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## LAND RENT IN THE CENTRAL BUSINESS DISTRICT OF A CITY AS A KEY FACTOR OF SOCIAL SERVICE DEVELOPMENT

*This article summarizes different approaches to investigation of land rent in the central place system e.g. in the business district of a large city or agglomeration as a key factor of social service development. The main purpose of the study is increase of profitability and competitiveness of service enterprises due to improvement of their location in the business district centre. Systematization of literature sources and approaches to solving the problem of land rent in central business district development allowed to single out the works of domestic scientists such as Tkachenko T. I., Drapikovskiy O. I., Ivanova O. O., Gritsai O. V., Vakulenko V. M., Dekhtiarenko Yu. F., Zakharchenko V. I., Litvinenko R. I., as well as researches of foreign scientists such as Fujita M, Thisse J.-F., Henderson V., Herbert Giersch. The urgency of solving this scientific problem is that land rent in central place system e.g. in the business district of a large city became the main driver of service sector development. The study of land rent development in the article is carried out in the following logical sequence: land rental development of trade objects in a monocentric city, retail locations, rent for trade in episodic demand goods, rent for trade in goods of constant demand, the main feature of the trading enterprises rent investigation, residential land rent of a city, two rent types of residential development estimation, rent function with replacement of production factors instead of output or rent gradient investigation. Methodical tools of the conducted research are methods of formalization, algorithm development, descriptive, analytical and synthetic. The object of the study is land rent development in the central business district of a large city or agglomeration. The article presents the results of an empirical analysis of land rent development in the central business district, which showed its influence on service sector location and growth. The study empirically confirms and theoretically proves procedures of land rent estimation for increasing profitability and competitiveness of service enterprises due to improvement of their location. The results of this study may be useful for different Tourism and Service Companies looking for the best location place in the central business district of a large city.*

**Keywords:** *land rent, location, central business district, key factor, social service, profitability, competitiveness.*

**Actuality of the issue.** Over 70 decades, service sector has experienced continued growth and deepening diversification to become one of the fastest growing economic sectors in the world. Modern service is closely linked to development and encompasses growing number of new destinations. These dynamics have turned tourism into a key driver for socio-economic progress. Land rent estimation for the service sector development allows choosing the best location place of different enterprises in the central business district of a large city. This place influences the increasing profitability and competitiveness of these enterprises.

**Formulation of the problem.** The increasing profitability and competitiveness of service sector enterprises depends of rational location in the central business district of a large city. Indeed, land rent in central place system e.g. in the business district of a large city became the main driver of service sector development. The study of land rent development in the article is carried out in the following logical sequence: land rental development of trade objects in a monocentric city, retail locations, rent for trade in episodic demand goods, rent for trade in goods of constant demand, the main feature of the trading enterprises rent

investigation, residential land rent of a city research, two rent types of residential development estimation, rent function with replacement of production factors instead of output or rent gradient investigation.

**Analysis of recent research and publications.** The problem of land rent development in the central business district has become the subject of various active studies of domestic and foreign scientists. The researches of theoretical and practical problems of land rent development in the central business district are conducted in the works of such scientists as: Tkachenko T. I., Drapikovskiy O. I., Ivanova O. O. (1997), Gritsai O. V. (1991), Vakulenko V. M., Dekhtiarenko Yu. F. (1997), Zakharchenko V. I. (2004), Litvinenko R. I. (1980), as well as in researches of foreign scientists as Fujita M, Thisse J.-F. (2004), Henderson V. (2000), Herbert Giersch (1995). However, despite some progress in the development of this problem, a number of important quality issues have not been addressed, or have only been addressed without their sound scientific solution. Insufficient research on the outlined problems caused the objective need to adapt the theoretical and methodological bases of land rent in the central business district with practical needs of service sector enterprises development.

**Highlighting previously unresolved parts of a common problem.** However, a comprehensive systematization and detailed characterization of land rent development in the central business district and their influence on service enterprises' development have not yet been conducted in detail.

**Formulating the goals of the article (Setting a task).** The main purpose of the study is increase of profitability and competitiveness of service enterprise due to improvement of their location in the business district place.

**Presenting main material.** Let us consider the city center role in the formation of land rents for service companies. In a monocentric city, processing and service companies focus on the central business district (CBD). Processing enterprises are attracted by the central transportation hub, and service companies are grouped in the city center to be able to meet their customers without problems (Gritsai, O. V., 1991). How is land being distributed in the CBDs between two types of companies?

