Determinants of the Satisfaction Based Pricing for the Egyptian Ports: An Ordinal Logistics Regression Model

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Abstract

The aim of this study is to construct a number of indices for the Satisfaction Based Pricing for the Egyptian Ports in order to investigate how the paid prices for services, along with the satisfaction received for Quality of services provided, the Cooperation between the Management of the port and the Maritime agencies, the quality of the infrastructure, and the development of services affect the Satisfaction Based Pricing in the Egyptian ports. The Scope of the study are the commercial ports that includes the ports of Alexandria, Al Dakhilah, Suez, Safaga, Nuweibaa, East Port Said, West Port Said, Adabya , Domiate and El Ain El Sokhna . Through this study, a questionnaire was created and distributed to sample of (117)[1] of Maritime agents dealing with the Egyptian ports to get their feedback concerning the satisfaction received for the prices paid for (14) fourteen maritime services obtained from the Egyptian ports. The current study shows that the price satisfaction for the services provided by the Egyptian ports is being affected by the satisfaction received for the paid prices, the quality of the services, and the quality of the infrastructure.

keywords: The Egyptian Ports; Price Based Satisfaction for the Egyptian Ports; Paid Price for Services; Development of the quality of services, the Quality of the Infrastructure at the Egyptian Ports; The Logistics Regression Model.

[1] This study is the first of a series of publications of a project lasted for three years started from December 2019 ending by July 2022 , where the author had done an extensive visits to the commercial ports in Egypt , and had designed a questionnaire to construct different indexes related to the pricing and the performance of the Egyptian ports, one of these are the Pricing Based Satisfaction the topic of this study.

1 Introduction:

The Egyptian Ports plays a major role in the economics and social development of the country as it is considered the main outlets for transporting foreign trade and supporting the balance of the current transactions, in addition to contributing to the Egyptian National income as the output from the Maritime sector as being part of the services sector constitutes about 50% of the Gross Domestic Product (GDP). Thus, the Egyptian ports achieve both spatial benefit and temporal benefit from the flows of goods and services, as well as cognitive and technical benefit resulting from the growth of markets and international economic relations.

Pricing for the services provided by the Egyptian ports is mainly determined through a central and Ministerial decree # 800 for the year 2016, the issuance of the decree at the year 2016 had created a rejection and a denial from the Maritime agencies dealing with the Egyptian ports. Several meetings had been conducted with the Maritime agencies and several amendments had been done to the decree# 800 issued which had created a dissatisfaction to the Maritime agencies concerning the pricing schemes for the services provided through the Egyptian ports, which is considered higher than older decrees.

This incidence highlights the importance of measuring the satisfaction concerning the paid prices for the services provided; given the importance of Egypt's location and the facilitation of trade, and the contribution to the Egyptian GDP, the thing that stresses on the importance to do a measurement for the satisfaction received by the Maritime agencies for the prices paid to the Egyptian ports along with other variables of the Quality of the services, the Quality of the Infrastructure, the Development of the ports and the co-operation between the port's management and the maritime agencies, hence constructing the Pricing Based Satisfaction Index the topic of this study.

The study is divided into eight parts including the Introduction part, and for the rest of parts: Section (2) presents the Literature Review. Section (3) is Methodology. Section (4) The survey results and the descriptive Analysis. Section (5) discusses the steps for building the indices and checking the reliability. Section (6) The Empirical Model and the findings, section (7) is the conclusion and finally section (8) is the recommendation.

2 The Literature Review:

The Purpose of the study is to measure the level of the Pricing Based Satisfaction for the services provided at the Egyptian ports for the services of the pilotage, towage, Mooring, Quarantine, docking, marine inspection fees, water supply, waste removal, water drainage, supply of food, supply of spare parts, repairs and maintenance, fuel supply and loading/unloading. The study created the index that measures the pricing-based satisfaction for the fourteen (14) services provided in the Egyptian ports to the paid prices at the ports, the Quality of services, the development of the quality of services, the cooperation of the ports' management with the shipment agencies, and the quality of the infrastructure.

When investigating the literature, few indexes had focused on the Quality only like the SERVQUAL index that is used to measure service quality (Parasurman et al., 1988) and consists of five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. SERVQUAL model had been used by Hopkins et al. (1993) for the logistics sector, in which Hopkins et al confirmed that customer expectations being the crucial requirement for customer satisfaction.

Cronin and Taylor (1992) proposed the SERVPERF model, which considers only actual performance and, thus, eliminates the expectation component present in the SERVQUAL model.

Grönroos (1984) developed a model consisting of the three dimensions of technical quality, functional quality, and corporate image, which effectively consider measuring the service satisfaction level.

Ha (2003) identified a group of port service quality factors, including "ready information availability of port-related activities," "port location," "port turnaround time," "facilities available," "port management," "port costs," and "customer convenience."

Thai (2008) developed and validated a measurement model (ROPMIS) to explore the concept of service quality in maritime transport. This model consists of the following six dimensions: resources, outcomes, process, management,

and image and social responsibility. This model incorporated newly developed elements, such as management-, image-, and social responsibility-related quality dimensions, on the basis of a comprehensive review of various service quality dimensions and factors in previous studies.

