



## MARKET CAPACITY FROM THE VIEWPOINT OF LOGISTIC ANALYSIS

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**Abstract.** The paper discusses market potential and market capacity as a relevant problem of logistic analysis in economy. The emphasis is laid on the concept of market capacity which is comprehended as market potential (the other term occasionally referred to is 'potential capital') and which is also the highest possible, from a theoretical viewpoint, amount of product/service sales that could be reached within a certain period of time by all the companies in the market. The paper focuses on the actually complete market (actually covered market) and on market niche (the uncovered part of markets). Studies show that from the viewpoint of logistic analysis, markets can be divided according to their closure. It has been established that according to the degree of closure a market can be open, close and intermediate. Possible scenarios of partly closed market formation have been studied. Results show that with the intensification of market closure, the economic system is essentially changing its behaviour.

**Keywords:** market capacity, gap, logistic analysis, demand, supply.

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### 1. Introduction

In modern society market activity is the most important tool for the organization of an entire economy (Zavadskas and Kaklauskas 2008; Girdzijauskas 2002, 2003, 2004, 2005). This paper discusses market in the view of its capacity. Market is considered from the standpoint of logistic analysis. Here the capacity of market is defined by the possibility of transactions, their

volume and value. The volume and value of transactions can be calculated within a certain time period (e.g. a year) and during the life-time of a commodity or service.

*The aim of the research* was to study markets from the standpoint of logistic analysis (see Fig. 1), i.e. to evaluate the capacity of markets according to their closeness with respect to logistic analysis, and to differentiate markets according to their capacities.

*Object of the research* is the market capacity and the problem of its closeness as well as other related components, i.e. potential market, market niche, real market, market gap and other subjects.

*Research methods:* theoretical analysis based on literature analysis and conclusions, comparisons, evaluation; generalization; abstraction, systemic analysis and modelling. Logistic model was studied by means of IT.

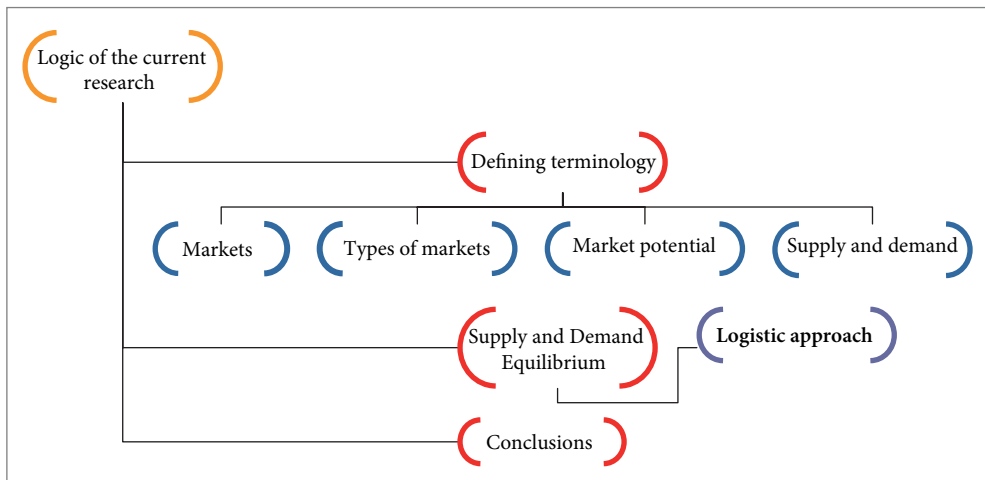


Fig. 1. Logic of the current research

The logic of the current study is presented in Fig. 1. The focus of defining terminology would lie on establishing types and characteristics of the following terms and concepts: a) markets; b) types of markets; c) market potential (and related concepts from Economics and Marketing); d) supply and demand. Further on, supply and demand equilibrium is pointed out as a precondition for a new theoretical approach introduced in this paper, namely the *logistic approach*, which is finally followed by the conclusions.

## 2. Defining terminology

The purpose of this section is to introduce the major terms in our research field, namely: a) a market; b) the types of markets; c) market potential; d) supply and demand. These terms would serve us a joint moment to follow our research goal of introducing the logistic approach in market capacity evaluation.

