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## **THE IMPACT OF PUBLIC INVESTMENT IN SEAPORTS INFRASTRUCTURE ON THE ECONOMIC GROWTH: THE TUNISIAN CONTEXT**

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### **ABSTRACT**

The establishment of seaport request heavy investment. It is expected to play a key role in strengthening economic growth. In Tunisia, the decision-makers accord a major importance to seaport activities. They allocated annually important amounts to develop it. The aim of this paper is to measure the real contribution of seaport infrastructure public investment on the economic growth between 1987 and 2011. To reach this objective, we have used in the empirical studies an econometric model, called Cobb-Douglas production function. The experiment results show that seaports infrastructures investments generate positive contributions to Tunisian economic growth; first, by direct contribution via its added value; as well, by indirect contributing via development of other economic activity.

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**Keywords:** Seaport Activities, Seaports Infrastructures, Economic Growth, Seaport Capital, Seaport Infrastructures Investment, Public Investment.

## 1. INTRODUCTION

The seaport constitutes the axial element of maritime sector. Large parts of maritime services are offered inside it, why various actors in maritime affairs are closely related to. To meet the requirements maritime actors, seaport required enormous equipments and installations. These are called seaport infrastructures, which are necessary for treating merchant ships and freighting goods. Nowadays, seaport is not a simple interface of treating ships and loading goods on board but it is also an economic entity which generates an added value contributing directly to the economic growth. It contributes indirectly to economic growth via its role in development of the rest of the economic branches.

Considered as public infrastructures, the seaports have been paid particular attention as economic growth factor. Some studies have interested in seaport economic effects (Goss (1990), Haynes *et al.* (1997), Charlier (1998), Gripaios (1999), Van Nieuwenhove (2003), Stern and Hayuth (2004), Ziang and Zhang (2005), Kwak *et al.* (2005), Heaver (2006), Martin (2006), Coppens *et al.* (2007), Chudasama and Sudhakar (2007), Lim (2008), Jung (2011), Acosta *et al.* (2011), Jung and Kim (2012), Nannan *et al.* (2013), Adolf *et al.* (2014)), Songa and Van Geenhuizenc (2014). These studies reveal the role of seaport infrastructures. First, they contribute to the development of the foreign trade and speed up the insertion of domestic economy in the international economy. Second, they consider the seaports as vital factors to attract new industries (Hyuksoo and Yeongseok (2009)). Third, seaports are considered as a focal point for the regional development (Jung, (2011); Songa and Van Geenhuizenc (2014)). Fourth, seaports are crucial for generating employment opportunities through effects associated with seaports and activities whether direct, indirect and induced activities. Finally, at the level of the economic growth process, the seaports constitute the real pillars to develop the rest of economic activities. For these raisons, many governments are directly or indirectly involved in process of seaport infrastructures development.

In Tunisia, seaports constitute the most important transit points on borders which link national and international economies. Along the period 1987-2011, nearly 95% of the total exchanged goods between Tunisia and the rest of the world have been passed through seaports. In view of its role to sustain foreign trade, Tunisian decision-makers accord to seaport activities a particular attention. During the last two decades, 6% of public spending for the development within the state budget was assigned to seaport infrastructures. Moreover, in 2013 Tunisian decision-makers decided to create a new seaport in the region of Enfidha, which will be start in 2015 with 3000 million dinars as investment. It is considered as the Hub Port covers mainly 3200 hectares, 2000 of which are specifically devoted to economic and logistic activities.

Usually, decision-makers proclaim that seaports will constitute not only the support of foreign trade but also as factor of consolidation of economic growth process. The increasing of public spending in seaports, the over exploitation of farming lands for industrial purposes and the environmental issues raise a major question: to what extent did seaports contribute to economic growth during the last two decades?

This paper is organized as follows: the second section is devoted to analyse the reality of Tunisian seaports. The third is assigned for an empirical approach where we describe an econometric model, which permitted to estimate the seaports infrastructures investment contribution to Tunisian economic growth. The fourth present the result and the last is preserved to conclude.

## 2. TUNISIAN SEAPORT ACTIVITIES

Tunisia is located in the center of the Mediterranean and widely opened to the sea. Some specific characteristics are attributed to the Tunisian seaports. First, they are not only owned by the state but also financed and arranged through the Merchant Navy and Port Office (MNPO, a public establishment). However, the exception is only for Skhira seaport which is managed by a private company TRAPSA.

### 2.1. Seaports specialization

The specialization is presented as the last typical characteristics. The complex of Bizerte Menzel Bourguiba is dominated by the traffic of liquid bulks essentially the Hydrocarbons. Seaport of the Goulette is specialized mainly in treating Cruise ships and Ferry Pax. Marine salt and crude oil are two main activities of Zarzis seaport. The main traffic of Sfax Sidi Youssef consists in solid bulk (phosphate, salt, cereals ...). Seaport of Sousse is dominated by the traffic of general cargo. The seaport of Gabes is specialized in dealing with chemical traffic of neighboring factories. Rades seaport is specialized in handling containers and trailers; according to the MNPO it hosts 79 percent of the total tonnage of containerized goods and 80 percent of traffic rolling units. Rades seaport makes the exception which meets the needs of almost all the Tunisian industrial companies. Finally, seaport of Skhira is being specialized in petroleum products.

