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The Role of Seaports in the Process of Economic Growth

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Abstract
Seaport activity constitutes an important economic activity in terms of development and integration in the world economic market. The seaport is expected to play an important role in the strengthening of economic growth. The Tunisian government allocated annually a great amount to develop public seaports. The aim of this paper is to measure the impact of public investments of seaports on the economic growth over the period 1987-2014. To attain this objective the empirical study of an econometric model called Cobb-Douglas production function is used. The results show that public investments of seaports generate positive contributions to Tunisian economic growth; first, by direct contribution via its added value; and second, by indirect contributing via development of other economic activity.
Keywords: Seaports, Economic Growth, Public Investment, Tunisia

1. Introduction

Evaluating the economic impact of a seaport is an important subject both in the political and scientific debate. Political evaluation of economic impacts of a seaport is habitually effectuated by the government to motivate the request for public funds for developing existing infrastructure or to construct a new seaport or to justify its social costs. Scientific evaluation of economic impacts of a seaport is effectuated by searchers to assess the economic and social impacts of seaport investments or to justify future port investments.

In Tunisia, seaports constitute the most important transit points on borders which link national and international economies. Along the period 1987-2014, nearly 95 per cent 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 seaports' activities a particular attention. During the last two decades, 6 per cent 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 start in 2015 with 3000 million dinars as an investment. It is considered as the Hub Port covers mainly 3200 hectares, 2000 of which are specifically devoted to economic and logistic activities.

Usually, government proclaims that seaports will constitute not only the support of foreign trade, but also as a factor of consolidation of the 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?

The rest of this paper is organized as follows: the second section is reserved to literature review. The third section devoted to analyzing the reality of Tunisian seaports. The fourth 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 fifth section presents the result and the last is preserved to conclude.

2. Literature Review

The seaports gain especial concern simply because they are regarded as a factor of economic growth in their countries. Seaport impacts on the economy are measured to assess the economic and social impacts of seaport investments or to justify future port investments. Three main methodologies that have been used to evaluate the economic impact of a port: Input-Output, computable equilibrium and gravity models (Bichou, 2007).

Several studies have discussed the topic of seaport and its impact on the economy: Goss (1990), Wakeman (1996), Haynes et al. (1997), Gripaios (1999), Van Nieuwenhove (2003), Stern and Hayuth (2004), Ziiang and Zhang (2005), Kwak et al. (2005), Musso et al. (2006), Heaver (2006), Martin (2006), Chudasama and Sudhakar (2007), Lim (2008), Jung (2011), Acosta et al. (2011), Jung and Kim (2012), Nannan et al. (2013), Hargono et al. (2013), Danielis and Gregori (2013), Shan et al. (2014), Adolf et al. (2014), Songa and Van Geenhuizenc (2014), Bottasso et al. (2014), Chang et al. (2015), Dwarakish and Salim (2015). The above-mentioned studies revealed the role of seaports in economies.

The major implications derived from these studies can be listed as follows: first, the process of seaport development is seen as a form of a transportation development system, the thing which facilitates the progress of international trade. Second, seaport promotes the exportation of goods and logistic services. Third, the seaport is considered as a focal point for the regional development. Seaport may still be seen as structuring elements within their surrounding urban region. Fourth, seaports are crucial for generating employment opportunities through effects associated with seaports and logistics activities (storing, distribution, container freight station function

etc.). Logistics activities last are enabled to create more employment occasions as well as the seaport industry itself. Fifth, the contribution of the seaport to economic growth is greatly increased due to its added value and those of logistics activities, which take place in the vicinity of seaports. Sixth, seaport speed up the insertion of the domestic economy in the international economy. Seventh, seaports as vital factors to attract new industries. Eight, seaports constitute the real pillars to develop the rest of economic activities.

3. 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).

3.1 Seaports specialization

The complex of Bizerte is dominated by the traffic of liquid bulks essentially the Hydrocarbons. The 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 consists in solid bulk (phosphate, salt, cereals…). The seaport of Sousse is dominated by the traffic of general cargo. The seaport of Gabes is specialized in dealing with the 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.

3.2 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 the previous reasons, the role of every seaport is rather limited to the satisfaction of the nearby industries.

Table 1: Tunisian Seaports traffic (Thousand Tons)

	Years		
Seaports	2008	2009	2010
Bizerte	5308	4706	3989
The Goulette	904	636	798
Rades	5854	5532	6296
Sousse	2351	1805	2243
Sfax	5092	4550	5018
Gabes	4155	4112	4773
Zarzis	796	1028	1355
Skhira	6661	5908	5878
Total	31121	28277	30350

Source: Annual reports of MNOP

3.3 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 per cent of Tunisian Seaborne Trade.

