

19TH-CENTURY VÖRÖSMART IN LIGHT OF THÜNEN'S LOCATION THEORY: ECONOMIC RESILIENCE AFTER WORLD WAR I

Attila TARNAI¹, ORCID ID: 0009-0005-2051-9728

Abstract

The aim of this study is to examine the applicability of Johann Heinrich von Thünen's location theory through the analysis of the 19th-century economic spatial structure of the former market town of Vörösmart. The theoretical framework of the Isolated State model is compared with local conditions, highlighting the factors responsible for the differences between the model and reality. The research is based on contemporary cadastral maps, census statistics, and other period sources. The analysis reveals that land use in Vörösmart in several respects corresponded to the logic of Thünen's production zones. In the innermost zones, intensive horticulture and viticulture took place, while in the outer zones, extensive agricultural production and livestock farming dominated. Proximity to the market determined both the intensity of production and the types of crops grown. At the same time, the model does not fully account for the impact of local topography, water networks, and trade relations. Nevertheless, Thünen's principles provide an effective framework for interpreting the local economic spatial structure. The settlement's self-sufficient, zone-based economy played a crucial role in maintaining stability after World War I, when new borders and isolation severely restricted external trade.

Keywords: Spatial economy, production zones, resilience, Vörösmart, Thünen.

JEL codes: R12, R14, N93

Introduction

The city has always been one of the most decisive factors in cultural and technological development. For the sake of prosperity, humankind realized early on the importance of cooperation; thus, the emergence of the first cities was fundamentally connected to the social needs of people, innovation-based growth, and the sharing of information. Cities are economic and technological centers that have exerted a significant impact both on those living within and outside their boundaries (Dömötör et al., 2016). When examining the specific reasons for the emergence of cities, several functions can be identified that directly explain the development of certain cities. One such city-forming function is the defensive role, which was characteristic primarily of ancient and medieval urban development. Cities provided protection to their inhabitants for long periods (e.g., Buda, Veszprém, Osijek, Szigetvár). The administrative and governmental role is another essential city-shaping function that developed in parallel with the defensive function. Well-defended fortifications were the most suitable locations for governance. This function created a hierarchical system, which could amplify the importance of certain cities. In antiquity and the Middle Ages, religious and cultural roles were also significant city-forming functions, and they still have a formative effect on people

¹ PhD Candidate University of Pécs, Faculty of Economics, University of Pécs, Doctoral School of Regional Policy and Economics, E-mail address: tarnai.attila@ktk.pte.hu
DOI: 10.29302/oeconomica.20254.27.1.4

today. Since the Industrial Revolution, the industrial function has been one of the most decisive city-forming factors. The industrial revolutions caused a large proportion of the rural workforce to move into cities and start working in industry, which in turn led to rapid urban growth. The accelerated urbanization triggered by the Industrial Revolution remains a present-day phenomenon. Finally, the commercial role—the distribution of goods and products—was one of the main reasons for the emergence of cities and continues to play a defining role today. Most cities emerged along trade routes, at river crossings, or in coastal port locations. While the importance of the defensive and religious functions has diminished over time, the commercial function still exerts a significant influence on urban development (Kovács and Vida, 2020).

In spatial economics, particularly regarding the location of cities and market centers, the position of a settlement determines its long-term opportunities. As technology advances, the spatial structure of cities evolves as well. A notable example is that, with the development of transportation and especially the advent of motorized vehicles, the significance of the distance from which labour, the raw materials needed for production, and goods intended for sale originate has decreased (Kovács, 2000). While transportation has become much faster over time, its cost implications remain substantial. From the perspective of corporate competitiveness today, it is of crucial importance to consider the geographical proximity of the site to both the target market and sources of raw materials.

One of the earliest and most influential approaches to the theoretical study of economic spatial structure was developed by Johann Heinrich von Thünen in his work *The Isolated State*. Although earlier economic observations with a spatial dimension had been made—such as Adam Smith's writings on the division of labour and market access—Thünen's model was the first to systematically organize the relationship between land use and transportation costs in an exact manner, based on spatial logic. The model is particularly significant in that it simultaneously highlights the economic rationality of production and its spatial manifestations (Beckmann, 1972). Thünen's theory holds epoch-making importance not only in the field of agricultural economics but also in the broader context of spatial economic thought, and it can even be regarded as a forerunner of modern economic models (Samuelson, 1983).

Literature Review, Research Questions, Sources, and Methods

This study examines the extent to which the principles of Thünen's location theory were reflected in the 19th-century economic structure of the former market town of Vörösmart. It seeks to determine which elements of Thünen's theoretical framework can be identified in Vörösmart's economy at that time, and to what extent the local land use structure mirrored the logic of his concentric zones. The analysis also explores whether the marketing of agricultural products—through weekly markets or long-distance trade—confirmed the functioning of Thünen's model, and how local natural conditions such as topography, soil quality, and water supply influenced the formation of economic zones. Furthermore, it considers the ways in which socio-economic stratification, for example between landowning peasants and cotters, was reflected in the spatial patterns of land use and production. In addition, the study aims to highlight how Vörösmart's economic structure—built along the lines of Thünen's principles—contributed to the settlement's ability to maintain economic stability even after the World War I, when new borders and trade restrictions brought about significant isolation.