If we review the rental schedule for intracity industrial enterprises, we will immediately see that the rental function of service companies is steeper, because in the service sector transport costs are relatively high. Service companies have to meet frequently with their customers. Thus, highly paid services are "delivered" to customers directly in the city center. At the same time, processing enterprises transport their products on intercity transport, and therefore, their transportation costs are relatively small.

How effectively does the market distribute land? In the language of developers, is it really that whoever "pays more and uses it more efficiently" gets the land? Service companies with their higher transport costs occupy land close to the city center. Such a distribution is actually effective, since they are the ones who benefit most from the proximity to the city center (Brokgauz, F.A., & Efron, I. A., 1899).

To make it clearer, let us suppose that a service company, located one block from the city center, changes sites with a processing company, located three blocks away. Calculations show that the exchange of sites leads to the fact that transportation costs of a service company will increase by a considerable amount, and the transportation costs of intracity industrial enterprises practically do not change.

The increase in transportation costs of a service company exceeds their decrease in the processing enterprise, so the total transportation costs increase. Market distribution, due to which the central region land is transferred to service firms, reduces total transportation costs.

So, in short, this is how the rent formation mechanism in services enterprises looks like. The next thing we will tell you about is the rental of retail objects in the space of a large city.

### Land rental of trade objects in a monocentric city

It seems that it is difficult to find a sphere of activity of all types of entrepreneurship and business that would be more dependent on profitable land rents than retail trade. The right location of the outlet is not only the key to the success of the entire enterprise, but also a profitable investment in the future prosperity of your business (Zakharchenko, V. I., 2004). By the way in this aspect the same profitability forming laws will serve you faithfully with placing trade objects in the space of a large city.

#### *Retail Locations*

Where in a monocentric city are the retailers located? If we go a few publications back, then in the first article of the urban land rent cycle (Vakulenko, V. M., Dekhtyarenko, Yu. F., & Drapikovskiy, O. I., 1997) we examined in great detail the question of the place centrality in the city and the commercial benefits that this centrality brings us.

The proposed then scheme is also applicable to explain the intracity distribution of trade enterprises. They divide the city into special trade zones, the area of which is determined by the economies of scale, per capita demand and transportation costs.

In accordance with such areas, the location of sales offices will be more or less advantageous, depending on whether a company meets the above criteria. Let's try to consider this in more detail.

#### *Trade in episodic demand goods*

So, retailers have two scales of action.

To begin with, we consider an enterprise whose economies of scale are large enough relative to per capita demand, for example, a store selling episodic goods. The market for such products has the following characteristics:

A small quantity of stores selling goods. The economies of scale with respect to the sale of episodic demand goods are depleted only when sales volumes are very high relative to aggregate demand, therefore there are only one or several stores selling it in the city. The effective sales volume for such a store will be, for example, 5 thousand units of goods per month, and the aggregate demand is 5 thousand per month.

Consumer goods. Consumers are distributed evenly throughout the city.

Absolute competition. Despite the fact that the city has only one (or several) stores selling episodic goods, access to the market is not too expensive. If there is a threat of a competitor, the economic profit is zero (Drapikovskiy, O. I., Ivanova, I. B., & Tereshchenko, N. O., 2016).

The profit of a retailer in a particular place in the city is equal to the excess of total income over total costs. Suppose that gross margin (price minus average costs) remains constant. If  $P_g$  is the price of the goods,  $G$  is the amount of goods sold,  $AC_g$  is the average cost, then the profit before rent is equal to:

$$P = G * (P_g - AC_g). \quad (1)$$

If, for example,  $P_g$  is 9 UAH.,  $AC = 5$  UAH., then the gross profit will be 4 UAH. If  $G$  is 5000, then the total income will be equal to 20 thousand UAH.

Where the episodic goods store will have maximum profit? If gross profit is constant, then by maximizing sales ( $G$ ), the company provides maximum gross margin. Of course, the sales volume reaches its maximum value in the center of the trading zone (median location) for the reason that the central place is available for a larger number of buyers.

Since the store selling episodic goods serves residents of the entire city, the profit is maximal in the city center. The advantage of the central location is reinforced by the monocentric city's radial transport network, which delivers pendulum migrants and buyers from the suburbs to the city center (Litvinenko, R. I., 1980).

As an exception, it should be noted that the profit of outlets with a significant economies of scale practically does not change if they are located in intracity subcenters of the second level – on the main areas and highways of densely populated quarters of the peripheral zone, the so-called “sleeping areas”. Here, not only the effect of centrality is triggered, but also the proximity to the mass consumer. However, the scale of operation of such retail outlets is limited only to residents of a particular housing estate, which somewhat affects the overall profitability of the enterprise.

