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Does globalization matter in container port efficiency?

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Abstract— the containerization participates in the globalization process because it plays an important role in the international trade, as consequence, this paper, try to study the real influence of globalization in the container ports efficiency, so it proposes the stochastic frontier analysis "SFA" to evaluate the efficiency scores of 36 global container ports throughout the period 2012 -2016. The results suggest that the ports with the best average efficiency scores do not necessarily have high globalization index.

Keywords— container ports, efficiency, globalization.

I. INTRODUCTION

The effect of the efficiency port reflected on its countries economic developments. Port efficiency varied from region to another according to the specific characteristics. It is known that the major container ports are the most efficient in the world. It means that there are different factors permitted this ports topped the first rinks. Several authors have investigated the relationship between efficiency and various variables using several approaches. However, the popular approaches used are two: the first, is to compute correlation coefficients to conduct other with simple non-parametric analysis. The second, usually referred to a two-step procedure, that to measure farm level efficiency and then to estimate a regression model where efficiency is expressed as a function of socioeconomic attributes.

The effects of globalization on the port sector are not facts wait during the last decade. The world's ports were affected by significant institutional and organizational reforms, mainly, through the adoption of privatization public policies, the deregulation and the decentralization of transport infrastructure. These reforms in the port governance were associated with more goals general improvement of port efficiency and the desire to reduce the state intervention in the planning and management of infrastructure Maritime. According to Cullinane et al.[1] containerization facilitated the globalization of maritime services.

In literature review there are many studies used DEA method to estimate port efficiency using several variables as [2], [3], [4], [5], [1], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18] and [19], the DEA is popular then other methods in efficiency measuring because it technique makes it possible to evaluate the differences between the points representing the input values and the observed outputs with respect to a point on the production frontier. The efficiency frontier is estimated using an envelope curve, so it is easier to apply in seaports sector. Conversely, the SFA method, there are only some of studies that used SFA to estimate port efficiency as [20], [21], [22], [23], [24], [25] and [26].

The earlier studies used container throughput (TEUs) as an output variable and a different variables that characterized the port infrastructure and superstructure as inputs variables. Even so, the variations in crane and handling technology are hardly captured in the literature [5]. The focusing on these kinds of samples, founded that is composed of the huge container ports. These views are expressed by several studies such as [19] and [27].

The main objective of this work is to estimate the efficiency parameters of the container ports, evaluate the efficiency scores obtained and identify the explanatory factors of the efficiency scores. To achieve these objectives it makes the following assumptions:

•a Cobb-Douglas production frontier estimate as a technical efficiency analysis tool.
•Container ports located high globalization countries are more efficient.

This paper first proposes a review of the literature on port efficiency. Second, it represents the methodology which describes the econometric methods, the variables and the source of data. Third, discusses the empirical results of the estimate model. Fourth, it represents the conclusion.

II. METHEDOLOGIE

A. Stochastic frontier model

This study used stochastic frontier model to estimate the technical efficiency of 36 container ports in the world. The Battese and Coelli (1995) [28] model can be expressed as follows:

$Y_{it}=x_{it}\beta+(V_{it} - U_{it})$ i=1..... N. t=1..... T.

With:

Y_{it}: is the output obtained by the i-th port at the t-th time period;

x_{it}: is the vector of input quantities of the i-th port at the t-th time;

β: is the vector of parameters

V_{it}: are random variables which are assumed to be iid. N $(0.\sigma_V^2)$;

$U_{it}= (U_i\exp(-\eta (t-T)))$;

Where:

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U_{it}: are assumed to be i.i.d. as truncations at zero the of N (m_{it}. $\sigma_U{}^2$)

$\sigma^2 = \sigma^2v + \sigma^2u$ et $\gamma = \sigma^2u / (\sigma^2v + \sigma^2u)$

V_i and U_i are independent

$m_{it} = z_{it}\delta$.

With z_{it}: is the vector of exogenous variables which may influence the efficiency of a port;

δ: is the vector of parameters

B. Data and variables

For the reason of the complexity port system and their connectivity, this paper used several variables such as:

Containerization throughput (TEU): this variable presents the traffic of containers in each port; we chose this variable for reason that containerization is used in the all world with the same standardization. The data are collected from the international containerization year book.

The Urban area: include the following variables: *Population city*: a population city designed the number of all the organisms (peoples) living in the same region (area).