For the presentation of Thünen's location theory, both domestic and international literature was used, providing a solid foundation for outlining the theory. In the first part of the study, I aim to present the theory briefly. Since, in addition to the original work, numerous studies analyse Thünen's location theory in detail, it is not my objective to examine it comprehensively. Following a concise introduction to the theoretical framework, the focus will be placed on the main findings related to the production zones. In this context, Vörösmart's economy will be characterized according to Thünen's model of production zones.

The analysis of Vörösmart's economy was carried out using contemporary cadastral maps and other historical sources, such as period articles, military and cadastral maps, and archival materials. Due to source limitations, statistical analysis proved to be one of the most effective methods for studying the former market town. The data collected during censuses provide a realistic picture of the region's historical economy. During the 19th century, the Austro-Hungarian Monarchy conducted several censuses in the area. The last census before the dissolution of the Monarchy took place in the early 20th century, in 1910.

The background and circumstances of the creation and publication of Thünen's *The Isolated State*

Johann Heinrich von Thünen was born in 1783 in Canarienhäusen, East Frisia, as a descendant of an old free Frisian landowning family. Even during his secondary school years, he received practical agricultural training, although he never completed his university studies. After the turbulent years of the Napoleonic Wars, in 1810 he purchased the 700-hectare Tellow estate, located 37 km from Rostock, where he developed a model farm. From the outset, he kept meticulous records of even the smallest details of economic activity, and these notes later served as the empirical basis for his book (Petersen, 1944; Waentig, 1930).

By 1820, he had gathered sufficient data and published *The Isolated State*² in German. The book can be divided into three main parts: the structure of the isolated state, the comparison between the isolated state and reality, and the impact of taxation on arable farming. The second, expanded edition appeared in 1842, examining the relationship between wages, the interest rate, and land rent. Thünen personally supervised this edition shortly before his death in the same year. While the volume primarily deals with income distribution, it also addresses spatial issues, particularly in the introduction and sporadically in the subsequent chapters.

The third and fourth volumes contain Thünen's shorter writings and notes. The fourth volume focuses mainly on topics such as land rent, forestry, and the valuation of timber stocks, as well as spatial issues, including settlement structure, population density, industrial agglomerations, and the role of transportation (Waentig, 1930).

The theoretical framework and methodological approach of *The Isolated State*

The primary aim of the work is to examine the spatial structure of land use. The author devotes considerable attention to how transportation costs, production intensity, and land rent influence agricultural decision-making. His theory is characterized by the fundamental idea that the principal endogenous factor is the pattern of land use, which is determined by the rational decisions of individual farmers. The methodology of *The Isolated State* is based on an idealized model, presenting the interrelationships through a simplified, abstract representation of reality (Dusek, 2013).

The first two pages of the book outline the theoretical assumptions—the framework—within which the isolated state operates. According to these assumptions, the *Isolated State* consists of a city situated in the middle of a fertile plain without navigable rivers or canals. The quality of agricultural land on this plain is uniform everywhere. At a great distance from the city lies wilderness, which cuts off the state from the outside world. The city is thus the only settlement supplying the countryside with handicraft products. It obtains its food and raw materials from the surrounding rural areas and nearby mines, meaning it cannot establish trade relations with any other settlements.

² The full title of the book is *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*, meaning *The Isolated State in Relation to Agriculture and Political Economy*. The subtitle of the first edition is *Untersuchungen über den Einfluß, den die Getreidepreise, der Reichtum des Bodens und die Abgaben auf den Ackerbau ausüben*, which translates as *Investigations into the Influence of Grain Prices, Soil Fertility, and Taxes on Arable Farming*.

From the perspective of this study, this raises a crucial question: under such circumstances, what kind of agricultural production develops, and how does distance—whether greater or smaller—from the city influence agriculture? To address this question, Thünen marked the various production zones with concentric rings (Samuelson, 1983).

Abstraction plays a major role in the development of the theory, as without it, it would be difficult to formulate comprehensive scientific models. The departure from reality manifests in several dimensions, including assumptions about spatial relations, transportation characteristics, economic structures, and decision-making behaviour. According to these assumptions, the terrain is flat with no mountains, there are no navigable rivers or canals, the soil is of identical quality and equally suitable for cultivation everywhere, and the climate is uniform. The city lies at the center of the land area (the concentric rings), while the outer edge (the area beyond the concentric rings) is uncultivated wilderness (Beckmann, 1972).

On the plain, there is only one city, completely isolated from external markets. The scattered producers across the plain all sell their goods in the city, and goods can only be sold at the market. As for transportation assumptions, all transport is carried out by horse-drawn wagons, and the cost of transport is proportional to the product's weight, volume, and price. The producer bears the cost of transportation. The economic assumptions state that product market prices are fixed, industrial production takes place within the city, and there are no taxes. The behavioural assumption is that economic actors behave consciously and rationally (Thünen, 1966).

Thünen's Production Zones

Thünen represented the production zones as concentric rings. At the centre of these rings stood the city, which in this interpretation is equivalent to the market where the goods produced in the surrounding zones were transported for sale. The production zones were established according to four main principles.

The first principle states: *"Given identical production costs, those goods that yield the lowest return per unit of area—measured by weight—should be produced farthest from the city."* In simplified terms, under identical conditions, goods that produce a greater mass per unit of land should be cultivated closer to the market, as their transportation costs are higher. Considering the efficiency of transportation methods in Thünen's time, this assertion was entirely reasonable. It follows logically that goods requiring lower transportation costs (being lighter and smaller in volume) should be produced farther away.

