

The economic benefits of transport infrastructure economics essay



Chapter 2- Literature Review

2. 0 INTRODUCTION

After the abolishment of the rail system in 1964 for economic reasons, road has been the only means of mobility for people and good inside Mauritius. With the economic growth of the country there has been progressively development on the road infrastructure. However, the development has brought about an increase in traffic on the Mauritian Road network and various researches have been done to show its impact on the economy. Hence, we will try to understand how public investment in road infrastructure affects the economic performance of Mauritius while at the same time shedding some light on how these investments are, and could be, financed.

2. 1 Economic Benefits of Transport Infrastructure:

2. 1. 1 Demand Side Policy

Road infrastructure in Mauritius is the most important factor which has enabled economic activities to take place. In 2011, there was approximately 2112 Km of main roads in Mauritius. Investment in road infrastructure is very important for an economy as it allows goods and services to be transported more quickly and at a lower cost. As a result, it lowers the prices for consumers and increases the level of productivity for firms. Evidently, we witness the number of Lorries and trucks full of goods on our main roads, for instance, the sugar cane production have to make use of the roads to deliver the raw cane to the factories. The tourism industry, the manufacturing sector, the agricultural sector, the financial services industry, the ICT as well as the seafood hub industry needs the transport infrastructure to operate.

Eventually, the improvement in the road infrastructure has been able to reduce the delivery time to transport goods. That is, firms are able to receive their raw materials at the right time without having to delay their production process and deliver their finished goods to the supplier without having to make their customers to wait. Hence, reduction in delivery implies lower labor costs and more efficient use delivery vehicles, which results in a reduction of the firms' expenses. Also, a reduction in delivery time is very profitable for firms specializing in perishable goods as this increase the chance that the good reach the customer in a good state.

Transportation investment reduces inventory costs, as firms do not have to stock their raw materials for a long period for time. Thus, their storage costs are minimized and they can take advantage of just-in-time system. Hence, these results in a reduction of the cost of production and an increase in productivity which makes it easier to reduce the price of the good.

Additionally, development in road infrastructure, also allows employees to reach their place of work in time. That is, this increase efficiency in productivity and less complaints about congestions. Also, the employees become more efficient as they have not spent mostly of their energy in travelling and this increase their willingness to work.

As seen before, improvement in transportations have brought an improvement in logistics. That's it refers to the improvement in transportation and about more efficient management of inventory.

Consequently, this enhance the business reorganization effect, that is, when

the productivity has increased, the national economic welfare is enhanced; firms are able to produce more or better goods and services than before.

Table 1. 1: own illustration

2. 1. 2 Supply side policy

The Supply- side Economics developed during the 1970's in response to the Keynesian economic policy after the failure of the demand management during the stagflation of the 1970 to stabilize the Western Economy.

Therefore, as in classical economy, supply- side economists put a primacy on the production of goods and services, rather than on demand for those goods and services.

Hence, investing in the infrastructural development can be seen as an opportunity to make use of the available underutilized resources (especially labour). Road infrastructural development has been creating many jobs in Mauritius, starting from road contractors, site managers, and accountants, engineers to those workers involving raw inputs like cements, gravel, and asphalt and drivers.

According to 2011 statistics, there were 46100 persons unemployed in Mauritius, thus this means that there is large pool of unemployed workers who can be used to improve our infrastructure. Therefore, infrastructure investment would provide an opportunity for construction workers to productively apply their skills and experience[1].

Additionally, according to the multiplier theory, an initial injection will make the national income increase eventually by a figure which is higher than the

injection itself. That is, by injecting in the road investment, this will cause several round of expenditure to occur that is, more labour will be employed, more raw materials will be demanded, causing the raw material industry to produce more and hiring more factor of production (labour). The increase in workers will eventually cause an increase in demand of goods and services and consumption. Consequently, there are multiple expenditures that follow and gradually spread all over the economy to all sectors; primary, secondary and tertiary.

