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Transport cost in location practice and economic geography: traditional theories, some new dimensions and policy implications

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Abstract. This paper outlines the main theoretical approaches to the role of transport in spatial organization and investigates possible new extensions at a theoretical and practical level, focusing on the analysis of transport cost. Beginning from the traditional theories of spatial distribution and the location of economic activities under transport cost, the analysis focuses on the related approaches of the new economic geography, which are based on the assumptions of the known "iceberg cost". After that, through the presentation of indicative empirical studies, the paper attempts to clarify new issues that should be taken into account in the relevant theoretical considerations as well as in the political practice. Thus, factors such as the change of production structure in the modern economies with the production of more quality products, lower mass, and higher relative value and intangible goods, in combination with the improved transport technology, have contributed to a continuous reduction of the transport cost of raw materials and productive goods over the years. These developments along with the growing importance of cost of moving people should be taken into account in the new theoretical interrogations and the political practice of regional and urban development.

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1. Introduction: the constant impact of transport on localization patterns and spatial organization

Transport cost as well as infrastructures and related transportation services are important in the location choice of economic activities, the distribution of settlements, and the organization of space in general.

The evolution of location patterns of productive activities and the spatial distribution of settlements are not independent from the development of systems and means of transport. Before the great inventions in the field of transportation (i.e., until the mid of 19th century), the location pattern of production activities is characterized by a dispersion in space, which dominates until the middle of the nineteenth century. The size and the structure of the settlement network in Central Europe during the thirteenth century is the most obvious example. According to Benevolo (1980), the majority of the settlements had a population less than 30,000 inhabitants and localized in a range of 6 to 20 kilometers. The smallest settlements were connected to the main urban network, which consisted of just 24 cities with a population of 50–150 thousand inhabitants. During that period, the main location factors were the availability of raw materials such as minerals and wool; energy resources such as wood, wind, and water; and natural routes of commuting such as ports, river roads, and transport hubs. The inland waterways transport in Europe had experienced a period of dynamic development especially in the UK, which was the first country to acquire a nationwide canal network (Burton, 1995; Blair, 2007). Hence, although the transport has not yet developed, it largely keeps an important role in the location of activities and distribution of settlements in combination with the natural assets of the areas.

After 1850, a gradual increase of the mobility in economic activities is observed. Because the importance of previous factors for several more decades of this new period has not been significantly reduced, new factors influence the location of industries, pushing them to the large cities. The main factors consider transport, telecommunications, and energy. The steam navigation (1807), the railway (1829), and later the car formed the conditions for the rapid transportation of raw materials, intermediate and final goods, employees, and customers (Christofakis, 2007). The development of electrical energy gave the ability for the location and concentration of economic activities far away from the places where traditional sources of energy were produced. Furthermore, through the invention of the telegraph, new developments in the telecommunication sector allowed the contacts with distant markets instant information and decision making from far away.

In many European countries, including Germany, Austria, France, Great Britain, and the United States, several applications of scientific knowledge in the transport sector emerged during the second half of the nineteenth century. Practical engineering drawings for many types of machines and vehicles were prepared based on the use of steam, electric batteries, and various types of internal combustion engines. Tires with tubes were constructed in 1889, allowing the ability for higher speeds. Of course, the incision in the evolution of the type and method of car production happened during the first decade of the twentieth century by Henry Ford, through the application of mass production, introducing the method of chain assembly (Komninos, 1986).

The influence of these changes created concentrations of activities where there were services and labour for industries. The networks of telecommunications and energy and the increasing capacity of transport attracted industries in large markets. However, because of the higher transport cost of road and rail transport in relation to waterways, for many decades, the created urban concentrations were originally based on traditional settlements with favorable natural patterns, which transformed into major poles in the new conditions of transport developments. According to a recent research of Glaeser and Kohlhase (2004), of the 20 largest U.S. cities in 1900, which later evolved in important transport hubs as well as national and supranational megacities, 7 were ocean ports where rivers meet the sea. The largest city of them all, New York City, has nowadays become the largest port in the country and, moreover, one of the most important metropolitan concentrations of the world. Also, 5 cities were ports where rivers meet the Great Lakes. Even Chicago, one of the latest cities, evolved to a U.S. transport hub, taking advantage of its geographical position and enabling the movement of goods from America's vast hinterland to the East Coast and Europe. Moreover, 3 cities are located in the Mississippi River and 3 more are in the Ohio River, and the remaining 2 cities from the 20 largest cities are located in the East Coast rivers.

