeneous population depends entirely on the capacity of the zone and the characteristics of its housing relative to the capacity and the characteristics of housing supply for the city as a whole. The concentration of demand in a zone is *independent* from the price of land in that particular zone.
3. The aggregate level of the equilibrium supply of urban housing is a positive function (in this general case a simple proportional function) of an exogenous factor of aggregate housing demand which is independent from land prices save for the negative influence of the minimum land price P_0 determined monopolistically at the macro-level. The intra-urban pattern of land prices and the average land price do not enter in the argument.
4. The average supply price of land at the level of the city as a whole is determined by a linear function (in the case of homogeneous population) of the minimum price P_0 and the aggregate 'density' of demand that is, the ratio of exogenous housing demand to total available capacity. Thus, the average supply price of land is *independent* from the intra-urban pattern of prices.

The main importance of these theoretical findings lies, of course, in the clear-cut relegation of the minutiae of the intra-urban pattern of land rents to a status of completely secondary significance and the promotion of the formation of aggregate levels of supply and land rents in relation to available capacity (and thus the role of public controls of urban development) to the forefront of urban theory. These major issues, however, should not obscure the fundamental change in our concept of the causal nexus of urban land economics that these findings suggest. This may be demonstrated by the implications of proposition 2. This, at first glance, appears to be paradoxical and contrary to everyday experience. We all know, after all, that demand for a certain urban area is clearly influenced by the local level of land prices. The apparent paradox is removed if we observe that demand per zone in our model is indeed influenced negatively by land prices but does so in proportions that are similar in all zones and which, moreover, reflect the interplay of demand and price at the level of the city as a whole. The key difference here is that between an approach from the viewpoint of the system as a whole and an approach from the viewpoint of particular areas or locational decisions. Ours is a function of the allocation of aggregate demand among urban zones. The same process if viewed from the restricted point of certain areas would have a structure that would have included local prices. In such a case, however, the model would have been partial and 'open', without deterministic solution. Such a partial approach presents no problem, of course, for NUE models where prices in urban zones are absolute in character determined by the utility function of households and conditions at the urban margin (and in some cases by the additional influence of the 'production function' for housing services).[5] In such NUE models land prices instead of being the *product* of the spatial allocation of demand are its determinant. In schematic form we have the following causal mechanism:



Such a causal model, leaving aside its theoretical weaknesses, places a formidable burden on a sup-

[5]For the more well-known statements of the 'production function' approach, see Muth (1969) and Mills (1972).

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posed extremely complex and sensitive price mechanism. This adds too great a weight on the shaky substructure of perfect competition. In terms of empirical research, any effort to tackle *simultaneously* the problem of prices and demand allocation from this perspective is bound to face a veritable nightmare of interconnections, multiple determinations and statistical problems of multicolinearity that make a clear-cut solution impossible.[6] In contrast, the theoretical formulation derived from a simple model of monopolistic competition suggests a truly 'classical' causal mechanism of one-way determinations[7]:

preferences of households
↓
spatial distribution of demand-supply (per unit of capacity space)
↓
intra-urban pattern of prices ← exogenously determined supply capacities

As we noted already the problems faced by neoclassical NUE models are not avoided by neo-ricardian or ricardian-marxian models which to a determinant extent are similarly based on the fundamental elements of perfect competition and the model of differential rents. What about the distinctive contribution of marxian models based on the concepts of 'absolute' and 'monopoly' ground rents? The concept of 'absolute' rent in marxian models essentially corresponds, leaving aside the justly criticised obscurities about its derivation from the 'organic composition of capital', to our concept of minimum price P_0. Marxian 'absolute' rent, however, is the minimum price demanded at points immediately inside the extensive urban margin which, in turn, is transmitted to the system as a whole through the mechanism of competition. In our model, however, land prices immediately inside the margin may be, and will normally be, higher than $P_0 \cdot P_0$ in our model is not determined at the urban margin but at the level of the system as a whole in the context of a complex mechanism involving social and economic patterns relevant to the behaviour of landowners that must be approached socially and historically. The price of agricultural land at the urban margin is indeed a major factor in this process but not necessarily the exclusive one. Thus, P_0 resembles to a very large extent Harvey's concept of class-monopoly rent (1974). The concept of 'monopoly' rent in Marx in its urban application essentially refers to prices deviating from the normal differential rent curve due to special conditions making for exceptional concentrations of demand in certain zones with scarce attributes. It is obvious that in our model such a form of land rent constitutes the normal form rather than an exception. Its definition, however, in terms of deviations from differential rents (and thus the 'normal' market ruled by perfect competition) must certainly be rejected.[8]

