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The Theses of the Doctoral Dissertation

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**Changes in the public road traffic in Hungary
/1869-2006/**

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I. Introduction

Road traffic counts have been carried out for nearly 140 years in Hungary. Technical and financial reasons had led to their introduction; the system of public roads maintenance was intended to be based on scientific grounds already in the nineteenth century. Then it was recognised that the volume of traffic determined the amount of covering material required by road maintenance and that more intensive upkeep was necessary where traffic was higher, which also entailed more substantial financial costs. Consequently, during the series of traffic counts launched in 1869, traffic measurements were carried out first on state roads and later also on municipal roads; nowadays traffic data is collected regularly along over ninety percent of the entire national road network. Besides their significance to engineering, these data represent information valuable also to several other fields; hence they have the potential to open up new and yet untrodden paths for a variety of social-scientific sub-disciplines, too.

I. Objectives

The main objective of the present dissertation is to reveal and analyse statistics on public road traffic in Hungary, and thus to find out about the reasons for and the regional characteristics of, the changes in traffic, as well as to establish what socio-economic implications the volume and composition of traffic have carried in different historical periods. Besides, the extensive, almost 140 years long time sequence of the analysis provided me the opportunity to follow the history of this socio-economically heterogeneous period from the point of view of the transport sector, and to present through this widely known sphere, the impacts of the actual political, economic and technological conditions.

Based on their particular features, the time periods covered in this dissertation required some differentiation along the analytical objectives. Therefore, the aims and possibilities of the enquiry had to vary concerning for instance the 19th-century traffic processes, in which period even the actual existence of traffic counts was uncertain, and with regard to the rather comprehensive statistics from recent times.

As a consequence of these limitations, the most important objective of the dissertation in its investigation of the 19th century was to determine the time when traffic counts were launched, to disclose the history of these counts, and to retrieve the results from counts that had earlier been assumed to be lost.

The better documented traffic processes of the first half of the 20th century promised the opportunity for carrying out more detailed analyses; and from the 1960s, the research could aim at embedding the traffic changes into a deeper socio-economic framework by demonstrating the mark of our increasingly transport-oriented world on road traffic as well as indicating the social-environmental feedback-effects of transport.

I. Applied methods and sources of data

The present dissertation is based principally on the processing of a series of road traffic data, which is supplemented by reviews of relevant literature and other statistics. Concerning its methodology, this work operates with analytical toolkits used in geography, geoinformatics and regional science, as well as it reflects some technological and ethnographical approaches. Similarly to the objectives, the implemented data exploration methods also vary with the examined time periods, the method of data processing however, is more or less uniform.

The assessment of the 19th-century road traffic developments was possible based on the research I have done in the National Archives of Hungary. Besides disclosing the results of the traffic counts, the dissertation evaluates the correspondence between the responsible ministry and the county administrations, which in several cases provides further explanation to the peculiar processes of the period.

The 20th-century statistics up to 1985 were already available in printed form, too; feeding these data to the computer meant the first step in this case. This typing work however, could be spared in case of the data from the most recent years, which are provided already in digital form.

Having digitalised the statistical data and having set up the geoinformatical foundations, further processing became possible. This latter included filtering out the errors from the digital databases, the conversion of the data by vehicle categories and by administrative divisions, as well as the development of an algorithm suitable for the geoinformatical representation of road traffic data. Carrying out these processes was followed by mapping and then, by analysing the results on several spatial levels (i.e. on the scales of the valid road sections, sub-regions, and counties) using the toolkits of regional science and geoinformatics.

II. Previous research and literature

Unlike technological and engineering-oriented investigations or assessments of the regional development potential of transport infrastructures, a social-economic approach in analysing public road traffic processes is hardly represented in the professional academic literature. So far there has not been any attempt to summarize and to comprehensively cover the whole period; individual authors studied only certain parts of it separately.

From among the contemporary authors the names of Károly Hieronymi and Tamás Murányi certainly deserve a mention since both have taken an active role in shaping traffic counts in Hungary. Hieronymi can be credited with the actual launch of traffic counts and with the first theoretical summary related to the counts (*A közlekedés / Transport*, 1869), while Murányi was the creator of the system of modern traffic counts. In many of his books he not only laid the technological and mathematical foundations but he also dealt with transportation as a social sub-system to be observed within a complex perspective.