Miremadi et al (2011) for the study that was implemented on Shahid Rajaie Port in Bandar Abbas, Iran . The result of the study and for the generic dimensions: tangible, responsive, assurance, empathy and reliability, found the gap between the customer expectations and the managers' perceptions for the Iranian port industry for the five dimensions of the SERVQUAL model.

Thai (2016) and for the survey that validated of (175) members of Singapore Shipping Association, and through the use of PSQ a four dimensional customer satisfaction model, as the PSQ dimensions of outcomes, management, process and image and social responsibility all have significant positive impact on customer satisfaction.

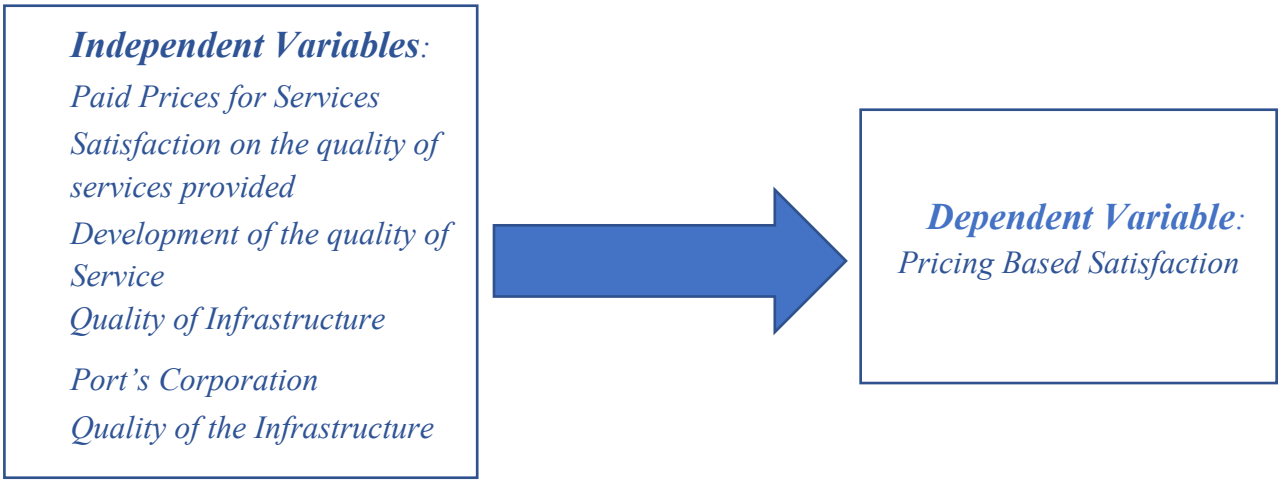
Le et al (2019) for the study that had been implemented at Cat Lai Port , Ho Chi Minh City, Vietnam, the findings of the study indicate that port logistics service quality is positively determined by five factors including responsiveness, assurance, reliability, tangibles and empathy. The study also found that the enhancement of the quality of services of port logistics and the technological advancement has a positive influence on customer satisfaction.

3.Methodology:

Through our study, we investigate the relationship between pricing-based satisfaction in the Egyptian ports for the services received[2] . The problem of the unavailability of an index representing the pricing satisfaction in the Egyptian ports. A survey was constructed for measuring pricing satisfaction in the Egyptian ports (see appendix 1).

[2] The services the paper studying are the Pilotage, Towage, Mooring, Quarantine, Docking , Food Supply, Spare Parts Supply, Repairs and Maintenance , Food Supply, Loading and Unloading

Accordingly, the analysis by designing a method to ask questions for measuring the satisfaction based pricing in the Egyptian ports upon which we can start investigating the interactions between satisfaction received from the prices paid for services and the other determinant of satisfaction related to the quality of services, the development of the services, the quality of Infrastructure, Ports' management cooperation with the maritime agencies.



The study constructs an Egyptian Satisfaction Based Pricing Index for ports that measures the pricing satisfaction level across different services pilotage, towage, Towage, Mooring, Quarantine, Docking, Marine inspection fees, Water supply, Waste removal, Water drainage, Supply, Spare parts, Repairs, Fuel supply and Loading/unloading. Characteristics are obtained from a primary field survey that will be explained more thoroughly in the next section. Finally, we interact the Satisfaction Based Pricing Index for ports with the hypothesized satisfaction determinants in an empirical model that will be illustrated in section (6).

3.1 Survey Design

Questionnaires are conducted for targeting shipping agents. For the port of Alexandria, Eldekhila, Suez, Safaga, Newabaa, East Portsaid, West Port Said, Adabia, Ain Sokhna and Domiatte. A pre-test was conducted for the study tools by interviewing about (25) shipping agents. Based on the pretest the survey of

shipping agent has been rearranged better and more enhancement had been done on the survey. The questionnaire was written in Arabic since Arabic is the official language in Egypt. Demographic data was collected on the agent concerning the ports that he/she is working in, the history of work and the size of agency itself.

