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Institutional pressures, green logistics activities and efficiency performance: a survey with logistics service providers in Brazil

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Abstract: The objective of this research is to verify the relationship between institutional pressures, green logistics activities and impacts on logistics performance. A survey of 56 logistics service providers was conducted. In relation to the data acquired, the return of 138 questionnaires answered by the middle/tactical managers of the 56 logistics service providers in Brazil was received. Institutional pressures were the antecedents capable of explaining the corresponding variation in the green logistics construct (green packaging) in R^2=0.3750, green logistics (green transport) in R^2=0.3909 and green logistics (green warehousing and buildings) in R^2=0.0389. Similarly, all green logistics constructs were able to explain the variation corresponding to a value observed in R^2=0.5442 referring to efficiency performance (costs). The results demonstrate the influence of institutional pressures on green logistics activities as well as the impact of green logistics on efficiency performance (costs).

Keywords: Institutional pressures, green logistics, performance, providers

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1. Introduction

Throughout world history, the use of natural resources has been central to economic development. While industrialization resulted in progress and modernity that brought advantages to organizations and comfort to people, it also caused significant social and environmental problems (Mores et al., 2018). The area of logistics that deals with ecological activities is known as green logistics which seeks to reduce the impacts and growing concerns of environmental degradation that traditional logistics have caused (Karaman et al., 2020). However, the uncertainty and ambiguity of the factors that influence the implementation of green logistics activities makes it urgent to explore and reveal the background, as well as the positive impacts on the organization's efficiency (Zhang, 2020).

Authors such as Sarkis et al. (2011), Ye et al. (2013) and Khor et al. (2016) have used theories to explain the antecedents that motivate organizations to include green activities in their industrial routines. From this perspective, the institutional pressures of institutional theory provide a basis for such antecedents to be researched. This theory seeks to understand the phenomena related to the pressures that organizations receive in the environment in which they are inserted. However, in addition to the antecedents that interfere with the inclusion of green logistics activities, it is also necessary to understand if their inclusion is efficient and generates a better performance in terms of logistics costs (Pazirandeh & Jafari, 2013; Ubeda et al., 2011).

This article aims at understanding how the performance of logistics efficiency is influenced by the inclusion of green logistics activities. In addition, we seek to understand more consistently the relationship between the main reasons for including green logistics activities and how these reflect on the performance of logistics efficiency.

2. Literature review

2.1. Institutional theory

Institutional theory has at its core institutionalism, which seeks the motivational explanation of organizations to incorporate practices and procedures defined by concepts that predominate in the organizational environment and that are institutionalized in society (Meyer & Rowan, 1977). The institutional isomorphism is the phenomenon of effective conduction of the organizations to the process of institutionalization. This phenomenon is directed towards a homogeneous character of the use of practices, processes and management by the organizations (Dimaggio & Powell, 1983; Zhu & Sarkis, 2016). According to these authors, there are three mechanisms that put pressure on the organizations, and promote this isomorphic conduction, being: coercive isomorphism; normative isomorphism and mimetic isomorphism.

The coercive pressures are those that occur through the influence exerted by norms, laws and governmental agencies (Dimaggio & Powell, 1983; Lo & Shiah, 2016; Zhu et al., 2010;). Normative pressures are usually exercised by internal and external stakeholders who are interested in the organization, where it seeks its full efficiency and professionalism (Berrone et al., 2010; Dimaggio & Powell, 1983; Lo & Shiah, 2016; Zhu et al., 2010). They are commonly represented by clients (Berrone et al., 2010). Mimetic pressures occur when an organization imitates the actions of successful competitors in the market by benchmarking successful organizational practices (Dimaggio & Lo & Shiah, 2016; Powell, 1983; Zhu et al., 2010; Zhu & Sarkis, 2016). For example, when companies are confronted with a new or emerging characteristic such as green logistics, and even in the absence of previous experience in this area, such organizations tend to act similarly to others, in order to be successful in this regard (Heinz & Delios, 2001).

2.2. Green logistics

Logistics activities are significant sources of environmental pollution and greenhouse gas emissions, which have harmful impacts on human health and the quality of ecosystems. Therefore, clients and governments require companies to reduce the environmental impacts (for example, carbon emissions) of their activities (Dekker et al., 2012; Fichtinger et al., 2015). There is widespread recognition that logistics affects the environment significantly, producing the desired service on the one hand, and a negative environmental impact on the other, and actions are required to change this scenario (Berntsen & Fuglestvedt, 2008), and that green logistics activities are inserted into business routines (Sbihi & Eglese, 2010).

Due to the fact that green logistics is a recent field of study, it has attracted the attention of researchers for their important role in supply chain management. When purchasing with the traditional logistics model, it is identified that only the economic objective is considered, but in the green logistics, social and environmental objectives are considered beyond the economic objective (Rabbani et al., 2017). Previously, logistics systems focused primarily on the goal of increasing the efficiency of industry activities in relation to timing and profits. However, the current atmosphere of increasing concern about environmental impacts has introduced the concept of green logistics as the basis for developing methods that can reduce the environmental impacts of logistics systems (Küçükoğlu et al., 2013).

It is one of the vital subcomponents of the Green Supply Chain Management process, which is highly required in recent years due to competition, globalization, customer demand and the exploration of new markets (Srivastava, 2007). The green practices responsible for the success of Green Supply Chain

Management have got in green logistics, one of its main foundations, alongside the development of green products, green procurement, ecological production practices, the use of cleaner technologies, green management and green marketing (Luthra et al., 2014).

2.3. Efficiency performance (costs)

The understanding of the performance of the logistic efficiency treated in this research needs a specific contextualization about the efficiency in the context of logistics management. To this end, authors such as Martel and Klibi (2016) argue that logistics management is the set of integrated activities, including freight transport, warehousing and inventory management, material handling and information processing through a necessarily efficient process in the most varied activities. This efficiency is crucial for the good performance of logistics activities. Logistic performance includes several dimensions that can be applied to each logistics area, such as costs, customer service, productivity and quality (Fawcett & Cooper, 1998). In the literature there are a considerable number of performance meters capable of measuring a given logistics system. Generally, cost related meters and the quality of the logistics service are always listed as crucial (Schramm-Klein & Morschett, 2006).

Regarding cost performance, authors such as Mollenkopf and Closs (2005) point out that the efficiency in logistics costs can not be neglected because organizations need profitability to survive. Under this premise, companies are constantly seeking alternatives to obtain better economic results, through activities and processes that provide cost efficiency (Carter & Rogers, 2008). Logistics transport and warehousing activities, for example, are cost factors that have had a strong impact on logistics services. Thus, the management of these activities requires alternatives that match the needs of the market and at the same time contribute to the economic efficiency of logistics activities (Pokharel, 2005).

Nowadays, due to the strong environmental wave, the market has required attributes of greening in the logistics services that contribute to the reduction of the environmental impact and at the same time meets the market demands. This demand according to Heilig and Voß (2016), for example, meets with green logistics solutions that are not only ecologically sustainable, but also economically reasonable. Authors such as Zhu et al. (2007) present two possibilities for responding to this demand. According to these authors, such responses can impact the economic performance of companies in two ways. A positive way, for example: a decrease in the cost of acquiring materials, a reduction in the cost of energy consumption, reduction of the waste treatment rate, reduction of fines for environmental accidents; and another negative form, represented by increased costs such as investment, training, operational and procurement costs of ecological materials (Zhu et al., 2007).

Based on this premise, authors such as Pazirandeh and Jafari (2013) argue that there is a need to critically measure whether ecological measures in a logistic context actually provide significant changes in cost performance. The authors further emphasize that logistics services must be carried out economically, that is, all processes and activities must be carried out as efficiently as possible.

The costs capable of measuring the efficiency of logistics in the context of green logistics are: obsolescence costs, administrative costs, inventory costs, warehousing costs, transport costs and total costs (Pazirandeh & Jafari, 2013).

