

CLASSIC AND MODERN IN THE LOCATION THEORY

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Abstract

Our intention is to contribute to the fulfillment of a foray into the first model of the location theory set forth by von Thunen in the work entitled “The isolated state”, issued in 1826. The author – considered as a pioneer in the economic science succeeded to make a geographical model based on distance and zone. Starting from the spatial configuration similarly to the Thunen’s we intend to present the conditions of building up a monocentric economy, with modern instruments. We wish to approach the making up of the equilibrium prices which appear for the industrial and agricultural products for different placements. We will find out the incomes of the zone, the real and nominal wages. Further, we will relax the restriction as for the registration or the industrial activity only in the town, and we will show the conditions which will generate a spur for the industrial firms in order to change the location. So that, they can consider that a monocentric configuration is sustainable, only if there is not another placement which could offer a bigger real salary for the workers. This approach suppose to obtain and to study of a function of potential. All these aspects are studied both on the base of some numerical simulation, and of some graphic building up. We think that with the help of our approach they could determine the influence factors in the placement of the industrial and agricultural activities.

Key words: distance, equilibrium prices, agricultural, industrial, location

INTRODUCTION

The authorship of the classic economy is bound to Adam Smith’s and David Ricardo’s contributions; their works “The Wealth of Nations” (1776) and *Principles of Political Economy and Taxation* (1817) are the initial step in the study of the economy. These works were noticed even from the first moment of their publishing, both for their scientific character, and also for the authors’ position as apologists of the English economy of that time, which was in the industrial revolution stage.

Almost at the same period, that is in 1826, a German economist - Johann Heinrich von Thunen (1783-1850) published his work – “The isolated state”. At that moment of issuing it, this remained unnoticed, maybe even for the fact that it was not translated into English, but after a century and a half, that is in 1966. This happened in spite of the fact that as Joseph A. Schumpeter asserted in his work – “History of Economic Analysis” (1954) quoting Alfred Marshall which refers to David Ricardo’s and von Thunen’s contribution– that “but, if we judge these

two last authors – only their capacity of issuing pure theory, then in my opinion, Thunen exceeds Ricardo and all the economists of the time”. [1]

Von Thunen’s work represents the theoretical step in studying of the spatial aspects from economy, and at the same time generating a field of the economy, named spatial economy. Von Thunen developed an analytical model referring to market, production and distance. In his approach he considered a space as being formed by a town placed in a uniform field on which could be found various agricultural crops and which produces all the industrial goods. This town is supplied with agricultural crops from the surrounding field and it is also known as a single centre. According to this configuration, all around the town are setting up concentric zones which are located various agricultural crops on, and which scores different annuities. Taking into account the making up of the transport costs, the price of the products will be different, because of the distance to the town. So, in the proximity of the town will be putted those

agricultural crops which could sustain a bigger annuity and, similarly in the most removed part, those with the smallest annuity. The delimitating factor of these zone is represented by the transport expenses which are supposed to be linear varying with the distance. Later, von Thunen drew the spatial configuration to the real world, by the inclusion of more towns, of the existence of transport ways, of the fiscality, etc.

Thunen's model – with all these extensions – could suffer criticism because of its simplicity, but even with all shortcomings, Thunen's contribution could not be denied, having the undoubtedly praiseworthy of the authorship in analysing of the location and also of a very effervescent contemporary literature. The agricultural conditions imposed in the model are in a way representative for the beginning of the XIX-th century, id est:

-a) - isolation – there is an isolated market included in an isolated state, that means it has no links with the outside;

-b) – uniformity – the field is flat and with uniform fruitfulness;

-c) – transport – it is supposed that there is no transport infrastructure, that means: roads, river ways, the products being transported by the use of horses and carts. The transport costs depend on the sort of the good, and also on the distance.

The model consists of a relation as follows:

$$R = Y(p - c) - Y \cdot f \cdot x \cdot m$$

In which: R – represents the annuity due to the unit of field;

Y – is the production (the harvest) related to the unit of field;

P – is the price on the market related to the unit of field;

c – is the medium cost of production related to the unit of production;

m- is the distance from the place of production to the market;

f – is the cost of transport related to the unit of production and to the distance.

MATERIAL AND METHOD

We start our scientific approach from a spatial configuration as Thunen's pattern, in

which the industry is located in a single town and the agricultural activity is spreading around it, named as single center economy. This type was treated by Masahisa Fujita, Paul Krugman and Anthony Venables in the most outstanding work in the field of the spatial economy at la beginning of this millennium; this develops and interprets the model with the help of the general equilibrium of a monopolistic competition of the transport costs – iceberg type. [2]

In this line, it is supposed that the economy is made from two sectors definite by industry (M) and agricultural (A), under conditions the entire agricultural sector is focused on the town. The agriculture is developing on a supposed linear area between [-k, and +k], where "k" represents the limit of the agricultural zone, and the town is located in the origin and it is defined with "O". This produces and exports the industrial goods in exchange for the agricultural goods. In this line, see the figure nr. 1 (bellow):