3.2 Sampling

As mentioned above, the sample for this study was drawn from shipping agents. So, we determine the relevant sample size from both of them. Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. It depends on a number of factors including the purpose of the study, population size, sampling error permitted etc. The appropriate sample size is determined based on the following formula:

$$n_0 = \frac{(Z_{\frac{\alpha}{2}})^2 \, p(1-p)}{e^2}$$

where:

$Z_{\alpha/2}$ is the critical value of the Normal distribution at α/2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96)

e is the margin of error and it is approximated to be 0.07

p is the sample proportion and we used 50%, that is conservative and gives the largest sample size.

N is the population size and equal to 286

So, n0= (1.96) 2 (0.5)(1-0.5) / 0.072 = 196

Then, we use the following formula using the correction factor:

sample size n= $\frac{Nn_0}{n_0+(N-1)}$

n= $\frac{196*286}{196+(286-1)} = 117$

So, we targeted to reach to around (117) for shipping agents. Non response occurs based on some reasons like wrong numbers, converting the company activity and company closing.

3.3 Field Survey on the Determinants of Pricing Satisfaction in Egyptian Ports

The survey is conducted in four geographical areas (cities): Alexandria, Eldekhila, Suez, Safaga, Newabaa, East Portsaid, West Portsaid, Adabia, Ain Sokhna and Dominate. This will be helpful in obtaining data and information about the trend of recent pricing satisfaction level for Egyptian ports. A pilot study was conducted to test the reliability of the survey; furthermore, different shipping agents were interviewed before and after the survey's implementation to complement the survey with more specific data and information. The results of the survey were incorporated to design the pricing satisfaction index for Egyptian ports and the empirical model.

Based on the surveyed population and using the sample size (s) in equation (1), the selected random sample is (117) for the shipping ports.

$$ss = \frac{\frac{z^2 \cdot p(1-p)}{e^2}}{1+\frac{z^2 \cdot p(1-p)}{e^2 N}} \qquad (1)$$

Where, z: z-score, p: Population proportion, e: Margin of Error (7%), and N: Population size.

More on the survey design is presented in Appendix (1).

3.4 Empirical Model to Examine the Determinants of Pricing Satisfaction in Egyptian ports (Logit Model)

Firstly, we Construct the Pricing Based Satisfaction Index (EPSI). Literature identified different methods of constructing pricing satisfaction index for Egyptian ports. Many factors were considered to be able to measure the satisfaction level such as Guidance, Towage, Mooring, Quarantine, Docking, Marine inspection fees, Water supply, Waste removal, Water drainage, Supply, Spare parts, Repairs, Fuel supply and Loading/unloading. These survey results are then used to construct an Egyptian Housing Price Index (ESPI) as explained in Section 5.

To further investigate the determinants of pricing satisfaction for the services provided in the Egyptian ports, an Ordinal Logistic Regression Model (OLM) was estimated based on the results of the field survey and the constructed satisfaction for prices about services index. We use the Proportional Odds Model which is a form of the Ordinal Logistic Regression Model that we believe is the most relevant to the nature of the variables. This is particularly because most of the included variables are categorical in nature (Harrell, 2015; Warner, 2008; Parsons et al. 2009). More on the details, steps and results of the empirical model are presented in section 6.

4 Survey Results and Descriptive Analysis

In this section, we present the results of the survey which applied for asking shipping agents. Descriptive Results are presented and analysed. The results of the empirical model that will be reported in the following section are built upon by this descriptive analysis.

The satisfaction level had been measured on a scale of (5) for each factor of measurement as shown in tables 1,2,3,4,5 and 6. The results for each factor were as per the follows:

1. **Pricing Satisfaction about services in the Egyptian Ports:**

Table 1: Factors/determinants affecting Pricing Satisfaction in Egyptian ports(%)

Items	Not Satisfied at all	Not Satisfied	Neutral	Satisfied	Very Satisfied
Guidance	6	18.8	34.2	40.2	0.9
Towage	6.8	19.7	48.7	24.8	0
Mooring	6.8	17.9	37.6	34.2	3.4
Quarantine	3.4	30.8	34.2	30.8	0.9
Docking	6	27.4	35	28.2	3.4
Marine inspection fees	6.8	26.5	31.6	35	0
Water supply	7.7	21.4	41	29.1	0.9
Waste removal	10.3	27.4	32.5	29.9	0
Water drainage	8.5	22.2	39.3	28.2	1.7
Food Supply	14.5	18.8	35.9	30.8	0
Spare parts	12	17.9	36.8	32.5	0.9
Repairs	14.5	23.1	33.3	29.1	0
Fuel supply	7.7	23.1	38.5	30.8	0
Loading/unloading	4.3	25.6	44.4	25.6	0

The Distribution is more likely to be a normal distribution for pricing satisfaction in the Egyptian ports. The results indicate that the Middle categories i.e, neutral and satisfied are the largest percentages in the sample data as shown in table (1).