Table 2: Decomposition of the Tunisian Seaports traffic (per cent)

Seaports	**Type of Goods**								
	Dry Bulk (%)			**Liquid Bulk (%)**			**Divers Goods (%)**		
	Years			**Years**			**Years**		
	2008	2009	2010	2008	2009	2010	2008	2009	2010
Bizerte	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	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

Source: Annual reports of MNOP

The actual contribution of Tunisian seaborne trade in the added value of the seaport 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.

3.4 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 for 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)

	Years		
Seaports	2008	2009	2010
Bizerte	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	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

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 equipment's and installations for 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.

4. 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.

4.1 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 from1987 to 2011. This model has been already inspired from the model of Aschauer (1989). This model incorporates the seaports infrastructures into the production function in the same way as the physical capital stock and the labor. The functional form is Cobb-Douglass 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.

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

Y_t represent the total production for year t, measured by the real gross domestic production; the data are published by the National Institute of Statistics. Kop_t represent the 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 measured 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 represent the labor factor for year t, the data are published by the National Institute of Statistics. θ, λ and β are, respectively, the elasticity of value added with respect to physical capital off seaport capital stock; seaport capital stock and labor factor.

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

$$LogY_t = a + \theta LogK_{op_t} + \lambda LogP_t + \beta LogL_t \quad (2)$$

With: $a = LogA$

The empirical equation is:

$$\Delta LogY_t = \alpha_0 + \alpha_1 \Delta LogK_{op_t} + \alpha_2 \Delta LogP_t + \alpha_3 \Delta LogL_t + \varepsilon_t \quad (3)$$

Where α_1; α_2; and α_3 are slope coefficients measured the rate of change in the VA, when there is a unit change in the value of inputs. α_0 is the intercept coefficient. It shows the rate at which VA will change independent of stated inputs. ε is the error term, which shows that other explanatory factors that might affect the magnitude of the VA that are not avowed in the model.

4.2 Measuring the seaport capital

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

$$P_t = (1 - \delta_p) P_{t-1} + I_{P_t} \quad (4)$$

With P_{t-1} represent the seaports capital for year *t-1*. Ip_t the seaport infrastructures investment of the year t, published in the annual reports of MNPO. δ_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 (decree number 2008-492 of February 25th 2008, Official gazette, Official Printing of the Republic of Tunisia; p. 825).

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 (ϑp_t) in 1987. It is presented as following:

$$\vartheta_{p_t} = \frac{Seaports\ Capital_t}{Added\ Value\ of\ Seaport\ Activities_t} \quad (5)$$

$$Seaports\ Capital_t = \vartheta_{P_t} \times Added\ Value\ of\ Seaport\ Activities_t \quad (6)$$

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

$$P_{1987} = Seaports\ Capital_{1987} = 3 \times Added\ Value\ of\ Seaport\ activities_{1987} \quad (7)$$

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

4.3 Measuring of physical capital off seaports capital

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

$$K_t = K_{op_t} + P_t \quad (8)$$

$$K_{op_t} = K_t - P_t \quad (9)$$

5. 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: ΔLOG(Y) Period: 1987-2014			
Explanatory variables	Coefficient	t-Statistic	Prob
α_0	2.673627	8.132980	0.0000
ΔLOG(Kop)	0.073517	2.169868	0.0326
ΔLOG(P)	0.071945	2.551029	0.0124
ΔLOG(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 approves 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 5per cent. 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 more empirical studies which analyze 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.

6. Conclusion

The seaport constitutes the principal element of the maritime sector. Large parts of maritime services are offered within it, why various actors in maritime affairs are closely related to. To meet the maritime actor's requirements, seaport required enormous equipment and installations. These are called seaport infrastructures, which are necessary for treating merchant ships and freighting goods. Nowadays, the seaport is not a simple interface of treating ships and loading goods on board. It may be considered a service that is generally useful to the economy, which contributes directly to the economic growth through its added value and indirectly via the development of the rest of the economic branches.

Seaports provide services which are regarded as useful to the economic growth. For any nation, seaports are also viewed as a business system which operates within a highly competitive market and hence they require continuous development to enhance the quality of services and efficiency of seaports.

Tunisian governments consider seaport infrastructures as a factor of economic growth. Annually, they allow a considerable amount (approximately 6 per cent of public spending for the development) to develop seaports. Face to this orientation, we are incited to analysis the real contribution of seaport infrastructures in the Tunisian economy.

The descriptive analysis indicates that seaport activity has 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 growth ones and confirms the orientation of governments towards sustaining these investments. The high seaport infrastructures elasticity of GDP suggests that the seaports infrastructures have an important indirect effect 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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