By examining the development of most major European cities, someone might find something similar to the U.S. example. According to Hall (1993), European hub cities of the nineteenth century attracted the first airports in the early twentieth century and the new high-speed railway systems in the late twentieth century.

In these circumstances and under the pressure of this intense mobility and continuing agglomeration of population and activities in the urban-industrial concentrations, the development policy is also adapted. In particular, the central state governments in many countries take the responsibility of organizing the infrastructure, and the industries are exempted from the related cost, which they would otherwise bear heavily. The organization of infrastructures (in which transport is included as a major part) in large cities highlights the importance of external economies and agglomeration economies due to the urban concentration (Perroux, 1955; Richardson, 1969). Furthermore, as already mentioned, transport plays an important role in the economy and space for the interconnection of market systems and movement of raw materials, goods, labour, and population in general.

For the past years, the technological development and the role of innovation and research and development have great importance to communications, to the location of economic activities, and generally to regional development. In many cases, the ability and the speed of knowledge transfer and information have a greater influence on the development of activities than the traditional means of transport (Christofakis, 2007). This new period of "technopolosis," as it is called, is characterized by the heavy growth of the knowledge industry and the use of high technology in the production process and creation of new products (such as working from a distance, constructions with the assistance of PC, robotics, etc.).

In this new context, the importance and influence of transport seems to change content. As Bithas and Nijkamp (1997) argue, the technical developments in the transport sector are characterized as an important driving force. New infrastructure opportunities that can result in attractive transport properties are realized (e.g., magnetic levitation, high-speed trains, vacuum tunnels, etc.). In transport operation, the use of informatics (e.g., telematics, new signaling methods, etc.) creates new prospects for decreasing the cost and increasing speed and reliability. The gradual evolution of transport technology inevitably leads to the convergence of space and time in the sense that the reduction of travel time from one area to another is succeeded; hence, the importance of distance or travel time is reduced, as it is described with this relatively newer synthetic term. To this direction, many researchers have outlined the continuing subjection of space in time. Labrianidis (2001) refers to the gradual elimination of space by time, whereas Kolko (2000) mentions even the death of distance. Despite the exaggeration of the arguments, new questions come up about the role of transport cost in the new economic geography, regional development, and spatial organization in general, which is the subject of theoretical and empirical studies.

In this framework, this paper outlines the main theoretical approaches to the role of transport in spatial organization and investigates possible new extensions at a theoretical and practical level, focusing on the analysis of transport cost. Section 2 includes the main theoretical approaches and political practices regarding the role of transport (focusing on infrastructures) in the spatial distribution of productive activities. Section 3 presents another group of theories that rely directly on transport cost as the main factor for the location choice of activities, starting with the traditional theories of this group and ending with the most recent approaches of new economic geography. Then, section 4 outlines the development environment that has been shaped during the last years, trying to analyze the nature of the transport cost into this new environment, according to some empirical evidence. This analysis helps to clarify new issues that could be taken into account in the relevant theoretical interrogations of urban and regional economics related to transport cost, and the respective policies of spatial organization. Finally, section 5 concludes the paper.

2. Theoretical approaches and political practices for the spatial distribution of activities and the role of transport

As it is known, the issues regarding transport and especially transport cost have been the basic issues of economic research and notably of economic geography and regional science not only at the theoretical level but also at the level of regulation and policy practice. Specifically at a theoretical level, there is a constant effect of transport in the form of either infrastructure or distance and transport cost in the location of activities, spatial organization, and urban and regional development in general (Glaeser, Kohlhase, 2004).

The theories of the spatial distribution of economic activities are perhaps the most important contribution to the development of economic geography and regional economics. They attempt to explain the spatial organization and, specifically, the spatial distribution of activities in combination with the spatial dispersion of settlements (Konsolas, 1997). Those theories and practices that followed, which were clearly influenced by the Keynesian state intervention policy in combination with the liberal economic policy of market economy, supported largely the formulation and implementation of the model of polar growth, which dominated for 30 years and is still implemented even nowadays (Hadjimichalis, 1992). In the majority of these theories, transportation is a key variable, especially the transport infrastructure, which is also the main norm of policy practice.