## 2.1. Defining a market

The literature of economics and marketing provides a number of various market definitions. Below are some of the most common ones:

“*Market* is a combination of commodity and monetary relationships, an exchange of commodities and services that take place between customers and salesmen according to the laws of production and circulation” (Jakutis et al. 2007).

“*Market* is an economic exchange system where two groups of market subjects interrelate based on different interests: customers and salesmen (consumers and manufacturers)” (Davulis 2009).

“*Market* is a sphere of exchange where a process of purchase and sales takes place” (Martinkus and Žilinskas 1997).

“*Market* is a meeting place for customers and salesmen, where demand and supply equilibrium exists, regulating mechanism expressed in price during the commodity exchange process” (Pranulis et al. 2008).

As indicated in the definitions above, the focus of the market is the exchange, whether defined by economists or marketing specialists. The economics would emphasise the demand and supply equilibrium and commodity and monetary relationships; while marketers would be more interested in customers and salespeople on one hand, and consumers and manufacturers, on the other one – focusing on market participants.

The size of market is associated with the number of consumers who need a certain market offer. Market is also associated with the price level. In economic literature (Davulis 2009), price is emphasized as the most important market parameter which indicates trade surplus and shortage. It should be emphasized that competition is one of market elements because it leads to setting the price.

## 2.2. Defining the types of markets

Economic literature (Mankiw 2008; Mankiw and Taylor 2006; Hall and Lieberman 2008; Hirschey 2009; Parkin et al. 2008; Carbaugh 2006; McConnell and Brue 2006) distinguishes these types of markets:

1. *Perfect competition market*, where consumers buy goods and manufacturers sell them at the same price.
2. *Monopolistic market* which refers to one manufacturer in the market.
3. *Monopolistic competition market*, i.e. a market where small manufacturers (service providers) prevail and produce similar products or provide similar services.
4. *Oligopolistic market* is dominated by some large competing companies producing the same product or close substitutes.

The fifth type of market is determined as *the market for the factors of production* is differentiated from the markets of product/service factors and includes the elements of *land, labour, capital and entrepreneurship* (Madura 2006; Friedman 2007; Grundey 2007; Mankiw 2008; Krugman and Obstfeld 2008; Grundey 2008; Todaro and Smith 2009). The market of factors of production is limited by the demand of products which need certain production factors.

In our paper, the market for the factors of production is discussed in the light of supply and demand of production factor in a particular economic sector. Here, by factors of production, we consider:

- a) *natural resources or land,*
- b) *labour or labour force,*
- c) *capital or production implements,*
- d) *qualification as the fourth production factor is emphasized.*

### 2.3. Defining the market potential: a variety of perspectives

Market has to function, only then it has potential. Among the parameters pertaining to the market is primarily market size that is inseparable from the *market potential* (Table 1). Here again, the focus of our perspective is the economic and marketing approaches.

We have to emphasise that *three major perspectives* and terms have been identified in the literature:

- Perspective No. 1: the market potential.*
- Perspective No. 2: the marketing potential.*
- Perspective No. 3: the potential market.*

**Table 1.** Selected definitions on market potential

No.	Source	Definition	Identified Approach
1.	McDonald and Christopher (2003: 182)	<i>Market potential</i> has been defined as the maximum possible sales opportunities for all sellers of a good or service.	Economics
2.	Stevens <i>et al.</i> (2006: 100)	<i>Marketing potential</i> is a quantitative measure of a <i>market's capacity</i> to consume a product in a given time period, which is a prerequisite for assessing profitability.	Economics-Marketing
2.	Kotler, Keller (2007)	<i>The potential market</i> is a group of consumers interested in market offer.	Marketing

Source: compiled by the authors.

Here we present a polemic discussion on the three identified concepts.

*The potential market* is a group of consumers interested in market offer (Kotler and Keller 2007). Other authors consider potential consumers (who might be interested in commodities offered by a company) to be potential market, but only those who have earnings to obtain these commodities (Pranulis *et al.* 2008). *The potential market* is also defined as a total of product sales an organization makes in a specific market (Stanton *et al.* 1991). Stevens *et al.* (2006) indicated that “*marketing potential* is a quantitative measure of a *market's capacity* to consume a product in a given time period, which is a prerequisite for assessing profitability” (Stevens *et al.* 2006: 100).

