Road infrastructure and freight capacity as factors of regional divergence in Mexico

Maritza Areli Velázquez Villalpando, PhD[1]

Rubén Macías Acosta, PhD[2]

Introduction

The road infrastructure and the level of freight transportation traffic are very necessary elements to identify the economic and industrial dynamics in the different regions of Mexico, but they are also factors that determine and drive (or limit) national and international trade. The productive infrastructure, specifically highways, influences the transit of cargo transportation, thus connecting production centers, which include industrial parks, with consumption and distribution centers such as cities, but they also serve as a link to international trade by connecting with the country's ports, airports and customs. For this reason the road infrastructure and with it, the logistic capacity as well as the level of connectivity of transportation, mainly cargo, contribute to the growth and development of the regions in Mexico, the current endowment represents for some entities a competitive advantage, while for others it is a great disadvantage, not having sufficient infrastructure or the necessary affluence to boost the region.

Mexico is a geographically very large country, which presents clear patterns of industrial concentration in some regions and, together with this, also presents inequalities in terms of the territorial distribution of infrastructure and its own traffic and traffic dynamics. This unequal distribution contributes to perpetuate a pattern of territorial inequality and regional divergence among the country's entities, regions and cities.

In the understanding of knowing the existing differences, not only in the physical-geographical, economic, social and even cultural aspects, the road infrastructure and mainly freight transportation, comes to attenuate these disparities within the country, leaving far behind the idea of a regional convergence, which is why this document aims to evaluate the impact of road infrastructure and freight transportation in the regional divergence in Mexico. There are entities with a large road extension where cargo transportation flows accumulate, on the other hand there are also entities with low road infrastructure, thus justifying their low level of disconnection with international trade, however there is also another group of entities that have good road infrastructure but low density of cargo transportation capacity; in this case the road infrastructure alone is not a guarantee of economic linkage or promotion of

[1] Researcher at Center for Economic Research and Teaching (CIDE-México), has a Regional Economics Phd, her research interests are focused in regional disparities, infraestructura and development, and economic regional development

[2] Researcher at Autonumus University of Aguascalientes (UAA-México), has a Master in commerce and international logistic, and Goverment and public administration, PhD. His research interests are focused in international economics, public policy for local development and regional development.

economic activities connected to the national market through the big cities or international connecting with ports and customs mainly.

The main contribution of this document comes from the fact that Mexico has been seen as a country with great potential to capture industrial relocation or Nearshoring, however not all regions are prepared to take advantage of this competitive advantage, so it is intentionally providing infrastructure and industrial parks called "development poles" in various parts of Mexico, However, if these industrial parks, highways and development poles are not properly linked to the centers of consumption, distribution and international connection, there is a risk that the efforts to provide infrastructure will be in vain and the constructed work will be underutilized or wasted.

If the flows of freight transportation are identified, at least at the federal entity level and correlated with its industrial profile, we can have a greater certainty of where to promote the productive infrastructure that serves as a basis to capture the Nearshoring, and in regions where there is neither industrial profile nor infrastructure, it is not enough to build industrial parks and roads, we must think of a logistics development strategy to boost the entity or region in question.

The content of this extended summary consists of 4 sections in addition to this introduction, in the next section we review some empirical works for Mexico, where the impact of infrastructure on development is evaluated, this section is a brief review of the state of the art of the subject; in the third section, we describe the methodology used, the data sources used and a first map of the road system in Mexico is shown. The fourth and final section is devoted to describing the main findings of the research and some conclusions.

1. Infrastructure and Development: A Review of Some Cases for Mexico

Some studies for both Latin America and Mexico on the impact of infrastructure on economic development have shown significant results in the long term. They suggest that, regardless of the methodology used, the data reflect impacts on different economic sectors and differ in investment decisions by economic agents. They also serve as a watershed to discuss the economic gap in different localities, especially because of the progressive poverty in marginalized regions that have not benefited. They also point out that infrastructure serves as a tool for commercial exchange and competitiveness. In the absence of infrastructure, industrial development is hindered and inhibits a greater degree of productive specialization, which is why productive infrastructure such as roads is of vital importance to promote development and connect all regions of a country.

Noriega and Fontenla (2007), who examine the effect of infrastructure investment as a complement to private investment in Mexico during the period 1950-2003, find that long-term growth is due to endogenous production factors, indicating that, for electricity and highways, infrastructure levels that maximize economic growth have not been reached.

Becerril et. al. (2009) developed an infrastructure indicator in physical units through a multivariate analysis of Mexican states during 1970-2003, and found that Mexico City, Veracruz, Tamaulipas, Jalisco, Baja California, Baja California Sur, Coahuila, Oaxaca, Michoacán, Sonora, Chihuahua, Quintana Roo, Nuevo León, Guerrero and the State of Mexico, have an above-average infrastructure indicator, showing that public sector investment is concentrated in a small number of states, Nuevo León, Guerrero and the State of Mexico have a productive infrastructure indicator above average, showing that public sector investment is concentrated in a small number of states, which are considered to be the northern and central regions with the greatest economic activity.

