Original Article

A performance model for Public–Private Partnerships: the authorized economic operator as an example

Um modelo de desempenho para parcerias público-privadas: o operador econômico autorizado como exemplo

Un modelo de rendimiento para asociaciones público-privadas: el operador económico autorizado como ejemplo

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Abstract

Public–Private Partnerships (PPPs) have become known as one of the alternatives for increasing the effectiveness of border controls. Excessive controls and the lack of cooperation can hinder trade in global operations. On the other hand, Trade Facilitation (TF) is a response to the observed growth in international supply chain operations over the last few years. Since TF involves a relationship between public and private agents, alternatives to solutions within the field of international trade fall into these types of partnerships. However, simply establishing a relation between both agents does not ensure that all of the benefits of TF will be reached. The objective of this research is to propose a theoretical model, one that can indicate which factors have the most influence over TF-oriented PPPs. The relationship between each variable and the performance of a partnership were tested. To validate the proposed model, we used Structural Equation Modelling (SEM). The findings show which factors influence the success of TF-oriented PPPs, using the Authorized Economic Operator (AEO) as an example. The data were gathered both at the national and international levels, focusing on professionals from the private and public sectors who either work with TF within their regular functions or have expertise on the subject. The results show that the factors that have the most influence over the performance of TF-oriented PPPs are, in order, the "micro-environment", the "abilities of parties" and the "macro-environment". Further PPPs that focus on TF may consider this model for implementation.

Resumo

As Parcerias Público Privadas (PPP) ficaram conhecidas como uma das alternativas para aumentar a eficiência dos controles de fronteira. Controles excessivos, falta de cooperação e procedimentos burocráticos podem atrapalhar o comércio em operações globais. Por outro lado, a Facilitação Comercial (FC) é uma resposta ao crescimento das operações de cadeias de suprimentos internacionais. Já que FC envolve uma relação entre os agentes públicos e privados, alternativas para o plano do comércio internacional encontram respaldo nesse tipo de parceria. Contudo, simplesmente estabelecer uma relação entre as partes não é garantia de que todos os benefícios da FC serão atingidos. O objetivo dessa pesquisa foi propor um

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modelo teórico que consiga indicar quais sãos os fatores que mais influenciam o sucesso de PPPs voltadas à FC. As relações entre cada variável e o desempenho da parceria foram testados de forma a quantificar suas forças. De forma a validar o modelo proposto foi utilizado o método de Modelagem de Equações Estruturais (SEM, na sigla inglesa). Os resultados mostram quais são os fatores que mais influenciam o desempenho de PPPs, valendo-se do programa Operador Econômico Autorizado (OEA) como referência para programas de FC. Os dados foram coletados, tanto em nível nacional, quanto internacional, focando em profissionais dos setores público e privado que trabalham diretamente com FC ou possuem conhecimento sobre o assunto. Os resultados mostraram que os fatores que mais influenciam o desempenho de parcerias voltadas à FC são, respectivamente, o microambiente, as habilidades das partes e o macro ambiente. Futuros programas de PPPs com ênfase em facilitação comercial podem se valer de modelos como esse para sua implementação.

Palavras-chave: Equações estruturais; Desempenho de parcerias; Comércio internacional

Resumen

Asociaciones Público-Privadas (APP) se hizo conocido como una de las alternativas para aumentar la eficacia de los controles fronterizos. Controles excesivos, falta de cooperación y procedimientos engorrosos pueden obstaculizar el comercio en las operaciones globales. Por otro lado, la facilitación del comercio (FC) es una respuesta al crecimiento observado en las operaciones internacionales de la cadena de suministro en los últimos años. Desde que FC implica una relación entre los actores públicos y privados, las alternativas al plan del comercio internacional son compatibles con este tipo de asociación. Sin embargo, solamente establecer una relación entre las partes no asegura si se alcanzarán todos los beneficios de la FC. El objetivo de esta investigación es proponer un modelo teórico que puede indicar cuáles son los factores que influyen en el éxito de las APP dirigidas a FC. La relación entre cada variable y el rendimiento de la asociación se ensayó. Con el fin de validar el modelo se utilizó el método de Modelos de Ecuaciones Estructurales. Los resultados muestran los factores que más influyen en el rendimiento de las APP, aprovechando el Operador Económico Autorizado (OEA) como referencia para los programas de facilitación. Se recogieron los datos, tanto a nivel nacional como internacional, centrándose en los profesionales de los sectores públicos y privados que trabajan directamente con FC o tienen conocimiento de ello. Los resultados mostraron que los factores que más influyen en las asociaciones orientadas a FC son, respectivamente, el "microambiente", las "capacidades de las partes" y el "entorno macro-". Futuros programas de APPs con énfasis en facilitación del comercio pueden considerar este modelo para su implementación.

Palabras clave: Ecuaciones estructurales; Rendimiento de las asociaciones; Comercio internacional

Introduction

In has been demanded that border agencies, importers and exporters improve their processes and technologies to help make the movement of goods across borders quicker, smoother and safer. As the volume and complexity of trade rise, national administrations attempt to address the increased traffic without extra resources, considering the awareness of the business community of the costs of trade (OECD, 2005).