“**Market potential** has been defined as the maximum possible sales opportunities for all sellers of a good or service. As such, it refers to the potential sales that could be achieved at a given time, in a given environment, by all the firms active in a specified product/market area or segment. Thus the concept of market potential extends our view of the market for our product, in that we see the product as competing against alternative means of satisfying the same need” (McDonald and Christopher 2003: 182).

Kotler and Armstrong (2010: 589) have identified and grouped **indicators for market potential** as follows:

**Group 1: demographic indicators** (education, population size and growth, population age composition);

**Group 2: sociocultural indicators** (consumer lifestyles, beliefs and values, business norms and approaches, cultural and social norms, languages);

**Group 3: geographical indicators** (climate, country size, population density – urban, rural, transportation structure and market accessibility);

**Group 4: political and legal indicators** (national priorities, political stability, government attitudes towards global trade, government bureaucracy, monetary and trade regulations);

**Group 5: economic indicators** (GDP size and growth, income distribution, industrial infrastructure, natural resources, financial and human resources).

Thus, market is more than a direct consumer demand for goods or services. In fact, consumers are interested in market products; they have specific income level and opportunity to accept a specific offer to buy a product or service.

In our further studies and calculations, we will consider the **market potential** as the *maximum amount of capital that can be rationally invested in a particular market. Such investment can be calculated in absolute values (monetary units) or use of the values within a time unit.*

#### 2.4. Defining supply and demand: modern perspective

The market is a meeting place of sellers and buyers, where in the process of exchange of goods or services, there is supply and demand equilibrium governing mechanism. Consequently, demand and supply must meet the equilibrium (Schall and Haley 1991). Actually, the place for the meeting of buyers and sellers may be virtual in nature.

The laws of market can be more easily understood when considering an ideal model of a competitive market in which there are two main parties: a) those who purchase goods and services, and b) those who sell them.

Thus, an individual buyer (consumer) and an individual seller (manufacturer) are two forces acting in an ideal competition market. The buyer, as an acting force, shapes market demand and the seller shapes market supply.

Even though, the aim of this paper does not imply a broad discussion on the origins of defining supply and demand, a brief summary could be beneficial. The polemic discussion on demand and supply could be dated back as far as 1776, when *Adam Smith* offered his perception on the matter in the well-known piece of research *The Wealth of Nations*. This book proposed the idea of supply price being fixed. On the other hand, the demand was perceived as increasing or decreasing depending on the price situation, which could also be

decreasing or increasing. Further on, a well known economist *David Ricardo* presented his perception of the economic model in his book *Principles of Political Economy and Taxation* in 1817. From today's perspective, we acknowledge that Mr. Ricardo's model preconditioned his ideas in defining supply and demand.

From today's perception, *supply* is an economic category listing the volume of goods and services that can be offered by manufacturers (suppliers) at different prices (Shone 2001). Whereas, *demand* could be defined a need or desire to obtain an item or service within the scope of available funds (Sterman 2000). The most important profitability factor of the company is the demand of its products or services.

Thus, supply and demand are the basic concepts of every economic system. Based on the interaction of these two factors, market price is developed in an ideal competition market. This is understood as a law of demand and supply. By drawing the so-called demand and supply curves it is possible to find out how the behaviour of consumers and manufacturers changes with changes in the prices (Martinkus and Žilinskas 1997).

Hence, the supply is the dependence of the amount of services sold by companies and the prices (Pranulis *et al.* 2008). To put it simply, it is a disposition to sell based on the desire and ability to sell.

Factors determining supply (Sterman 2000; Carbaugh 2006; Parkin *et al.* 2008):

- price of goods and services;
- price of alternative goods and services;
- change of technologies;
- price of resources;
- taxes;
- other factors.

### 3. Supply and demand equilibrium in market capacity: the logistic approach

Since the supply is directly linked to the price and quantity, the law of supply, i.e. supply curve is formulated in the following way: there will be more goods offered and sold if their price increases. It could also have a reverse version: there will be less goods and services offered and sold if their price declines. Accordingly, the increase of price will increase the amount of supply, and the decrease in price will reduce supply.