We chose the number of population city for the reason that if there is an important number of population city the port be more efficient. Therefore, this meaning that there is a density of human structures such as houses, commercial buildings, roads, bridges and railways.

Land area: the land area is the surface of the area (region) measured in square kilometers.

We select also the variable land area for each port city for the reason that big cities can have the most efficient. The data are collected from the Demographia World Urban Areas.

International trade: international trade is the exchange of goods and services between countries. We chose export and Import factors for each country for the reason that international trade affect port efficiency. Whenever, the international trade increase port will be more efficient. The data are collected from the International Trade Statistics.

Port infrastructure: the infrastructure depends on the development of seaports to move domestic and international commerce. Transport infrastructures are high and are one of the reasons for the country's low competitiveness. We chose this factor for the reason that the container port that has the important quality of infrastructure is more efficient. For this factor we chose four variables such as: total quay length, maximum alongside depth, total terminal area and total container storage capacity.

Globalization: the globalization index variable includes economic globalization, social globalization and political globalization. The data are collected from the (KOF) Globalization Index, which measuring the three main dimensions of globalization. This variable is introduced for the reason that globalization affects port efficiency. It is supposed that more cities have globalization more they have higher efficient ports.

III. EMPIRICAL RESULTS

As shown in table 1, the estimate of γ is 0.379, which indicates that the vast majority of error variation is the inefficiency error ui (and not due to random error vi).

Table 1. The maximum likelihood estimators.

Variables	parameters	OLS		ML	
Constant	β_0	-0.169	(-0.200)	0.466	(0.610)
X1	β_1	0.251	(0.289)	0.208	(0.239)
X2	β_2	-0.512	(-0.146)	-0.454	(-0.143)
X3	β_3	0.108	(0.623)	0.105	(0.635)
X4	β_4	-0.105	(-0.553)	-0.109	(-0.585)
X_5	β_5	0.115	(0.679)	0.137	(0.673)
X_6	β_6	0.168	(0.327)	0.100	(0.212)
X_7	β_7	-0.200	(-0.928)	-0.210	(-0.101)
X_8	β_8	-0.496	(-0.124)	-0.184	(-0.444)
Constant				-0.673	(-0.108)
Z1				0.772	(0.111)
sigma-squared (σ2)		0.280		0.376	(0.340)
Gamma (γ)				0.379	(0.158)
log likelihood		-0.799		-0.785	

Y= Throughput (TEUs). x_1= population city; x_2= Land area (km2)
X_3= Import (billions of dollars). x_4= Export (billions of dollars). x_5= total quay length
X_6= maximum alongside depth. x_7= total terminal area (km^2)
X_8= total container storage capacity. z_1= Globalization index

The estimated ML coefficient of extent of import showed a positive value of 0.208 which was significant. Therefore, the increase of import extent by one percent will increase output by a larger proportion (20.8 percent). The estimated ML coefficients for population city, Import, total quay length, maximum alongside depth showed positive values of 0.208, 0.105, 0.137 and 0.100 respectively. All these values were significant. This indicates that augmentation of the inputs; population city, Import, total quay length and maximum alongside depth by one per cent will increase output by 0.208 per cent 0.105 percent 0.137 percent and 0.100 percent respectively. However, contrary to expectation, the coefficient for; land area, export, total terminal area, total container storage capacity showed a negative value of 0.454, 0.109, 0.210, 0.184 respectively which was not significant.

The analysis of the results presented in table 2 show that all the container ports achieved score efficiency more than 0.5. The most efficient container ports in this study is Shanghai affected a level efficiency equal to 0.861 and the less efficient is Antwerp affected the last rank with a level efficiency more than 0.501. The difference between the score efficiency is caused by the selected variables used for this estimation.