The most important theories in this group were developed by Christaller (central place, 1933), Perroux (enlargement poles, 1950), and Boudeville (growth poles, 1961) (Christofakis, Papadaskalopoulos, 2011). In particular, Christaller relied on the study of the distribution of settlements in southern Germany and attempted to analyze the role of the city as a settlement that serves not only its residents but also the population of the surrounding areas. To this direction, the concept of "central place" was developed, which is determined by the location of a settlement and various activities at the center of an area. That location—that is, the urban center—supplies itself and also the surrounding areas with goods and services. In the space, there are many such central locations that serve their surrounding areas. This process results in the establishment of an integrated system with hierarchically structured settlements (cities, towns, and villages), where each center is surrounded by six others in the form of hexagons (Richardson, 1969; Konsolas, 1997). The notion of distance plays an important role in the regularities that determine the distribution of settlements in space, although the importance of transport cost is great, which of course varies with the distance.

However, the most important theoretical approaches of this group refer to the model of polar development in the 1950s, which guided a major part of analyses and regional development policies until the 1970s. The studies mainly of Perroux as well as Myrdal and Hirschmann formed the basis of this model. More specifically, the French economist F. Perroux (1955) supports the view that development does not appear everywhere at once but becomes evident in some places—poles of development—with varying intensity, spreads through different channels, and causes diverse effects on the overall economy. The enlargement pole is indicated as a propulsive industry or as a sum of propulsive industries that boost positive effects on the surrounding area. The propulsive industries tend to attract other activities (complementary and non complementary), which face the poles of external economies and agglomeration economies of urban concentration, thus further enhancing the poles and creating beneficial effects in the entire region (Christofakis, Papadaskalopoulos, 2011). The national economy is a combination of active systems characterized by driving propulsive industries and poles of geographically concentrated industries and activities and related inert systems, specifically affected industries and dependent regions by the geographically concentrated poles (Szajnowska-Wysocka, 2009). The first systems cause the growth of the second. To this direction, Boudeville (1968) argues that the regional growth pole is a set of industries located in an urban area, causing the further development of economic activity across the zone of its influence.

At the level of political practice, the large urban centers would be the platform on which the development and change in the structures of a country would be based because after the first stage of the concentration of development in the urban centers, the diffusion to the remaining space will take place. For these reasons, the state -mainly through the creation of large-scale infrastructures, which indirectly enter in the developmental process (Skagiannis, 1994) - must interfere for the organization of space, urban or otherwise. The basic perception that prevailed was that the actions of the central public agents could effectively organize the economic activities in space. Hence, the emphasis of policies was given in the support (through the establishment of appropriate infrastructures and the provision of special motives) of establishment, in a few selected spatial units—poles, industrial complexes, and large units of high technology and specialization in basic key branches. These activities will lead to the development of both the pole and its surrounding region through the diffusion of growth. In this context, the creation of modern economic, regional, and social infrastructures is required, which will assist the location of industry in poles, strengthen the relationships and flows with the other areas, and ensure a high standard of living for people (Christofakis, Papadaskalopoulos, 2011).

To this direction, many researchers attempted to measure the effect of public infrastructure in the development process based on different theoretical backgrounds and developing specific methodological approaches in most cases (1), whereas others focused on examining the impact of transport infrastructure in national and regional development (2). Most of them concluded that there is a positive relationship between infrastructure and regional income, employment, and productivity. However, there is great difficulty in the incorporation, quantification, and allocation of basic components and relevant factors of the determination of infrastructure. As a result, an inability of safe assessment that leads to incorrect or incomplete conclusions often exists (Skagiannis, 1994; Plaskovitis, 2000).

3. Transport cost, localization, and regional development: traditional approaches and new economic geography

The theories in which transport holds a prominent position, especially on the part of infrastructure, were important for the establishment of spatial and regional economics. However, another group of theories that rely directly on transport cost as the main factor for the location choice of activities essentially founded spatial economics, specifically the inclusion of the variable of space in economic theories based primarily on the variable of transport cost.

In particular, as it is well known, traditional economic theories had disregarded for many decades the spatial dimension of economic activities because of the fundamental assumption of classical and neoclassical approaches for the free mobility of labor and capital within the space. More specifically, according to these approaches, resources move automatically and inexpensively and moreover, can be distributed uniformly in space because any imbalance that appears on prices and incomes is a temporary phenomenon. It is eliminated automatically by the operation of the market mechanism (Richardson, 1969).