Trade Facilitation (TF) is an answer to the increased uncertainty in global supply chain operations. TF can be explained as the application of methods for the reduction of barriers that can hinder trade in global operations. Its overall objective is to increase the flow of goods, services and people across international borders without compromising the security of this process or the ability of governmental agencies (mostly customs) to charge taxes and collect revenue (Moïsé, 2013).

One of the greatest benefits of TF is the reduction of trade-related costs. This benefit is interesting to both the private and the public sectors due to the advantages for former one and the clear visibility for the latter. When applied to developing countries, the need for TF measures has accelerated as a consequence of the increased participation of trade in Gross Domestic Product (GDP) and the dependence on faster supply chain management techniques, among other factors (Hellqvist, 2003). On the other

hand, although TF presents long-term savings and benefits to a country, there are many set-up and operating costs involved in the implementation of measures.

Duval (2006, p. 23) notes that the implementation of some TF measures "may often not be related to regulatory, training, or equipment costs, but to political costs". Political costs indicate the importance of the government in fostering TF. TF involves a relationship between a public and a private party. Therefore, it can be viewed as a type of Public–Private Partnership (PPP), but simply establishing a relation does not guarantee that all of the benefits of TF will be made available for everyone.

Although classic PPPs are mostly oriented towards the provision of infrastructure, some that have the provision of a service as their goal are established. In international trade, this particular type of PPP is viewed as a customs–business partnership (CBP) and shares the advantages and risks of classic PPPs (Zhang & Preece, 2011). These types of partnerships have taken the form of structured programmes. One in particular is becoming the most important in international trade worldwide: the Authorized Economic Operator (AEO), from the World Customs Organization (WCO).

This paper aims to propose and validate a theoretical model that is able to measure the main factors affecting the performance or success of a TF-oriented PPP. This model draws from the theory of PPPs and presents a relational model between

the critical success factors (CSFs) and the perceived/expected performance of a PPP. The relation between each factor and the performance of a partnership are tested, quantifying the strength of such relations using Structural Equation Modelling (SEM).

Once it is known which factors have a stronger influence over PPP performance, the decision-making process can be improved, in addition to the odds that both public and private parties will gain access to the advantages of participating in a TF programme. Although some studies focus on analysing the impacts of trade measures (see Hoekman & Shepherd, 2013; Moïsé & Sorescu, 2013), the present paper is dedicated to analysing the relationship between the government and businesses when addressing Trade Facilitation, which, to date, has no references in the literature. The originality of this work is that it contributes to a theoretical model that assesses the performance of PPPs in the TF context.

Literature review

Streamlining trade in global operations is an interdisciplinary subject. Many aspects can be considered because multiple interests are involved. These multiple interests are not monolithic on each side. On the government side, many agencies are aware of multiple and different controls due to sanitation, agricultural issues, security and tax, for example. On the economic operator side, there are also multiple perspectives, from terminals, importers, and logistics. As a complex and interdisciplinary problem, this article covers the following aspects: TF, public–private partnerships, a programme for resolving the trade-off in global operations (controls versus facilitation), and the critical success factors applied.

Trade facilitation

International trade is composed of the interaction between economic operators and border administrations, both immersed in an environment replete with national and international rules and regulations. Within this environment, TF has been drawing the attention of scholars, governments and the international trade community, particularly since the TF agreement of the World Trade Organization came into force in February 2017. At its core is the concern for the operational quality of commerce, being firmly rooted "in the frustrations experienced by businesses when moving goods across borders" (Grainger, 2014, p. 1167). It is also anchored in the understanding of commercial facilitation, which is defined by the Organization for Economic Co-operation and Development (OECD) as policies and measures adopted for the improvement of the performance of each supply chain link and the reduction of trade-related costs (Moïsé, 2013).

TF must balance the urge for competitiveness from businesses and other economic operators with the need for control from governmental authorities (Morini, 2014). However, despite being easily related to customs and other border agencies, TF is not limited to them, therefore reaching out to other fields, such as the international business environment, the quality of infrastructure among countries and their internal regulations (Portugal-Perez & Wilson, 2012).

Although there are studies related to measuring the determinants of international trade and its impacts on the economy (Agosin, Alvarez, & Bravo-Ortega, 2012; Egger & Larch, 2013; Wang, Wei, & Liu, 2010), credit cannot be given to one isolated factor but, rather, to the conjunction of several factors that make a country (or countries) succeed in foreign trade performance (Hanousek & Kocenda, 2014). Among such factors are institutions, infrastructure, technology, internal processes, and many others. The overall objective of TF and its various aspects is to increase the flow of goods, services and people across international borders without compromising the security or the ability of governmental agencies (mostly customs) to charge taxes and collect revenue (Macedo & Scorza, 2014).

Reducing the cargo time inspection can be considered a TF measure at the operational level that has a significant impact on business competitiveness. It reduces lead-times and accelerates supply chains, also giving national governments the benefit of increasing the collection of tax revenue (Engman, 2005; Helble, Shepherd, & Wilson, 2007; Zaki, 2008).

Moreover, TF rests on other basic concepts, such as: transparency, the predictability of networks, the streamlining of processes, the integration of border agencies and the harmonization of procedures and norms (Moïsé, Orliac, & Minor, 2011; Turnes & Ernst, 2015). Governments and businesses can form partnerships for the development of a given project that combines their mutual interests. This also occurs in the field of customs and international trade. Some of these PPPs, as they are called, are TF-oriented and can be found within the conventional PPP universe.