3. Materials and methods

3.1. Hypotheses and model

The constant presence of institutional pressures in the organizations environment has made the most diverse companies rethink their traditional operations philosophies and implement various ecological practices and activities with a view to improve and preserve the environment (Wu et al., 2012).

Within this theme, it has been noted that in developed countries the normative institutional pressures that refer to the image of the organization vis-à-vis the clients receive a lot of importance for large companies. Likewise, institutional coercive pressures have become a strong source of behavioral change in these countries. Recently, one of the world's most rigorous environmental laws has been enacted in Japan, involving for example the production, collection and recycling of products manufactured by companies (Zhu et al., 2010).

Still about Japan, it has been identified within the heart of the institutional pressures that large Japanese companies always carry out proactive environmental practices to lead their competitors. Unlike other countries, Japanese companies anticipate the influence of mimetic pressures, but compliance with competitors' environmental practices is a constant task (Zhu et al., 2010).

Institutional pressures have helped to understand the causes that influence companies to include greener activities (Sarkis et al., 2011), such as the inclusion of green logistics activities in the business processes of logistics service providers.

Within the core of green logistics, logistic services companies aim to provide services that have got the capacity to effectively minimize environmental impacts (Sarkis, 2006). In relation to these services, in addition to the activities inherent to the production operations, there is a need for the actions related to transportation, warehousing and handling of products (Dey et al., 2011), buildings (Freis et al., 2016) and packaging (Seuring & Müller, 2008) to form a broader and more comprehensive system capable of mitigating the environmental impacts of these activities (Dey et al., 2011).

Transportation is the logistics activity that emits the biggest quantity of carbon, and this requires a lot of attention due to its high environmental impact power (Dekker et al., 2012). Transport consumes millions of gallons of fossil fuel daily, resulting from severe congestion, air pollution, greenhouse gases (GHGs), and consequently global warming. These adverse impacts have led governments in many countries to promote greener and less environmentally harmful modes of transportation (Kitthamkesorn & Chen, 2017).

Another logistics activity that needs attention is the warehousing. A high proportion of emissions comes from heating, cooling, air conditioning and the lighting structure of the warehouses. There are also emissions caused by material handling devices in warehousing activities due to the type of technology used by the equipment (Fichtinger et al., 2015). In the warehouse construction, the existence of low-carbon alternatives such as those related to natural light, thermal insulation, solar panels, lighting systems (Freis et al., 2016) and construction materials (Perotti et al., 2012), can mitigate waste of energy, reduce carbon emissions and environmental pollution. However, storage-related activities have received little attention in research on alternatives to how to reduce the impacts of these activities on the environment (Freis et al., 2016).

In the same way, packaging also represents a source of pollution and environmental impact, these being physical and tangible (Hollos et al., 2012). Packaging plays an important role throughout the supply chain, for example in materials handling, warehousing, transportation, among others (Jahre & Hatteland, 2004). The characteristics of the packaging, such as size, shape and materials, are of great importance in terms of the possibilities of mitigation of environmental impact (Hollos et al., 2012; Sarkis, 2003). As logistics service providers are essential for the construction of a sustainable supply chain (Azadi & Saen, 2011), it is required that the packaging is environmentally friendly that can be recycled, remanufactured and with attributes of ecological design (Zhu et al., 2005). In order for green logistics activities to be recognized as applicable, they need empirical support to prove that such activities contribute to cost efficiency without compromising the customer's ability to meet customer expectations (Pazirandeh & Jafari, 2013).

Assessing the impacts of green logistics activities on cost performance is an essential measurement. Its goal is to maximize value through customer needs (environmental concerns) while covering costs incurred in a more efficient way. Evaluate these impacts is of major importance (Wang et al., 2015). Authors such as Pazirandeh and Jafari (2013) argue that logistics cost efficiency can be measured from the perspective of transport costs, inventory costs, warehousing costs, administration costs, obsolescence costs and total logistical costs. These measures were adopted in the present research.

Based on these assertions, the hypothetical model of research focused on the three green logistics activities previously discussed, being green transportation, green warehousing and buildings and green packaging. Thus, the proposed model makes explicit the institutional pressures, green logistics activities and logistic efficiency (costs) performance through their relations and hypotheses.

From the theoretical basis for the elaboration of the hypothetical model presented in Figure 1, the present research has the purpose of research to test the following hypotheses:

H1 - Coercive pressures positively influence green logistics activities about green packaging.

H2 - Coercive pressures positively influence green logistics activities about green transport.

H3 - Coercive pressures positively influence green logistics activities about green warehousing and buildings.

H4 - Normative pressures positively influence green logistics activities about green packaging.

H5 - Normative pressures positively influence green logistics activities about green transport.

H6 - Normative pressures positively influence green logistics activities about green warehousing and buildings.

H7 - Mimetic pressures positively influence green logistics activities about green packaging.

H8 - Mimetic pressures positively influence green logistics activities about green transport.

H9 - Mimetic pressures positively influence green logistics activities about green warehousing and buildings.

H10 - Green logistics activities about green packaging positively influence efficiency performance (costs).

H11 - Green logistics activities about green transport positively influence efficiency performance (costs).

H12 - Green logistics activities about green warehousing and buildings positively influence efficiency performance (costs).

3.2. Population framework and structural equation modeling

The population framework for the study consists of companies that operate logistics services in Brazil. The sample size for the present study calculated by G*Power software version 3.1.9.2 (Faul et al., 2009) was 119 respondents with a statistical power of 95%. If more than 119 respondents the statistical power increases (in the case of this survey, 138 completed were received). Random sampling is used in this study. The analysis unit of the study is logistics service providers. As the study combines is sues related to green logistics motivators and efficiency performance, the most appropriate respondents would be the middle/tactical

managers of these companies according to Zhu and Sarkis (2004) and Zhu et al., (2016).

Data collection was done primarily through an institutional website and by telephone contact with companies. In these contacts, the purpose of this research and the profile of the professional capable of answering the questionnaire were exposed to the attendant. Once this first contact with the companies was made, the attendants then provided the professionals' emails so that the questionnaire was sent to fill in.

After the contact, it was sent the link of the electronic questionnaire to the email of the professional identified by the company with the characteristics required for the research (middle/tactical managers). The questionnaire sent has a total of 30 questions regarding the variables under analysis. A five-point Likert scale was used to measure the degree of relationship between the variables (1-strongly disagree and 5-strongly agree). A total of 138 respondents completed the survey questionnaire.

3.3. Estimation of results

For the estimation of results, only complete data were used, which, after tabulation, were submitted to the Mahalanobis Distances test, which identified the presence of 6 extreme multivariate cases, which were outliers, were removed from the sample of 138 questionnaires. Resulting, therefore, in 132 records for the treatment, estimation and analysis of the results.

3.4. Structural Equation Modeling - SEM

In the present study it was chosen Structural Equation Modeling for its usefulness when working with complex theories (relating theories and/or constructs for example), or when the theory is still developing as the theories related to sustainability (Jabbour et al., 2013), and to be used in studies on green logistics according to Pazirandeh and Jafari (2013).

This type of technique for data treatment has an effective applicability that stands out in relation to the other multivariate techniques. This advantage occurs because of its ability to analyze multiple relationships at the same time (Hair et al., 2012). In it, it is possible to test a theory of causal order among a set of variables. The Structural Equation Modeling also makes it possible to determine how much the predictive variables explain the dependent variable (Hair et al, 2009).

Several research have used structural equation modeling to confirm hypotheses and theories in the industrial circle. This research has been carried out in several continents as in the works of Avelar-Sosa et al. (2014), García-Alcaraz et al. (2016), Jabbour et al. (2013), (2014), Pazirandeh and Jafari (2013), Realyvásquez et al. (2018).

It was adopted the Structural Equation Modeling – SEM with Partial Least Squares - PLS, for the following reasons: existence of multiple relationships between variables, non-normal data and prediction contrast after the research problem (Hair et al., 2017).