The second principle states: *"Of two products that yield the same output per unit of area, the one with the higher production cost should be produced farthest from the city."* Thünen determined the placement and order of the production zones based on the gross profitability of products (the difference between the unit price and production cost) in relation to transportation costs (distance). This principle therefore suggests that in the more distant zones, goods should be produced that generate greater profit per unit of land, since this extra profit offsets the higher transportation costs. Furthermore, the Thünen model assumes that the cost of production factors—such as subsistence goods, tools, and labour—decreases with distance from the city, the central market.

The third principle states: *"In general, it is clear that near the city, those products should be cultivated whose weight or volume is large in relation to their value... as well as those products that easily lose their quality and must be consumed fresh."* This means that perishable goods, regardless of their weight or production cost, should be produced in the immediate vicinity of the market. In the 18th and 19th centuries, when preservation posed serious challenges, this statement was especially true. For perishable products such as dairy goods, vegetables, and fruit, it was essential that they reach the market as quickly as possible.

Finally, the fourth principle states: *"The same type of product can be produced closer to the market only under a more intensive system of cultivation, and farther from the market only under a less intensive system."* This principle makes it clear that the intensity of agricultural production must

decrease with distance from the market. In the work, three forms of cultivation play an important role: crop rotation, ley farming, and the three-field system. Of these, crop rotation is the most intensive method, requiring significant human labour and input use, and was therefore practiced on land closest to the city. Since the production zones are depicted as concentric rings, the zones nearest the city contain the smallest land area. As one moves farther from the city, the amount of available land increases. Ley farming and the three-field system were practiced in the more distant zones, where larger areas were available. In these systems, different plots were left fallow each year, and livestock grazing areas shifted annually (Kovács, 1962).

Vörösmart's fit within the framework of Thünen's theory

Before analysing the 19th-century economic conditions of the settlement using Thünen's theory of concentric production zones, it is necessary to identify, in the course of introducing the settlement, those assumptions which in the theoretical model are taken as given, but which in the space and period under study were either not present in reality or applied only to a limited extent. I also aim to explain the reasons for these deviations from the model.

Vörösmart was built on the loess-covered hill known as Báni Hill. The Báni Hill is a loess-covered hilly region stretching along the course of the Danube River. Its average elevation is about 200 metres above sea level. The hill extends from Pélmonostor in a north-easterly direction all the way to the Danube, reaching Kiskőszeg (Lóczy, 1912). This hill was surrounded by marshland, so construction at the foot of the hill and the start of agricultural production only began after the construction of the Albrecht embankment (Dunántúl, 1911). In Thünen's model, the state occupies a flat area where soil quality is uniform throughout. By contrast, in the settlement under study, both loess-covered hills and humus-rich plains were present. The settlement also developed along the Danube River and, during the period studied, had a Danube port. Furthermore, in 1910, the Drava Valley railway line, which also served Vörösmart, was opened. In reality, therefore, transportation was not limited to horse-drawn carts (see: *Pécsi Napló*, 1910; *Pécsi Közlöny*, 1897). Several contemporary sources confirm that the settlement maintained active trade relations with the northern part of the former Baranya County, particularly with the Mohács district. This indicates that the local market cannot be regarded as isolated or independent from external trade, since economic connections remained intense at least until the 1920s.

Table no. 1: Examination of the Theoretical Framework

Thünen's Assumption (Theoretical Framework)	Reality (In the Case of Vörösmart)
Uniform, flat land area.	Hill, lowland, and marshland are all present.
No navigable river or canal.	Has a Danube port.
The soil is suitable for cultivation everywhere and is of uniform quality throughout.	Part of the area is floodplain and unsuitable for cultivation. There is a loess-covered hill favourable for viticulture and fruit production, as well as a humus-rich plain.
The climate is uniform throughout.	The settlement has a specific microclimate.
The market is isolated from the outside world.	Active trade with surrounding settlements.
Products are transported exclusively by horse-drawn carts.	Has a Danube port, and by 1910 was also served by a railway line.
Economic actors make rational decisions.	In reality, economic actors are able to make only limitedly rational decisions.

Source: Based on Thünen (1966), own compilation

It is reasonable for the reader to ask what purpose is served by examining the economy of historical Vörösmart through the lens of Thünen's theory when the theory's basic assumptions diverge so greatly from reality. However, all major towns were located at a considerable distance from Vörösmart, which led to a form of self-sufficiency within the settlement. The importance of this self-sufficiency is well illustrated by the statistical data from 1910, which demonstrate that agricultural production, animal husbandry, and small-scale crafts were all significant in the settlement.

