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# Assessing core-periphery relation through travel patterns - The case of Israel

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## ABSTRACT

There is an urgent need for understanding the processes through which investments in transport infrastructure modify the economic geography landscape of a region or country. The “New Economic Geography” (NEG) suggests that the concentration of economic activities is determined by ‘centripetal’ and ‘centrifugal’ forces which in turn determine the balance between the economic and geographical core and periphery regions. Transport can, and should be, understood as the balancing factor between these forces. In order to take a snapshot of core-periphery relation in a country, travel patterns between centre and periphery in Israel in 2007 are analysed using Mobile Phone signal tracking. Results show that despite Israel being a very small country the level of inter-regional travel as a proportion of overall travel is small. Furthermore, despite the clear economic core in Israel (the Metropolitan area of Tel Aviv), the periphery regions seem to remain independent. Yet, analysis of the inter-regional travel that does take place suggests a greater dependence of (travel from) the periphery to the centre than vice versa. This in turn suggests that investments in more long-distance transport infrastructure in Israel would further increase the dependency of the periphery on the centre and could increase core-periphery disparities.

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## 1. Introduction

Transport is considered the blood system of society, and physical mobility of passengers and goods can be regarded as the ‘oxygen’ for almost any human activity we carry out; a good reason to invest in transport infrastructure. In almost all countries, Israel included, the largest state budget for infrastructure is that for transport, also at times of austerity. Much of these investments are in long-distance, inter-city transport infrastructure in the hope to spur regional development and close the gap between the centre (or the ‘core’) and the periphery by providing better accessibility to the periphery (Goetz, 2011). While extensive research efforts have been devoted to assess whether such investment are ‘worthwhile’ in economic terms (Chatman & Noland, 2011; Deng, 2013), yielding mixed evidence and subject to a host of methodological limitations, little efforts have been devoted to empirically examine how such investments shape the economic geography of a country and the relation between centre and periphery. As a result, there is only a

relatively crude understanding of the spatial socio-economic impacts of large investments in transport infrastructure and consequently a poor basis for decision making.

As an initial step towards closing the knowledge gap described above, this research aims to analyze core-periphery relation through travel patterns between centre and periphery regions and from that try to infer the level of economic interactions between these regions and degree of socio-economic dependency.

Israel, being a small country with a developed economy and a transport network is chosen for the analysis. It is expected that in such a country travel patterns will indicate an extensive links between all regions of the country and given the direction of most such travel (i.e. from periphery to the core or vice versa) the degree of dependency between the regions can be inferred. This will allow discussion on the likely effect of investments in long-distance transport infrastructure on the economic geography of a country and whether such investments would benefit or not the periphery regions allowing to close core-periphery disparities. By that, this paper aims to contribute to understanding wider spatial economic and social impacts of transport networks and to open the door for

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more advanced research that tries to understand the processes through which investments in transport infrastructure shape the economic geography of a country and shape core-periphery relation.

In the next section, the need to examine the effect of transport infrastructure on a country's economic geography is emphasized through a brief review of the relevant literature on the links between transport and (regional) development and a description of the New Economic Geography theory. In Section 3 the research methodology is described followed by results in Section 4. In Section 5 conclusions are drawn.

## 2. The need to empirically examine transport and economic geography relation/inter-dependency

To date, trying to understand the spatial socio-economic impacts of investment in transport infrastructure has largely been narrowed down to the economic approach and questions about the relation between investment in transport infrastructure and economic development/growth (or productivity growth). Such research goes back at least 40 years and to the works of [Aschauer \(1989\)](#), which often refers to as the first to provide empirical evidence that there is a link and it is positive,<sup>1</sup> and [Munnell \(1990\)](#). Both researchers did not focus on transport infrastructure, but more generally on public spending and investment in infrastructure, including transport, and both were not conclusive on whether there is a positive link between public expenditure and productivity. A recent review of the empirical evidence on the “impacts of transport infrastructure on productivity and economic growth” by [Deng \(2013\)](#) shows that the empirical evidence is far from conclusive. This is also evident when comparing the results obtained by [Sloboda and Yao \(2008\)](#) for the US, [Nannan, De Jong, Storm, Mi \(2012\)](#) for China, and [Lavee, Beniadi, and Solomon \(2011\)](#) for Israel, which also show the importance of the spatial level at which the research is done ([Berechman, Ozmen, & Ozbay, 2006](#)). [Banister \(2012\)](#) and [Deng \(2013\)](#) both conclude unequivocally that there is still no definitive empirical answer to the question of whether investment in transport infrastructure leads to economic growth, which is not surprising given the myriad factors determining economic growth (see also [Banister & Berechman, 2000](#)). Despite the above, in political and policy circles there is an assumption supportive of public investment, transport infrastructure in particular, to encourage economic growth.