In the work of Tapia (2018) it is stated that there is a rearrangement of economic agents and a commercial displacement in the relationship between the development of road infrastructure and regional development in the garlic producers sector of Oaxaca and Puebla, during 2003-2016, Similarly, Fuentes (2003) evaluates whether public investment, Similarly, Fuentes (2003) evaluates whether public investment in infrastructure can alter regional income patterns and analyzes whether its effectiveness depends on its economic and social composition, and on the characteristics of the receiving regions, through clusters, in his work he finds that the impact of public investment on regional economic growth will depend on the characteristics of the region in which the investment takes place.

Finally, Ayvar and Silva (2021) reaffirm through a data envelopment analysis that Baja California Sur, Colima and Tlaxcala were efficient in the use of their inputs for the provision of basic infrastructure to their population, which made it possible to contribute to the fight against poverty and social backwardness. In these studies, most of them point out that the Mexican government needs to implement economic policy mechanisms that encourage the states with the greatest backwardness to make adequate use of resources and increase the construction of infrastructure. Without adequate infrastructure, it will not be possible to detonate growth and development in regions that have not been favored in previous economic models.

2. Methodology

The methodology is quantitative-descriptive and correlational, where the following variables are analyzed:

1) The extension and road density that each entity has, four types of roads are identified: Federal Free (FL), Federal Quota (FQ), State Free (SF) and State Quota (SQ).
2) The proportion of freight transportation capacity for each state: mainly identifying trucks and tractor-trailers with 3 and 4 axles.
3) The industrial weight of each state, measured by the proportion of employment and value added in manufacturing industries.
4) Correlational analysis of the highways, traffic volumes and industrial profile of each state.
5) Identification of the entities with the best competitiveness ranking in terms of industrial profile and dynamics of autotransportation.

Highway Infrastructure in Mexico.

The road system in Mexico has been consolidated over several decades according to INGEI,

> "Some highways are in charge of the federal government and constitute the highway corridors, which provide access and communication to the main cities, borders and maritime ports of the country and, therefore, register most of the passenger and cargo transportation. Some sections are free, that is, there is no cost to drive along them, while others are toll roads, where a toll must be paid to use them."

Map 1: Trunk Road Corridors

Source: Comunication and Transport Department (2018)

In addition to federal highways, there are state highways, which, as their name indicates, are the responsibility of the governments of each state and include paved and surfaced highways, rural roads and dirt roads. Although Mexico has a wide coverage of highways and roads, not all of them present the best conditions for the correct transit, to guarantee an adequate logistic network throughout the national territory.

3.Main results and conclusions

Of the 32 states that make up Mexico, the highest concentration of roadways and cargo transportation capacity is found in the central region towards the northern border of the country; however, the south-southeast region, which is the most economically backward, has some states with good road infrastructure, such as the state of Oaxaca, This situation leads us to recognize that infrastructure alone is not enough to promote industrial development or national or international trade, and therefore to promote the region, but rather to maintain low economic conditions in spite of the road infrastructure.

The South-Southeast part of Mexico is a very narrow area but geographically more rugged, so access and connectivity becomes more complicated, while the north is more extensive with greater distances between cities, but it is flatter and with better road access, which facilitates connectivity between regions and cities. The central zone of the country is narrow, with good road coverage, but the density and condition of the roads is a limitation, then considering elements such as those mentioned, there are economic spaces with better possibilities to capture the Nearshoring and to take better advantage of the infrastructure that will be developed from the new regional development policies in Mexico, so the general conclusion is that infraestructure and freigth capacity are enhancing only regions with an economic advantage, and regions with low socioeconomic conditions are not getting linked to Nearshoing dynamic, leading a deep regional divergence in México between Center and North versus South.

References

Ayvar, A.F., & Silva, J. (2021).Provisión de infraestructura en México: Un estudio a partir del Análisis Envolvente de Datos. *Análisis económico*, vol. XXXVI (93), pp. 51-66 2448-6655-ane-36-93-51.pdf

Becerril, O.U., Álvarez, I.C., del Moral, L.E & Vergara R. (2009). Indicador de infraestructuras productivas por entidad federativa en México 1970-2003. *Gestión y política pública* , vol. 18 (2), pp. 379-438.

http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-10792009000200005&lng=es&nrm=iso

Fuentes, N.A. (2003). Crecimiento económico y desigualdades regionales en México: el impacto de la infraestructura. *Región y sociedad*, vol. 5 (27), pp. 81-106. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1870-39252003000200003&lng=es&nrm=iso

Noriega, A., & Fontenla, M. (2007).La infraestructura y el crecimiento económico en México. *El trimestre económico*, vol.74 (296) , pp. 885-900. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2448-718X2007000400885&lng=es&nrm=iso

Tapia, L.A. (2018). Infraestructura carretera y economía regional: El caso de los productores de ajo de Oaxaca y Puebla. *Región y sociedad*, vol. 30 (73), https://doi.org/10.22198/rys.2018.73.a944