Factors that determine the supply curve shifts are the same as those determining supply, except the price of the commodity. In other words, the supply curve will move to another location if one of the component factors starts to change. Movement of the supply curve up or down depends on the change of product's price. If there is no change in price but in any other factor, then the supply curve moves to the right or to the left.

The supply of some goods can adapt much more rapidly to changes in price than the supply of other products reflecting the elasticity of supply. When the supply of goods can not be quickly changed in negotiating the change of price, and when the amount of products to be sold does not change after the price has been increased, then the supply is said to be inelastic. On the contrary, when the supply of goods can quickly adapt to fluctuations in the

price and when the slightest increase in price leads to increase in the quantity of supply of goods or vice versa, the decrease of price decreases the supply of goods, then the supply of such product is said to be elastic (Bhaskar 2000).

The most important factor in the company's profitability is the demand for its goods (services).

Demand is a willingness to buy. It refers to the ability and desire to buy. Demand determining factors are as follows (Varian 2003; Krugman and Obstfeld 2008):

- price;
- customer income;
- taste and prioritizing;
- price of alternative goods/services;
- expectations on price change.

An inverse relationship between the volume of price and sales when everything else does not change is called a demand-based approach, i.e. a demand curve. This law states that there will be more goods or services purchased if their price declines with no changes in all other factors. Likewise, there will be less goods/services bought if their price increases with no changes in all other factors.

Factors that determine the demand curve shifts are the same as those determining the demand of goods/services except their price. The demand curve shifts to another location if a factor other than price changes. The equilibrium of supply and demand is the relationship between the volume of service (Q) and price (P) which satisfies the buyer's and seller's interests when their desires and possibilities overlap (see Fig. 2).

The equilibrium price reflects that the amounts of goods sold and bought are even. When the price is higher, the supply exceeds the demand. The unsold goods and competition between

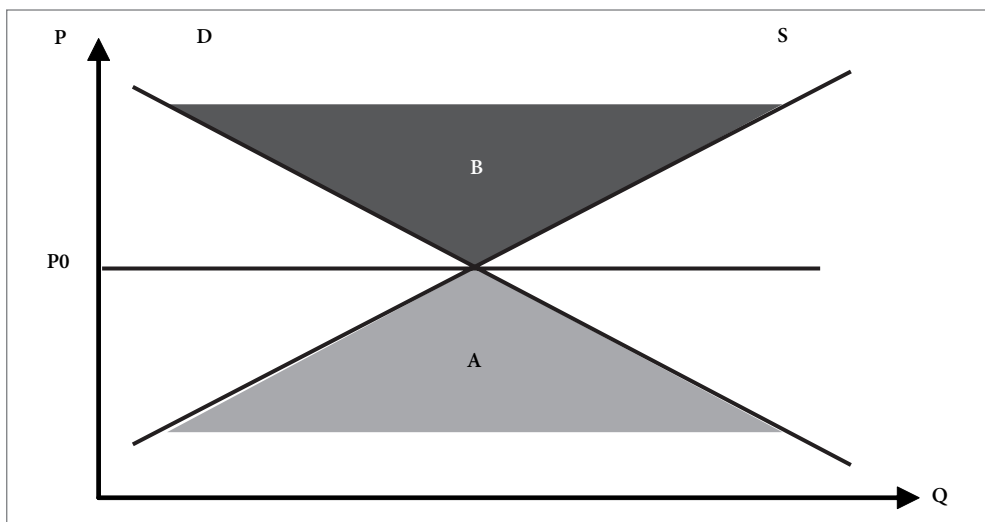


Fig. 2. Demand and supply equilibrium point

companies lead to a price reduction to the equilibrium point (Po) (see Fig. 2). With the price lower than the equilibrium, similar forces increase the price. When companies increase the price, the demand exceeds the supply to the equilibrium point.

Surplus (B) is when supply exceeds demand (price above the equilibrium point). Shortage (A) is when demand exceeds the supply (the price below the equilibrium point). A typical case is a market situation when the demand curve goes down and the supply curve goes upward, then market forces cause the price to move toward the equilibrium. This ensures market stability.