2. 1. 3 The Costs of Not Investing in Infrastructure

Investing in infrastructure is expensive, but not investing in infrastructure also is expensive. There is opportunity costs of not investing in infrastructure include: increased congestion, no forward linkages[2], absence of competitive edge in moving good, foregone productivity and jobs. Mauritians waste a lot of time stuck in traffic and it is said that the traffic congestion costs the Mauritian economy around Rs 2 billion per year (Mauritius Road Development Authority). Thus, this Rs 2 million could have been use for other purposes instead of being wasted. Also, congestion does not only affect the economy but also the environment.

The major cause of traffic congestion is the significant increase in the number of vehicles on the road, which was not accompanied by adequate road infrastructure. For instance the total vehicles on the road was 291, 605 in 2004 and 400, 919 vehicles registered in 2011 at the National Transport Authority while the road network only increased from 2, 020 km in 2004 to 2112 km in 2011 (Digest of Road Transport and Road Act)

2. 2 Understanding the Links between Transportation and the Economy

There have been several debates on the linkages between transportation and the economic performances. However, three methods that helped once to determine the link between transport infrastructure and economic growth were the macroeconomics, microeconomic research and the General Equilibrium Approaches.

2. 2. 1 Empirical

Road infrastructural development and its impact on economic performance has not been a common area of research in Mauritius. The rare literature available for our country is available in Khadaroo and Seetanah (2008) and Zainah (2009), with the former using a dataset of 50 years up to the year 2000 and showed that the long run effect of transport capital to output (0.263) is positive and also higher than the short run effect (0.145). However, on a global perspective, this area has had a vast number of researches, with the most important starting in the U. S in the late 1980's. Public Infrastructure, which comprises of road investment as well, is used in many notable studies. Among the main type of methodology used, we have got work done at both Microeconomics and Macroeconomic level.

Microeconomics analysis is done by estimating all the costs and benefits if road infrastructure projects. Knaap and Oostervahen (2003) worked at micro level and found that mature economies have little effect of improved infrastructure. A theoretical work of the importance of transport is found in the SACTRA report (1999). A 20% total time to be saved from road

improvement in certain regions is presented in this report. However, Cost
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Benefit Analysis does not take into account the broader effects of public infrastructure on the general economy, as often required by policy makers (Lakshmanan, 2011).

The present study is based on the macroeconomic impact of road infrastructural development. The basic method for incorporating public infrastructure in the literature is by the Production function approach in a static econometric model. An extended Cobb- Douglas function is used as proposed by Aschauer (1989):

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Where Y is the level of output, A is the level of productivity, K is the private capital stock, L is labour employed, and S is the government funding. The pioneer work of Aschauer (1989) measured the impact of public infrastructure on productivity and Gross Domestic Product (GDP) of the US during the period of 1949 to 1985 revealed the importance of public capital to productivity. Moreover, he estimated an output elasticity ranging from 0.39 to 0.56 with respect to public capital and a significant 0.24 in the case of core infrastructure (including transport).

A similar work was carried out by Munnell (1990) with modification being made by adding Marginal Factor Productivity with transport capital stock. Her model was a Log-linear production function with data used for the period of 1948-1987. Her result showed a significant impact, more precisely, for a 1% increase in public capital, productivity would be raised by 0.34%.

Based on the criticisms of the Production function approach and insignificant results (see Tatom, 1991), many studies then triggered off by using the Cost <https://assignbuster.com/the-economic-benefits-of-transport-infrastructure-economics-essay/>

Function Approach. Lynde and Richmond (1992) used data from 1958-1989 and found an output elasticity of 0.20% of public capital stock to productivity while Nadiri and Mamuneas (1993) obtained a negative effect of -0.05% to -0.21%. Other studies include that of Morrison and Schwartz (1996) and Gillen (1996).

It should be highlighted that, despite many works being carried out in this field, there is a wide discussion on whether transport really has a significant impact on a nation's wealth. Button (1998) questioned "about whether infrastructure provision actually fosters economic development or whether it is provided as a product of the economic development process. Banister and Berechman (2001) goes further by saying that economic growth happens modestly from infrastructure improvement and instead it is capital, labour and others that triggers growth (Looney, 1997).