2. Paid Prices for the Services:

Table 2: Factors/determinants affecting Paid Prices for Services (%)

Items	Very High	High	Moderate	Acceptable	Cheap
Guidance	6	24.8	41.9	27.4	0
Towage	7.7	19.7	41.9	30.8	0
Mooring	4.3	21.4	37.6	35.9	0.9
Quarantine	6	23.1	40.2	30.8	0
Docking	8.5	20.5	41.9	27.4	1.7
Marine inspection fees	7.7	24.8	35	30.8	1.7
Water supply	7.7	19.7	38.5	33.3	0.9
Waste removal	6.8	19.7	41	31.6	0.9
Water drainage	4.3	21.4	40.2	33.3	0.9
Food Supply	6.8	18.8	41.9	29.9	2.6
Spare parts	6.8	20.5	41	31.6	0
Repairs	4.3	23.9	34.2	35.9	1.7
Fuel supply	6.8	18.8	29.1	42.7	2.6
Loading/unloading	6	17.9	31.6	41.9	2.6

Here in table (2), it refers also concerning the paid prices for the services that it is more likely to be normal distribution, the results indicate that the middle categories i.e, moderate and acceptable are the largest percentages in the sample.

3. Satisfaction of the Quality of services provided:

Table 3: Factors/determinants affecting the quality of the Service Satisfaction (%)

Items	Not Satisfied at all	Not Satisfied	Neutral	Satisfied	Very Satisfied
Guidance	11.1	11.1	12	50.4	15.4
Towage	11.1	11.1	16.2	45.3	16.2
Mooring	11.1	9.4	17.9	41	20.5
Quarantine	12.8	7.7	20.5	46.2	12.8
Docking	10.3	11.1	15.4	45.3	17.9
Marine inspection fees	7.7	6.8	23.1	52.1	10.3
Water supply	7.7	6.8	23.1	46.2	16.2
Waste removal	9.4	15.3	20.5	43.6	11.2
Water drainage	10.3	6.7	33.5	39.3	10.3
Food Supply	7.7	6.8	37.6	39.3	8.5
Spare parts	12.8	12	36.7	34.2	4.3
Repairs	11.8	9.5	35.9	39.3	3.4
Fuel supply	13.7	12.7	30.8	39.3	3.6
Loading/unloading	9.4	6	29.9	43.6	11.1

Here in table (3), it refers also concerning the level of the satisfaction of the services that it is more likely to be normal distribution, the results indicate that the middle categories i.e, neutral and satisfied are the largest percentages in the sample.

4. Development of the Quality of services:

Table 4: Factors/determinants Affecting Development of the Quality of services (%)

Items	Not Acceptable	Acceptable	Neutral	Good	Very Good
Guidance	9.4	19.7	31.6	30.8	8.5
Towage	10.3	14.5	34.9	23.1	16.2
Mooring	10.3	22.2	30.8	23.9	12.8
Quarantine	9.4	24.8	29.1	22.2	14.5
Docking	12.8	27.4	31.6	17.1	11.1
Marine inspection fees	7.7	24.8	31.6	25.6	10.3
Water supply	12.8	29.9	32.5	9.4	15.4
Waste removal	11.1	26.5	35	17.9	9.4
Water drainage	12.8	25.6	37.6	9.4	14.5
Food Supply	8.5	29.1	35.9	17.9	8.5
Spare parts	19.7	21.4	29.9	20.5	8.5
Repairs	17.1	25.6	26.5	21.4	9.4
Fuel supply	18.8	24.8	20.5	23.1	12.8
Loading/unloading	10.3	37.6	16.2	22.2	13.7

Here in table (4), it refers also concerning the determinants affecting the development of the quality of services that it is more likely to be normal distribution, the results indicate that the middle categories i.e, neutral and good compared with not acceptable and acceptable.

5. The Cooperation of the Port's Management with the Shipping Agents:

Table 5: Factors/determinants Affecting Port's Corporation (%)

Items	Not Corporate at all	Not Corporate	Neutral	Co-operative	Very Co-operative
Guidance	11.2	13.7	17.9	44.4	12.8
Towage	7.7	13.7	23.1	41	14.5
Mooring	7.7	2.6	25.6	47.9	16.2
Quarantine	2.6	8.4	26.5	43.6	17.9
Docking	6	3.4	20.5	56.4	13.7
Marine inspection fees	3.6	4.3	26.5	53	13.7
Water supply	6	4.3	24.8	46.2	18.8
Waste removal	6	2.6	31.6	41.9	17.9
Water drainage	9.4	1.7	31.6	41	16.2
Food Supply	8.5	6.8	31.6	38.5	14.6
Spare parts	9.4	5.1	34.2	39.3	12
Repairs	10.3	8.5	23.1	42.7	15.4
Fuel supply	11.3	5.8	22.2	42.7	17.9
Loading/unloading	9.4	7.7	23.9	41.9	17.1

Here in table (5), it refers also concerning the determinants affecting the cooperation between the ports employees and the shipping agents, the results indicate that the middle categories i.e, neutral and cooperative are the dominants in the data sample.