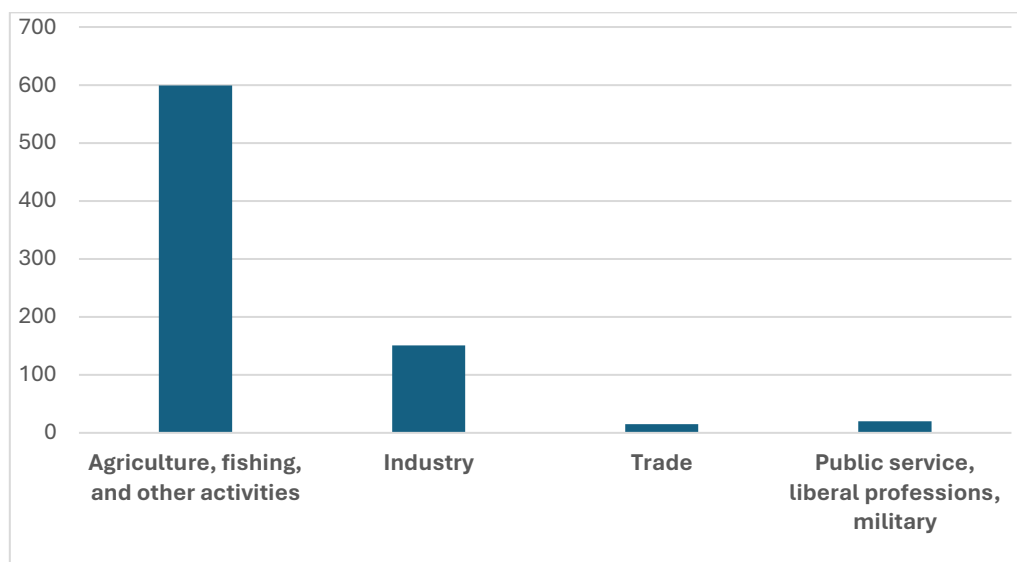


Figure no. 1: Employment statistics in Vörösmart in 1897

Source: According to the *Agricultural Statistics of the Countries of the Hungarian Crown (1897)*, own compilation

From the above figure, it is clear that the majority of Vörösmart's population worked in the agricultural sector. Among them, there were a total of 373 landowners or tenants in the settlement. In addition to agricultural production, industrial output was also outstanding. A total of 110 small-scale craft owners were recorded, which was considered exceptional within the Barnyavár district. These craftsmen primarily produced agricultural tools and household goods, most of which were sold at the local market. Accordingly, the settlement had significant textile, pottery, iron and metal, carpentry, food, and construction industries (*Agricultural Statistics of the Countries of the Hungarian Crown, 1897*). Thanks to its self-sufficiency, the settlement was able to maintain its economic stability even during the First World War and the subsequent economic crisis. Vörösmart's pursuit of self-sufficiency can be paralleled with Thünen's *Isolated State*, which likewise examines the potential for economic independence and the local utilization of resources.

Thanks to its location and central role, Vörösmart was granted the right to hold fairs in 1842, which at the time was still accompanied by the status of a market town (Lábadi, 2008). Under the Municipal Act of 1871, it lost its market town status, but retained the right to hold fairs (Orosz, 2002). As a result, it became a kind of commercial center in the region. The Vörösmart marketplace—known at the time as the *vásártér*—can be interpreted as the center of the concentric rings described in Thünen's theory of production zones, in much the same way that the central market fulfils this role in the *Isolated State* model.

The Thünen-Pattern of Land Use in the Case of Vörösmart

In *The Isolated State*, the production zones are depicted as perfect concentric circles. In reality, however, they cannot manifest in such regular circular forms. In Thünen's work, the primary function

of the circles is to represent the distance from the market; therefore, it is not strictly necessary to think of them as concentric circles.

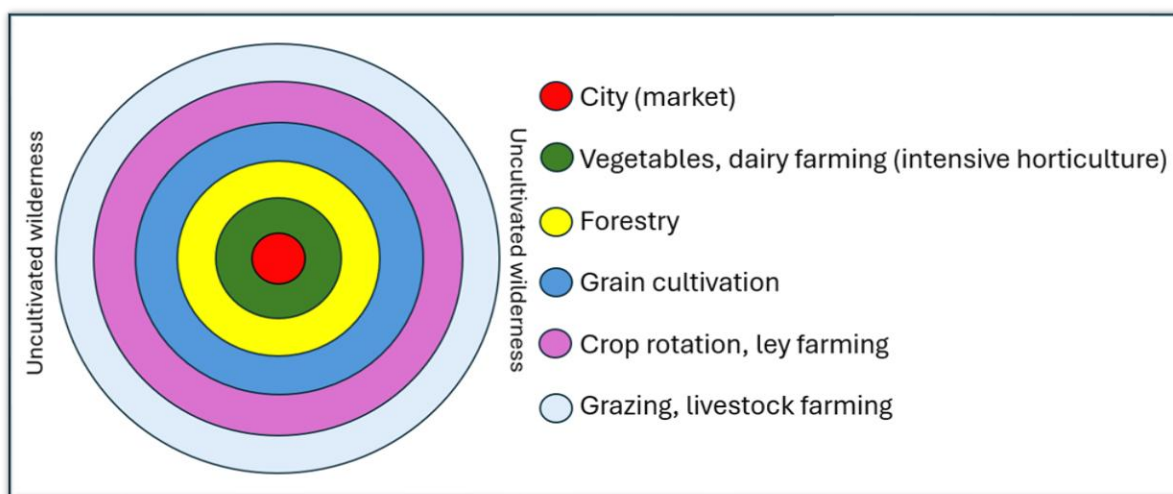


Figure no. 2: Thünen's Location Theory, Production Zones

Source: Based on Thünen (1966), Dusek (2013), and Kovács (1962), own compilation

Vörösmart was considered a prosperous settlement and was one of the municipalities with the largest territory in the Drávaszög region (*Dunántúl*, 1911). Naturally, the settlement's cadastral map does not reflect a regular circular shape.