The first reaction to the above-mentioned assumptions came early enough through some theoretical efforts to investigate factors that influence the location of activities (3). To this direction, the great importance of transport cost that creates the distance was recognized primarily on theories that attempted to explain the factors that influence the location choice of various industries. First, by attempting to establish an integrated approach regarding the location of farm activities, Von Thünen (1826) considers land annuity as a determinant of land use, which is formed according to the distance from the market. The net income from the sale of a product produced in the center (i.e., the market) is given by the difference in price of the product and the cost of productive factors. When the production is made outside the center, an additional cost element is the distance cost, which arises from the delivery of the product to the market, that is, transport cost. Therefore, the relation between distance and net income is negative. As the distance from the city center increases, the net income decreases. According to the model, the most efficient use is the one that yields the higher net income in each area.

On the basis of Von Thünen's approach, other theorists, particularly Losch (1943) (4), consider that the products with the highest yield per hectare will be produced closer to the market, whereas others went further (Dunn, 1954), questioning the universalization of transport cost and introducing the existence of many markets. Also, because it is understood that the major mass of agricultural activity takes place outside urban areas, several theorists (5) focused on investigating the spatial balance of activities that are being implemented mainly in the urban space, such as industry, services, and households, with greater or lesser emphasis on transport. To this direction, one of the most important theories of urban organization that relies almost exclusively on the structure of transport networks in urban areas is the approach of Hoyt (1939) for the creation of urban cores within a monocentric urban model. The logic of the basis of Hoyt's theory is that the transport network in a city does not cross all areas evenly by providing the same ease of access to the center but tends to favor some areas more than others. Therefore, the development occurs along the highways and extends to the outer zones of the city because of its easy accessibility from the center. As a result, the structure of the city is characterized by the existence of areas created according to the spatial allocation of the transport networks in urban space. Some others (Harris, Ullman, 1945; Blumenfeld, 1955), emphasize the relationship between transportation technologies and urban structure and introduce factors such as the need for some activities for specialized functions, the incompatibility of some land uses, and the agglomeration economies, concluding the formation of multiple cores in the urban space (Sidiropoulos, 1994; Glaeser, Kohlhase, 2004).

The founder of the location theory of the industrial activity is A. Weber (1909) (6), who initially considered transport cost as the unique factor that affects the location choice of an industrial unit. The other cost factors (labor and capital) are facing the same supply conditions in each area. On this basis, the known spatial triangle identifies the optimal location area between the areas of raw materials and the market, and then labor cost is added in the process of location choice as one more factor of variable cost. On the basis of the analysis of Weber, Hoover (1948) highlights the need for division between the means of transport and the competition that develops between them, resulting in different transportation service rates in different directions. Isard and Greenhut, in their books issued in the same year (1956), apply the principle of substitution between productive factors, taking transport cost as an input in the production process (Konsolas, 1997).

However, the basis for the main theoretical implications of the operation of transport cost and its effects on space was first used by Samuelson (1952, 1954) through the assumption of the "iceberg cost," on which a big part of the new economic geography's approaches was later based (Glaeser, Kohlhase, 2004; McCann, 2005). The traditional formulation of Samuelson's iceberg cost, as developed in the neoclassical trade theory and also followed by the new trade theory, considers that the transport cost of a good refers to the loss of its part during the transport process. The product loses some of its quantity and, therefore, a part of its value during the transportation. It's like the phenomenon of an iceberg that melts gradually. As emphasized by Fujita et al. (1999), the basis of the analysis of Samuelson is way behind the assumptions of Von Thünen, where there is wear cost, such as Samuelson's iceberg cost; that is, the cow pulls the wagon loaded with wheat and eats a portion of the load, transferring it to the market. According to McCann (2005), this determination of the size of transport costs helped the classical and neoclassical models of international trade, which were essentially aspatial, to circumvent problems associated with the explicit specification of the cost in geographical terms, as attempted by others (e.g., Isard) at the time. The basic formulation of the iceberg cost function depicts transport costs as a discontinuity between domestic and foreign prices of the relevant commodities. However, in this analysis, the distances are nonexistent within each country because the product prices are the same for each area. Hence, we refer to countries without dimension, where space is nonexistent. Moreover, between countries, although there is a relevant differentiation of prices, it is observed that from the relative function, there is not any spatial variable. Among others, space is completely homogeneous. For example, if two countries are far from each other, then the transport cost will be high because a large size of the iceberg cost is generated by the greater loss in the transported quantity of the product. Hence, as noted by McCann (2005), through the definition of iceberg cost, the distance and transport costs are treated in exactly the same way as tariff costs and can be combined in a single variable, greatly simplifying the analysis. In addition, despite all the efforts to improve these models in the context of the new international trade, there is still a significant lack in the formulation of a special constant relationship between the (iceberg) transport cost and the distance - that is, space.