Let's note with $p^A \equiv p^A(0)$ the price of the agricultural good sold in town. Each replacement from the agricultural zone produces an unit of agricultural good and exports to the town the surplus comparing to the local consumption. The spatial configuration of the agricultural producers is supposed that as removed are they from the town, they will receive a smaller price following the impact of the transport costs. So, the price of an agricultural good in a "r" placement will be as follows:

$$p^A(r) = p^A e^{-\tau^A |r|} \quad (1)$$

in which τ^A . represents the transport cost afferent to the agricultural good from the "r" placement to the town. By this form, the price of a "r" location from the interval [-k +k] is depending on:

- The price of the agricultural good soled in the town (centre);

- The cost of the transport of the agricultural good, that means according as τ^A has a smaller value, that means a bigger cost;

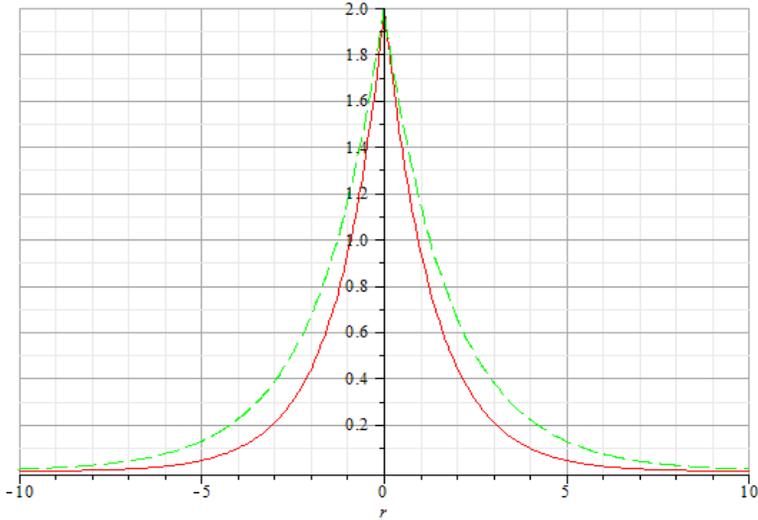


Fig. 1 Monocentric configuration
tau = 0.75 solid line, tau(A) = 0.55 dot line, p(A) = 2

- The placement of the location “r” to the town; as more removed it is, as bigger is the cost of transport and as smaller is the price of the agricultural good.

See for that figures nr. 1 and 2.

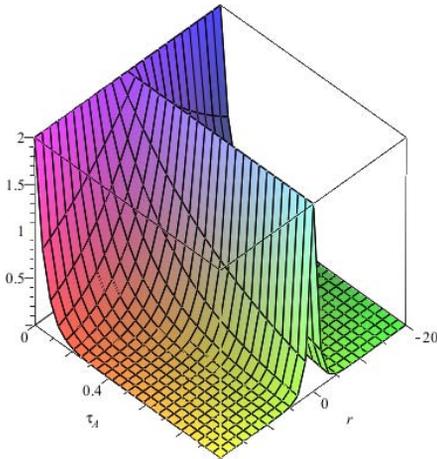


Fig. 2 Relation between price of agricultural good, transport cost and location

Further on, if we define with $R(r)$ the annuity for the field, with $w^A(r)$ the wage of the farmers at the “r” replacement and with c^A the number of the farmers, in these conditions, the annuity could be defined as:

$$R(r) = p^A(r) - c^A w^A(r) = p^A e^{-\tau^A |r|} - c^A w^A(r) \quad (2)$$

At the limit of the agricultural zone the annuity of the field tends to a very small dimension, approximated by 0, thus determines the agricultural wage in this place to be equal with:

$$w^A(k) = \frac{p^A e^{-\tau^A k}}{c^A} \quad (3)$$

Taking into account the fact that this economy is described by the standard assumptions from the models of the new geographic economy, we appoint with N the labour force from the economy, and with μ the share from the income of a consumer afferent to the acquiring of the industrial goods, and inclusively $(1-\mu)$ of the agricultural goods. Thus, it is established a relation between the price of the agricultural goods and the total number of workers, costs of transport of the agricultural good, the limit of the agricultural zone “k” and the number of farmers, this relation being as follows:

$$p^A = \frac{(1-\mu)(N-2c^A k)}{2\mu \int_0^k e^{\tau^A |r|} dr} \quad (4)$$

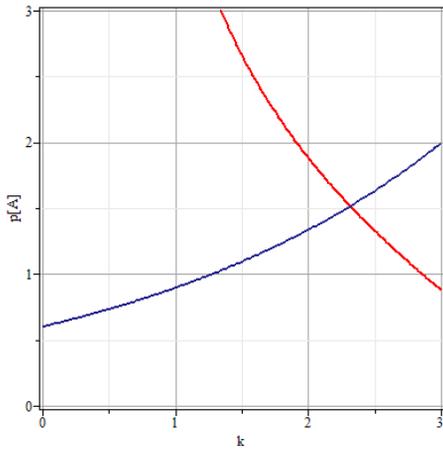


Fig. 3 Determination of the equilibrium for $p(A)$ and k $\mu = 0.4$, $\tau(A) = 0.75$, $\tau(M) = 1$, $c(A) = 0.6$, $N = 5$