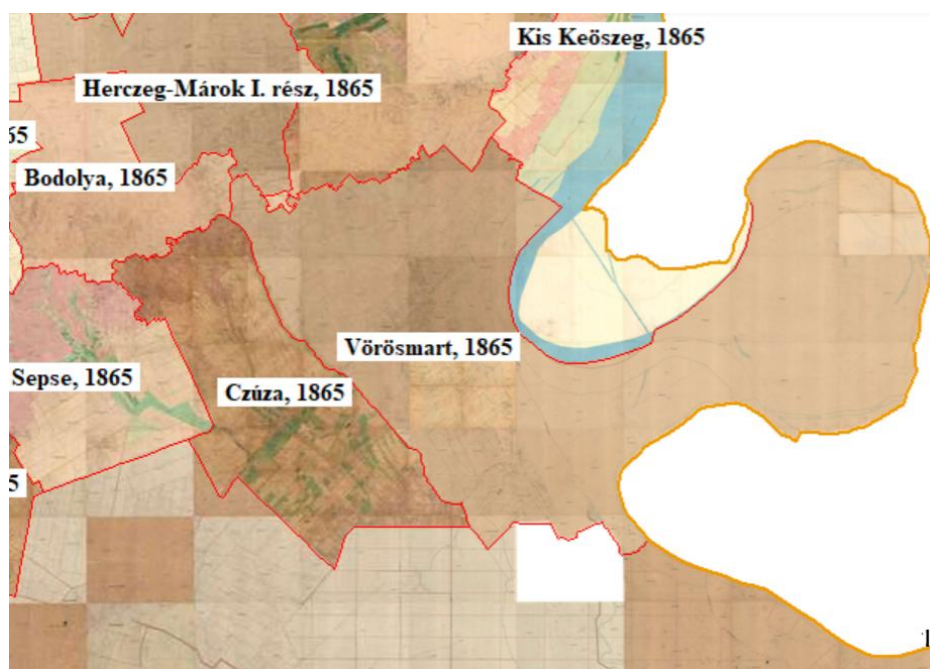


Figure no. 3: Cadastral Map of Vörösmart (1865)

Source: Arcanum Digital Map Collection, Habsburg Empire – Cadastral Maps (19th Century)

The analysis of the cadastral map from 1865 allows for several observations that provide valuable information for comparing Thünen's model with the actual spatial structure of the settlement under study. According to the map, part of the settlement's cadastral area—specifically the eastern section—is floodplain land unsuitable for cultivation.

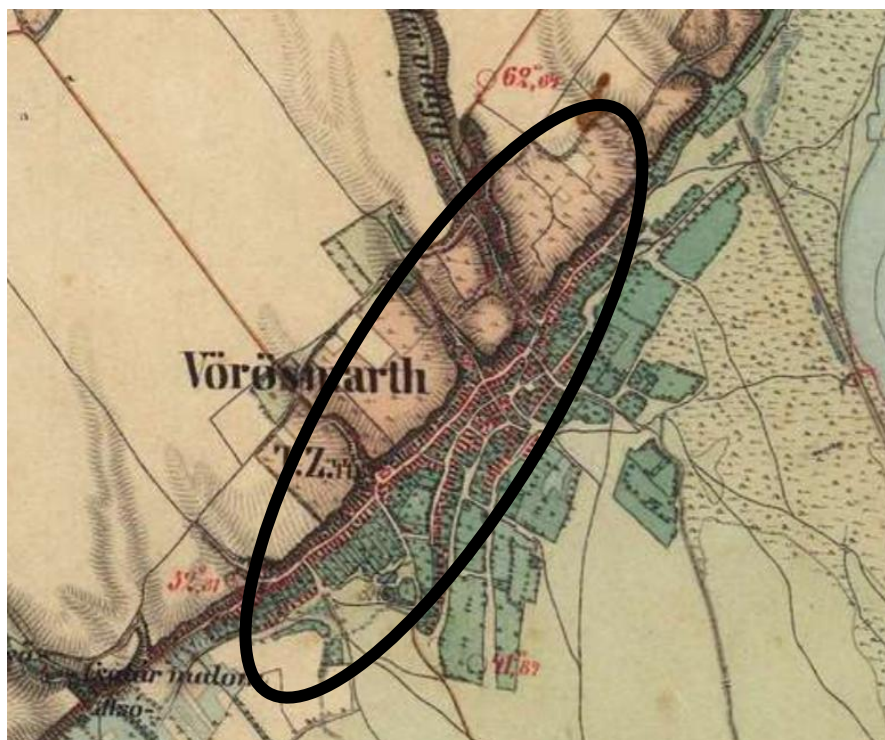


Figure no. 4: Map of Vörösmart, 19th Century

Source: Arcanum Digital Map Collection, Europe in the 19th Century

According to Thünen's fourth principle, the production zone closest to the city consists of freely cultivated farmland where intensive production takes place. In theory, this is where crops requiring greater care and attention are grown. In this zone, intensive production presupposes significant use of inputs and labour. Due to proximity to the market, perishable products are also located in this zone (Sinclair, 1967).