A significant shift toward this direction is the contribution of Krugman (1991) under the model of new economic geography. Thus, the diachronic role of transport cost has been proven to be unalterable because the basic approaches of the new economic geography have been developed over the traditional mode of transport cost. In particular, the founder of new economic geography, Krugman (1991), and others who followed, with main interpreters Fujita et al. (1999) and Fujita and Thisse (2002), have developed their models based on the function of the iceberg cost. Krugman suggests the interaction of external economies and, more specifically, scale economies in transport cost for the interpretation of regional industrial concentration because the establishment of scale economies in the transport cost and production encourages the industries to be concentrated in certain places of space. The basis of his analysis is in regard to the attempt to convert Samuelson's traditional iceberg cost function, giving it a clearly determined spatial dimension by introducing explicitly the variable of distance, as determinative of the value of the transported good. So if the transport cost includes the price of the transport product, the price will increase exponentially, depending on the transported distance, following the course of a convex curve positively sloped. Moreover, the price of the goods to their final destination increases as the transport distance increases with a higher rate for those goods that have higher initial values.

In general and in accordance with the abovementioned analysis, it can put the claim that scale economies in transport are operated, and therefore, the reduction of transport cost pushes industries to concentrate on certain places in order to create scale economies in transport cost and production in a market that operates under imperfect competition and resembles the form of monopolistic competition (Konsolas, 1997; Polyzos, 2003). Although the assumptions made assist in the functional integration of the distance function in transport cost, thus developing a general equilibrium model for the spatial analysis of economic phenomena (McCann, 2005), they also set the limitations of the model, which in many cases are not confirmed by empirical evidences, as acknowledged later by Krugman himself (1998). The complete homogeneity of space, which considers that each destination has the same measure of distance, the exponential increase in the prices of transported goods according to the distance, the formation of transport cost per unit of output only in the distance and independent of the transported weight or the mass of the product, the fixed technological costs and the absence of production technology and transport diversification (because the production technology of a commodity is essentially identical to the technology used for its transport), the lack of other cost factors, and so on, are some assumptions that create deviations from current reality (McCann, 2005).

Apart from these important issues and parameters, which should also be taken into account in the various models of the interpretation of spatial economic phenomena based on transport cost, the evolution of the nature of transport cost due to the technological changes and changes in the structure of economic activity should be considered as well.

4. The new development environment and the nature of transport cost: some new dimensions

The developmental evolution itself, through the technological change in the production and transport and changes in the structure of economic activity, has significantly altered the correlations between the cost of the different types of the transport work supplied. In particular, significant changes in recent years on the structure and location of economic activities, changes in productive methods because of the demands for the "just in time" shipments of goods, the increasing mobility of staff in the service sector, and the massive increase of car ownership, leisure time, and disposable income have significantly altered the determinant factors of global growth (European Commission - Eurostat, 2007).

Until now, various models emphasized the interpretation of the determinant factors and spatial impacts of the transport cost of commodities (raw materials, intermediate goods, and finished products), undermining the cost of moving people. However, according to Glaeser and Kohlhase (2004), the orientation about the transport cost of goods should change. In addition, the correlations between the transport cost of goods and the people have changed so far, with a clear advantage of the latter over the former. Particularly, the cost of transport goods has decreased significantly over the years. In particular, as reported by Glaeser and Kohlhase (2004: 199–204), in the United States, the average cost for land transport of 1 tonne per mile in 1890 was 18.5 cents (in U.S. dollars, 2001 prices), whereas nowadays, it once reached 2.3 cents. This size for all types of transport, from 16 cents, which was the year 1960, falls to 11 cents in 1992. Moreover, according to the same source, the cost of freight transport products as a percentage of the U.S. GDP decreased from 9% in 1960 to 6% in 1990 and remained relatively stable for the next decade (1990–2000). These changes are due to the differentiation of two major determinant factors: First, the improvement of the technology has significantly lowered the transport cost of goods. Second, at present, the value of goods is based more on quality rather than quantity as compared with the past, and more qualitative than quantitative bulky and natural products are transported. Hence, nowadays, fewer tons of goods in relation to GDP are transported. This also leads to the fact that in many products (such as computers), the mass and the weight have been reduced over time.