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Table 2: scores efficiency and mean globalization index

	Container ports	Country	Mean effici	Mean globali
1	Shanghai	China	86.1	60.036
2	Singapore	Singapore	75.2	88.224
3	Shenzhen	China	81.7	60.036
4	Hong Kong	China	80.7	60.036
5	Ningbo	Korea	83.5	63.912
6	Busan	Korea	84.5	63.912
7	Guangzhou	China	80.2	60.036
8	Qingdao	China	81	60.036
9	Dubai	UAE	82.4	76
10	Tianjin	China	80.1	60.036
11	Rotterdam	Netherland	56.7	91.308
12	Port Klang	Malaysia	76.5	78.68
13	Kaohsiung	China	79.2	60.036
14	Dalian	China	80.2	60.036
15	Hamburg	Germany	70.7	79.836
16	Antwerp	Belgium	50.1	91.636
17	Xiamen	China	77.5	60.036
18	Los Angeles	USA	79.1	75.02
19	Long Beach	USA	77.7	75.02
20	Tanjung. P	Indonesia	79.9	56.602
21	Ho Chi Minh	Vietnam	79.3	50.328
22	Bremen	Germany	72.6	79.836
23	New York	USA	76.9	75.02
24	Yingkou	China	79.1	60.036
25	Lianyungang	China	81	60.036
26	Colombo	Sri Lanka	81.9	50.942
27	Tokyo	Japan	79.7	65.318
28	Algeciras	Spain	70.4	84.134
29	Valencia	Spain	66.5	84.134
30	Jeddah	Saudi. A	78	66.028
31	Port Said	Egypt	81.7	58.738
32	Santos	Brazil	81.3	59.718
33	Manila	Philippine	78.2	57.042
34	Piraeus	Greece	74.8	80.276
35	Ambarli	Turkey	81.6	69.236
36	Tanger Med	Morocco	78	63.792

The mean technical efficiency of the container port was found to be 77.33 percent, which indicates that the output could be increased by 22.67 percent if all container ports achieved the technical efficiency level of the best container port. Figure 1 represents the variation of the mean efficiency and the mean index globalization matches to each country.

Figure 1. The variation of the mean efficiency and the mean index globalization

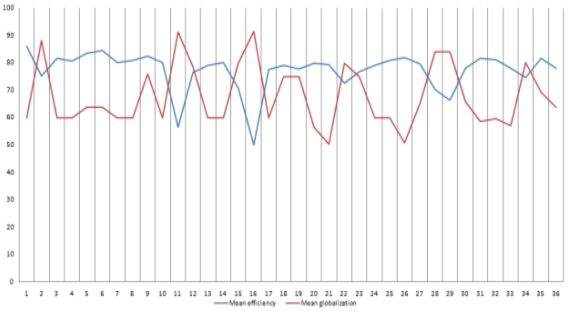

Fig1. Mean efficiency and mean index globalization variation

The variation lines are not similar, it's independent when one increases the other decrease, which improved that there is no influence on the container efficient caused by globalization index.

IV. CONCLUSION

The technical efficiency gives the possibility to container ports to avoid in the process of production. For this purpose, the technical efficiency of container ports can be improved. Several factors can explain variations in technical efficiency, this study considers containerization, urban area, international trade, port infrastructure and globalization index as mainly variable to evaluate efficiency.

The finding results showed that the efficiency scores are reasonably high for the sample of container ports, in addition, the variables Import, total quay length, maximum alongside depth improved efficiency. The variables land area, export, total terminal area, total container storage capacity has no implication in the model. This study proved, a major synthesis, that there is no affect on the container efficient caused by globalization.

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REFERENCES

[1] K. Cullinane, D.-W. Song, Ji. P. and T.-F.Wang, "An application of DEA windows analysis to container port production efficiency."Review of Network Economics 2004, 3 (2). 7.

[2] S. Munisamy and G. Singh, "Benchmarking the efficiency of Asian container ports."African journal of business management 2011, 5. 1397-1407.

[3] S. Niavis and T. Tsekeris, "Ranking and causes of inefficiency of container seaports in South-Eastern Europe"European Transport Research Review 2012, 4. 235-244.

[4] E. Almawsheki and Z. Muhamed, "Technical Efficiency Analysis of Container Terminals in the Middle Eastern Region."The Asian Journal of Shipping and Logistics 2015, 31(4). 477-486.

[5] K. Bichou, "An empirical study of the impacts of operating and market conditions on container-port efficiency and benchmarking," Research in Transportation Economics 2012.

[6] W.D. Cook, J. Zhu, "Data Envelopment Analysis: Modelling operational processes and measuring productivity". Boston: Kluwer Academic Publishers 2002.

[7] B. Demirel, K. Cullinane and H. Haralambides "Container Terminal Efficiency and Private Sector Participation." The Blackwell Companion to Maritime Economics 2012. 571-598.