6. The Myth of the 'Law' of Differential Rent

The fundamental differences between the theoretical model we have advanced and standard NUE models or alternative non-neoclassical approaches are not restricted to the general-theoretical or the conceptual level. Although there are indeed substantial *morphological* similarities between our model and models that are essentially based on urban applications of the Ricardo-Von Thünen theory of differential rent and its correlative assumptions about perfect competition, the specific implications about the causal determination of land prices and their absolute level and pattern of change in the two approaches, differ radically. This point has obvious relevance for the analysis and evaluation of urban land policy and thus deserves some further critical comments. The necessity of a systematic critique is greatly increased by the alarming fact that the traditional theory of differential rent forms the

[6]These limitations are quite obvious in the case of the 'hedonic prices' (or indices) model. For its theoretical presuppositions which are essentially a direct effort to confront the problem of the heterogeneity of the product (housing) within the constraints of neoclassical assumptions, see Rosen (1974). For a review of applications, see Blomquist and Worley (1981).

[7]'Classical' in the sense that it is consistent with the methodological and epistemological values established by classical economists, especially Ricardo, who strongly preferred systems of equations of the causal type or the 'decomposable' type, as opposed to completely interdependent systems of simultaneous equations. For a modern authoritative defence of this tradition, see Pasinetti, 1974: 42–45.

[8]For the marxian categories of ground rent see Arghiri Emmanuel, 1972: 216–226; Edel, 1976; Harvey, 1973; Demathas and Courtis, 1977. I consider Arghiri Emmanuel's presentation, especially his highly critical account of the concept of absolute rent, as the most helpful and clear-cut despite the fact that he does not refer to urban applications of Marx's concepts.

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backbone of *all* currently available models of the urban land market. This is well-known for the case of standard NUE models as well as for the few influential neo-ricardian models which, though free of most of the neoclassical apparatus, retain the essentials of the initial formulation (Scott, 1976; Hartwick and Hartwick, 1975). Lastly Marxian models of urban rent whether influenced by neo-ricardian Sraffa-type formulations or more 'fundamentalist' in character, do retain the differential rent theory though in a more relativised form (Edel, 1976; Bruegel, 1975; Farhi, 1973; Demathas and Courtis, 1977; Harvey, 1973). Harvey, as we noted, in his later work (1974) has shifted towards a theory based exclusively on Marxian monopoly rent. This concept, however, can hardly sustain, in its original formulation, a truly general model but must remain a 'deviation' from Ricardian differential rent. It is worth our while, therefore, to examine more closely the arguments and implications of the 'law' of differential rent.

Differential rent in a zone i in urban models derived from Ricardo and Von Thünen is mainly determined by the cost of transport from and to places of employment. We have the fundamental 'law-like' proposition that:

$$P_i = f(T_0 - T_i)$$

where P_i is the price of land (per constant housing unit) in i (formed exclusively by differential rent) and T_i, T_0 are, respectively, the transport costs from i and from the most distant zone of the urban area (the urban margin) to places of employment. As a result, the growth of the city and the attendant geographical extension of the margin cause an increase of land prices in the system as a whole (due to the increase of T_0). An increase of transport costs has similar results while their decrease will lower prices throughout the urban system. None of these well-known 'theorems' applies within the context of the monopolistic competition model of the urban market. In contrast, a fundamental proposition that directly derives from such a model, namely the prediction that land prices in the system as a whole will increase when the ratio of total floorspace demand to the exogenously determined (by public controls) total available capacity is increasing even if there is substantial excess capacity, is completely ruled out by the 'law' of differential rents.