Public–Private Partnerships

PPPs are a long-term contract between a private and a public party for the provision of public services or goods. In this type of relation, the private initiative takes upon itself most of the risks involved in the project since it assumes the role of the government in providing the specific public service to the population (Lopes & Caetano, 2015). On the other hand, not every PPP is oriented towards the execution of infrastructure projects. Some partnerships are established for the provision of a service. Although not widely discussed in the literature, these types of partnerships can be viewed in the papers shown in Table 1.

Knowing that not all partnerships are for providing infrastructure and that some can be oriented towards services, a special type of PPP can be found among those and is the focus of this study: the CBP. A CBP is a type of relationship built between a government and private initiatives for reducing transaction costs and the need for constant interventions in the process of moving goods across borders while not loosening the security standards imposed by customs (Zhang & Preece, 2011). In this sense, one can view CBPs as a specific type of PPP that describes the singular partnership between a business and border authorities for purposes of TF. Therefore, it is a TF-oriented PPP.

Table 1
Previous definitions concerning PPPs beyond the provision of infrastructure.[*]

Authors	Definition
Forman (2006, p. 112)	"Partnerships between the public and private sectors represent one of the strongest means to detect, deter, disrupt and deny terrorist and other criminal organizations illicit profits and material support required to fuel their evil acts".
Yuan, Skibniewski, Li, and Zheng (2010, p. 96)	"Their urgent needs for quality public facilities and services make public sector adopt PPP methods to deliver corresponding satisfactory projects. Additionally, a successful PPP project relies on the satisfaction of end users, particularly in the operational stage" (p. 91). "Concurrently, providing quality service is very important for every stakeholder group, which is also a distinguishable characteristic of PPPs".
Cruz and Marques (2011, p. 393)	"For example, Fraport, the airport manager in Frankfurt, has been widening its business to areas such as ground handling and logistics, real estate, security, advertising, consulting, among others".
Rebeiz (2011, p. 421)	"A public-private partnership (PPP) is an agreement between a host government and a private entity in which the private sector supplies infrastructure assets and services that are traditionally provided by the government".
Cheung and Chan (2011, p. 409)	"[...] [PPP as a] flexible management mechanism, expertise and cost-awareness".
Brunet-Jailly (2012, p. 487)	"[...] PNWER [Pacific Northwest Economic Region] is an operating public/private sector partnership designed for the facilitation of trade across the larger region"; Integrated Border Enforcement Teams (IBET).
Kee and Forrer (2012, p. 200)	"[...] when PPPs are done properly, in a way that is responsive and flexible in the delivery of services, and when they are held accountable to standards of performance in ways that are transparent to the public, [...] such partnerships are a success for democracy".
Swanson and Smith (2013, p. 335)	"[...] the idea of private support to public disaster response is framed as a public-private partnership (PPP)".

Source: own elaboration.
[*] In chronological order.

Authorized Economic Operator (AEO) as a tool for TF in global operations

One of the TF initiatives at the global level that is becoming the most widespread TF programme among countries is the Authorized Economic Operator (AEO). It is an initiative for spreading a culture of compliance and safety, therefore increasing the flow of goods between countries and the security of supply chains on a global scale. The AEO was developed by both customs authorities and economic operators with the objective of ensuring a common understanding and uniform application of legislations and safety measures in an attempt to integrate stakeholders more cohesively into the process of moving goods and people across borders.

The programme was born in Europe under the guidelines of the SAFE (Framework of Standards to Secure and Facilitate Global Trade) package by the World Customs Organization (WCO). Its main objectives are to (World Customs Organization, 2012, p. 3):

- Establish standards that provide supply chain security and facilitation at a global level to promote certainty and predictability;
- Enable integrated and harmonized supply chain management for all modes of transport;
- Enhance the role, functions and capabilities of customs;
- Strengthen co-operation between customs administrations to improve their capability of detecting high-risk consignments;
- Strengthen customs/business co-operation;
- Promote the seamless movement of goods through secure international trade supply chains; and
- Streamline border controls.

Bearing in mind the guidelines of the SAFE package, an AEO can be defined as "[...] a party involved in the international movement of goods in whatever function that has been approved by or on behalf of a national customs administration as complying with WCO or equivalent supply chain security standards" (World Customs Organization, 2010, p. 4).

However, the AEO can be viewed as the most complete and comprehensive TF programme at present since it was designed to be made a global initiative. Therefore, for the purposes of addressing CBPs and TF-oriented PPPs, in this research, the AEO was chosen as the best representative of such partnerships.

Methodology

This research approaches the matter of TF-oriented PPPs by assessing their performance. As a means of measuring performance in a quantifiable manner, Structural Equation Modelling (SEM) was elected since it has the ability to relate latent and observed variables via statistical tools (Kohn, McGinnis, & Kara, 2011; MacCallum & Austin, 2000; Svensson, 2012). However, to use SEM, first, a theoretical model must be built to explain the relation between these variables.