In the case of Vörösmart, the land closest to the center was used for horticulture, viticulture, and fruit production, which in many respects corresponds to Thünen's principles. On the hill (the northern part of Vörösmart), viticulture had always been practiced. By 1910, there were 617 holds of vineyards. The wines produced from the grapes grown there rivaled those of other regions in both price and quality. The superior quality of Vörösmart wine is reflected in the fact that its price exceeded that of premium wines produced in Villány (*Dunántúl*, 1911). Consequently, there was high demand for wines from the slopes of Báni Hill. Viticulture is an agricultural activity requiring intensive production. In the 19th century, grape cultivation demanded far more attention and labour than it does today. Vineyards were planted directly above wine cellars carved into the hillside, so during harvest, transporting the grapes was a relatively cheap and quick process. Proximity meant that reaching the vineyards required little time, leaving more time for carrying out the necessary work processes. In the lower part of the settlement and around the houses, gardens were established where various vegetables were grown. On the cadastral map, this area was referred to as "outer gardens." Like viticulture, horticulture requires intensive production, making it important for the gardens to be located close to the dwellings. These gardens were cultivated primarily for household needs, but part of the perishable produce was sold at the central market. For highly perishable products, proximity to the market was crucial. The 1865 cadastral map clearly shows that the land immediately surrounding the settlement had a heavily fragmented ownership structure, indicating high demand for land use near the residential area. This inner zone primarily included the plots closest to the settlement, such as Kis-hegy, part of Várhegy, Kígyósi-hegy, and, to the south, the Külső kertek ("outer gardens").

In *The Isolated State*, the second production zone is the so-called forest belt. Thünen includes forestry within this zone, particularly timber production (firewood, construction timber, and utility

wood). According to Thünen's principles, the more difficult—and therefore the more expensive—it is to transport a product, the closer it should be produced to the market (Kovács, 1962). The eastern part of Vörösmart, directly along the course of the Danube River, was floodplain covered with dense forest. This area is close enough to the settlement to be classified as part of the second production zone. In the 19th and early 20th centuries, utility timber and firewood were extracted here. Although in terms of proximity it fits the second production zone, it did not form a complete circle around the settlement—it was located on the eastern side only—thus it lacked the circular shape. The reason for this is that the floodplain was unsuitable for agricultural production, so the western part suitable for cultivation was used for farming instead. Regardless of its shape, timber extraction was carried out in accordance with Thünen's first principle. It should also be noted that there was another forested area farther to the south (Bokroshát and Seprőshát), which Vörösmart leased from the Bellye Estate (Archduke Albrecht, 1883). This area lay outside Thünen's second production zone; however, timber was also harvested there and transported by boat to the "Cserepes" port near the settlement.

Thünen classified intensive arable farming into the third production zone. In this zone, grain and less perishable crops are grown. Crop rotation is already observed here, which still indicates intensive land use. While grain is cumbersome and costly to transport, its durability allows it to be stored for long periods, providing sufficient time for transportation. Furthermore, in processed form, grain represents higher added value, as its market value and economic utility increase through processing (Fujita, 2012). In the case of Vörösmart, the horticultural zone is followed in a semicircle by the area of intensive arable farming. It is a semicircle because it does not extend into the floodplain, which was more characteristic of forestry and grazing. Several mills operated in the settlement, so most of the grain was transported there for processing. The following areas can be classified into the third zone: above Kishegy, the more distant part of Várhegy, part of Kígyós, and most of Kereked Főle.

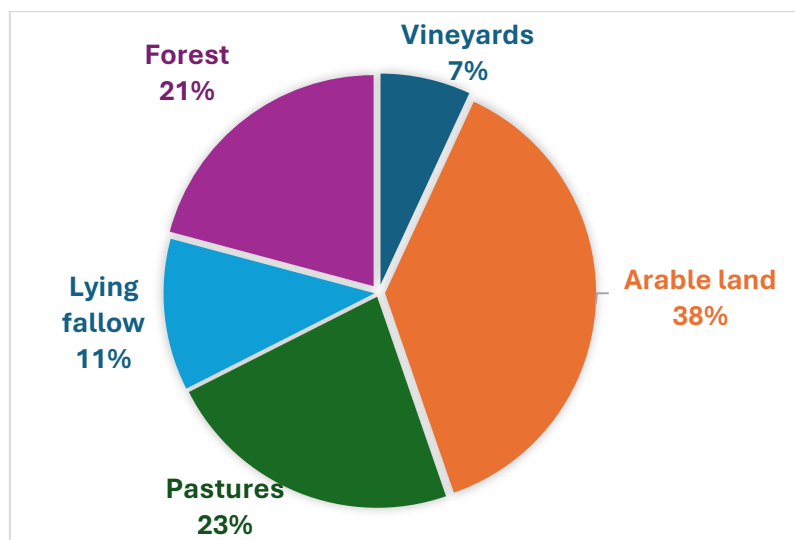


Figure no. 5: Distribution of Land Areas

Source: Based on the *Agricultural Statistics of the Countries of the Hungarian Crown* (1897), own compilation

In the *Isolated State* model, the fourth production zone is characterized by extensive agriculture and grazing-based animal husbandry. In this zone, larger land areas are available, and through the three-field system, significant yields can be achieved with relatively minimal use of inputs. Rotational grazing—mainly involving breeding and slaughter cattle—also appears here. Only dairy cattle are kept in the first production zone closest to the city, due to the perishability of milk (Kovács, 1962). In the case of Vörösmart in 1910, the distribution of land was as follows: 38% arable

land (including gardens), 23% pasture, 11% lying fallow, 7% vineyard, and 21% forest (MKOMS, 1897). Part of the fallow land and some of the pastures were located in the floodplain. When the waters receded, fodder was collected from these areas. According to the 1897 agricultural statistics, pig, horse, poultry, and cattle breeding were significant in Vörösmart. Sheep breeding was also present, though to a lesser extent. Cattle breeding focused entirely on dairy cows. A dairy cooperative operated in the settlement, with a total of 110 members. In 1900, its members delivered 6,377 liters of milk to the cooperative, which produced 230 kilograms of butter annually. In line with Thünen's principles, dairy cows were kept within the settlement and grazed on the nearest available land, both due to the perishability of milk and to facilitate milking. However, their fodder was collected from more distant meadows.