These points do not, of course, imply that transport costs are of no importance in the context of our model. They are, indeed, a fundamental determinant of land prices. Transport costs, however, enter the argument as determinants of the distribution of demand and therefore influence the pattern of *differences* in price between zones. They do not determine the *absolute* levels of prices as in Von Thünen models. The absolute levels of prices move in tandem according to the determinant influence of the monopolistic mechanism of equilibrium between aggregate levels of supply and demand of housing space. Thus, the geographical extension of the city with adequate rates will result in a stability or decrease of prices. The later result is, as we pointed out, rejected as an impossibility by differential rent models. This point involves certain important differences between the two models with regard to the meaning of urban expansion and the urban 'margin'. It also demands some analytical proof. Let us consider for the sake of this argument the simple case of urban system favoured by general NUE models where there is a single centre of employment, residential areas are concentric rings arranged around this centre and the sole factor entering the demand argument of households is the distance from the place of employment measured by the radius r of each ring. Similarly, we will assume that no 'absolute' ground rents exist. Thus, in terms of our model the minimum land price P_0 will equal zero. Lastly, we assume that the population is homogeneous.

We assume that the evaluation of each concentric ring of radius r from the viewpoint of household demand is based on an index w_r which is determined by the following identity:

$$w_r = r^{-c}$$

Parameter c is a measure of the cost of increasing distance from employment. Given this formulation, the basic demand allocation equation (15) in our model becomes

[9]In the opposite case, prices would have been determined under conditions of absolute *scarcity* of land, a situation that can be easily handled by some neoclassical models. Such a case, however, has limited interest and should not be confused with the one we examine here.

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(i) $$N_r = N\frac{C_r \cdot r^{-c}}{\sum_{r=0}^{r=R} C_r \cdot r^{-c}}$$

Points r = 0 and r = R are, respectively, the centre of the city and the outer limit of the area within which residential development is permitted (R is the radius of the city as a whole). For each concentric ring, capacity C_r is determined by the diameter of the ring, its width which is assumed equal to unity and an exogenously determined floor ratio L_r. We assume, for simplicity, that floor ratios are similar throughout the city:

(ii) $L_r = u$ where u is a constant

Given the assumption that P_0 equals zero and equations (11) and (12) in our model, land prices in this simple case will be determined by the following:

(iii) $$P_r = \bar{P} \cdot \frac{N_r/C_r}{N/C}$$

(iv) $\bar{P} = q \cdot H/C$ where q is a parameter

Variables N_r, C_r and N, C refer, respectively, to household demand and capacity for zone r and the city as a whole, $\bar{P}$ is the average land price in the city and, lastly, H is the exogenously determined aggregate housing demand. For a valid comparison with perfect competition models some additional assumptions are necessary. We must assume that the institutionally determined floor ratios L_r and the outer limit defined by R are of sufficiently large size so as no significant restrictions on the free operation of the urban housing and land market according to the assumptions of perfect competition are imposed. From the viewpoint of perfect competition models, such institutional controls must be of a type that makes them completely neutral and useless superimpositions on the urban system. Conditions as these are not difficult to find despite the apparent severity of the theoretical assumptions. I would say, on the contrary, that they are the rule rather than the exception since, save for a few highly controlled European historical cities, the existence of relatively liberal floorspace ratios and, more importantly, substantial excess capacity are quite common. This is certainly true for American cities which are the standard case of application of NUE models. More to the point, the case of Athens with its high excess capacity and very high floorspace ratios should certainly cause no difficulty to the adoption of such a dismissive attitude towards the role of public controls.