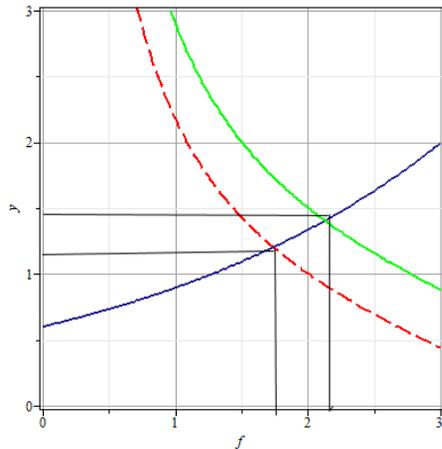


Fig. 4 Determination of equilibrium for $p(A)$ si k $\mu = 0.4$, $\tau(A) = 0.75$, $\tau(M) = 1$, $c(A) = 0.6$ $N = 5$ - curve solid green, $N = 4$ - curve dot red

On the other hand it could be determined the price of the agricultural good, starting from the equalization of the real wages of the industrial and agricultural workers, wherefrom results that the price of the agricultural good is equal also with:

$$p^A = c^A e^{\mu(\tau^A + \tau^M)k} \quad (5)$$

The figure number 4 presents how an increase in the labour force, that is N , increases the price of the agricultural goods and of the border for the agricultural zone.

Up to now the whole approach was based on the assumption that the industrial activity takes place only in the centre of the economy. Otherwise, in order to register this monocentric configuration it is necessary a condition which suppose that not any firm has an incentive for placement in another location than that in which there is it. In the terms of the model, this condition is transposed in the fact that not any other location offers a real bigger wage for the industrial workers. In this line, it is defined a function of potential which is presented for the different sizes of the N , as in the figure nr. 5.[3] Thus, the curves move from the down side to the upper side, for the increasing sizes of the N ; consequently, the curve with red suits to $N=3$, meanwhile the interrupted curve suits to $N=\infty$

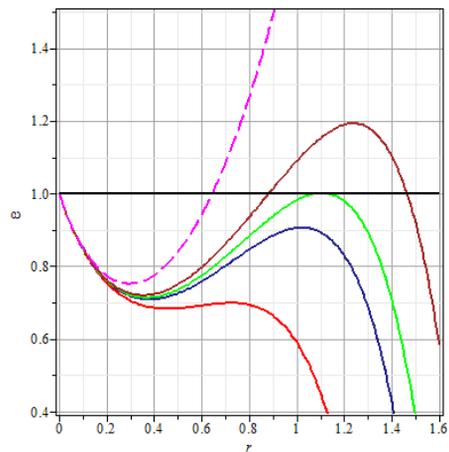


Fig. 5 Potential curves for monocentric configuration $\text{Rho} = 0.75$, $\text{sigma} = 4$, $\mu = 0.5$, $\tau(T) = 0.8$, $\tau(M) = 1$, $c(T) = 0.5$

As they notice from the graph, when one goes away from the centre of the configuration, that is from the town, the function of potential increases first, and then begin to lower. The result of these tendencies mirrors the fact that initially, the appropriate replacement to the town are more attractive and also emphasizes the basement of choosing a replacement definded of distance to the prejudice of other rival firms. They can notice that when N registers sizes small enough, the curve for potential is smaller

than the unit for all the replacement, less the centre of the configuration. These cases describes the monocentric, that is those to which the workers would not receive a real bigger wage than that which they receive in the centre of the configuration.

At the moment the population increases, the curves of the potential function begin to increase, reaching the unit, and determining a criticising population, to which it suits o critical distance. From this level, the monocentric structure is replaced with another urbane structure of the economy.

RESULTS AND DEBATES

In order to resume the search they were foreshadowed a series of developments of a spatial model von Thunen's type. Even if apparently simplistic and restrictive comparative with the real world, this helps to the understanding of the economic and social mechanisms which are scoring in connection with the crowding phenomena of the productive activities. It is circumscribing in a class of models from the so called New Economic Geography.

On the other hand, it represents a basis for the extensions to the spatial configurations with multiple towns. On the base of such a model, the results could be also extended to study of the place played by the terminals of

transport, as for by the ports in making up some important urban locations.

We intend to achieve such an research on the context of Galati and Braila ports. In our approach we have done both the numerical simulations and also the graphs helping by the Maple 14 program.

CONCLUSIONS

We appreciate this theme as in idea and practical importance for Romania; we also consider that by theoretical clarifying, the spatial component has to be re-estimated and the applied studies have to explain o lot of phenomena from the today Romanian economy, as: the commercial liberalism, the importance of the transport substructure upon the urban phenomena, the commercial relations of Romania with the Moldavia Republic, the renewing the Danube transport networks, etc.

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