6. The Quality of the Infrastructure:

Table 6: Factors/determinants Affecting the quality of the Infrastructure

Items	Not Acceptable	Acceptable	Neutral	Good	Very Good
Guidance	12	23.1	10.3	43.6	11.6
Towage	12.8	21.4	19.7	34.2	12
Mooring	12.8	35	12.8	34.2	5.1
Quarantine	13.7	29.9	17.9	35.9	2.6
Docking	12.8	32.5	26.5	22.2	6
Marine inspection fees	7.7	47.9	10.3	30.8	3.4
Water supply	14.5	26.5	31.6	18.8	8.5
Waste removal	12	38.5	23.9	17.1	8.5
Water drainage	14.5	27.4	29.1	22.2	6.8
Food Supply	13.7	31.6	31.6	18.8	4.3
Spare parts	14.5	23.9	25.6	35	0.9
Repairs	16.2	32.5	28.2	21.4	1.7
Fuel supply	17.1	22.2	20.5	26.9	13.3
Loading/unloading	14.5	26.5	18.8	32.5	7.7

For the quality of the infrastructure. The results indicate that acceptable and good are the largest percentages in the sample data as shown in table (6).

5. The Construction of the Different Indices:

5.1 Checking Reliability

To assess the reliability of each set of variables, Cronbach alpha was checked. This study has set the cutoff value for 0.7 of Cronbach alpha as a minimum score for reliability based on the literature (CHO & KIM, 20; Lance et al, 2006; Griethuijsen et al., 2014).

Table 7: Reliability statistics

Set of variables	Cronbach's Alpha
Pricing Satisfaction	**0.942**
Paid Price for Services	**0.964**
Satisfaction on the quality of services provided	**0.913**
Development of the Quality of services	**0.949**
The Corporation	**0.941**
The Quality of the Infrastructure	**0.944**

For the set of items, which measures pricing satisfaction for services, the data is reliable as shown in table (7) with Cronbach alpha 0.942. For the second set of items representing paid price for services, the data shows that the reliability analysis of Cronbach alpha is equal to 0.964, whereas the third set of items is represented by service satisfaction has Cronbach alpha of 0.913.

Using the same ideology, it was found that Cronbach alpha for the set of items representing service development, Port's corporation and port's infrastructure are 0.949, 0.941 and 0.944 respectively.

The index is designed to measure the degree of the pricing satisfaction for the Egyptian ports. The Index is designed as this satisfaction is measured using the paid prices to the ports for different services, the satisfaction on the quality of services, the development of the services, the cooperation between the ports operators and the shipment agencies, and the satisfaction of the quality of infrastructure.

5.2 Building different indices

We compose the index through three main steps: (1) weighing, (2) normalization, and (3) aggregation. To estimate the index weights, Principal Components Analysis was used (PCA) as indicated in (Filmer and Pritchett 2010). This approach standardizes the sub-indicators by calculating z-scores using the following formula:

$$I = \frac{x-\bar{x}}{\sigma}, \qquad (2)$$

Where,

- x is the sub-indicator value,
- $\bar{x}$ is the mean value,
- σ is the standard deviation value.

After applying the normalization and aggregation steps, the index scores are then divided into three quintiles: low, moderate, and high. The adequacy of the data to employing Factor Analysis is measured by Kaiser-Meyer-Olkin (KMO) test. As reported in table 8, KMO is greater than 0.8 which affirms the robustness of designed indices.

Table 8: Kaiser-Meyer-Olkin (KMO) test

Set of variables	KMO
Pricing Satisfaction	**0.898**
Paid Price for Services	**0.946**
Satisfaction on the quality of services provided	**0.835**
Development of the Quality of services	**0.905**
The Corporation	**0.910**
The Quality of the Infrastructure	**0.895**

After constructing the Index, the nature of the variables of the Index is continuous, a cut had been done for the data into three categories to give a focused indication for each category.

The constructed index is then employed in the empirical model to examine the determinants of pricing satisfaction for the Egyptian ports, as illustrated in the next section.

6. Determinants of Satisfaction Based Price: The Empirical Model and the Findings:

As explained in the previous section, the ESPI is the dependent variable and it is ordinal in nature; divided into three levels: low, moderate, and high, where the high is the reference point for future comparisons. The ordinal logistic regression model takes the following form:

$$log\left[\frac{P(Y\leq j)}{1-P(Y\leq j)}\right] = \alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k) \qquad j = 1 \ldots J-1 \quad (1)$$

Where,

- X is the set of k predictors/independent variables with J-1 levels response/dependent variable,
- α_j is called the threshold,
- β is the parameter for each predictor variable.
- The cumulative logit probability model (e.g., $P(Y \leq j)$) Takes the form as:

$$P(Y \leq j) = \frac{e^{\alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k)}}{1 + e^{\alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k)}}. \quad (2)$$

6.1 Model Variables

The dependent variable is the Egyptian pricing Satisfaction Index (EPSI). Three Satisfaction price levels are distinguished in the study as the dependent variable of the ordinal logit model: Low (low prices), Moderate (moderate prices), High (high prices), as shown in table 9.