Thus, the amount of goods/services which a company wants and is able to sell in the market, the relation to the price at which the product/service is sold is called supply (Varian 2003). The relation between change in price and that of the amount of goods/services purchased in the market is relatively stable: the size of the demand of goods/services changes in the opposite direction with regard to the change in price (Girdzijauskas and Boguslauskas 2005). To summarize, it can be stated that the more developed the economy of a country, the richer and the higher is the number of goods/services. This fact indicates the direct dependency of the demand for goods/services on the supply.

High demand fills the market. Resolution of market capacity problem would make it possible to learn the essence of financial bubbles or that of credit trap (Girdzijauskas *et al.* 2009; Girdzijauskas and Štreimikienė 2008, 2009; Kaklauskas *et al.* 2009a,b, 2010). Market capacity can be defined as the amount of goods/services actually sold. Hence, market capacity can be understood as market receptivity to a particular product or service.

In practice, the impact of market capacity as well as that of market (capital) niche occurs if only the investment is valued on the basis of the logistical function of capital growth. Market capacity can be understood as capital amount which can be efficiently assimilated by the investment environment (Bodie *et al.* 2001). Considering the population size (K) a function of time (t), the absolute growth of product can be modelled by exponential formula (Girdzijauskas 2008):

$$K = K_0(1 + i)^t, \tag{1}$$

where  $K_0$  – the initial value of the product (product amount);  $i$  – growth rate.

In economy the growth of product is limited due to the market saturation. Let us consider the P. F. Verhulst’s (1804 to 1849) differential equation on the population growth.

$$\frac{dK}{dt} = \left( 1 - \frac{K}{K_p} \right) \cdot k \cdot K, \tag{2}$$

where  $K_p$  – a potential (limiting or maximum) value of biological population or other product expressed by units estimating product quantity;  $k$  – growth rate evaluating coefficient (increase over a time unit).

Of all the possible proportion coefficient  $k$  values let us accentuate one that is equal the capital growth rate logarithm, i.e.  $k = \ln(1 + i)$ . Then, considering population a capital and having replaced time  $t$  by  $n$ , we will have as follows (Girdzijauskas 2002):

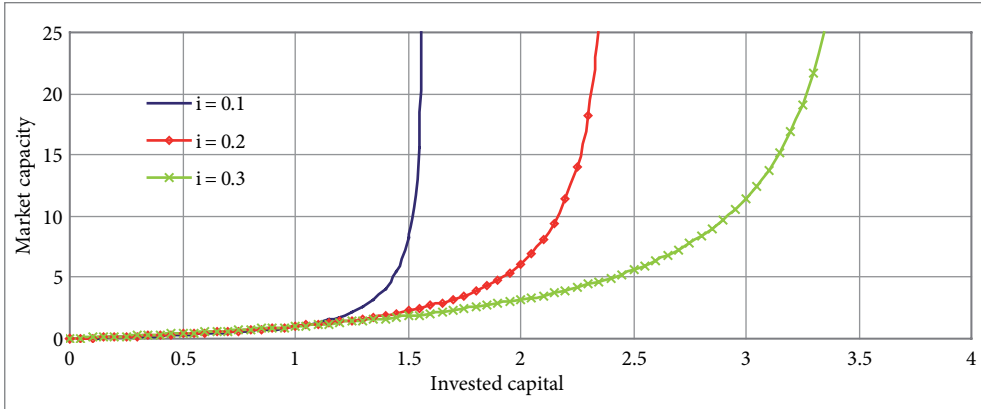
$$K = \frac{K_p \cdot K_0 \cdot (1 + i)^n}{(K_p - K_0) + K_0 \cdot (1 + i)^n}. \tag{3}$$



Here we will find the value of market capacity  $K_p$ .

$$K_p = \frac{K \cdot K_0 \cdot ((1+i)^n - 1)}{K_0 \cdot (1+i)^n - K}. \quad (4)$$

The obtained market capacity equation was used for evaluation of the dependency of market capacity size (potential value) on the value of invested capital at various interest rates (Fig. 3).



**Fig. 3.** Dependency of market capacity (potential value of size) on the amount of invested capital at existing various interest rates

In terms of market capacity, we see that its size depends on the value of invested capital: with the increase of invested capital, the capacity of market increases. The specific nature of growth should be noted: slow growth at the beginning and sudden, especially fast growth in later stages. Growth characteristics are the same at different interest rates. The difference here is merely that at higher interest rates, rapid growth phase occurs later.