[8] Z.Y. Ding, JO. G.S, Y. Wang and G.T, Yeo. "The Relative Efficiency of Container Terminals in Small and Medium-Sized Ports in China."The Asian Journal of Shipping and Logistics 2015,

ISSN 1737-9288

31. 231-251.

[9] Mi J. Hyun. Ho. P., Y.K. Sang, "Efficiency Analysis of Major Container Ports in Asia: Using DEA and Shannon's Entropy."International Journal of Supply Chain Management 2016, 5(2).

[10] K. X. Li., M. Luo and J. Yang, "Container Port Systems in China and the USA: A Comparative Study." Maritime Policy & Management 2012, 39 (5). 461– 478.

[11] H. Schoyens and J. Odeck, "the technical efficiency of Norwegian container ports: A comparison to some Nordic and UK container ports using Data Envelopment Analysis (DEA)." Maritime Economics & Logistics 2013. 15. 197-221.

[12] E. A. Tetteh, H. L. Yang and F. Gomina Mama,"Container ports throughput analysis: A comparative evaluation of China and five West African countries." International Journal of Engineering Research in Africa 2016. 22. 162-173

[13] J. Tongzon and W. Heng, "Port privatization, efficiency and competitiveness: Some empirical evidence from container ports (terminals)."Transportation Research Part A: Policy and Practice 2005. 39(5). 405–424.

[14] V.F. Valentine and R. Gray, "The measurement of port efficiency using data envelopment analysis." In: Proceedings of the 9th World Conference on Transport Research, 22–27 July 2001. Seoul. South Korea.

[15] T.-F. Wang, K. Cullinane and D.-W. Song, "Container port production efficiency: A comparative study of DEA and FDH approach."Journal of the Eastern Asia Society for Transportation Studies 2003, 5. 698–713.

[16] J. Wu and L. Liang, "Performances and benchmarks of container ports using data envelopment analysis."International Journal of Shipping and Transport Logistics 2009, 1(3). 295–310.

[17] Y.C. Wu and M. Goh, "Container port efficiency in emerging and more advanced markets."Transportation Research Part E: Logistics and Transportation Review 2010. 46(6). 1030–1042.

[18] J.Wu, H. Yan and J. Liu, "DEA models for identifying sensitive performance measures in container port evaluation." Maritime Economics & Logistics 2010, 12(3). 215–236

[19] A. Yuen, C.L., A. Zhang and W. Cheung, "Foreign participation and competition: A way to improve the container port efficiency in China?" Transportation Research Part A: Policy and Practice 2013, 49. 220-231

[20] K. Cullinane & D.-W. Song, "A stochastic frontier model of the productive efficiency of Korean container terminals". [in:] Applied economics 2003. Vol. 35. No. 3. pp. 251–267.

[21] K. Cullinane, T.F. Wang, D.W. Song, P. Ji, "The technical efficiency of container ports: Comparing Data Envelopment Analysis and Stochastic Frontier Analysis". Transportation Research 2006a, 40(4): 354–374.

[22] K. Cullinane, D.W. Song, "Estimating the relative efficiency of European container ports: A Stochastic Frontier Analysis". Port Economics: Research in Transportation Economics 2006b. 16(1): 85–115

[23] Q. Liu, "Efficiency analysis of container ports and terminals". Ph.D. Thesis. University College London. UK, 2010.

[24] A. Biswas and V. Smita, "Parametric Approach for Estimation of Technical Efficiency." International Journal of Scientific Engineering and Technology. 2013.

[25] T. Serebrisky, M.S. Javier, A. GonzolA, S-A. Ancor, B-G. cecilia and S. Jordan, "Exploring the drivers of port efficiency in Latin America and the caribbean." Transport Policy 2015.

[26] A. Hlali, "Efficiency of the 26 major container ports in 2015: comparative analysis with different models", International Journal of Economics & Strategic Management of Business Process, BEMM 2017, 10: 15-20

[27] K. Cullinane & T. Wang, "The efficiency analysis of container port production using DEA panel data approaches." OR spectrum 2010, 32. 717-738.

[28] G.E. Battese and T. J. Coelli, "A model for technical inefficiency in a stochastic frontier production function for panel data". Empirical Economics 1995. 20(2): 325–332.

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