The exploration of the details related to the first traffic counts can be attributed to László Tóth. Although he could not find the actual results, his study provided valuable guidelines without which the present dissertation could not have made further steps. The work by Vilmos Kolozsváry (1962) is also outstanding, in which the author presents the changes in the traffic of individual vehicle categories based on detailed socio-economic foundations.

From the period from the 1970s till now, a number of articles should be mentioned by István Antal and Csaba Koren: Antal highlights the general and special (cross-border, foreign vehicle) traffic tendencies, while Koren examines the different traffic attributes, traffic flows and traffic load distribution along roads using more complex methods. One could make a special note here of the analysis by Csaba Koren and Emese Makó, in which they carry out a study of the county-level associations between the volume of traffic, the availability of cars, and the regional GDP.

Beyond the works listed above, which were exclusively written by engineers, there has been little if any attention to the topic by geography; the spatiality of traffic volumes has been studied only as a side issue in geographical journals and in books of transport geography.

III. Research results and conclusions

- 1) The most important “tangible” outcomes of the study are the following:
 - a) the route-level representation of traffic count results of the years 1869 and 1872/73;
 - b) the description of the traffic count results from the years 1870/71 and 1874 on the level of individual count sections, and the representation of more particulars about the counts (Map 1);
 - c) the partial exploration of the results from the 1894 counts concerning municipal roads;
 - d) the digitalisation of all earlier not digitalised results;
 - e) the sub-regional calculation of the count results from the years following 1985 (Map 2);
 - f) the creation of data series homogenised for the county sequence from 1963; and
 - g) the development of an algorithm for the geoinformatical representation of traffic data by valid sections (Map 1; Map 3).

Based on the data and literature mentioned above and after my own analyses I could arrive at the following major conclusions:

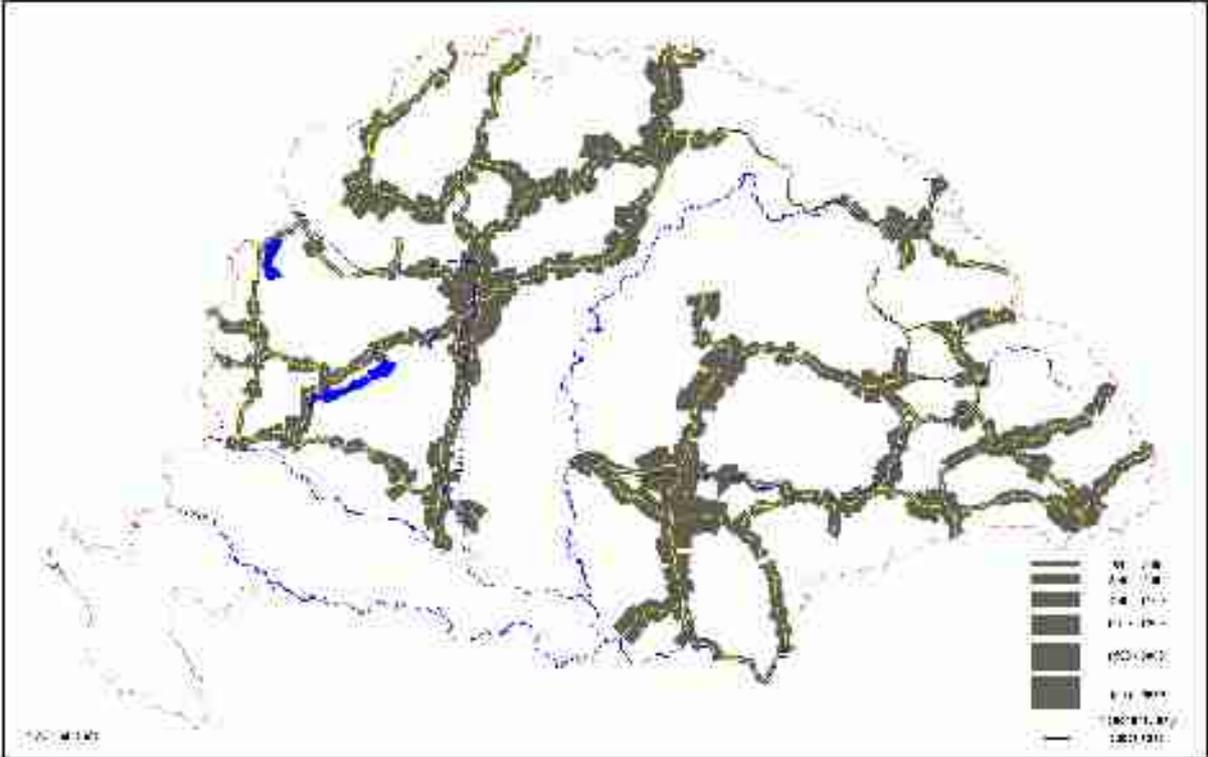
- 2) The study progressively reviews the history and the results of the national road traffic counts while also embedding these data, which originally served technological purposes, into a social-economic system of relations. The outcomes of this research indicate that the volume of traffic requires a different interpretation in each historical period: while in certain periods (following the construction of the railway network) the size of traffic could rather be regarded as a marker of under-development, recently it has been corresponding more with indicators of progress.
- 3) It is also observed that the change in the geographical locations of traffic maximums is a consequence of the global shifts in the spatial division of labour. While until the beginning of the 1980s the busiest sections of the national road network had been associated with settlements, nowadays the traffic along a significant part of the clearway network has exceeded that of the main roads of the towns in the countryside. This indicates the intensification of the inter-regional division of labour besides the enduring presence of local relations.
- 4) Furthermore, I have demonstrated that there has been an increase in the spatial divergence in traffic volumes; that the degree of inequalities stagnated only in the periods of economic crisis, and while during the times of economic boom, the growth in traffic always coincided with an increase in territorial inequalities.
- 5) Also, it can be claimed that it is the distribution of the traffic of trucks which describes economic processes better, and the human factors that determine the use of personal cars are rather “incomprehensible” through economic rationality.
- 6) Finally, the results from my analysis prove that the level of economic development is in connection with the volume of not only the traffic but of the emissions along public roads. This, via the principle of ‘more developed region –