Table no. 2: Livestock in Vörösmart in 1897

Animal	Quantity (head)
Cattle	404
Horse	511
Pig	1452
Poultry	8688
Sheep	89

Source: Based on the *Agricultural Statistics of the Countries of the Hungarian Crown* (1897), own compilation

In the case of Vörösmart, the fourth zone also mainly comprised larger, contiguous areas used for grain production. In the south, Kerekedálja, Sétánfok szél, and Kandá fell within this zone, while in the north, Kígyós, Hársas alja, Barátok völgye, Csatári szántó, and Esze alja belonged here.

Thünen classified extensive livestock farming in the outermost zone. In *The Isolated State*, this zone lies far from the city and encompasses vast areas, which are well-suited to grazing-based animal husbandry. While the previous zone was, according to Thünen, characterized by beef cattle raising, here coarse- and fine-wool sheep farming predominated. One might rightly ask why livestock farming was placed so far from the city center. The answer lies in the fact that animals are easy to transport, as they can walk to the market on their own. The real significance of sheep farming, however, was in wool production. In Thünen's time, wool was a highly marketable commodity, fetching good prices. Although transporting it was not straightforward, it was not perishable, allowing ample time for delivery. Moreover, the revenue from wool sales more than covered the additional transportation costs (Dusek, 2013). In Vörösmart, sheep farming played only a marginal role; in 1910, only 89 sheep were recorded in the settlement, a small number that indicates the species was not a defining element of local animal husbandry. I found no reliable sources on exactly where these sheep were grazed. However, cadastral maps clearly show that the so-called "Szönde meadows" were located in the areas farthest from the village. From this, I infer that part of the fodder for the animals was obtained from there, meaning that this zone also shows some parallels with Thünen's theory.

The last two economic zones north of Vörösmart are less clearly identifiable. This is due to the proximity of neighbouring settlements, which leaves little land available for division. As a result, the available plots are used for intensive production. The same applies to the western part of Vörösmart, where the settlement borders the village of Csúza. Only in the south can Thünen's economic zones be identified with relative precision; in this area, they are well delineated and correspond closely to the four Thünen principles outlined earlier. This effectively illustrates why Thünen chose to place his observations in an environment completely isolated from the outside world.

It is noteworthy that the historical and social dimensions of the spatial structure—such as the fragmentation of land ownership, the emergence of railway and shipping opportunities, and foreign trade relations—influenced the location of the zones but did not override their economic logic. The

results show that the Thünen model provides a flexible theoretical framework that can still be relevant in describing economic space today. The settlement under study demonstrates that the model's basic principles can be valid even when reality differs significantly from the model's idealized framework.

The significance of Thünen's principles in the economy of Vörösmart after the Treaty of Trianon

Following the Treaty of Trianon, parts of the southern territories were detached from Hungary. In 1922, the final border was established, and as a result, the Drávaszög and Bácska regions became part of the Kingdom of Serbs, Croats and Slovenes (Gulyás, 2021). This new border separated the area from the northern Baranya settlements, while the constant and strict control of the South Slavic authorities significantly hindered—and eventually rendered impossible—the maintenance of commercial relations with the northern territories. At that time, no bridge connected the Drávaszög to Bácska, meaning that locals could only cross the Danube by ferry. River traffic was irregular, and during the winter months, when the Danube froze, all transport stopped for months (Bács Megyei Napló, 1932, March 25, p. 3).

These circumstances led to the economic isolation of Vörösmart after 1920. However, due to its self-sufficiency, the settlement managed to maintain economic stability for a long time. The Bellye estate, one of the largest estates of the Austro-Hungarian Monarchy, was plundered by South Slavic settlers after the annexation, and parts of its territory were distributed among the newcomers (Kaposi, 2022). Since parts of the Drávaszög settlements belonged to the estate, most villages suffered a severe economic crisis. Vörösmart, however, had only a small proportion of its territory within the estate, and thus, thanks to its self-sufficiency, it was able to preserve its economic stability even in difficult and uncertain times.