Following the debate over the causality of Public Infrastructure and economic growth, in the last decade many studies have been using the Causality Approach (Herranz-Loncan, 2007) and others using dynamic econometrics framework (see Khadaroo and Seetanah, 2008; Lakshmanan, 2011; Pradhan and Bagchi, 2012). Herranz-Loncan (2007) carried out a study using the VAR model for the period of 1850-1935 for the Spanish economy and found that only for individual state level infrastructural improvements had an impact on growth as compared to national level development had insignificant impact on growth rates.

Pradhan and Bagchi (2012) recently found bidirectional causality between road transportation and economic growth. They used data for the period of

1970-2010 applied to the Vector Error Correcting Model (VECM). Same findings were made for road transportation, capital formation, Gross Domestic Capital Formation and economic growth. They suggest that expansion of transport infrastructure (mainly road and rail) along with gross domestic capital formation will lead to substantial growth of the Indian economy.

Sturm, Kuper and De Haan (1995) found that Basic Infrastructure such as roads, railroad, harbor, etc.. had Long Run benefit on the Netherland economy whilst Complementary Infrastructure in the likes of electricity, water supply, gas had only short term effects. They found an output elasticity of around 0. 3% with respect to public capital.

A pioneer work on road infrastructure and economic development was carried out by Queiroz and Gautam (1992) where they empirically showed a significant correlation between kilometers of paved roads and GDP in a cross section analysis of data from 98 countries. Averaged density of paved roads (km/million inhabitants) and road conditions were found to be associated with economic development.

Last but not the least, developing countries has also attracted interest in the empirical analysis, albeit it is very few. This is due mainly due to unavailability of data, specially for African countries. One of the most referred paper for developing countries is that of Looney (1997). The former studied public capital to explain a significant effect on Pakistan's economic growth over the period of 1973-1990.

Table 1. 2: Summary of some major studies

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Study

Dataset

Results/ Output Elasticities

Aschauer(1989)

1949-1985

0.39-0.56

Munnell(1990)

1948-1987

0.34-0.37

Garcia-Milla and Mc Guire(1992)

1969-1983

0.04(but significant for highways and education)

Lynde and Richmond(1993)

1959-1989

0.20

Canning(1998)

1950-1995

significant

Fernald(1999)

1953-1989

0. 35

Khadaroo and Seetanah(2008)

1950-2000

0. 263(Long Run result)

Pradhan and Bagchi(2012)

1970-2010

significant

Nadiri and Mamuneas(1993)

1947-1989

-0. 05 to -0. 21

Tatom(1991)

1949-1985

not significant

2. 3 Financing of Road Infrastructure

Studies about road infrastructure in Mauritius have mainly focused on the link about growth and road infrastructure. Hence, we wish to analyze how those investments have been financed and what are the future financing projects and its impact on the Economy.

Facing morning and afternoon traffic congestion which is estimated to cost the Mauritian economy around Rs 2 billion annually, the Road Development Authority is implementing a Road Decongestion program projects via PPP that will include the operations and maintenance of the entire Road decongestion program as Mauritius's first user pay toll road.

2. 3. 1 What is Public private partnership?

The U. S. Federal Highway Administration states that “ Public Private Partnerships (PPPs) are contractual agreements formed between a public agency and private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects”. That is, the private entity performs part of a government organization's service delivery functions, and assumes the associated risks for a significant period of time. Hence, in return the private entity receives as benefit a financial remuneration from either the governmental budget or the user charges or from both.

PPPs have been used in many countries to deliver infrastructural projects including Australia, Italy, Greece, UK, France, Portugal, Spain or Germany.

Several literatures have analyzed the cost and benefit of PPP scheme in transport. For instance, De Palma (2007) elaborated on the reasons about increasingly involvement of the private sector in the construction and operation of roads globally. He explained that normally public funding is insufficient to meet the increasing demand for road infrastructure and that nowadays the principle of the user should pay is widely acceptable. Moreover, he also stated that commercial pressures can encourage private operators in terms of lower maintenance costs, toll collection and other operating costs than the public sector. In addition, he supported his views with economic theories, which suggest that private firms have the incentive to take the responsibility of congestion and user costs borne by the customers.