Since no previous attempts at drawing such a model could be found in the literature, this research chose to view TF from the perspective of PPP theory, placing special emphasis on the AEO programme (for reference, see Campos et al., 2018). Illuminating TF as a partnership, a criterion could be developed for analysing the subject, and therefore, measurement could become possible by means of the CSFs. In other words, PPP theory was used as a platform for designing a performance measurement model for TF.

The methodological approach is divided into five major steps. Steps 1 and 2 include a review of the literature on both TF and PPP and a collection of every main CSF concerning public–private partnerships. Step 3 addresses the creation of an initial conceptual model that presents a relation between the CSFs and the performance of a TF-oriented partnership. Step 4 aims to validate the theoretical model and develop the

questionnaire. The final step (Step 5) concerns gathering a significant sample, running the model and analysing the data.

Building up our Critical Success Factors in PPPs

Aerts, Grace, Dooms, and Haezendonck (2014) and Chou and Pramudawardhani (2015) use the CSF concept in PPPs. CSFs are elements that determine how well PPPs function.

Based on previous studies (Osei-Kyei & Chan, 2015), CSFs in PPPs are related to the quality of the relationship established between parties. Fig. 1 presents a list of CSFs in the PPP context. The list is grounded in the previous literature review by Osei-Kyei and Chan (2015) from 1992 to 2013. We added more two articles (Aerts et al., 2014; Chou & Pramudawardhani, 2015). The original list of the other 27 articles can be viewed in Osei-Kyei and Chan (2015).
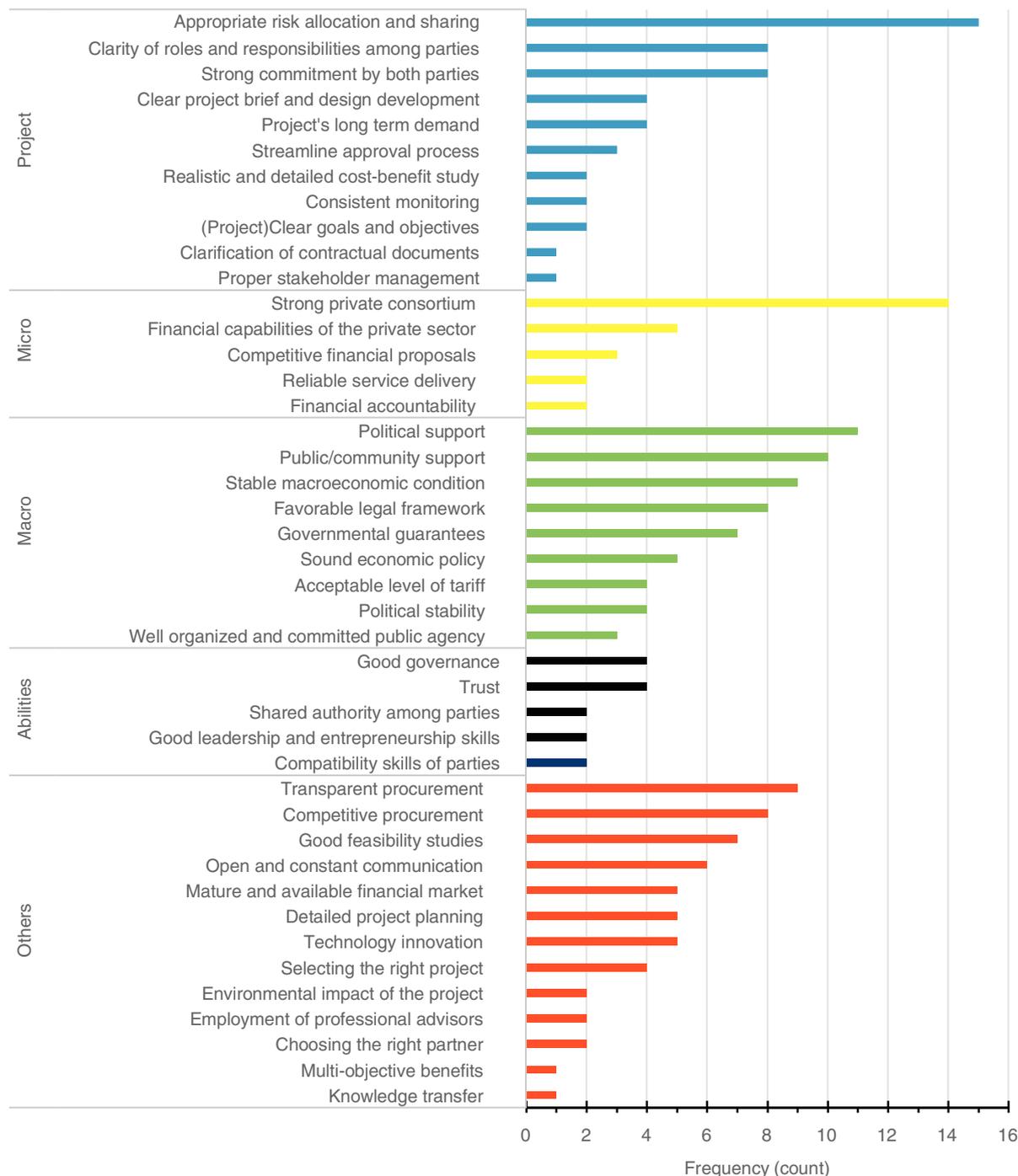

Fig. 1. Main CSFs found in the literature review from 1992 to 2015.