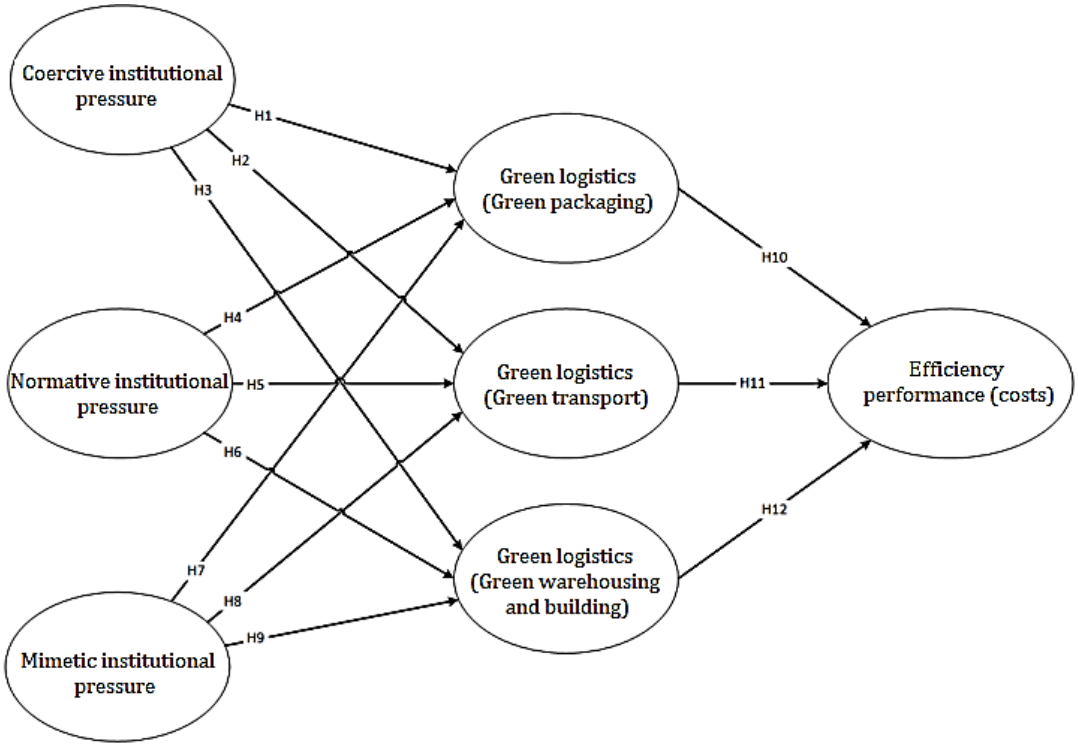

Figure 1. Hypothetical model.

4. Results and discussion

It received the return of 138 questionnaires answered by middle/tactical managers from 56 companies. This represents an average of 2.46 professionals per company. In the case of 72 respondents (52.2%) have got undergraduate degrees in administration, 58 (42.2%) have got a degree in engineering and 8 (5.8%) have got degrees in other areas of knowledge. About 138 respondents, 17 (12.3%) answered that their company has 20 to 99 employees, 30 (21.7%) answered that their company has 100 to 499 employees and 91 (65.9%) answered that their company has more than 500 employees.

In order to estimate the relationships among the constructs with the Structural Equation Modeling by means of the estimation by Partial Least Squares, it was used the software SmartPLS version 3 (Ringle et al., 2015), configured according to the parameters: Weighting Scheme = Path Weighting Scheme; Data Metric = Mean 0, Variation 1; Data Iterations = 300; Abort Criterion = 1.0E-7 (for example., 0.0000001); and Initial Weights = 1.0 (Hair et al., 2017). The factorial loads obtained after the execution of the Partial Least Squares (PLS) estimation algorithm are shown in the measurement model presented in Figure 2. The variables present in the research questionnaire that formed the measurement model are presented in Appendix A.

Reliability in this type of research is very important. In this case can be verified by Cronbach's alpha analyzing on values ranging from 0 to 1 (Cronbach, 1951). The objective is to analyze the absence of random error in the units of measurement of the scale. Closer to 1, the greater the evidence of the reliability of the set of items. However, Cronbach's alpha analysis tends to provide a severe underestimation of reliability, when evaluating the internal consistency of variables in models with partial least squares estimation (Henseler et al., 2009). Specifically, in the case of MEE-PLS, the reliability check focuses on the analysis of the results of the composite reliability (Hair et al., 2011).

Thus, according to the rules, it is possible to indicate that the indicators have internal consistency, since the measures that reflect the composite reliability are greater than 0.70. Another analysis was also carried out in order to verify the factorial loads obtained by the average variance extracted (AVE). An AVE value of 0.50 or higher indicates a sufficient

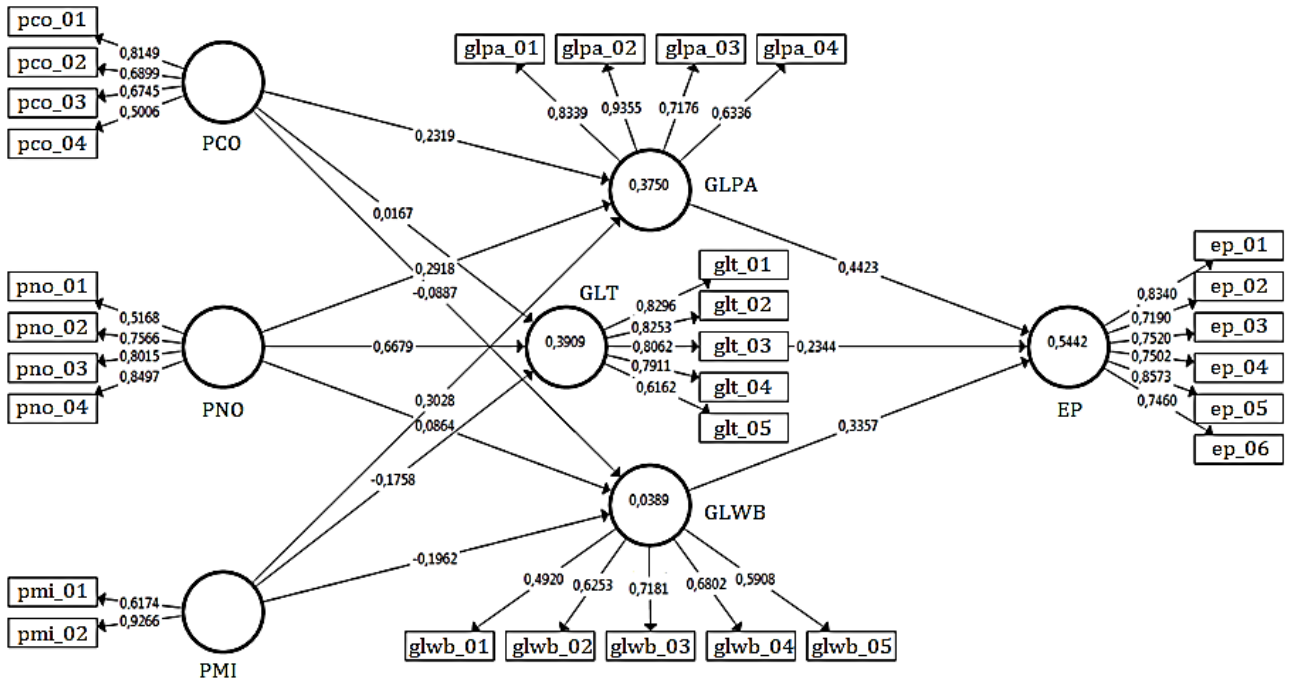

Figure 2. MEE-PLS measurement model structural path (results).

degree of convergent validity. Conversely, an AVE value of less than 0.50 indicates that, on average, more of the measurement error remains in the indicator than the variance explained by the construct (Hair et al., 2017). In the case of the present study, the AVE values analyzed together demonstrated sufficient for the acquired results. Table 1 shows the values.

Table 1. Reliability tests values.