Since there are no restrictions on the business involved in the sale of goods of episodic demand, the store selling them receives zero economic profit. Competition for the best point of sale raises the price of land to the point at which economic profit is zero. If a store selling episodic goods refuses to pay its economic profit to the landowner, the latter will lease the land to another store of the same profile.

#### *Trade in goods of constant demand*

Let us now consider a type of activity with a moderate economies of scale relative to per capita demand, for example, enterprises selling constant demand goods. They differ in the following characteristics.

A significant quantity of stores. The economies of scale in the consumer goods sale are very moderate relative to the total demand for them, so there are a lot of such stores in the city. The effective sales for each store are, for example, 4 thousand units of goods per month, and the total demand is 20 thousand per month (Brokgauz, F. A., & Efron, I. A., 1899).

Buyers of essential goods. Buyers are evenly distributed throughout the monocentric city.

Absolute competition. The business of selling essential goods is relatively cheap. Given the threat of new competitors, economic profit is zero (Drapikovskiy, O. I, Ivanova, I. B., & Tereshchenko, N. O., 2016).

The profit of a store before annuity payments is equal to total revenue minus total costs. If  $H$  is the quantity of goods sold,  $P_h$  is the price of the goods,  $ACh$  is the average cost, then the total profit is equal to:

$$P = H \cdot (P_h - ACh). \quad (2)$$

If, for example,  $P_h$  is 8 UAH.,  $ACh$  – 5 UAH., then the gross profit is 3 UAH. If  $H$  is equal 4000, then the gross profit is 12 thousand UAH.

In accordance with a simple option of urban rent, sellers of essential goods divide the city into a certain number of equal shopping areas (according to the number of enterprises), and each store is located in the center of the shopping area.

This result can also be expressed using the functions of the proposed annuity. The function of the proposed annuity of an essential goods store depends on the location of other stores. The location near other stores gives lower sales volumes, and therefore, the store owner is willing to pay lower rents. The function of the proposed annuity has maximum values in each center of the trading zone.

The exception is in those accommodation options that approach the nodal stations of urban transport highways, where there is always a significant flow of people and a large turnover. In these areas, due to the environment of increased contact, the profitability of trade enterprises will also be as high as possible.

Proceeding from this, the question arises: will the owners of essential goods stores follow the allocation scheme, arising from a simplified version of the centrality theory? From a simplified version of the theory it follows that the specific transportation costs (costs per kilometer) are the same in all directions. In a monocentric city with a developed communications network, this assumption is not true (Fujita, M, & Thisse, J.-F., 2004).

The radial transport network “picks up” people at the stations of the peripheral micro-districts and delivers them to the nodal stations of the middle belt or to the very center of the

city. Traveling to the city on radial lines is cheaper than between the radial lines, so a trip from the “sleeping areas” to the store in the city center or center of the second level may be easier than a trip to the store located on the periphery. If so, then most essential goods stores will gravitate towards local or citywide centers.

*The main feature of the trading enterprises rent*

The desire of shopping facilities to group in a city central area is further enhanced by the external effects of purchases. If goods from different stores are not absolute substitutes (that is, they fully satisfy the demand of citizens), then buyers visit several stores to compare the goods available in them, and therefore, transportation costs are lower if the stores are grouped in one place.

Since the central area can be reached from anywhere in the city, most stores, especially those with significant economies of scale, will most likely be located close to the city center. If the store provides for sale related products (complementary or auxiliary to goods of a different profile), then buyers will save on the costs associated with their purchases by the mutually close placement of both stores in the city center (Herbert Giersch, 1995).

A lot can be said about the peculiarities of the land rent of retail objects in the space of a large city. This topic cannot be limited to the scope of this article. Therefore, we considered here only the most significant points. Next time we will talk about land rent in the field of residential development.

**Residential land rent of a city**

At the end of a series of articles on the land rent of a large city, we only need to consider the issue of territories under residential development. Land rent in this case acts not only as the basis of the cost of apartments in multi-storied buildings, and not only as an expression of the price of land in the private sector, but, above all, it is a measure of the elite and prestige of placing your home (Henderson, V., 1990).

*Two rent types of residential development*

The function of the proposed rent for land under residential development (residential bid-rent function) indicates how much the “producers” of housing are willing to pay for land in different areas of the city. In accordance with the residual principle, “producers” of housing are ready to pay land rent equal to the excess of total income over total costs. There are two types of functions of the proposed rent: one takes place if housing is built with fixed shares of production factors, and the other if homebuilders are replacing these factors. Let's take a closer look at both cases.