Table 9: The Dependent variable: ESPI

Categories	Code
Low Satisfaction	1
Moderate Satisfaction	2
High Satisfaction	3

The study employs a model for the shipping agents survey and another for the shipping agents survey. The independent variables for this model are summarized in table (9).

Table 10: Explanatory variables in the model: The shipping agent Survey

Variable	Description	Value labels
X_1 (Paid Price for Services)	The prices paid for the services provided by the Egyptian Ports for the (14) types of services[3].	Cheap, Moderate, Expensive
X2 (Satisfaction on the quality of services provided)	The satisfaction concerning the provision of services that meet the expectation of the client[4]	Low Satisfaction, Medium Satisfaction, High Satisfaction
X3 (Development of the quality of services)	improvement and the reform process witnessed for the quality of the (14) services studied.	Bad, Neutral, Good
X4 (Port's Management Cooperation)	the cooperation of the port's management in relation to services provided	Not Corporative, Neutral, Corporative
X5 (Quality of the Infrastructure)	The Improvement of the quality of the infrastructure and the upgrading of the equipment used	Bad, Neutral, Good

[3] Pls refer to the Appendix for the clarification of the (14) types of services.

[4] Lopez and Poole (1998, P83) as the concept of customer satisfaction based on UNCTAD (1998) Model, as the customers do this comparison between their perception of services and what they do expect, as the gap between the two is what we do call as the satisfaction level, as the lesser the satisfaction gap, the better the perceived service quality.

6.2 The Empirical Findings:

As previously indicated, we apply Ordinal Logistic Regression model (Logit). To make sure that our results are reliable, Ordinal Logistic Regression model (OLM) assumptions were checked and verified for this model5. As established in literature (e.g. Akın & Şentürk (2012) and Garson (2012) parameter interpretation of the Ordinal Logistic regressions is different and more complex than Binary and Multinomial Logistic regression analysis. It requires both the identification of a reference category as well as deriving and interpreting exponential of estimated. In the below model, we define a reference category for each variable and interpret according to the known 'interpretation Odds Ratio' method as explained in Field (2009)6.

To interpret the empirical models, it is worth noting that the reference category is the 'Expensive/Good/Corporative' category. This means that, the smaller the value of exponential ß, the higher the effect of the independent variable on dependent variable. In other words, small values of the exponential coefficients indicate that they are less likely to be 'cheap/bad/not corporative', hence implying a strong perceived impact on the pricing satisfaction in the Egyptian ports.

Model for The Satisfaction Based Pricing in the Egyptian Ports Survey-LOGIT Equation

$logit(Low\ satisfaction) = -39.423 + 0.080$*Paid prices is cheap + 0.543 * Paid prices is moderate

+0.177*Satisfaction of the quality of services is low+ 0.353* satisfaction of the quality of services is medium – 1.297*Quality of the infrastructure is bad– 0.260*Quality of the infrastructure is neutral

[5] Assumptions of the Ordinal Logistic Model are: (1) The dependent variable should be measured at an ordinal level, (2) Ordinal independent variables must be either continuous or categorical, (3) there is no multicollinearity between independent variables and (4) he effects of any explanatory variables are consistent or proportional across the different thresholds.

[6] The odds ratio indicates how many times more or less is the likelihood of one event being investigated with respect to another event being investigated and is calculated by getting the exponential for β (Salmi et. al. 2015).

logit(Medium satisfaction) = −13.754 + 0.080*Paid prices is cheap + 0.543 * Paid prices is moderate +0.177*satisfaction of the quality of services is low+ 0.353* satisfaction of the quality of services is medium – 1.297*Quality of the infrastructure is bad– 0.260*Quality of the infrastructure is neutral

Table 11: Ordinal logit model estimation results for shipping agents (Dependent variable is pricing satisfaction in the Egyptian Ports)

Variable	***Parameter Estimates***	
Variable Option	**B**	**Exp(B) / Odds Ratio**
$\alpha_1(\leq Low\ satisfaction)$	-39.423***	-
$\alpha_2(\leq Medium\ satisfaction)$	-13.754***	-
X_1 (Paid Prices for services)		
Cheap	0.080**	1.083**
Moderate	0.543***	1.7212***
Expensive (Ref)	-	-
X_2 (Satisfaction on the quality of services)		
Low satisfaction	0.177***	1.1936***
Medium satisfaction	0.599**	1.820**
High satisfaction (Ref)	-	-
X_3 (Development of the quality of services)		
Bad	-2.379	0.273
Neutral	-1.120	0.771
Good (Ref)	-	-
X_4 (Corporation Port)		
Not Corporative	-1.499	1.064
Neutral	-2.042	0.907
Corporative (Ref)	-	-
X_5 (Quality of the Infrastructure)		
Bad	-1.297***	0.273***
Neutral	-0.260*	0.771*
Good (Ref)	-	-
Psedudo R^2 (Nagelkerke)	0.171	

Source: own study, * significant at 0.1; ** significant at 0.05; *** significant at 0.01

-2loglikelihood= 439.969, $\chi^2_{(11)}$ =26.934, p-value= 0.005

Primarily, the two intercepts are used to differentiate the category of pricing satisfaction in the Egyptian Ports These are also called the cut points of comparison -39.423 is used for comparison of lowest satisfaction to Moderate and highest satisfaction, -13.754 is used to compare category low satisfaction, moderate to the highest satisfaction.