Source: Own elaboration adapted from Osei-Kyei and Chan (2015), Aerts et al. (2014) and Chou and Pramudawardhani (2015).

Due to the lack of papers dedicated to exploring the world of PPPs beyond the infrastructure perspective, the CSFs found are mostly oriented towards this type of partnership. In this sense, the first step to finding the relation between the CSFs and PPP performance is to define an initial conceptual model, which is our next step.

The theoretical model, questionnaire and hypothesis

This section addresses steps 3 and 4. From the list of 43 CSFs that were found in the literature review (Fig. 1), we held a two-round meeting with a selected panel of specialists. They were asked to discuss each factor and state their opinion regarding whether a CSF was related to a TF-oriented PPP. They were also asked to restructure the list of factors and the matrix itself according to what they saw made sense. The panel consisted of 16 people coming from different sectors of society such as:

- **Private:** 10 specialists (eight national and two international) belonging to a large corporation with intensive internationalization operations. National: GE, Avon, Caterpillar, Honda, Volvo, BASF, Stork Prints and Fiorde; International: DHL Europe and Novartis in Europe;
- **Consulting:** two specialists from auditory and legal services;
- **Government:** four specialists from the Ministry of Industry, Foreign Trade and Services (2), the Ministry of Finance, Customs administrations (1), and the Ministry of Agriculture, Livestock and Food Supply (1).

The AEO was used as a reference for a broad and comprehensive TF programme with a worldwide reach. The main criteria for choosing this panel of specialists was to (1) guarantee an audience of people who address TF on a regular basis within their professional functions and who are deeply immersed in the subject (and are thus able to contribute to the research with hands-on experience) and (2) span the field in terms of both profession (lawyers, trade officers, etc.) and origin (private sector, public sector and academia). This background and variety are what made these professionals eligible for conducting the review of both the model and the questionnaire (Appendix 1).

This process resulted in the elimination of 15 items considered to have a very weak relation with TF-oriented PPPs or no relation whatsoever. Factors related to procurement had no relation with TF-oriented PPPs. The reason was that by considering an AEO programme, no type of procurement or consortium is required but, rather, the will of businesses to become compliant and obtain the certification. Regarding public support, for the same reason, it also does not affect the adoption of a programme such as an AEO. Other factors, such as selecting the right project, technology innovation, detailed project planning, the project's environmental impact and knowledge transfer, were also removed from the list since none of them has an intrinsic connection to TF programmes.

It is not necessarily the case that such factors would not have any connection to TF, but rather, they are not critical for a TF-oriented PPP, as they are for other types of PPPs. The focus is on improving processes for reducing administrative and legal barriers to trade, not on discussing technology innovation or environmental impact, much less knowledge transfer. Similarly, there is no selection of different projects to be analyzed in a TF-oriented PPP, given that the TF programme has already been established. The question is whether businesses will choose to comply to be certified.

The remaining 28 factors were reordered into 16 groups, called "dimensions". These dimensions served as the foundation for the establishment of five constructs, namely: abilities of parties, project's quality, macro-environment, micro-environment and PPP performance. In other words, the model was composed of five constructs containing at least three dimensions each. The 28 remaining CSFs, by their turn, could be found within each of these dimensions. This provided guidance for the creation of 52 questions, which means that each dimension elicited a minimum of three questions each. The final version of the proposed model for examining TF-oriented PPP performance can be found in Fig. 2 (a similar model can be seen in Campos et al., 2018, where the authors first tested its validation and presented preliminary results before engaging the target sample described in this paper).

The constructs found in the model were built from the literature review on CSFs conducted by the research group. This means that each construct contains within itself some dimensions drawn from the critical factors. For instance, if we take the macro-environment construct as an example, it is composed of the dimensions of the economy, the government and regulation. Each of these dimensions, in turn, is composed of their own critical success factors, such as "favourable legal framework" and "stable macroeconomic condition".

The questions were actually made in the form of statements meant to capture the respondents' perception of what affects PPP performance. To that end, they were given a 5-point Likert scale ranging from "completely disagree" to "completely agree". The three highest scoring statements (the most agreed with) were "having a formal/official channel of communication between parties improves the partnership's performance[1]", "the interchange of information between the leaderships of the public and private sectors is a determinant of a partnership's success", and "the involvement of parties is fundamental to the performance of a partnership". All three statements belonged to the "abilities group". On the other end of the spectrum, the most disagreed with statements were related to the macro-environment ("having jurisprudence concerning the formation of partnerships positively affects their performance"), the "project's quality" group ("standardized contract models contribute to the performance of a partnership") and the "micro-environment" group ("the private party must be able to raise the necessary funds for a partnership on its own").

According to the literature review (third column) and the original problem, we worked with the following hypotheses to design the model (Table 2).