Most economies have changed production structure by moving from the raw materials, the primary sector and the industry to the services. In 1900, 40% of the U.S. employment is related to workers on farms. In 2000, only 1.9% of the employment covered the activities of the primary sector, and 14.1% of the employment was in the manufacturing sector, which has also undergone a significant decline over time. In contrast, more than 50% of workers were employed in service sectors (Glaeser, Kohlhase, 2004). For all types of freight transport (road, rail, air, and sea), transport costs face a related constant decrease as the economy is directed away from the production of bulky goods with low value to the production of more expensive and quality goods, whose transport cost is less relevant to their value. Moreover, through the improvement of technology in freight transport (improved means, combined transport, logistics, etc.), the reduction of financial cost is accompanied by the reduction of time travel cost. The latter, of course, does not exist in the case of passenger transport, which leads to the opposite direction, mainly due to the increase of urban commuting and despite a relative reduction at the same time in the costs for long distance trips (due to the consequences of the deregulation and emergence of low-cost air carriers). Especially for urban passenger transport, the related cost increases over time, mainly because of the increase of the congestion and delays on road travels. According to a recent study of Eurostat (2007), for the year 2004, it has been calculated that within the EU of 25 members, each European citizen traveled 32 kilometers per day on average, using only the surface means of transport. This figure exceeds 36 kilometers if land, sea, and air transport travelers are added. Also, according to a report (2007) of the Texas Transportation Institute for urban mobility in the United States, the average annual delay per passenger at peak hours for all the urban areas in the United States amounted to 38 hours in 2005, whereas the relevant size was just 14 hours in 1982. According to the same source, the average annual fuel consumption per urban passenger in the United States at peak hours rose from 9 gallons in 1982 to 26 gallons in 2005 (Fig. 1).

According to the latest available data of the same source, peak travelers per 10 citizens have been increased from 4.1 in 1982 to 5.5 in 2011. However, traffic congestion in the United States seems to have stabilized in the past several years (Schrank, Lomax, 2013), which may be due to recession. More specifically, at the national level, the Texas Transportation Institute report finds the travel time index (travel time index = congested travel time / free flow travel time) steady again at 1.18 in 2001, the fourth year in a row at this level, and down at 1.22 in 2004–2007, except in 2005 when it was 1.23 (Fig. 2).