more polluted region', questions the sustainability of the current development trends.

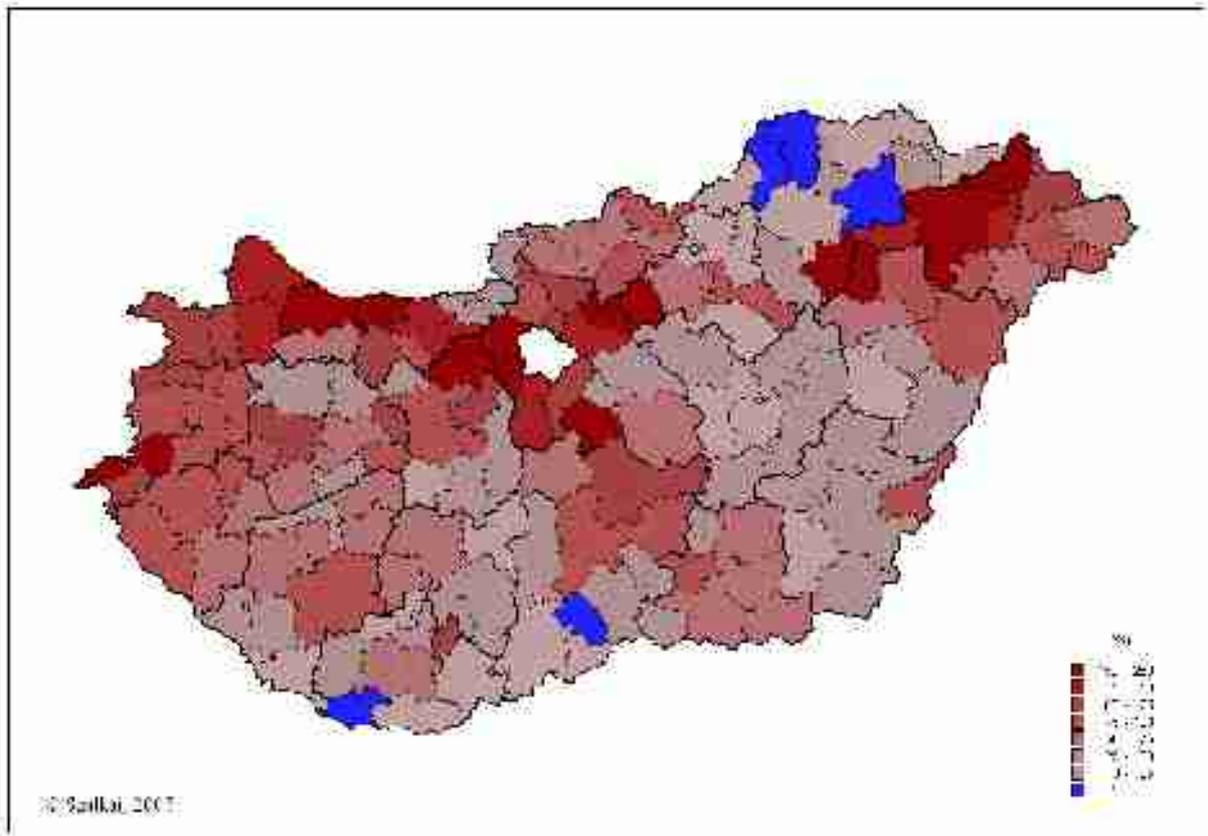
IV. Publications within the topic of the dissertation