Constructs	Cronbach's alpha	Composite reliability	AVE
EP	0,8689	0,9016	0,6054
GLPA	0,7884	0,8655	0,6217
GLT	0,8350	0,8834	0,6050
GLWB	0,6062	0,7605	0,3921
PCO	0,6054	0,7692	0,4614
PNO	0,7201	0,8264	0,5510
PMI	0,4329	0,7582	0,6199

As the focus of the SEM (structural equation modeling) - PLS (partial least squares) is on the explanation of the variance of the endogenous latent variables, the fundamental interest is that the R^2 level of the constructs is high (Hair et al., 2011). This coefficient is a measure of predictive accuracy of the model and R^2 values range from 0 to 1. Higher levels indicate higher predictive accuracy (Hair et al., 2017). For values of 0.75; 0.50 or 0.25 (Hair et al., 2011; Hair et al., 2017) and 0.67; 0.33 or 0.19 (Chin, 1998), the consideration is that the variables can be described as: substantial, moderate or weak, respectively. Another important evaluation of the structural model is to establish the predictive capacity of the model, for which values of Q^2 above zero show that the model has predictive relevance (Hair et al., 2017). Thus, considering the above statements and the rules pointed, it is possible to state that the EP (efficiency performance), GLPA and GLT constructs have got a moderate R^2 and the GLWB (green logistics, green warehousing and building) construct has a weak R^2. The values of R^2 and Q^2 are shown in Table 2.

Table 2. Determination coefficient and predictive relevance.

ENDOGENOUS LATENT VARIABLES	R^2	ANALYSIS	Q^2
Efficiency performance – EP	0.5442	Moderate	0.3041
Green packaging - GLPA	0.3750	Moderate	0.2249
Green transport - GLT	0.3909	Moderate	0.2302
Green warehousing and buildings - GLWB	0.0389	Weak	0.0181

According to this information, it is concluded the analysis of the results as a function of the structural equation modeling with estimation by partial least squares (SEM - structural equations modeling, PLS - partial least squares) and the hypotheses expressed by the hypothetical model presented in Figure 1 can be considered: supported or rejected.

Based on the factor loads shown in Figure 2, it can be seen that most of the dependencies were positively related, so that the efficiency (cost) construct over Table 2 obtained a value of R^2=0.5442. In other words, this means that the green logistics constructs (green packaging, green transport and green warehousing and buildings) are able to explain the variation corresponding to a value observed in ≈54% efficiency performance (costs). Similarly, it is found in the constructs of green logistics - packaging green, green logistics - transport green and green logistics – green warehousing and buildings, have got values of R^2=0.3750, R^2=0.3909 and R^2=0.0389, respectively.

This means that green logistics correspond to ≈38% in the case of green packaging, ≈39% in green transport, ≈4% in green warehousing and buildings.

According to the data shown in Figure 2 and Table 1 it is possible to carry out the evaluation of the hypothesis of the research. Relationships that proved to be positive and statistically significant were hypotheses H1, H4, H5, H7, H10, H11 and H12 are supported by the structural model through the structural path analysis. The H8 hypothesis, although statistically significant [H8; PIMI (mimetic institutional pressure) → GLT (green logistics - green transport) = -0.1758; $p<0.05$], was also rejected, since the relationship between mimetic pressures and green logistics activities sign other than assumption (negative sign). The synthesis of the research results is presented in Figure 3.

In order to discuss the hypotheses treated in this research, this part focuses on relating the data acquired in the results with relevant works present in the literature.

In relation to H1, it can be observed that it was positive and statistically significant, where the coercive pressures positively influence the green logistics activities (green packaging) [H1; PCO (coercive institutional pressure) → GLPA (green logistics - green packaging) = 0.2319; $p<0.10$]. This is in line with the work carried out by Lau (2011), where a comparison between China, a developing country, and Japan, a developed country, are confronted about the performance of green logistics activities in the appliance manufacturing industry. In this work, coercive pressures have played a significant role in the performance of green logistics in China. The same author still advocates the importance of regulatory standards and compliance in developing countries that are generally more reactive and less proactive. Works such as Lo and Shiah (2016) with electronics manufacturing companies also demonstrated this strength of legal regulations by linking the motivation with the practices of companies that have turned green. In the specific case of Brazil that is characterized as a major food producer whether

they are in natura or processed the existence of several legislations on packaging of these products may have contributed to the positive relation of hypothesis 1, even more because Brazil is an exporter of these products.

In terms of H4, it can be observed that it was positive and statistically significant, where the normative pressures positively influence the activities of green logistics (green packaging) [H4; PNO (Normative institutional pressure) → GLPA (green logistics - green packaging) = 0.2918; p<0.01]. This is related to the claim of Lo and Leung (2000) that in developing countries as in the case of Brazil and China, even though late in relation to developed countries consumers/customers are gradually becoming more conscious, from the point of view environmental and starting to favor greener products and using more sustainable packaging.

The research of Zailani, Eltayeb et al. (2012) goes straight to this position, where normative institutional drivers were significant in the adoption of green packaging in a survey of 132 - ISO 14001 certified manufacturing companies in Malaysia. The work demonstrated that this type of institutional driver drove companies to adopt proactive environmental strategies such as eco-design, which is the environmentally conscious design of a product and its packaging in order to minimize the adverse environmental impact throughout its life. However, the continued awareness of consumers and customers about the consumption of environmentally friendly products and packaging is a major challenge in emerging countries (Ye et al., 2013).

As for H5, it was positive and statistically significant, where normative pressures positively influence the activities of green logistics (green transport) [H5; PNO (normative institutional pressure) → GLT (green logistics - green transport) = 0.6667; p<0.01]. Regarding this, works such as Lai et al. (2006) and Tate et al. (2011) can explain this behavior. The authors describe that companies may experience pressure from multiple clients within a particular industry, or in their business and professional relationships. Thus, companies perform (greener) services required by customers even before the publication of standards and laws. This is corroborated by authors like Zhu et al. (2013).

As for H7, it was positive and statistically significant, that is, the mimetic pressures positively influence the activities of green logistics (green packaging) [H7, PIMI (mimetic institutional pressure) → GLPA (green logistics - green packaging) = 0.3028; p<0.01].

In this regard, it is noted that the competitors present in the market have had significant influence in the adoption of greening strategies of several companies. In fact, companies are always responding to competitors' environmental initiatives, even when they have different market orientations (González-Benito & González-Benito, 2008). Corroborating with the positive relation of hypothesis 7, the work of Zhu and Sarkis (2006) argues that the observance of competitors' green strategies is very important. The authors also say that the increasingly globalized market brings clear evidence that companies are given strong pressures. These pressures are represented by the practices carried out by the competitors regarding the inclusion of green practices in their processes, including green packaging that is currently one of the main demands of consumers.

Connected to this statement General Motors recently invested in a reusable packaging program to meet the demands of customers. This attitude strengthened the brand vis-à-vis the market and still influenced other companies in the industry to adopt such a measure (Emmet & Sood, 2010).

Regarding the H10, it was positive and statistically significant, that is, the green logistics activities (green packaging) positively influence efficiency performance (costs) [H10; GLPA (green logistics - green packaging) → EP (efficiency performance - costs) = 0.4423; p<0.01]. Research that addressed the issue of green packaging like Zailani Jeyaraman et al. (2012) identified results of cost reduction linked to the use of green packaging. This behavior, according to the authors, occurs because there is a reduction in packaging waste, in which case the adoption of green returnable packaging has led to a general reduction of costs. Similar cases, such as General Motors with returnable and sustainable packaging (Emmet & Sood, 2010) and with ISO14001 certified companies in Malaysia (Eltayeb et al., 2011) confirm this positioning.

In relation to H11 it was positive and statistically significant, that is, the green logistics activities (green transport) positively influence efficiency performance (costs) [H11; GLT (green logistics - green transport) → EP (Efficiency Performance - costs) = 0.2344; p<0.01]. A similar result was presented in the study by Pazirandeh and Jafari (2013), where green transport activities had a positive and significant impact on the cost efficiency of multinational companies in Sweden. The authors further describe in the research that these multinational companies hired logistics service providers with drivers trained in eco-driving, and that there was a direct positive impact on logistics efficiency in reducing transport costs, lower inventory costs and lower logistics costs in the total.