Paid Prices of Services. Regarding the shipping agents' model, the large exponential ß of the paid prices (1.083) indicate that this variable is significantly perceived as cheap. This means that the odds ratio for being cheap is more likely to be in the highest quintile pf pricing index compared with the reference category 'expensive'. Paid prices 'moderate' is 1.7212 times more likely of being in the highest category of pricing satisfaction in the Egyptian Ports quintile compared to paid prices being 'expensive'.

Satisfaction on the quality of Services. Results of the shipping agents model show that the odds ratio for low are 1.1936 times more likely to be in the highest category of the price index as compared to high satisfaction. This implies that the high satisfaction of the quality of services are more significant in affecting the pricing satisfaction in the Egyptian Ports as compared to the reference 'satisfaction on the quality of services.

Development of the quality of services. The results show that *Service development* doesn't have a significant effect on pricing satisfaction in the Egyptian Ports. In the same manner, the cooperation between the ports employees and the shipping agents. Port doesn't have any significant effect on pricing satisfaction in the Egyptian Ports.

Quality of the Infrastructure*:* The small exponential ß of the quality of the infrastructure (0.273) indicates that this variable is significantly perceived as good. This means that the odds ratio for being bad is less likely to be in the highest quintile compared with the reference category 'good'. The quality of the infrastructure 'neutral' is 0.771 time less odd of being in the highest category of pricing satisfaction in the Egyptian Ports quantile compared to quality of the infrastructure being 'good'.

6.3 Statistical Checks

Model Fitting Information, Goodness-of-Fit, Pseudo R-Square, Parameter Estimates and Test of parallel lines are checked. Tables (12) and (13) illustrate the results of the shipping agent model. Results in table (12) suggest that our model fit very well (p>0.05) which indicates that we fail to reject the null hypothesis depending on the observed data with adequate fitness. Pseudo-R-Square show that around 15.6% of the variation in the pricing satisfaction in the Egyptian Ports can be attributed to the independent variables included in the model.

Table 12: Goodness of fit for shipping agent model

	Model	-2 Log Likelihood	df	Sig.
Shipping Agent Model	Pearson	266.595	261	.393
	Deviance	293.540	261	.181

Model fitting information for our model, -2loglikelihood for the estimated model is 266.595 and the value for Chi-square (11.9970, df = 9, p-value< 0.05). The statistically significant Chi-square statistic (p<0.05) indicates the statistically significance of the model.

Table 13: Test of Parallel Lines for both models

	Model	-2 Log Likelihood	Chi-Square	df	Sig.
Model	Null Hypothesis	439.969	-	-	-
	General	427.999	11.970	9	0.836

Now, it is important to make the test of parallel lines. The null hypothesis in the test of parallel lines states that the location parameters (slope coefficients) are the same across response categories.

Parallel Lines: One of the assumptions underlying Ordinal Logistic Regression is that the relationship between each pair of outcome groups is the same. This is commonly referred to as the test of Parallel Lines because the null hypothesis states that the slope coefficients in the model are the same across response categories (and lines of the same slope are parallel). If we fail to reject the null hypothesis, we conclude that the assumption holds.

As shown in table 13 for our model, the Parallel Line test for the model is 427.999 with Chi square value 11.970 and p-value= 0.٨٣٦ which is greater than the 5% level of significance. This indicates a failure to reject the null hypothesis. Thus, the proportional odds assumption appears to hold for the general model.

7 Conclusion:

The Egyptian Pricing Satisfaction Index (EPSI) index indicates that the price satisfaction of the Egyptian ports is affected by the satisfaction of the paid prices, the satisfaction of the quality of services, and the quality of the infrastructure. The factors of the degree of cooperation between the ports' management the marine agencies and the evolution and the development of the quality of services were insignificant in determining the satisfaction of the prices for the Egyptian ports.

The Distribution of the answers received is more likely to be a normal distribution for pricing satisfaction in the Egyptian ports. The results indicate that the Middle categories i.e, neutral and satisfied are the largest percentages for the sample data. This is also for the paid prices for the different services, for the satisfaction of the quality of the services received, for the development of the quality of services, for the quality of the infrastructure, and for the cooperation between the ports' managers and the maritime agencies.

8 Policy Recommendations:

The importance of studying the Satisfaction Based Pricing for the pricing schemes for the different services provided by the Egyptian ports; the Questionnaire attached in Appendix (1) would be a base to be used by the Authorities of the Egyptian ports to measure the satisfaction level concerning the paid prices along with different factors indicated in the study. The study highlights the importance to do the exercise before any change in the pricing schemes to measure the level of Satisfaction for the services provided by the Egyptian Ports.