Given the role of transport in organizing our life and in shaping our society and landscape, a ‘yes’ or ‘no’ answer (and by how much) to the question whether investments in transport infrastructure are worthwhile is not only limited but may also be misleading. Instead, a better understanding of the social as well as economic impacts of investment in transport infrastructure is needed. By changing absolute and relative accessibility, investments in transport infrastructure (large infrastructure projects especially) play an important role in the complex location decisions of households regarding home and work location and in the complex decision of firms with regard to location of offices, factories, etc. This important and complex policy and planning matter can be downscaled, for research purposes, to asking how the transport network (and changes to it) determines the balance between the socio-economic core and periphery of a country. In political and policy circles there is an assumption that investment in transport infrastructure will ‘bring’ the periphery closer to the centre and by that help reducing any gaps (and inequalities) between regions.

<sup>1</sup> Although this work has been largely discredited, including by Aschauer himself ([Aschauer, 2000](#)).

Location Theory since its origins in the work of [Von Thünen \(1826\)](#) and much later [Alonso \(1964\)](#) and many others has largely emphasized the attraction of economic activities to the centre and the competition for locating at the centre. The outcome of this competition, the spatial distribution of economic activities, showed the economic value (rent) of each activity. Recently, Paul Krugman's ‘New Economic Geography’ (NEG) ([Krugman, 1991a and b](#)) suggested there is a power struggle, to attract economic activities, between the core and the periphery – it is not only the centre that can attract activities, even if the tendency remains for activities to be drawn to the centre.

The main question the NEG tries to answer is “why and when does manufacturing become concentrated in a few regions, leaving others relatively underdeveloped?” ([Krugman, 1991b](#), p. 484). The answer to this question, which provides a theoretical framework for understanding core-periphery relations (or power balance), depends according to [Krugman \(1998\)](#) on the “tug of war between forces that tend to promote geographical concentration and those that tend to oppose it – between ‘centripetal’ and ‘centrifugal’ forces” (p. 8).<sup>2</sup> While the NEG provides a convincing framework to understanding core and periphery relation it does not explicitly discuss the role of transport (accessibility) as the factor determining the balance between ‘centripetal’ and ‘centrifugal’ forces. “In the NEG models, the transport sector is a silent sector” ([Lafourcade & Thisse, 2011](#), p. 83). Yet, transport should be assumed as the balancing factor between the centripetal and centrifugal forces and thus a key determinant of the economic geography landscape. Over the years, the NEG literature did try to directly address the transport costs question (the main determinant of accessibility from an economic view point). The general conclusion in the literature, which was formulated by [Krugman \(1999\)](#), supports the conclusion that lower transport costs will lead to the creation of core-periphery. In other words, improving accessibility between regions will tend to favor the core and increase economic inequalities. While the same general conclusion is supported by [Alonso-Villar \(2007\)](#), she offers other outcomes as well.

‘Real’ world location decision and everyday travel behaviour (everyday ‘practices’ – see [de Certeau, 1984](#)) are complex and go beyond economic considerations to be driven by a mix of socio-economic factors. Accessibility (transport) considerations are an important factor in location decision, yet also accessibility considerations are on their own quite complex and are coupled with a range of social factors (age, gender, household characteristics, etc.) as demonstrated for long-distance travel by, for example, [Ettema, Arentze, and Timmermans \(2011\)](#) and [Dargay and Clark \(2012\)](#).

Based on the above, we can no longer assume automatically that the core is ‘better’ than the periphery and therefore the periphery will always be second-best and that, as a result, we have to bring the periphery closer to the centre to ‘better’ its socio-economic situation. What is needed is an empirical analysis to show the balance between core and periphery and the balance between the centripetal and centrifugal forces described by the NEG. This balance is assumed here to be determined by transport (costs) between regions. A starting point for such an analysis is presented here by giving a snapshot picture of core-periphery relation in Israel as reflected in travel between different regions. It is assumed that given the small size of Israel and the economic dominance of its centre there will be a high degree of interactions between the

<sup>2</sup> Centripetal forces include: market size effects (demand), thick labour supply, and pure external economies (e.g. agglomeration economies and variety economies), while centrifugal forces include: immobile factors (such as land and natural resources), land rents, and pure external diseconomies (e.g. agglomeration diseconomies for example in the form of transport congestion) ([Krugman, 1998](#)).

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