According to Perotti et al. (2012) when dealing with green transport and the inclusion of logistical activities of this type are not only linked to environmental benefits, but also to reduce costs and improve efficiency. For example, more efficient vehicle loading implies a better use of it, thus reducing the transportation costs of the items transported. From the ecological perspective, this activity can also be considered as a means of reducing the number of trips, and consequently reducing environmental pollution. Another example to be mentioned relates to the optimization of travel

routes and distances, which usually implies a decrease in travel times, as well as fuel consumption and atmospheric emissions. The adoption of newer vehicle fleets, for example: energy-efficient and less polluting vehicles, can facilitate access to restricted markets such as eco-industrial parks (Zeng et al., 2017) with specific areas of limited access.

Finally, H12 presented positive and statistically significant, that is, and green logistics activities (green warehousing and buildings) positively influence efficiency performance (costs) [H12; GLWB (Green logistics - green warehousing and buildings) → EP (Efficiency Performance - costs) = 0.3357; p<0.01]. Regarding this result, Lieb and Lieb (2010) describe in their research with logistics services providers that the implementation of high-efficiency and low-energy lighting projects in warehouses are essential initiatives and are already being carried out by senior executives of this sector. Other research like Mallidis et al. (2012) show that the sharing of transport operations through shared warehouses between logistics companies, reduces the amount of carbon emitted as well as considerably reduces the costs incurred in these logistics activities. Warehouses built with energy-efficient attributes promote an even greater reduction of carbon emissions.

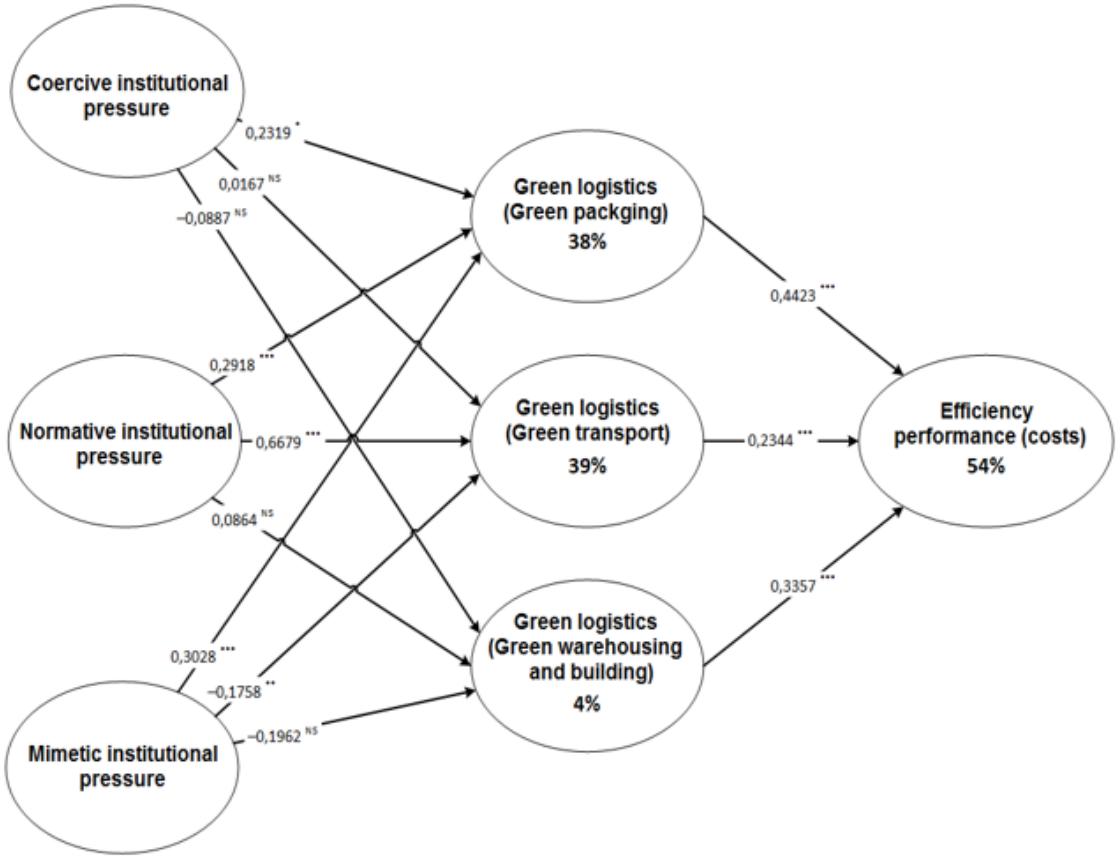

Figure 3. Research model (synthesis results).
Note: NS = not significant | *** p<0,01 | ** p<0,05 | * p<0,10.

5. Conclusions

The present work sought to investigate in the circle of logistics service providers whether the relations of influence between institutional pressures and green logistics activities are supported, as well as whether this relationship influences the efficiency performance (costs) of these providers. In keeping with the theoretical hypotheses used to construct the model, the empirical test confirmed the hypotheses H1, H4, H5, H7, H10, H11 and H12.

Green logistics is nowadays one of the most promising industrial activities. Many studies have investigated green supply chain management practices and their impact on environmental performance. Researchers on green logistics have focused their efforts on areas such as emissions reduction. Meanwhile, green logistics offers a vast field full of opportunities. This study examined the relationship between institutional pressures and green logistics activities and their impact on efficiency (cost) performance. The dimension of the institutional pressures was divided into three constructs (coercive, normative and mimetic pressures) in the green logistics dimension also in three constructs (green packaging, green transport and green warehousing and buildings) and in the efficiency performance dimension in a construct (costs).

In conclusion, the evaluation of the study measures and structural models using SEM revealed that institutional pressures were the antecedents capable of explaining the corresponding variation in the green logistics construct (green packaging) in R^2=0.3750, green logistics (green transport) in R^2=0.3909 and green logistics (green warehousing and buildings) in R^2=0.0389. Similarly, the constructs on green logistics were able to explain the variation corresponding to a value observed in R^2=0.5442 referring to efficiency performance (costs).

This means that the institutional pressures moderately explained the activities of green logistics (green packaging and green transport) and weakly the activities of green logistics (green warehousing and buildings). green logistics activities (green packaging, green transport and green warehousing and buildings) also moderately explained efficiency performance (costs). Thus, there is evidence that green logistics activities contribute to a good efficiency performance (costs), at least in relation to the companies surveyed. These results support the decision-making process of logistics service providers in Brazil to improve their performance in a globalized market.

Appendix A

COERCIVE INSTITUTIONAL PRESSURE [PCO]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
pco_01	National legislation on the environment promotes cleaner activities and emission reductions in logistics operations (Dubey et al., 2015; Zhu et al., 2013)	1 O O O O O 5
pco_02	Regional legislation on the environment promotes the conservation of natural resources in logistics procedures (Dubey et al., 2015; Zhu et al., 2013)	1 O O O O O 5
pco_03	Legislation specific to transportation and logistics promotes ecological activities within logistics operations (Dubey et al., 2015; Zhu et al., 2013)	1 O O O O O 5
pco_04	Legislation of neighboring countries (For example: Mercosur) promotes ecological activities within the logistics activities (Dubey et al., 2015; Zhu et al., 2013)	1 O O O O O 5
NORMATIVE INSTITUTIONAL PRESSURE [PNO]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
pno_01	Services performed for foreign clients (For example: Mercosur) promote greener activities within logistics activities. (Wu et al., 2012; Zhu et al., 2013)	1 O O O O O 5
pno_02	The establishment of a green image of the company, encourages ecological activities within the logistics operations (Wu et al., 2012; Zhu et al., 2013)	1 O O O O O 5
pno_03	The media activity promotes ecological activities within logistics operations (Wu et al., 2012; Zhu et al., 2013)	1 O O O O O 5
pno_04	Public environmental awareness encourages ecological activities within logistical activities (Wu et al., 2012; Zhu et al., 2013)	1 O O O O O 5
MIMETIC INSTITUTIONAL PRESSURE [PMI]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
pmi_01	Green strategies of substitute service companies promote green activities within conventional logistics activities (Zhu et al., 2013; Ye et al., 2013)	1 O O O O O 5
pmi_02	Associations/booklets of associations/logistics groups promote green activities within logistics activities (Zhu et al., 2013; Ye et al., 2013)	1 O O O O O 5