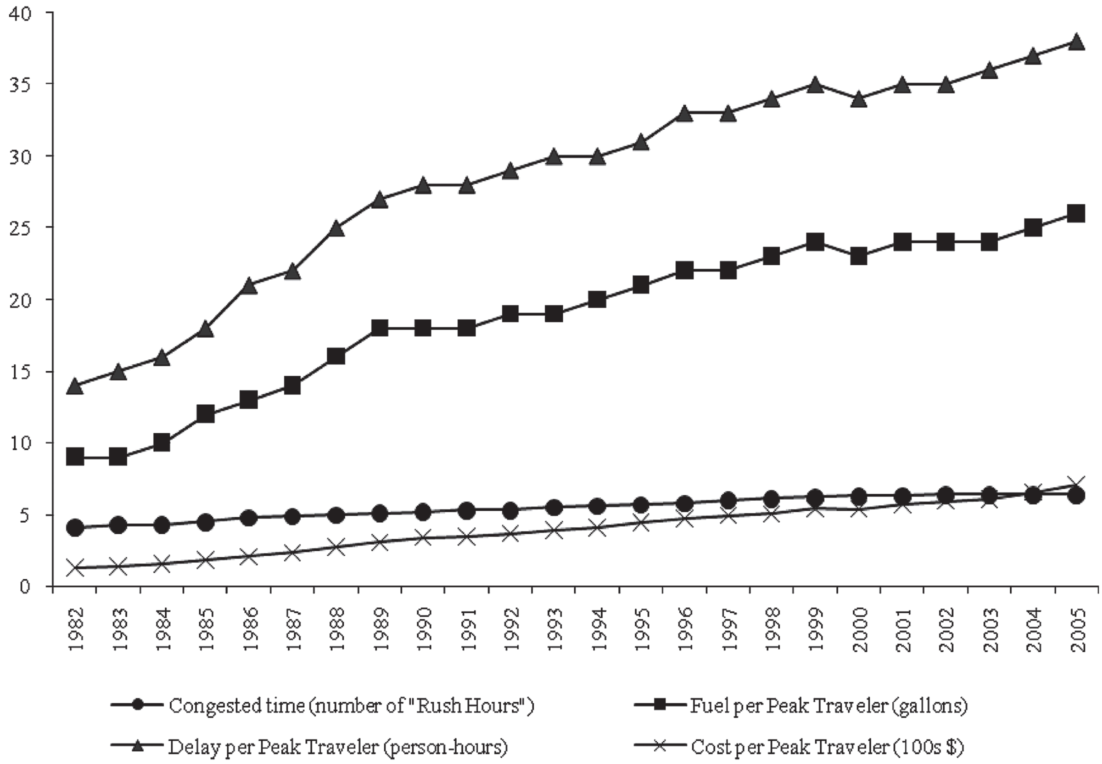

Fig. 1. Average annual congestion rates for U.S. urban areas (1982–1995)

Source: Texas Transportation Institute, 2007

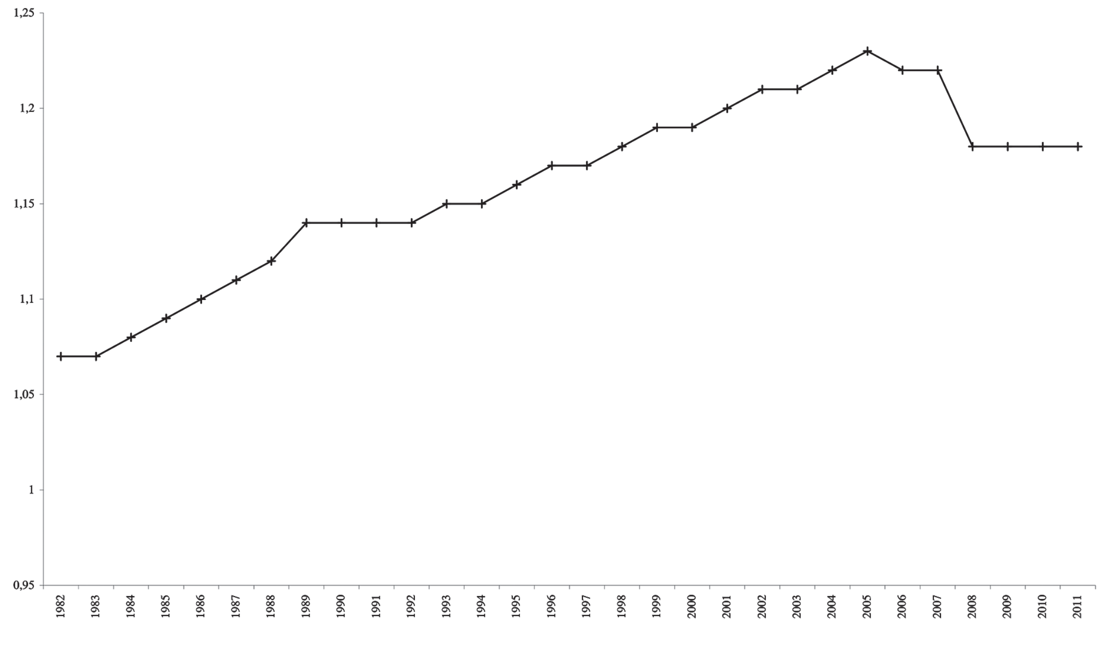

Fig. 2. Travel time index in the United States (1982–2011)

Source: Texas Transportation Institute, 2012

In this new context, the agglomeration economies certainly do not expire but change content. Transport cost remains important for the transport of goods, but it is again increasing importance for the moving of people. Hence, we can now discuss more for agglomeration economies to services and consumption economies, identified by the need of people to access more quality products and services (e.g., cultural activities and administrative services), which require greater personal contact. The new communication technologies lead to this direction, which "removes" the interpersonal contact of producers with customers and suppliers to a greater extent for production activities rather than for services (Kolko, 2000). These new "industries" (such as information, communication, sound and image, leisure, and general activities of the new economy) are located according to the ability of interpersonal, face-to-face contact and communication or even the possibility of electronic transfer of information. The first main factor reinforces the concentration in major metropolitan centers, which historically have a strong tradition in the availability of specialized functions, such as consultancy services, universities, financial services, public administration, cultural services, and so on (Hall, 1993).