### 2.2. Shortage of competition among Tunisian seaports

The shortage of competition among Tunisian seaports is considered as common characteristics. The stability in the proportion contribution of each seaport in the Tunisian seaborne trade as mentioned in table 1 proves this shortage of competition. For this previous reason, the role of every seaport is rather limited to the satisfaction of the nearby industries.

**Table 1: Tunisian Seaports traffic (Thousand Tons)**

Seaports Names	Years		
	2008	2009	2010
Bizerte-Menzel Bourguiba	5308	4706	3989
The Goulette	904	636	798
Rades	5854	5532	6296
Sousse	2351	1805	2243
Sfax-Sidi Youssef	5092	4550	5018
Gabes	4155	4112	4773
Zarzis	796	1028	1355
Skhira	6661	5908	5878
Total	31121	38277	30350

Data Source: Annual reports of MNOP

### 2.3. Dominance of bulk traffic

Tunisian seaborne trade is dominated by bulks either dry or liquid. Table 2 reveals that the portion of bulks is more than 74% of Tunisian Seaborne Trade.

**Table 2: Decomposition of the Tunisian Seaports traffic (%)**

Seaports Names	Type of Goods								
	Dry Bulk (%)			Liquid Bulk (%)			Divers Goods (%)		
	Years			Years			Years		
	2008	2009	2010	2008	2009	2010	2008	2009	2010
Bizerte-Menzel Bourguiba	15	16	30	68	70	47	17	14	23
The Goulette	31	21	22	11	11	15	58	68	63
Rades	11	08	10	21	21	18	68	71	72
Sousse	62	56	63	02	01	03	36	43	34
Sfax-Sidi Youssef	80	77	78	04	03	02	16	20	20
Gabes	68	62	70	24	32	23	08	06	07
Zarzis	57	73	86	34	20	13	09	07	01
Skhira	0	0	0	100	100	100	0	0	0

Data Source: Annual reports of MNOP

The actual contribution of Tunisian seaborne trade in the added value of the seaports activity is rather weak and has not a major impact on reinforcing the economic growth process. It is because treating or handling the bulks does not require a big number of labor forces.

#### 2.4. Disequilibrium of seaports public investment

Seaport infrastructure gains a special importance from the economic policy makers in Tunisia. The amounts allocated to port investments in Table 3, are considered significant compared to the spending designated to development in the State budget. During the last few years, the port of Rades has benefited from such important portion of the public investments.

**Table 3: Seaports infrastructures Public investment in Tunisia (million Dinars)**

Seaports Names	Years		
	2008	2009	2010
Bizerte-Menzel Bourguiba	15	14.8	0
The Goulette	68.1	74.9	1.1
Rades	72.6	76.9	38.6
Sousse	14	19.3	4.5
Sfax-Sidi Youssef	10.5	13.5	3
Gabes	21.8	24.3	2.5
Zarzis	25.53	12.98	1
Skhira	0	0	0
Seaports infrastructures public investments	227.53	236.68	50.7
State total spending of development	3244	4013	4326

Data Source: Annual reports of MNOP and the budget State

The particular interest granted to the seaport of Rades is simply justified by its tie up with the regular Mediterranean shipping lines. However, the rest of seaports use the same equipments and installations since a long period. These make them unable to answer to some new requirements of the maritime actors.

Based on the above description, it seems that most Tunisian seaports have a low direct contribution in the economic growth. Therefore, we cannot approve and sustain this deduction without the use of an econometric analysis model which is useful to detect the global effects (direct and indirect) of seaports infrastructures on the economic growth.

### 3. EMPIRICAL APPROACH

According to Baum and Kurte (2002), the economic effects of transport infrastructures can be evaluated by two types of analyses, mainly micro-economic and macro-economic. Micro-economic analyses are often upstream made to estimate the economic profitability of transport infrastructures which will be carried out. However, macro-economic analyses are often downstream made to measure the contribution of transport infrastructures on economic growth.

#### 3.1. Econometric Model

The developed model in this paper allows us to estimate the effects of public investments in the seaport infrastructures on the economic growth in Tunisia from 1987 to 2011. This model has been already inspired from the model of Aschauer (1989). This model incorporates the seaports infrastructures into production function in the same way as the physical capital stock and the labor. The functional form is Cobb-Dougllass production function. It is traditionally used in the production function approach which specifies the evolution rule of the Gross Domestic Production due to the rise of production factors.

$$Y_t = A \left( K_{op_t} \right)^\theta \left( P_t \right)^\lambda \left( L_t \right)^\beta \quad 1-1$$

- $Y_t$  : Total Production for year  $t$ , measured by the Real Gross Domestic Production; the data are published by the National Institute of Statistics.
- $K_{op_t}$  : Physical Capital off seaport capital for year  $t$ . The data are not for immediate use. They require further calculation as it will be explained in the next paragraph.
- $P_t$  : Seaport capital for year  $t$ : the data require a specific calculation according to the method that will be presented in the next paragraph.
- $L_t$  : Labor factor for year  $t$ : the data are published by the National Institute of Statistics.
- $\theta$ ,  $\lambda$  and  $\beta$  : are respectively, the output elasticity of physical capital off seaport capital stock; seaport capital and labor.