GREEN LOGISTICS - GREEN PACKAGING [GLPA]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
glpa_01	Use of environmentally friendly materials in packaging contributes to the efficiency of logistics costs (Lau, 2011; Zhu et al., 2013; Chhabra et al., 2017)	1 O O O O O 5
glpa _02	Use of eco-design in packaging contributes to the efficiency of logistics costs (Lau, 2011; Zhu et al., 2013; Chhabra et al. 2017)	1 O O O O O 5
glpa _03	Use of cleaner technologies in packaging contributes to the efficiency of logistics costs (Lau, 2011; Zhu et al., 2013; Chhabra et al., 2017)	1 O O O O O 5
glpa _04	Use of recycled packaging materials purchased externally, from the company contributes to the efficiency of logistics costs (Lau, 2011; Zhu et al., 2013; Chhabra et al. 2017)	1 O O O O O 5
GREEN LOGISTICS - GREEN TRANSPORT [GLT]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
glt_01	Optimization in the use of energy-efficient vehicles contributes to the efficiency of logistics costs (Rostamzadeh et al., 2015; Lieb & Lieb; 2010; Perotti et al., 2012)	1 O O O O O 5
glt _02	Optimization of the distribution process, through a better route and scheduling contributes to the efficiency of logistics costs (Rostamzadeh et al., 2015; Lieb & Lieb, 2010; Perotti et al., 2012)	1 O O O O O 5
glt _03	The use of green technologies less harmful to the environment, within transport contributes to the efficiency of logistics costs (Rostamzadeh et al., 2015; Lieb & Lieb, 2010; Perotti et al., 2012)	1 O O O O O 5
glt _04	Encouraging eco-driving to reduce fuel consumption, contributes to the efficiency of logistics costs (Rostamzadeh et al., 2015; Lieb & Lieb, 2010; Perotti et al., 2012)	1 O O O O O 5
glt _05	Use of green fuels (for example: biodiesel) contributes to the efficiency of logistics costs (Rostamzadeh et al., 2015; Lieb & Lieb, 2010; Perotti et al., 2012)	1 O O O O O 5
GEEN LOGISTICS – GREEN WAREHOUSING AND BUILDINGS [GLWB]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
glwb_01	Construction materials from ecological processes (such as recycled steel, concrete and asphalt) contribute to the efficiency of logistics costs (Perotti et al., 2012; Lieb & Lieb, 2010; Lin & Ho, 2008)	1 O O O O O 5
glwb _02	Constructions with thermal insulation contributes to the efficiency of logistics costs (Perotti et al., 2012; Lieb & Lieb, 2010; Lin & Ho, 2008)	1 O O O O O 5
glwb _03	Buildings with natural lighting contributes to the efficiency of logistics costs (Perotti et al., 2012; Lieb & Lieb, 2010; Lin & Ho, 2008)	1 O O O O O 5
glwb _04	Energy-efficient lighting systems contribute to the efficiency of logistics costs (Perotti et al., 2012; Lieb & Lieb, 2010; Lin & Ho, 2008)	1 O O O O O 5
glwb _05	Efficient material handling equipment, contributes to the efficiency of logistics costs (Perotti et al., 2012; Lieb & Lieb, 2010; Lin & Ho, 2008)	1 O O O O O 5
EFFICIENCY PERFORMANCE – COSTS [EP]		1-strongly disagree <> 5-strongly agree (five point Likert scale)
ep_01	Green logistics procedures, in transport services contribute to the reduction of transport costs (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012)	1 O O O O O 5
ep_02	Inventory costs are reduced, due to green logistics activities (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012; Memari et al., 2016; Ye et al., 2013)	1 O O O O O 5
ep_03	Green logistics activities contribute to the reduction of warehousing costs (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012)	1 O O O O O 5
ep_04	Administrative costs decrease because of green logistics activities (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012)	1 O O O O O 5
ep_05	Green logistics activities, are responsible for reducing the obsolescence costs (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012)	1 O O O O O 5
ep_06	Total logistics costs are reduced due to green logistics activities (Pazirandeh & Jafari, 2013; Chopra, 2003; Lorentz et al., 2012; Memari et al. 2016; Ye et al., 2013)	1 O O O O O 5

Conflict of interest

The authors have no conflict of interest to declare.

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References

Avelar-Sosa, L., García-Alcaraz, J., & Castrellón-Torres, J. (2014). The Effects of Some Risk Factors in the Supply Chains Performance: A Case of Study. *Journal of Applied Research and Technology*, *12*(5), 958-968. https://doi.org/10.1016/S1665-6423(14)70602-9

Azadi, M., & Saen, R.F. (2011). A new chance-constrained data envelopment analysis for selecting third-party reverse logistics providers in the existence of dual-role factors. *Expert Systems with Applications*, *38*(10), 12231-12236. https://doi.org/10.1016/j.eswa.2011.04.001

Berntsen, T., & Fuglestvedt, J.S. (2008). Global temperature responses to current emissions from the transport sectors. *Proceedings of the National Academy of Sciences of the USA*. 105, 19154-19159. https://doi.org/10.1073/pnas.0804844105

Berrone, P., Cruz, C., Gómez-Mejia, L.R., & Larraza, M. (2010). Socioemotional wealth and organizational response to institutional pressures: do family-controlled firms pollute less? *Administrative Science Quarterly*, *55*, 82–113. https://doi.org/10.2189/asqu.2010.55.1.82

Carter, C.R. & Rogers, D.S. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of Physical Distribution & Logistics Management*, *38*(5), 360-387. https://doi.org/10.1108/09600030810882816

Chhabra, D., Garg, S.K., & Singh, R. K (2017). Analyzing alternatives for green logistics in an Indian automotive organization: A case study. *Journal of Cleaner Production*,*167*, 962-969. https://doi.org/10.1016/j.jclepro.2017.02.158

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. Modern methods for business research, 295(2), 295-336.

Chopra, S. (2003). Designing the distribution network in a supply chain. *Transportation Research Part E: Logistics and Transportation Review*, *39*(2),123-140. https://doi.org/10.1016/S1366-5545(02)00044-3

Colicchia, C., Marchet, G., Melacini, M., & Perotti, S. (2013). Building environmental sustainability: empirical evidence from Logistics Service Providers. *Journal of Cleaner Production*, *59*, 197-209. https://doi.org/10.1016/j.jclepro.2013.06.057

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, v. 16, n. 8, p. 297-334, 1951. https://doi.org/10.1007/BF02310555

Dekker, R., Bloemhof, J., & Mallidis, I. (2012). Operations research for green logistics - an overview of aspects, issues, contributions and challenges. *European Journal of Operational Research*, *219*(3), 671-679. https://doi.org/10.1016/j.ejor.2011.11.010

Dey, A., Laguardia, P., & Srinivasan, M. (2011). Building sustainability in logistics operations: a research agenda. *Management Research Review*, *34* (11), 1237–1259. https://doi.org/10.1108/01409171111178774

Dimaggio, P., & Powell, W.W. (1983). The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147-160. https://doi.org/10.2307/2095101

Dubey, R., Gunasekaran, A., Papadopoulos, T., & Childe, S. J. (2015). Green supply chain management enablers: Mixed methods research. *Sustainable Production and Consumption*, *4*, 72-88. https://doi.org/10.1016/j.spc.2015.07.001

Eltayeb, T.K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources, Conservation and Recycling*, *55*, 495–506. https://doi.org/10.1016/j.resconrec.2010.09.003