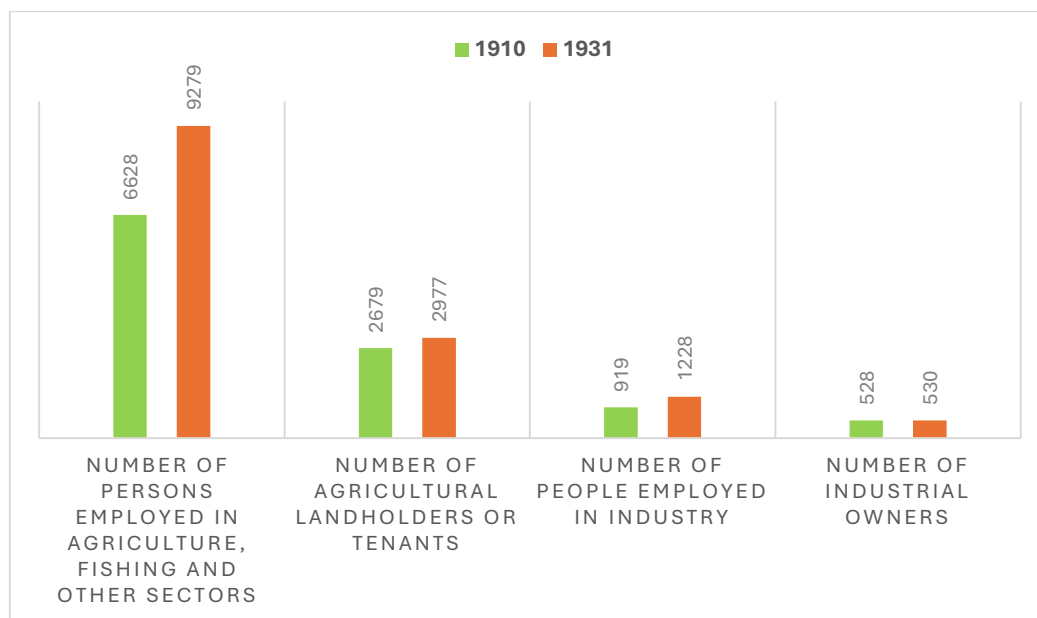


Figure no. 6: Changes in the economy of the district of Batina between 1910 and 1931

Source: Own editing based on the data of the 1910 and 1931 censuses (Batinai district)

Following the isolation caused by the Treaty of Trianon, the economic structure of the Batina district – to which Vörösmart also belonged – underwent significant changes. Statistical data show that between 1910 and 1931, the number of people employed in agriculture, fishing, and related sectors increased from 6,628 to 9,279, indicating the growing role of agricultural production. Particularly noteworthy is the increase in the number of agricultural landholders or tenants (from

2,679 to 2,977), reflecting a strengthening of local self-sufficiency. This development corresponds closely to Thünen's principles, as farmers with their own land were more likely to engage in production adapted to the proximity of the market and local conditions, thereby ensuring the food supply of both the settlement and the district. Although no direct statistical series for Vörösmart from 1931 is available, the district-level data suggest that similar processes were likely taking place in the village as well. This supports the conclusion that economic stability was maintained in the interwar period, due in part to a self-sufficient economic structure aligned with Thünen's principles.

This represents a clear example of how an economy structured along Thünen's principles could contribute to the survival of a settlement under extreme circumstances. The village's production patterns—concentrating perishable goods and intensive cultivation close to the centre, while using outer zones for less intensive agriculture and livestock—created a resilient economic structure. When external trade links were cut off, this localised, zone-based organisation allowed Vörösmart to rely primarily on its own resources, mitigating the impact of geopolitical changes and border shifts.

Conclusion

This study examines the applicability of Thünen's location theory in describing the spatial structure of 19th-century Vörösmart. Johann Heinrich von Thünen was among the first to recognize the significance of spatial economics. While managing his estate in Tellow, he meticulously recorded every piece of data. From the insights gained from this dataset, he developed his life's work, more widely known by its abbreviated title, *The Isolated State*. The work systematically organizes the relationship between land use and transportation costs in an exact manner, based on spatial logic. *The Isolated State* depicts a fictional state whose centre is a city—in this sense, the market. The production zones are represented as concentric circles, each forming a distinct production zone. These zones are defined according to their distance from the city, production costs, transportation costs, and product prices. The framework within which the isolated state was conceived is fictional and far removed from reality, with key characteristics including uniform space and soil quality, the absence of foreign trade and external relations, the lack of certain means of transportation, and the assumption of the rationality of economic actors, among others.

Despite the idealized nature of the framework, certain elements of Thünen's theory can be recognized in the economic structure of 19th-century Vörösmart. Using the systematically collected statistical data from the 1910 census and the 1897 agricultural survey, along with contemporary cadastral and military maps and newspaper articles, it is possible to identify the settlement's economic spatial structure. The market of the settlement can be considered the center of Vörösmart's cadastral area. In accordance with Thünen's principles, vegetables, fruit, dairy products, and grapes were produced closest to the center in the 19th and early 20th centuries. Similar to the model, forestry occupied the second production zone; however, this area was not arranged in a complete circle around the town. Timber harvesting was carried out in the eastern floodplain, while the remaining western section of the second zone was used for grain cultivation. In the case of timber production, proximity to the market was important due to the high transportation costs. Following the model, this was succeeded by the third production zone, characterized by intensive agricultural production, mainly grain, which could be stored for long periods without spoiling. The further one moves from the settlement, the greater the discrepancy between Vörösmart's example and the theoretical model. The livestock production zone—which in Thünen's model is located farthest from the market—can only be identified in the south, where large meadow areas provided fodder for livestock raised in the immediate vicinity of the settlement. The main reasons for these differences are that Vörösmart had to share parts of the surrounding land with neighboring settlements, and that some of its area was floodplain unsuitable for grain cultivation. The fit of the model was further complicated by the fact that, in addition to horse-drawn carts, other means of transport—railway and boat—were also available.

The resilience of this economic structure became particularly evident after the Treaty of Trianon, when new borders in 1922 placed the Drávaszög region within the Kingdom of Serbs, Croats and Slovenes. The settlement became economically isolated due to the loss of direct links to northern Baranya and the strict border controls of the South Slavic authorities. Nevertheless, the zone-based, self-sufficient organisation of production—closely aligned with Thünen’s principles—enabled Vörösmart to sustain itself under these extreme conditions. Even as neighbouring villages dependent on the Bellye estate faced economic crisis, Vörösmart’s diversified, locally oriented economy allowed it to preserve stability during the interwar period and the turbulent decades of the 20th century.

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