Furthermore, Debande (2001) who studied the consequences of the private sector involvement in the transport infrastructural projects concentrated about the benefits of the PPP scheme. Firstly, Debande (2001) stated that, “recourse to the private sector to finance and operate infrastructure projects will improve the ex ante screening and monitoring of a project and increase its productive and managerial efficiency”. Additionally, he elaborated that the private sector who will take the responsibility for designing, constructing, financing and operating the infrastructure will consider it as his obligation to take full account of the risk associated. For instance, he will be able to have a better evaluation of the financial risk being responsible of the capital cost of the project and account for several other risks like managerial risk to improve service quality.

Nevertheless, the main disadvantage of the private financing could be when it imposes its monopolist power. That is, road being an important factor in an economy, the private firm might use it for its own benefit by imposing strict rules on the Government or even stop its functioning if they are not satisfied, which would be at the cost of the economy.

2. 3. 2 What is Toll road?

A toll road is one for which the driver is required to pay a fee or charge to be able to use it. In a period of crisis and at the same time increasing public debt, toll road is considered as a measure to lower the burden of the government by financing the road development project to some extent. That is, toll can offer access to outside financing for countries facing budget problems and limited debt capacity.

For the case of Mauritius, till now the fee amount has not yet been decided by the government. However, the Minister of Public Infrastructure and Transport, Anil Baichoo has announced that public transport and utility vehicles will be exempted from the charge. The toll will be introduced in places where alternate roads exist. Thus, drivers will be able to opt for the other way if they want to avoid the toll payment. Those who pass through the toll roads will benefit from a grant from the government.

The experience of toll roads started many decades ago and gained momentum recently with the privatization of the road infrastructural projects. Initially, it started in developed countries, mainly in Europe and the United States of America, and widespread in developing countries in Asia, Africa and Latin America with the Public Private Initiative of the World Bank.

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Italy was the first European country to apply the use of motorway toll near Milan in 1924. Also the first major toll road in the U. S is the Lancaster Turnpike, between Philadelphia and Lancaster which was built in the 1790's. Additionally, the first toll motorway in U. K, the M6 toll is said to save motorists approximately 45 minutes on average journey time. It is operated under the private sector company Midland Expressway Limited which was granted a 53 year concession to operate and maintain the M6 Toll.

2. 3. 2. 1 Advantages of toll roads

Toll roads have been a subject of research for many decades because toll roads are expected to alleviate many existing issues due to traffic and transport. For instance, the main use of toll road is for reducing congestion. For instance, in Mauritius it is said that traffic congestion cost the Mauritian economy around Rs 2 billion which is indeed a huge sum. A major economic theory suggested toll road as a solution for market failure. Market failure occurs because of the presence of externalities. Hence, the term externalities can be defined as a situation in which the production and consumption of a good has an impact on a third party. For example, in case of roads, the decision of a driver to use a road can cause an externality on other drivers if his presence on the road network reduces the speed of all other users and increases their journey times. Thus, toll roads provide a solution for market failure as drivers pay a fee for traveling on some roads and the fee for traveling on a road reflects the size of the negative external effect imposed by each driver on other drivers. Evidently, the road users should consider the external costs occurred in the transport system such as the environmental costs, by internalizing the external cost (Tillema et al.

2003). That is, the one doing pollution is going to pay and his marginal willingness to pay be equal to total marginal social costs.

2. 3. 2. 2 Empirical

It is also said that collecting of tolls provides a mechanism for financing construction and maintenance for new road projects. Furthermore, the two main economic benefits of toll roads are time saving as well as energy saving. Evidently, a study (Munroe 2006) has shown that toll users do benefit a lot from the travel time saved. That is, based on his analysis he concluded that the estimated economic benefit of time saving from TCA's toll road is at least \$182 million per year.