Emmet, S., & Sood, V. (2010) Green Supply Chains: an action manifest. United Kingdom: John Wiley & Sons, 2010.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41(*4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Fawcett, S.E., & Cooper, M.B. (1998). Logistics performance measurement and customer success. *Industrial Marketing Management*, *27*(4), 341-357.
https://doi.org/10.1016/S0019-8501(97)00078-3

Fichtinger, J., Ries, J.M., Grosse, E.H., & Baker, P. (2015). Assessing the environmental impact of integrated inventory and warehouse management. *International Journal of Production Economics*, *170*, 717-729.
https://doi.org/10.1016/j.ijpe.2015.06.025

Freis, J., Vohlidka, P., & Günthner, W. A. (2016). Low-Carbon Warehousing: Examining Impacts of Building and Intra-Logistics Design Options on Energy Demand and the CO2 Emissions of Logistics Centers. *Sustainability*, *8*, 448.
https://doi.org/10.3390/su8050448

García-Alcaraz, J. L., Adarme-Jaimes, W., & Blanco-Fernández, J. (2016). Impact of human resources on wine supply chain flexibility, quality, and economic performance. *Ingeniería e Investigación*, *36*(3), 74–8.
https://doi.org/10.15446/ing.investig.v36n3.56091

González-Benito, J., & González-Benito, O. (2008). Operations management practices linked to the adoption of ISO 14001: an empirical analysis of Spanish manufacturers. *International Journal of Production Economics*, *113*(1), 60-73.
https://doi.org/10.1016/j.ijpe.2007.02.051

Hair Jr., J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M. (2017). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). Thousand Oaks: Sage Publications.

Hair Jr, J.F., Black, W.C., Babin, B.J., Anderson, R.E., & Tatham, R.L. (2009). Multivariate Data Analysis. Upper Saddle River: Pearson Education, Inc.

Hair Jr, J.F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139-151.
https://doi.org/10.2753/MTP1069-6679190202

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414-433.
https://doi.org/10.1007/s11747-011-0261-6

Heilig, L., & Voß, S. (2016). Inter-terminal transportation: an annotated bibliography and research agenda. *Flexible Services and Manufacturing*, *29*(1), 35-63.
https://doi.org/10.1007/s10696-016-9237-7

Heinz, W.J., & Delios, A. (2001). Uncertainty, imitation, and plant location: Japanese multinational corporations,1990–1996. *Administrative Science Quarterly*, *46*(3), 443–475.
https://doi.org/10.2307/3094871

Henseler, J., Ringle, C.M. & Sinkovics, R.R. (2009), The use of partial least squares path modeling in international marketing, Sinkovics, R.R. and Ghauri, P.N. (Ed.) *New Challenges to International Marketing* (*Advances in International Marketing, Vol. 20*), Emerald Group Publishing Limited, Bingley, pp. 277-319.
https://doi.org/10.1108/S1474-7979(2009)0000020014

Hollos, D., Blome, C., & Foerstl, K. (2012). Does sustainable supplier cooperation affect performance? Examining implications for the triple bottom line. *International Journal of Production Research*, *50*(11), 2968–2986.
https://doi.org/10.1080/00207543.2011.582184

Jabbour, A.B.L.S., Jabbour, C.J.C., Latan, H., Teixeira, A.A., & Oliveira, J.H.C. (2014). Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: Direct and indirect effects. Transportation Research Part E: *Logistics and Transportation Review*, *67*(C), 39-51.
https://doi.org/10.1016/j.tre.2014.03.005

Jabbour, C.J.C., Jabbour, A.B.L.S., Govindan, K., Freitas, W.R.S. & Teixeira, A.A. (2013). Environmental management and operational performance in automotive companies in Brazil: the role of human resource management and lean manufacturing. *Journal of Cleaner Production*, *47*, 129-140.
https://doi.org/10.1016/j.jclepro.2012.07.010

Jahre, M., & Hatteland, C. J. (2004). Packages and physical distribution. Implications for integration and standardization. *International Journal of Physical Distribution & Logistics Management*, *34*(2), 123-139.
https://doi.org/10.1108/09600030410526923

Karaman, A.S., Kiliç, M., & Uyar, A. (2020). Green logistics performance and sustainability reporting practices of the logistics sector: The moderating effect of corporate governance. *Journal of Cleaner Production*, 258.
https://doi.org/10.1016/j.jclepro.2020.120718

Kitthamkesorn, S., & Chen, A. (2017). Alternate weibit-based model for assessing green transport systems with combined mode and route travel choices. *Transportation Research Part B: Methodological*, *103*, 291-310.
https://doi.org/10.1016/j.trb.2017.04.011

Khor, K. S., Udin, Z. M., Ramayah, T., & Hazen, B. T. (2016). Reverse logistics in Malaysia: The Contingent role of institutional pressure. *International Journal of Production Economics*, *175*, 96-108.
http://doi.org/10.1016/j.ijpe.2016.01.020

Küçükoğlu, I., Ene, S., Aksoy, A., & Öztürk, N. (2013). Green capacitated vehicle routing problem fuel consumption optimization model. International Journal of Computational Engineering Research, 3(7), 16-23.

Lai, K.H., Wong, C., & Cheng, T.C.E. (2006). Institutional Isomorphism and the Adoption of Information Technology for Supply Chain Management. *Computers in Industry*, *57*(1), 93–98.
https://doi.org/10.1016/j.compind.2005.05.002

Lau, K. H. (2011). Benchmarking green logistics performance with a composite index. *Benchmarking: An International Journal*, *18*(6), 873-896.
https://doi.org/10.1108/14635771111180743

Lieb, K. J., & Lieb, R. C. (2010). Environmental sustainability in the third-party logistics (3PL) industry. *International Journal of Physical Distribution & Logistics Management*, *40*(7), 524-533.
https://doi.org/10.1108/09600031011071984

Lin, C. Y., & Ho, Y. H. (2008). An empirical study on logistics service providers' intention to adopt green innovations. Journal of technology management & innovation, *3*(1), 17-26.

Lo, C.W., & Leung, S.W. (2000). Environmental agency and public opinion in Guangzhou: the limits of a popular approach to environmental governance. *The China Quarterly*,*163*, 677-704.
https://doi.org/10.1017/S0305741000014612

Lo, S. M., & Shiah, Y. A. (2016). Associating the motivation with the practices of firms going green: the moderator role of environmental uncertainty. *Supply Chain Management: An International Journal*, *21*(4), 485-498.
https://doi.org/10.1108/SCM-05-2015-0184

Lorentz, H., Töyli, J., Solakivi, T., Hälinen, H., & Ojala, L. (2012). Effects of geographic dispersion on intra-firm supply chain performance. *Supply Chain Management: An International Journal*, *17*(6), 611-626.
https://doi.org/10.1108/13598541211269229

Luthra, S., Garg, D., & Haleem, A. (2014). Empirical analysis of green supply chain management practices in Indian auto-mobile industry. *Journal of The Institution of Engineers (India)*, *95*(2),119-126.
https://doi.org/10.1007/s40032-014-0112-6

Mallidis, I., Dekker, R., & Vlachos, D. (2012). The impact of greening on supply chain design and cost: a case for a developing region. *Journal of Transport Geography*, *22*,118-128.
https://doi.org/10.1016/j.jtrangeo.2011.12.007

Martel, A., & Klibi, W. (2016). Supply chains: issues and opportunities. In: Designing Value-creating Supply Chain Networks. Springer International Publishing.
https://doi.org/10.1007/978-3-319-28146-9

Memari, A., Abdul Rahim, A.R., Absi, N., Ahmad, R., & Hassan, A. (2016). Carbon-capped Distribution Planning: A JIT Perspective. *Computers & Industrial Engineering*, *97*, 111–127.
https://doi.org/10.1016/j.cie.2016.04.015

Meyer, J. W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American journal of sociology*, *83*(2), 340-363.
https://doi.org/10.1086/226550