The importance of the use a flexible system for pricing for the Egyptian ports that should differ from port to another, as most of the answers of the satisfaction of prices along with the Quality received ranks from Neutral to Satisfied, very few responded by extremely satisfied, the thing that highlights the importance of visiting the pricing mechanisms in order to push for the highly satisfied level that would definitely affect the flow of the ships and also increasing the income for the Egyptian Ports.

Special incentives (as price discounts on services) should be provided for different Maritime Agents for the use of different services and according to the volume of work with the port. What is needed is expanding the system of incentives for the Maritime agents to increase the revenues for the government.

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Appendix 1: The Questionnaire distributed to the Marine Agents

Participants' names

(Agent data is optional)

Marine agent name: ……..Company……nationality

Tel.:……

Check the ports usually used to get the services from :

☐ Alexandria ☐ Al Dakhilah	☐ Suez ☐ Safaga ☐ Nuweibaa	☐ East Port Said ☐ West Port Said ☐ Adabya ☐ Ain Sokhna	☐ Damietta

Type of Goods Transferred

☐ Containers

☐ Liquid Bulk

☐ Dry Bulk

☐ General Cargo

☐ Others

Please specify……

No. of visits to the Egyptian ports……..period of stay……

1- How long have you been working with the ports subject of the research?

1- ☐ Less than one year

2- ☐ 1- 5 years

3- ☐ 6- 10 years

4- ☐ 11- 20 years

5- ☐ More than 20 years

2- No. of employees in the company:

Number of Employees : ☐☐☐

First: The Questions concerning the satisfaction of the prices:

1- How satisfied are you with the prices of the following services:

Service	Highly dissatisfied (1)	Dissatisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection fees					
Water supply					
Waste removal					
Water drainage					
Food supply					
Spare parts supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

2- **How would you rate the fees you pay for the following services:**

Service	Very Expensive (1)	Expensive (2)	Moderate (3)	Acceptable (4)	Low Prices (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection					
Water supply					
Waste removal					
Water drainage					
Food Supply					
Spare parts Supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

Second: How satisfied you are with the Quality of services:

1- Rate your satisfaction with the Quality of the following services:

Service	Highly Dissatisfied (1)	Dissatisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection					
Water supply					
Waste removal					
Water drainage					
Food Supply					
Spare parts Supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

Third: Improving services provided at ports:

How would you rate the improvement witnessed for the quality of services the following services:

Service	Highly Dissatisfied (1)	Dissatisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection					
Water supply					
Waste removal					
Water drainage					
Food Supply					
Spare parts Supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

Fourth: The Co-operative the Port's Management:

Please rate the cooperation of the port's management in relation to the following services:

Service	Highly non-cooperative (1)	Not cooperative (2)	Neutral (3)	Cooperative (4)	Highly Cooperative (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection					
Water supply					
Waste removal					
Water drainage					
Food Supply					
Spare parts Supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

Fifth: In relation to the following services:

How would you rate the quality of the infrastructure and upgrading of the equipment used for the following services?

Service	Not acceptable (1)	Acceptable (2)	Neutral (3)	Good (4)	Very good (5)
Pilotage					
Towage					
Mooring					
Quarantine					
Docking					
Marine inspection fees					
Water supply					
Waste removal					
Water drainage					
Food Supply					
Spare parts Supply					
Repairs and maintenance					
Fuel supply					
Loading/unloading					

محددات الرضا عن التسعير للموانئ المصرية: نموذج الانحدار اللوجستي الترتيبي

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الخلاصة:

الهدف من هذه الدراسة هو بناء عدد من المؤشرات لقياس الرضا عن التسعير للخدمات المقدمة من الموانئ المصرية، فيتم دراسة أثر أسعار الخدمات بالإضافة الى مجموعة أخرى من المحددات مثل جودة الخدمات المقدمة، جودة البنية التحتية، التطور في الخدمات، ومدى تعاون إدارة الميناء مع الوكيل الملاحي على درجة الرضا الخاصة بالتسعير، فمن خلال الاستبيان الذى تم استيفاؤه من قِبل عينة الدراسة والتي شملت عدد (١١٧) من الوكلاء الملاحيين وأيضا شمل نطاق الدراسة موانئ كلا من الإسكندرية، الدخيلة، السويس، سفاجا، نويبع، شرق بورسعيد، غرب بورسعيد، الأدبية، دمياط، والعين السخنة. شمل نطاق الدراسة عدد (١٤) خدمة من الخدمات التي تقدمها الموانئ البحرية بمصر، حيث أظهرت الدراسة أن الرضا عن أسعار الخدمات التي تقدمها الموانئ المصرية يتأثر بالرضا عن كلا من السعر المدفوع للخدمة، وجودة الخدمات المقدمة، وجودة البنية التحتية.

الكلمات الدالة: الموانئ المصرية؛ الرضا عن تسعير الخدمات بالموانئ المصرية؛ السعر المدفوع للخدمات ؛ تطوير نوعية الخدمات وجودة البنية التحتية بالموانئ المصرية ؛ نموذج الانحدار اللوجستي الترتيبي.