Rent function with fixed shares of production factors (see Indicators for Sustainable Urban Development, 1997).

In order to consider this case, it is necessary to highlight a number of the city housing sector development features. Assume that firms in the housing sector have the following characteristics:

Production. Each firm produces  $Q$  sq. meters of housing, using land and other factors of production. After the company has built the building, it can be used either as one housing (with an area of  $Q$  sq. meters), or divided into  $x$  units of housing, each  $(Q / x)$  sq. meters of living space.

Extraterrestrial costs. For the construction of each building, firms use extra-terrestrial production factors (for example, the cost of raw materials and supplies, construction and finishing work, supply systems, etc.) of volume  $K$ .

Fixed shares of factors of production. Each firm produces its own  $Q$  sq. feet of housing, using for this  $T$  ha of land and  $K$  other factors of production excluding land prices.

Prices of houses. The land price function has a negative slope and a convex shape.

Absolute competition. Markets are absolutely competitive, so the company receives zero economic profit.

In accordance with the residual principle, the proposed land rent for land is equal to the excess of total income over total extra-terrestrial costs. Total income is equal to the price of housing ( $P$ ) times  $Q$ , and total costs are equal to the cost of extra-terrestrial production factors ( $K$ ) plus the cost of land ( $R \times T$ ) (Drapikovskiy, O. I, Ivanova, I. B., & Tereshchenko, N. O., 2016). Since  $P$  varies depending on the distance to the city center ( $u$ ), the proposed land rent is:

$$R(u) = P(u) * Q - K / T. \quad (3)$$

If, as it increases, the price of housing falls, the function of the proposed land rent under residential development has a negative slope.

Therefore, the function of the proposed annuity for land under residential development has a straight decline line. The horizontal line represents extraterrestrial costs per 1 ha of land, which are assumed to be the same in all places. Since the proposed annuity is equal to total income minus extra-terrestrial costs, the function of the proposed annuity lies below the income function, and the distance between two straight lines is equal to the cost of extra-terrestrial production factors. At  $u^*$ , total revenues are equal to extra-terrestrial costs, so the proposed rent on land is zero. The function of the proposed annuity is convex because the function of the price of housing is convex.

#### *Rent function with replacement of production factors*

The previous function of land rent was built on the assumption that housing is produced using a fixed share of production factors. Real estate developers use the same combination of production factors in all places without regard to land prices. And what happens if, as land prices rise, homebuilders begin to replace the land with other production factors?

The functions of the proposed rent for inflexible and flexible housing producers has parabolic line. An inflexible company uses the same combination of production factors in all areas of the city. As for a flexible company, as land prices increase, it replaces the land with extra-terrestrial factors of production, building some higher buildings as they approach the city center (Drapikovskiy, O. I, Ivanova, I. B., & Tereshchenko, N. O., 2016).

The flexible rent function is located above the inflexible rent function in all places except the point  $u = 6$ . At this point, the combination of production factors of an inflexible company turns out to be a randomly effective combination, therefore both construction companies use the same combination of production factors. If the ratio of production factors used by an inflexible company is effective at  $u = 6$ , then in other places it is inefficient (the coefficient is too small for places closer to the city center and too large for places further from the city center). For all areas, with the exception of  $u = 6$ , a flexible company builds housing at a lower cost and therefore offers a higher rent than an inflexible one.

#### *Instead of output or rent gradient*

From the analysis of rents on land under residential development, two conclusions can be drawn. Firstly, the proposed rent function has a negative slope. Secondly, the function of the proposed rent has a convex shape due to consumer substitution (which makes the housing price function convex) and the substitution of production factors (which increases the convexity of the rent function).

How quickly does the price of land for residential buildings decrease as the distance to the city center increases? This question can be answered by calculating the rent gradient. This indicator (rent gradient) is the percentage change in land rent (or market value) per km. The gradient value depends on: 1) the housing price gradient (percentage change in housing prices

per km); 2) the relative importance of land in housing production (Drapikovskiy, O. I., Ivanova, I. B., & Tereshchenko, N. O., 2016).

The average value of the housing prices gradient in Ukraine is 4 %. That is, a distance of one kilometer from the city center reduces the market value of housing by 4 % – from 150 thousand to 144 thousand dollars), the cost of land is assumed to be equal to 20 % of the total cost of property in place A. Since the cost of capital property is the same in all places, the land completely absorbs the decrease in market value (by 6 thousand dollars), which falls from 30 to 24 thousand dollars, which is a 20 % decrease. Since the market value is simply the quoted value of the annual rental income (annual rent divided by the interest rate), the rental gradient (percentage change in rent per land per km) is 20 %, or five times the value of the housing price gradient (Drapikovskiy, O. I., Ivanova, I. B., & Tereshchenko, N. O., 2016).