Mollenkopf, D.A., & Closs, D.J. (2005). The hidden value in reverse logistics. *Supply Chain Management Review*, *9*(5), 34-43. Retrieved from
https://www.proquest.com/trade-journals/hidden-value-reverse-logistics/docview/221132943/se-2

Mores, G. V., Finocchio, C. P. S., Barichello, R., & Pedrozo, E. A. (2018). Sustainability and innovation in the Brazilian supply chain of green plastic. *Journal of Cleaner Production*, *177*, 12-18, 2018.
https://doi.org/10.1016/j.jclepro.2017.12.138

Pazirandeh, A., & Jafari, H. (2013). Making sense of green logistics. *International Journal of Productivity and Performance Management*, *62*(8), 889-904.
https://doi.org/10.1108/IJPPM-03-2013-0059

Perotti, S., Zorzini, M., Cagno, E., & Micheli, G.J.L. (2012). Green supply chain practices and company performance: the case of 3PLs in Italy. *International Journal of Physical Distribution & Logistics Management*, *42*(7), 640-672.
https://doi.org/10.1108/09600031211258138

Pokharel, S. (2005). Perception on information and communication technology perspectives in logistics: A study of transportation and warehouses sectors in Singapore. *Journal of Enterprise Information Management*, *18*(2), 136-149.
https://doi.org/10.1108/17410390510579882

Rabbani, M., Farrokhi-Asl, H., & Asgarian, B. (2017). Solving a bi-objective location routing problem by a NSGA-II combined with clustering approach: application in waste collection problem. *Journal of Industrial Engineering International*, *13*(1), 13-27. https://doi.org/10.1007/s40092-016-0172-8

Realyvásquez, A., Maldonado-Macías, A.A., & García-Alcaraz, J.L. (2018). Effects of employees' physiscal and psychological characteristics over manufacturing systems' performance. *Ingeniería e Investigación*, *38(*2), 79-89. https://dx.doi.org/10.15446/ing.investig.v38n2.65202

Ringle, C.M., Wende, S., & Becker, J.M. (2015). Smart PLS 3. Bönningstedt: SmartPLS GmbH.
Available on the website: http://www.smartpls.com

Rostamzadeh, R., Govindan, K., Esmaili, A., & Sabaghi, M. (2015) Application of fuzzy VIKOR for evaluation of green supply chain management practices. *Ecological Indicators*, *49*,188-203. https://doi.org/10.1016/j.ecolind.2014.09.045

Sarkis, J. (2006). *Greening the supply chain*. Springer Science & Business Media. https://doi.org/10.1007/1-84628-299-3

Sarkis, J. (2012). A boundaries and flows perspective of green supply chain management. *Supply Chain Management: An International Journal*, *17*(2), 202–216. https://doi.org/10.1108/13598541211212924

Sarkis, J. (2003). A strategic decision framework for green supply chain management. *Journal of Cleaner Production*, *11*(4), 397-409. https://doi.org/10.1016/S0959-6526(02)00062-8

Sarkis, J., Zhu, Q., & Lai, K.H. (2011). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics*, *130*(1), 1-15. https://doi.org/10.1016/j.ijpe.2010.11.010

Sbihi, A., & Eglese, R.W. (2010). Combinatorial optimization and Green Logistics. *Annals of Operations Research*, *175*, 159–175. https://doi.org/10.1007/s10479-009-0651-z

Schramm-Klein, H., & Morschett, D. (2006). The relationship between marketing performance, logistics performance and company performance for retail companies. *International Review of Retail, Distribution and Consumer Research*, *16*(2), 277-296. https://doi.org/10.1080/09593960600572399

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, *16*(15), 1699-1710. https://doi.org/10.1016/j.jclepro.2008.04.020

Srivastava, S.K. (2007). Green supply chain management: a state-of-the-art literature review. *International Journal of Management Reviews*, *9*(1), 53–80. https://doi.org/10.1111/j.1468-2370.2007.00202.x

Tate, W.L., Ellram, L.M., & Dooley, K.J. (2011). Transaction cost and institutional drivers of supplier adoption of environmental practices. *Journal of Business Logistics*, *32*(1), 6–16. https://doi.org/10.1111/j.2158-1592.2011.01001.x

Ubeda, S., Arcelus, F. J., & Faulin, J. (2011). Green logistics at Eroski: a case study. *International Journal of Production Economics*, *131*(1), 44-51. https://doi.org/10.1016/j.ijpe.2010.04.041

Wang, S., Liu, Z., & Bell, M. G. (2015). Profit-based maritime container assignment models for liner shipping networks. *Transportation Research Part B: Methodological*, *72*(4), 59-76. https://doi.org/10.1016/j.trb.2014.11.006

Wu, G.C., Ding, J.H., & Chen, P.S. (2012). The effects of GSCM drivers and institutional pressures on GSCM practices in Taiwan's textile and apparel industry. *International Journal of Production Economics*, *135*(2), 618-636. https://doi.org/10.1016/j.ijpe.2011.05.023

Ye, F., Zhao, X., Prahinski, C., & Li, Y. (2013). The impact of institutional pressures, top managers' posture and reverse logistics on performance - Evidence from China. *International Journal of Production Economics*, *143*(1), 132-143. https://doi.org/10.1016/j.ijpe.2012.12.021

Zailani, S.H.M., Eltayeb, T.K., Hsu, C., & Tan, K. C. (2012). The impact of external institutional drivers and internal strategy on environmental performance. *International Journal of Operations & Production Management*, *32*(6), 721-745. https://doi.org/10.1108/01443571211230943

Zailani, S., Jeyaraman, K., Vengadasan, G., & Premkumar, R. (2012). Sustainable supply chain management (SSCM) in Malaysia: A survey. *International Journal of Production Economics*, *140*(1), 330-340. https://doi.org/10.1016/j.ijpe.2012.02.008

Zeng, H., Chen, X, Xiao, X., & Zhou, Z. (2017). Institutional pressures, sustainable supply chain management, and circular economy capability: empirical evidence from Chinese eco-industrial park firms. *Journal of Cleaner Production*, *155* (Part 2), 54-65. https://doi.org/10.1016/j.jclepro.2016.10.093

Zhang, W., Zhang, M., Zhang, W., Zhou, Q., & Zhang, X. (2020). What influences the effectiveness of green logistics policies? A grounded theory analysis. *The Science of the total environment*, 714. https://doi.org/10.1016/j.scitotenv.2020.136731

Zhu, Q., Geng, Y., Fujita, T. & Hashimoto, S. (2010). Green supply chain management in leading manufacturers Case studies in Japanese large companies. *Management Research Review*, *33*(4), 380–392. https://doi.org/10.1108/01409171011030471

Zhu, Q., Geng, Y., & Sarkis, J. (2016). Shifting Chinese organizational responses to evolving greening pressures. *Ecological Economics*, *121*, 65-74. https://doi.org/10.1016/j.ecolecon.2015.11.010

Zhu, Q., & Sarkis, J. (2006). An inter-sectoral comparison of green supply chain management in China: Drivers and practices. *Journal of Cleaner Production*, *14*(5), 472-486. https://doi.org/10.1016/j.jclepro.2005.01.003

Zhu, Q., & Sarkis, J. (2016). Green marketing and consumerism as social change in China: Analyzing the literature. *International Journal of Production Economics*, 181(part B), 289-302. https://doi.org/10.1016/j.ijpe.2016.06.006

Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*, *22*(3), 265–289. https://doi.org/10.1016/j.jom.2004.01.005

Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: drivers, practices and performance. *International Journal of Operations and Production Management*, *25*(5), 449-468. https://doi.org/10.1108/01443570510593148

Zhu, Q., Sarkis, J., & Lai, K. (2007). Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, *15(*11-12), 1041-1052. https://doi.org/10.1016/j.jclepro.2006.05.021

Zhu, Q., Sarkis, J., & Lai, K (2013). Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices. *Journal of Purchasing and Supply Management*, *19*(2), 106-117. https://doi.org/10.1016/j.pursup.2012.12.001