The linear form of the equation 1-1 obtained by logarithmic transformation is:

$$\text{Log}Y_t = a + \theta \text{Log}K_{op_t} + \lambda \text{Log}P_t + \beta \text{Log}L_t \quad 1-2$$

With:

$$a = \text{Log}A .$$

The empirical equation is:

$$\Delta \text{Log}Y_t = \alpha_0 + \alpha_1 \Delta \text{Log}K_{op_t} + \alpha_2 \Delta \text{Log}P_t + \alpha_3 \Delta \text{Log}L_t + \varepsilon_t \quad 1-3$$

### 3.2. Measuring the seaport capital

The relative data of the seaport capital are not for immediate use, they request calculation as follows:

$$P_t = (1 - \delta_p) P_{t-1} + I_{P_t} \quad 2-1$$

With:

- $P_{t-1}$  : Seaports Capital for year  $t - 1$ .
- $I_{P_t}$  : Seaport Infrastructures Investment of the year  $t$ , published in the annual reports of MNPO.
- $\delta_p$  The rate of depreciation of seaport infrastructures corresponds to the rate of accounting method applied in Tunisia which is equal to 5 per cent.

To estimate the seaport capital stock, we calculate the seaport capital for the basic year, in our analysis ( $P_{1987}$ ). To determine it, we use the coefficient of capital that represents the ratio of the seaports capital stock to the added value of the seaports ( $\vartheta_{p_t}$ ) in 1987. It is presented as following:

$$\vartheta_{p_t} = \frac{\text{Seaports Capital}_t}{\text{Added Value of Seaport Activities}_t} \quad 2-2$$

$$\text{Seaports Capital}_t = \vartheta_{p_t} \times \text{Added Value of Seaport Activities}_t \quad 2-3$$

Usually, in seaport activities the unit of added value request three units of seaports capital.

$$P_{1987} = \text{Seaports Capital}_{1987} = 3 \times \text{Added Value of Seaport activities}_{1987} \quad 2-4$$

The added value at factor costs is published by the National Institute of Statistics in the National Accounts.

### 3.3. Measuring of physical capital off seaports capital

The physical capital  $K_t$  is defined as the total tools and equipments used in the production process. The seaports capital constitutes a part of this capital which can be estimated separately.

$$K_t = K_{op_t} + P_t \quad 3-1$$

$$K_{op_t} = K_t - P_t \quad 3-2$$

## 4. RESULT DISCUSSION

The estimation of the equation 1-3 by the Ordinary Least-Squares gives the following result in the table 4.

**Table 4: Estimation results**

Endogenous variable: $\Delta\text{LOG}(Y)$			
Period: 1987-2011			
Explanatory variables	Coefficient	t-Statistic	Prob
$\alpha_0$	2.673627	8.132980	0.0000
$\Delta\text{LOG}(K_{op})$	0.073517	2.169868	0.0326
$\Delta\text{LOG}(P)$	0.071945	2.551029	0.0124
$\Delta\text{LOG}(L)$	0.166948	2.316195	0.0228
R-squared = 0.929034			
Durbin-Watson stat = 2.804891			
F-statistic = 69.81954 ; Prob (F-statistic) = 0.000000			

The value of various statistics of global judgment of the model and especially R-squared and Durbin-Watson approve that the actual result is satisfactory. Fisher's and student's statistics show that the model is globally and individually significant with an error margin of 5%. Particularly, the associated coefficient to the physical capital stock off seaports capital stock and labor are statistically significant and above all, they are both positive. The obtained result is in harmony with most empirical studies which analyse the impacts of the infrastructure on the economic growth process. In fact, the seaports infrastructures stimulate the process of the economic growth via several canals of transmissions. First the investments affect positively the supply as they come up with an increase of production capacities. They also modify the structure of transport costs, which favor the economic growth process. Then, these investments are stimulating foreign trade as well as foreign direct investments. Such encouraging results do approve the general tendency of Tunisian government to develop seaports infrastructure as much as possible.

## 5. CONCLUSION

Tunisian governments consider seaport infrastructures as factor of economic growth. Annually, they allow a considerable amount (approximately 6% of public spending for the development) to develop the seaports activity. Face to this orientation, we are incited to analysis the real contribution of seaport infrastructures in the Tunisia economy. The descriptive analysis indicate that seaport activity have low directly effects on economic growth. However, the econometric analysis shows an important role of these infrastructures. The seaport infrastructures elasticity of GDP is equal to 0.071. This result affirms the positive effects of seaports infrastructures investments on the Tunisian economic ones and confirms the orientation of governments towards sustaining these investments. The high seaport infrastructures elasticity of GDP suggest that the seaports infrastructures have an important indirectly effects on economic growth. The used model has the particularity to detect the global contribution of seaport infrastructures on the economic growth. To decompose this contribution it is necessary to appeal to sectoral analysis.

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