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[1] Though the statements only used the term "performance", as opposed to "PPP performance", there was an introductory text which contextualized the respondents to understand "performance" as related to TF oriented PPPs.
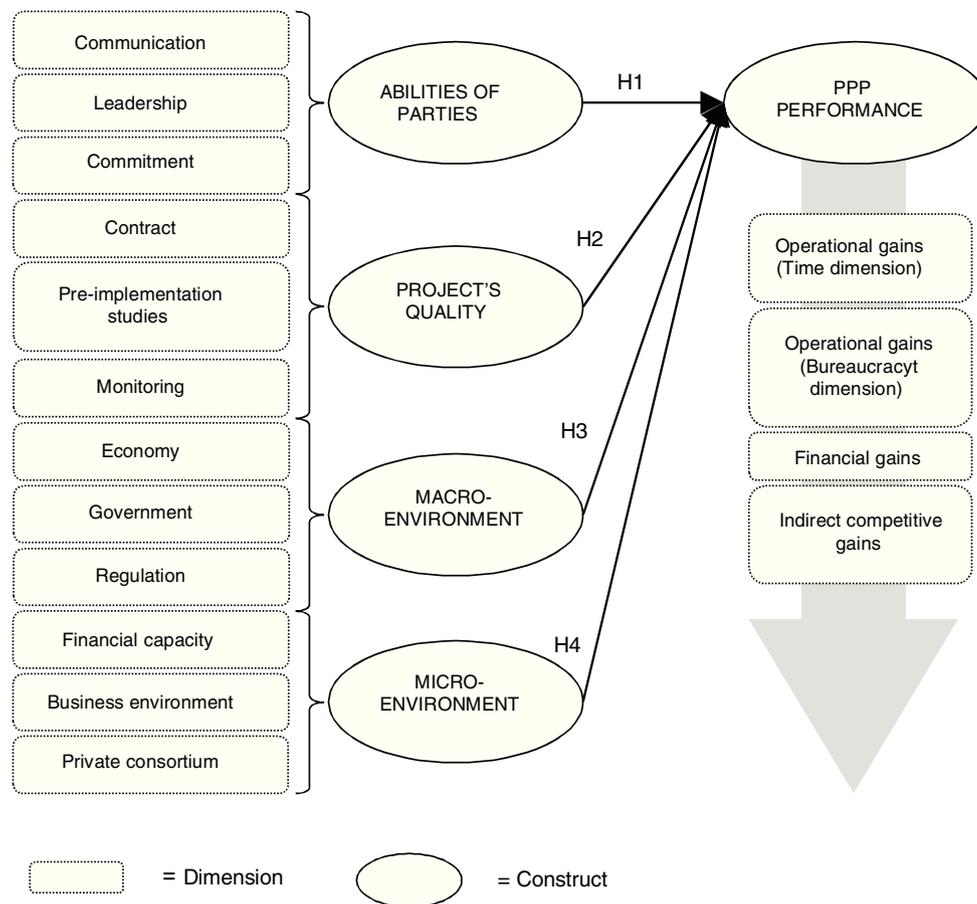
Fig. 2. Final version of the proposed PPP performance model.
Source: own elaboration based on Campos et al. (2018).

Table 2
Study hypotheses (drawn from the PPP performance matrix).

Hypotheses	Description	Papers that address specific CSFs related to the hypothesis (adapted from Aerts et al., 2014; Chou & Pramudawardhani, 2015; Osei-Kyei & Chan, 2015)
H_1	The abilities of the parties involved in a PPP to have a positive influence on its performance.	Abdul-Aziz and Kassim (2011), Hwang, Zhao, and Gay (2013)
H_2	The PPP project's quality has a positive influence on its performance.	Tang, Shen, Skitmore, and Cheng (2012), Mladenovic, Vajdic, Wündsch, and Temeljotov-Salaj (2013), Hwang et al. (2013), Tang and Shen (2013), Aerts et al. (2014), Chou and Pramudawardhani (2015)
H_3	The macro-environment has a positive influence on the performance of a PPP.	Babatunde, Opawole, and Akinsiku (2012), Cheung, Chan, and Kajewski (2012), Aerts et al. (2014), Chou and Pramudawardhani (2015)
H_4	The micro-environment has a positive influence on the performance of a PPP.	Ng et al. (2012), Cheung, Chan, and Kajewski (2012), Aerts et al. (2014), Chou and Pramudawardhani (2015)

The sample

The chosen sample for this study was professionals from academia and the private and public sectors who addressed TF within their regular functions, that is, international trade researchers, customs officials, export and import agents, lawyers, and many other professionals from the field of international trade. They were approached either via email or by a focal point from within their organization with whom the researchers had contact. To assess the sample size and statistical power of analysis, the G*Power 3.1 software was utilized (Faul, Erdfelder, Lang, & Lang, 2009), in addition to the recommendations made by Chin and Newsted (1999) and Hair, Hult, Ringle, and Sarstedt (2013).

The questionnaire was sent to the International Network Customs Universities (INCU). The INCU is the main think tank on customs issues. It has affiliates from 80 countries, including professionals from the public and private sectors, international organizations (e.g., the World Customs Organization) and universities. In total, the questionnaire was completed by 123

members of the INCU. Of this total, 83 replies were from national respondents, versus 40 international respondents, with a worldwide geographical distribution ranging from, for example, Afghanistan to the US. Interestingly, more than 67% of the contributions came from the private sector alone.