- Szalkai, Gábor (2001): Elérhetőségi vizsgálatok Magyarországon (Studies on accessibility in Hungary), Falu-Város-Régió, 2001/10, pp. 5-13.
- Szalkai, Gábor (2003): A közúti térszerkezet és a hálózatfejlesztés vizsgálata Romániában (A study of the spatial structure of public roads and network development in Romania) Falu-Város-Régió, 2003/8, pp. 19-24.
- Szalkai, Gábor (2003): Erreichbarkeitsuntersuchungen am Beispiel Ungarns, (In: Ákos Jakobi (ed.): *Frontiers of Geography*), ELTE TTK, Budapest – Heidelberg, pp. 133-146.
- Szalkai, Gábor (2005): Hálózati hányados (The network quotient), (In: József Nemes Nagy (ed.): *Regionális elemzési módszerek*), ELTE Regionális Földrajzi Tanszék – MTA ELTE Regionális Tudományi Kutatócsoport, Budapest, 2005, pp. 229-237.
- Szalkai, Gábor (2006): Elérhetőségi és forgalmi változások az elmúlt évek gyorsforgalmi úthálózat fejlesztéseinek következtében (Changes of accessibility and traffic volumes due to the recent extension of the Hungarian motorway system), *Közúti és Mélyépítési Szemle*, 2006/11-12, pp. 18-24.
- Szalkai, Gábor – Dusek, Tamás (2006): Az időtér és a földrajzi tér összehasonlítása (Comparing time-space and geographical space), *Tér és Társadalom*, 2006/2, pp. 47-63.
- Szalkai, Gábor (2007): A közúti forgalom változása Magyarországon (Changes in public road traffic in Hungary), (In: László Gulyás –József Gál (eds.): *Európai kihívások IV. nemzetközi tudományos konferencia*), SZTE, Szeged, 2007, pp. 305-309.
- Szalkai, Gábor (2007): Az elérhetőség változása a Bánátban (Changes in accessibility in Bánát), (In: László Gulyás (ed.): *Régiók a Kárpát-medencén innen és túl*), Eötvös József Főiskola, Szeged, 2007, pp. 281-285.
- Szalkai, Gábor (2007): Az első közúti forgalomszámlálások Magyarországon (The first Hungarian public road traffic counts), (In: Zsolt Szőnyi (ed.): *A Kiskőrösi Közúti Szakgyűjtemény Évkönyve VI. kötet*), Magyar Közút Kht., Budapest, 2007, pp. 116-120.

Map 1. The volume of public road traffic in 1874 [draught animal/day]



Map 2. Changes in public road traffic by sub-regions, 1985-2006



Map 3. The volume of public road traffic in 2006 [vehicle/day]