#### *Rent gradient*

So, the smaller the share of land in the cost of housing, the greater the percentage reduction in land rent that is necessary to absorb this decrease in housing prices. If, for example, the share of land in the value of a house is 10 %, then the rental gradient is 10 times larger than the gradient in the price of housing. These problems are discussed at Selections of the Wufeng Lins's archives in Ch'ing Taiwan (2015).

With these findings, we conclude a series of articles on land rent. However, for obvious reasons, all material about rent and its features was not presented on the pages of this publication. It requires a more in-depth and detailed study that goes beyond journal publications.

**Conclusions.** The different approaches to investigation of land rent in central place system e.g. in the business district of a large city or agglomeration are disclosed. The role of land rent as a key factor of social service development is highlighted. The mechanism to increase profitability and competitiveness of service enterprises due to improvement of their location in the business district place is shown. The land rent in the central place as the main driver of service sector development is substantiated. The land rental development of trade objects in a monocentric city is explored. The retail locations, rent for trade with episodic demand goods as well as rent for trade in goods of constant demand are explored. The main feature of the trading enterprises rent investigation, residential land rent of a city are researched. Two rent types of residential development estimation, rent function with replacement of production factors are highlighted. The specific rent gradient is investigated. The results of an empirical analysis of land rent development in the central business district, which showed its influence on service sector location and growth are proposed. The procedures of land rent estimation for increasing profitability and competitiveness of service enterprises due to improvement of their location are defined. The results of this study may be useful for different Tourism and Service Companies looking for the best location place in the central business district of a large city.

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## ЗЕМЕЛЬНА РЕНТА В ЦЕНТРАЛЬНОМУ БІЗНЕС РАЙОНІ МІСТА ЯК КЛЮЧОВИЙ ФАКТОР РОЗВИТКУ СЕКТОРУ СОЦІАЛЬНИХ ПОСЛУГ

*У цій статті узагальнено різні підходи до вивчення земельної ренти в центральній територіальній системі, наприклад, у діловому районі великого міста чи агломерації як ключового фактору розвитку сектору соціальних послуг. Основною метою дослідження є підвищення рентабельності та конкурентоспроможності підприємств сфери послуг за рахунок поліпшення їх розташування в центрі ділового району. Систематизація літературних джерел та підходів до вирішення проблеми земельної ренти у розвитку центрального ділового району дозволила виділити праці вітчизняних науковців, таких як Ткаченко Г. І., Драпівський О. І., Іванова О. О., Грицай О. В., Вакуленко В. М., Дехтяренко Ю. Ф., Захарченко В. І., Литвиненко Р. І., а також дослідження зарубіжних вчених, таких як Фуджіта М., Тісс Ж.-Ф., Хендерсон В., Герберт Гірш. Актуальність вирішення цієї наукової проблеми полягає в тому, що земельна рента в системі центрального міста, наприклад в діловому районі великого міста, є основним рушієм розвитку сфери послуг. Вивчення формування земельної ренти у статті проводиться в такій логічній послідовності: оренда земельних ділянок, розвиток торгових об'єктів в моноцентричному місті, торгові точки, земельна рента за торгівлю товарами з епізодичним попитом, земельна рента торгівлі товарами постійного попиту, дослідження земельної ренти торгових підприємств, рента житлових земельних ділянок міста, два види ренти житлової забудови, функції ренти із заміною виробничих факторів замість дослідження виробництва або градієнт ренти. Методичними засобами проведеного дослідження стали методи формалізації, розробки алгоритму, описові, аналітичні та синтетичні. Об'єктом дослідження є формування земельної ренти в центральному діловому районі великого міста або агломерації. У статті представлені результати емпіричного аналізу формування земельної ренти в центральному діловому районі, який показав її вплив на ефективність розташування та економічне зростання підприємств сфери послуг. Дослідження емпірично підтверджує та теоретично доводить процедури оцінки земельної ренти для підвищення прибутковості та конкурентоспроможності підприємства сфери послуг за рахунок поліпшення їх місцезнаходження. Результати цього дослідження можуть бути корисними для різних туристичних та сервісних компаній, які шукають найкраще місце розташування в центральному діловому районі великого міста.*

**Ключові слова:** земельна рента, місцезнаходження, центральний діловий район, ключовий фактор, соціальне обслуговування, рентабельність, конкурентоспроможність.

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