Attorneys, customs brokers, consultants, importers, and professionals from general industries, inspection companies, and trading companies are some examples of the variety of agents who participated in the study. In contrast, the public sector contributed only approximately 11% of the total responses, being the least representative group. Academia, in turn, represents approximately 17% of responses and was the group that presented the highest contribution from foreign professionals (roughly 80%). The remaining 5% of respondents were categorized as "others" because they did not claim to have a single affiliation with either the public/private sector or academia. Sex and age were not included in the final profile questionnaire because they were not elected as measurable variables for this study.

Structural Equation Modelling (SEM)

This research used a quantitative approach to its subject by means of multivariate data analysis. Since theories of public–private partnerships for TF are briefly discussed and considering the objective is the prediction and explanation of the established constructs, Partial Least Squares Path Modelling (PLS-SEM) was chosen, in light of the recommendations by Hair et al. (2013). The proposed model presents both reflexive and formative indicators, which is another reason for utilizing PLS-SEM (Chin & Newsted, 1999; Hair et al., 2013).

The greatest number of arrows converging on a latent variable is 4 (greatest number of predictors). Considering the number of predictors to be 4, a significance level of 5%, a statistical power of 0.8 and an effective medium size (f^2) of 0.15 (which is equivalent to an R^2 of 13%), the minimum sample size is of 85 responses. Since the actual sample utilized for validating the statistical model consisted of 123 responses, it was deemed adequate for Partial Least Squares Path Modelling (PLS-SEM). Post hoc analysis for this sample indicates that: (1) any R^2 over 9.17% would be observed as being significant, thus maintaining the statistical power at 0.8 and the significance level at 5%; and (2) for the medium size effect, the statistical power is 0.939, which is well above the value of 0.8 recommended by Chin and Newsted (1999) and Hair et al. (2013).

For the calculations and validations of the statistical test, developed by SEM multivariate analysis, the SmartPLS 3.0 (Ringle, Wende, & Becker, 2014) and SPSS Statistics 21 software packages were utilized.

Results

The model presents reflexive indicators (Abilities of Parties, Macro-environment, Micro-environment and Project's Design) and one formative indicator (PPP Performance); thus, each indicator should be evaluated according to adequate criteria.

Evaluation of formative measurement models

According to Hair et al. (2013), the criteria for evaluating formative measurement models are: convergent validity, multicollinearity, and significance and relevance. Convergent validity was studied by means of redundancy analysis. This analysis was conducted by correlating the formative construct's variables with a global measure of the indicator. The construct was modelled as the independent variable and the global measure as a dependent variable. According to Hair et al. (2013), a path coefficient above the threshold of 0.8 provides support for the convergent validity of the formative construct. In the case of the "PPP Performance" construct, the value was of 0.81.

To test the co-linearity of the indicators, the SPSS Statistics 21 software was utilized to calculate the tolerance values and the Variance Inflation Factor (VIF). A multiple regression of the formative construct's indicators (with any other indicator) was undertaken to analyze their tolerance results and VIF. All values fall within the following parameters: tolerance is above 0.2, and the VIF is below 5.

To analyze significance and relevance, the bootstrapping technique of SmartPLS was utilized. According to the T-statistic of the outer weights, some variables presented non-significant values. However, Hair et al. (2013) recommend that the outer loadings be analyzed as well. When analysing the T-statistic of the outer loadings, most variables presented significant values ($p < 0.01$), whereas some presented non-significant values. In this case, the recommendation is to exclude the latter from the model.

Evaluation of reflexive measurement models

According to Hair et al. (2013), the criteria for evaluating reflexive measurement models are: (1) internal consistency (compound reliability); (2) the indicator's reliability; (3) convergent validity (extracted mean variance); and (4) discriminant validity. On first analysis, all indicators were used in the constructs' measurement. The evaluation of convergent validity was performed by means the average variance extracted (AVE). Only the latent variable of the "Micro-environment" presented an AVE less than the minimum recommended by Ringle, Sarstedt, and Straub (2012) of 0.5. Thus, the indicators that presented the lowest loads on the construct were excluded, and a new adjusted model was obtained.

The evaluation of the adjusted measurement model indicated that all latent variables achieved the minimum recommended AVE. Regarding compound reliability (CR), every variable presented values above 0.7, which is considered adequate (Hair et al., 2013). Discriminant validity was assessed at the indicator level of the latent variables. Most indicators presented higher factorial loads within their respective latent variable than any other variable. However, some indicators presented high factorial loads for latent variables to which they did not belong, thus having to be excluded. In relation to the level of latent variables of the adjusted model, the variance of the root mean square error (RMSE) was greater than the correlations between all latent variables (both vertically and horizontally) (Ringle et al., 2012),

Table 3
Synthesis of the evaluation of the measurement model.

Latent variable	Abilities	Macro-environment	Micro-environment	Project's quality
Abilities	**.778**			
Macro-environment	.769	**.811**		
Micro-environment	.773	.760	**.796**	
Project's quality	.771	.786	.741	**.808**
Average Variance Extracted (AVE)	.606	.657	.633	.653
Composite Reliability	.932	.905	.873	.929
Cronbach's Alpha	.918	.869	.806	.910

Source: our primary research.

Source: our primary research.

as indicated in Table 3 (bold diagonal), thus reinforcing the discriminant validity (Fornell & Larcker, 1981; Ringle et al., 2012).