Therefore, the new theoretical interrogations of urban and regional economics on transport cost as well as the political practice for spatial organization should turn to new fields, which now refer not only to the transport cost of "natural" goods on which the iceberg cost was founded, supporting the basic assumptions of the new economic geography, but also to the transport of quality products, intangible goods, and people.

5. Conclusions and main policy implications

To sum up, to all historical periods of the evolution of spatial development patterns, transport, and particularly the availability of means and transport networks, the adequacy of infrastructures and the quality of services have played a key role in the spatial distribution of not only economic activities but also overall development.

In particular, transport cost has supported an important part of the traditional and contemporary theoretical approaches constituting a basic factor for the location choice of activities and the organization of space in general. The school of new economic geography, as discussed in the previous sections of the paper, relying on the basic assumptions of Samuelson's iceberg cost and giving a clear spatial dimension, attempted to interpret the forces that led to the concentration of activities in a few spatial units. However, besides the important contribution of these models in the contemporary spatial economic analysis, there are some inherent weaknesses that limit the full adjustment with the factual aspects of the spatial behavior of activities. As McCann (2005: 316) states, "We could argue that from the perspective of economic geographers or transportation scientists, the iceberg assumption is probably the weakest aspect of new economic geography models."

Apart from the inherent weaknesses of these models, the modern reality leads to a redefinition of the nature of transport cost because technological changes in the production and transport and changes in the structure of economic activity have significantly altered the correlations between the cost of the different types of the transport supplied work. The results from all of these, as the related empirical studies prove (Kolko, 2000; Glaeser, Kohlhase, 2004), are the increase of the cost and the importance of moving people, mainly due to the increase of urban commuting (despite the relative reduction in the costs for long distance trips), and the steady related reduction of the transport cost of producing goods, especially in the past years. The main factors that assist these changes is the greater geographical dispersion of economic activities with a trend of turning away from the traditional urban cores and old urban centers, resulting in the clear geographical distinction between the residential and labor areas and therefore the increase of the need for greater mobility. According to the Eurostat (2007) data, an increasing number of households with at least two members work in completely different areas. Furthermore, factors such as the rapid growth of the services sector and the increase of requirements for transfer of professionals associated with these services, the increase in disposable income resulting in massive market of cars and motorcyclists, and, in conjunction with that, the increase in leisure time for travels and vacations contribute to the reinforcement of people mobility. Moreover, because of the changing structure of economies and the technological change by shifting to quality and service, modern economies are removed from the production of bulky goods, with relatively low value, to the production of more expensive and quality goods, whose transport cost is less related to their value.

Therefore, the theoretical interrogations of urban and regional economics related to transport cost and the policies for spatial organization must seek more emphasis to issues that mentioned not only the transport cost of "natural" goods but also the transport of quality products, intangible goods, and people. All these, of course, must be adjusted and specialized based on the basic fundamental principle of spatial dissimilarity.

Notes

(1) Kyriazopoulos (2006) refers to Rather, Aschauer, Biehl, Eisner, Evans and Karras, Holtz-Eakin, Moomaw, Mullen and Williams, Khanam, Waters, Lynde and Richmond, Nadiri and Mamuneas, and Morrison and Schwartz, among others.

(2) Ibid., Kraft et al., Vickerman, and Banister and Berechman, among others.

(3) It should be noted that the first arguments were not mentioned in the absence of the spatial dimension of economic activities in the traditional economic theories. They focused primarily on the incorporation of the dynamic dimension of economic relations in the static models of classical economic theory (Richardson, 1969; Konsolas, 1997).

(4) The second edition of the book of A. Losch was translated in English in 1954, with the title *The Economics of Location*.

(5) Kottis (1976) refers to Hoyt, Nurse, Richardson, Alonso, Wingo, and Beckmann, among others.

(6) The approaches of Weber were published in English in 1929, with the title *Theory of the Location of Industries*.

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