Additionally, Duff and Irvine (2005) elaborated that road user charges can promote economic efficiency and fairness. That is, the drivers who choose to use the road will value their use of the road system at an amount equal or greater than its cost. And on the other hand those who value the road system at an amount less than its cost will prefer not to drive. Hence, this is going to prevent wasteful allocation of scarce resources to a use for which people are unwilling to pay and it reflects the idea that who shall pay will use.

Taking into account, the evidences of the success of Road pricing system in various countries, Baichoo and Baichoo (1999) summerised the advantages of an Automatic Road Pricing System as congestion reduction, a measure to generate revenue and under the environmental aspect as air pollution reduction.

In order to know the public opinion about toll roads, several surveys were conducted. For instance, Kockelman and Kalmanje studied the Credit Based Congestion Pricing and the public opinion in several journals. Hence, Kockelman and Kalmanje (2005) conducted a survey to assess public opinion about a new policy called Credit Based Congestion Pricing (CBCP). CBCP is revenue neutral policy where generated tolls are returned to drivers in a uniform way, consequently, average drivers happens to pay nothing and long distant drivers do pay. Their survey was based on a sample of 500 individuals where, 25 percent supported the policy. Oswald et al (1995 cited Podgorski and Kockelman 2005) tried to study the Tolling finance and application through a mail out mail back survey. Hence, they found that the use of toll revenues to improve non tolled facilities was acceptable.

In addition, Podgorski and Kockelman (2005) elaborated in his journal that Wilbur Smith (FHWA 2002) as well as Pacific Rim Resources' (2001) conducted telephone survey to know about the respondents who were willing to use toll roads and they were keen to support toll roads as a means to save time.

There has been a lot of literature on pricing policies which were basically based on economics aspects. However, Tillema et al. (2003) stated that that the literature really done much research on the spatial consequences and they explained the importance of accessibility between the transport system and the land use system.

2.3.2.3 Critics of toll road

Several studies were done to elaborate on the different risks facing toll roads. Sihombing et al. (2011) based his study in literature; he divided toll road infrastructure risks in Indonesia into nine parts: private equity risks, financial risks, economic credit risks, planning risks, design risks, procurement risk, construction risks, operational risks and concession risks. . Evidently, Fisher and Babbar (1996) studied the challenges related to private toll roads through the experience of eight privately financed toll road projects and found that the public sector was generally responsible for the political and revenue risks whereas the private was responsible for the project risk.

Baichoo and Baichoo (1999) tried to explain the major issues related with Road Pricing System and elaborated that it can become a serious problem for low income earners as it would result in an increase of their expenditure; also this is not going to cure congestion but only shift the congestion problem from motorway to side roads. Hence, in his paper he proposed a pilot project in Mauritius so as to minimize the financial risks.

Taking into account limited budgetary resources, Jamaica used the deferred financing facility as solution to finance road infrastructure (Spencer, 2007). Deferred financing refer to a financing facility where contractors are paid when the projects are completed. However, Spenser (2007) criticize that deferred financing has caused the Debt level to increase in Jamaica, resulting in a worst government deficit.

The transport infrastructure sector has not been spared by the current crisis period (Tanaka, et al., 2005). The worsening Economics condition has caused many road projects to fail resulting in an increase in the level of risks.

Consequently, the private financing of road projects has decreased in developing countries, so Tanaka, et al. (2005) used the Value-for-Money (VTM) methodology to assess and evaluate the risk in private finance projects. However, the VTM methodology was criticized as it lacks transparency.

Government intervention is very important in private toll roads to be able to mitigate the level of risks during the project lifecycle (A. El-Amm, 2003). He summarized the risk mitigation strategies as a four “ s” strategies namely; shape the risk, share the risk, shed the risk and sustain the residual risk, where he mentioned making use of hedging tools.

http://ops.fhwa.dot.gov/freight/freight_analysis/improve_econ/appa.htm#s13

[http://www.whitehouse.](http://www.whitehouse.gov/sites/default/files/infrastructure_investment_report.pdf)

[gov/sites/default/files/infrastructure_investment_report.pdf](http://www.whitehouse.gov/sites/default/files/infrastructure_investment_report.pdf)

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