It is easy to show that on the basis of relationships (i)–(iv) land prices in all locations of the urban area, and more specifically the prices for the centre of the city and the urban margin will be given by the following expressions:

(v) $P_r = \bar{P}[(2-c) \cdot R^c/2u] \cdot r^{-c}$

(vi) $P_{r=1} = \bar{P}(2-c) \cdot R^c/2u$

(vii) $P_{r=R} = \bar{P}(2-c)/2u$

In this simple formulation we define the centre of the city by r = 1. The solution of the system for r = 0 would have required a more complex 'utility' – distance function. It is obvious, moreover, that for positive land prices parameter c of the demand function must be equal to or greater than +2.

Let us assume that the share of urban land that is available for residential use in each zone is constant and equal to m. Total floorspace capacity then is

$C = \pi \cdot R^2 \cdot m \cdot u$ (where π is the well-known mathematical constant).

Relationships (iv), (vi) and (vii) then become:

(iv′) $\bar{P} = 2 \cdot A \cdot H \cdot R^{-2}/u$ where $A = q/2 \cdot m \cdot \pi$

(vi′) $P_{r=1} = A \cdot H \cdot (2-c) \cdot R^{c-2}/u^2$

(vii′) $P_{r=R} = A \cdot H \cdot (2-c) \cdot R^{-2}/u^2$

If within a period of time from t_0 to t aggregate exogenous demand H increases at rate h while total capacity C increases by g due to the extension of the outer limits of the city as these are defined by public controls, then for time t we will have:

$$R_t = R_0 \cdot (1+g)^{1/2}$$

(viii) $P_{t,r=1} = P_{t_0,r=1} \cdot (1+h)/(1+g)^{1-\frac{1}{2}}$

(ix) $P_{t,r=R} = P_{t_0 r=R} \cdot (1+h)/(1+g)$

(x) $\bar{P}_t = \bar{P}_{t_0} \cdot (1+h)/(1+g)$

In the general case of differential rent models, changes in land prices will take place when transport costs change (change in c) and when aggregate demand H changes, since this will result in a shift of the *real* (as opposed to the institutional) urban margin. Institutionally determined capaci-

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ties do not, as we noted, enter the argument as long as they are sufficiently high. In the following table we compare the theoretical predictions of such models with those derived from the monopolistic competition model for a variety of possible 'scenaria' ('+' denotes increase, '−' decrease, '0' constancy).

	Monopolistic Competition Model			*Standard Differential Rents Model*		
	$P_{r=1}$	$P_{r=R}$	$\bar{P}$	$P_{r=1}$	$P_{r=R}$	$\bar{P}$
1. $c_t > c_0$	+	−	0	+	0	+
2. $h = g$	+	0	0	+	0	+
3. $h > g$	+	+	+	+	0	+
4. $h < g$	±*	−	−	+	0	+
(*depends on the particular combination of h, g, c)						
5. $h = 0, g > 0$	−	−	−	0	0	0

The two models are in agreement in one point only: prices in the centre of the city will increase if aggregate housing demand or transport costs increase, other things being equal. Even in the case of the central zone, however, the models show important differences in scenaria 4 and 5. Moreover, whatever the agreements between predictions about the *direction* of change, the predictions about the absolute level of prices will differ significantly. In all other cases of possible change in the fundamental parameters of the urban system the results of the two models are mostly different. This divergence acquires radical dimensions in the case of the average level of the price of land where, as the table shows, the two models imply diametrically opposed theoretical and practical approaches to the major issues of land policy and policy for urban development.

Thus, the rejection of the classical 'law' of differential rents and its neoclassical (or 'alternative') descendants is necessitated by reasons that surpass the purely theoretical level: there are urgent 'practical' reasons – political as well as normative in a more general sense. This issue is especially relevant in the case of Greek urban politics and urban theory and research where, in the present period, conflicts over land policy and the policy for urban growth (especially that for Athens) are very intense (Emmanuel, 1982). Having said this, I would insist that such 'topical' motivations, though an essential part of the research process, should not detract from the significance of the wider argument concerning the inadequacies of modern urban economic theory.

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