How should the sudden growth be considered? If capital gradually increases when all other variables do not change (i.e. constant), capital values are achieved at which, due to the specifics of logistic system, it is necessary to rapidly increase market capacity. If market capacity cannot be increased, it is necessary to change other parameters, such as interest rate. If this cannot be done, the system becomes unstable.

While examining the markets from logistics aspect, we observe limitations of the markets or their closeness (in the latter formula it is the  $K_p$  value). A more detailed analysis shows that according to the degree of closeness (change in  $K_p$  value) markets may be opened or closed. There are also intermediate markets: the so-called half-closed or half-opened markets, i.e. with more than one characteristic. Here the logistical aspect of markets closeness should be distinguished from other types of coverage – geographical, political or other (although there is a certain, indirect connection among them). Most markets are opened or partially opened. For modelling open markets, composite interest (exponential) models are best suited.

As we see, **closed markets are modelled by means of logistic models**. The analysis of such models shows that there are *two ways for the emergence of a closed market* (Girdzijauskas 2008).

*The first one* occurs due to the continuing growth in profitability of investment, the supply may exceed the real demand and the insufficient demand limits the capacity of market. Often, this is the case of a real estate market. It is formed when the demand is artificially increased for speculative purposes (Girdzijauskas *et al.* 2007, 2008, 2009).

*The second way* is when limited supply brings about huge demand (frequently the demand is met during auctions). An example may be a rare items market. Essentially, these are rare goods. Here the market consists of that single commodity. These are mostly antiques, unique works of art, rare precious stones, some archaeological finds, etc. Trade in such goods is carried out in an auction, which highlights the specificity of consumer behaviour (bidding excitement, passion for gambling, hedonistic approach to consumption, etc.) (Girdzijauskas and Štreimikienė 2008, 2009; Štreimikienė and Girdzijauskas 2008).

Logistic analysis shows that with the increase of market closeness the behaviour of producers changes, herewith, increasing the possibility of the occurrence of economic paradoxes. It should be emphasized, however, that not only the niche, but also the capacity of market volume is not a constant. With changes in market capacity there occur changes in the degree of market closeness with all its consequences, such as threats of instability, etc.

#### 4. Conclusions

1. The capacity of market is defined by the possibility of transactions, their volume and value. The volume and value of transactions can be calculated over a certain period of time (e.g. a year) and throughout the entire lifetime of a product or service.
2. From the logistic analysis point of view, markets can be classified according to their degree of closeness. In this respect, markets can be opened, closed or intermediate.
3. For modelling open markets, the composite interest (exponential) models are best suited.
4. From the perspective of logistic analysis, closed markets are more important. Capital growth in such markets can be modelled by means of logistic models.
5. There are two possible ways for a partially closed market formation. First, when supply starts to exceed real demand and the insufficient demand limits (closeness) market capacity. Second, when limited supply causes a high demand.
6. Logistic analysis shows that with the increasing closeness of the market, the behaviour of producers and consumers also changes thus increasing the possibility of the occurrence of economic paradoxes.

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## RINKOS TALPA: LOGISTINĖS ANALIZĖS POŽIŪRIS

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**Santrauka.** Straipsnyje aptariamos rinkos potencialo ir rinkos talpos dimensijos kaip nūdienos ekonomikos problemų sprendimo galimybė logistinės analizės požiūriu. Autoriai nagrinėja užpildytą (prisitintą) rinką (praktiškai aprėptą rinką) ir nišos rinką (neapreptą rinkos dalį). Vertinant iš logistinės analizės perspektyvos, rinkos gali būti skirstomos pagal jų uždaramą. Nustatyta, kad pagal uždaramo laipsnį rinka gali būti trejopa: atvira, uždara ir vidutiniškai uždara. Išnagrinėti galimi iš dalies uždaros rinkos formavimosi scenarijai. Tyrimo rezultatai rodo, kad intensyvėjant rinkos uždaramui ekonomikos sistema keičia savo elgseną.

**Reikšminiai žodžiai:** rinkos talpa, atskirtis, logistinė analizė, paklausa, pasiūla.

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