According to the results, the convergent validity, discriminant validity and reliability indicated a positive evaluation of the measurement model. Therefore, it is possible to say that the latent variables have been adequately measured.

Evaluation of the structural model

Before evaluating the structural model, it is necessary to evaluate the co-linearity of the structural model. To that end, the tolerance values and VIF of each sub-part of the structural model were analyzed. The values are within the parameters established by Hair et al. (2013), that is, the tolerance level above 0.2 and the VIF below 5.

To analyze the significance of the indicators, the bootstrapping technique was utilized (Efron & Tibshirani, 1998). The use of this method for analysing the significance of the loads obtained for the observed variables is not based solely on model estimation. It calculates the estimates of the parameters and the confidence intervals based on multiple estimations (Hair, Anderson, Tatham, & Black, 2005; Hair et al., 2013).

Student's T statistic analyses the hypothesis that the correlation coefficients are equal to zero. In case the results of this test indicate values above 1.96, the hypothesis is not supported, and the correlation is significant (Efron & Tibshirani, 1998; Hair et al., 2013). Table 4 presents the values of the coefficients between the constructs and the respective Student's T statistic. Values were also estimated by the bootstrapping technique. All relationship values presented Student's T values above 1.96 (significance level = 5%), except the "project's
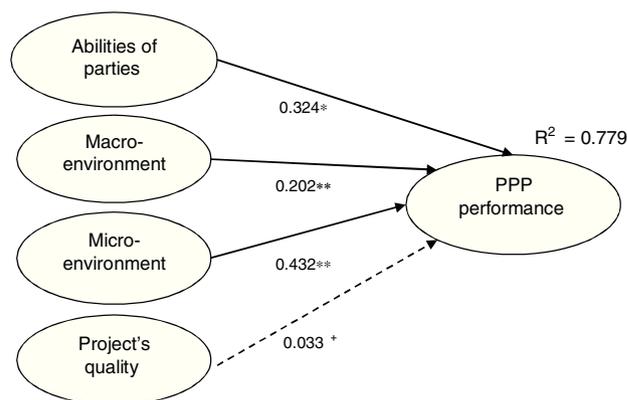

Fig. 3. Validated model. *Notes*: $*p < 0.05$, $**p < 0.01$, $***p < 0.001$, +: not significant.
Source: our primary research.

quality" construct, which presented a T value of 0.198, which is not significant.

To evaluate the determination coefficient (R^2), the studies of Cohen (1977) and Faul et al. (2009) were used, determining that the f^2 values of 0.02, 0.15 and 0.35 are considered to be small, medium and high effects, respectively. Such f^2 values correspond to R^2 values of 2%, 13% and 25%, respectively. According to the answers gathered by the research, the "PPP performance" construct presented an R^2 value of 0.779, which is considered high. The resulting model is presented in Fig. 3.

In addition to evaluating the magnitude of the R^2 values as criteria for predictive precision, it is necessary to evaluate the Q^2 value, which is an indicator of the model's predictive relevance. The Q^2 measure applies a technique that omits part of the data matrix and uses model estimates to predict the omitted part. Specifically, when a PLS-SEM model presents predictive

Table 4
Coefficients of the structural model – between constructs.

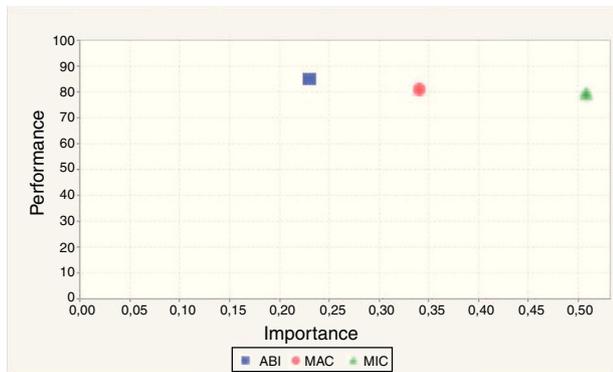| Causal relationship	Mean	Standard Error	T value	p-Value (two-tail-like growths)
Abilities→PPP	0.209	0.103	1.959	0.050
Macro-environment→PPP	0.326	0.106	3.069	0.002
Micro-environment→PPP	0.426	0.097	4.470	0.000
Project's quality→PPP	0.018	0.101	0.198	0.843

Source: our primary research.

Fig. 4. Importance-performance map analysis for PPP performance. *Notes*: ABI, abilities of parties; MAC, macro-environment; MIC, micro-environment. *Source*: our primary research.

Table 5
Results of the hypothesis testing.

Hypotheses	Description	Results
H_1	The abilities of parties involved in a PPP have a positive influence on its performance.	Supported
H_2	The PPP project's quality has a positive influence on its performance.	Not supported
H_3	The macro-environment has a positive influence on the performance of a PPP.	Supported
H_4	The micro-environment has a positive influence on the performance of a PPP.	Supported

Source: our primary research.

relevance, it accurately predicts the data points of the indicators in reflexive measurement models. The Q^2 value for the model was 0.421. For SEM models, Q^2 values above zero for a given latent, endogenous reflexive variable indicate the predictive relevance of the path model.

To strengthen the precision of the dimensions of the influence exerted by the constructs of the "abilities of parties", the "macro-environment" and the "micro-environment" on the "PPP performance construct", an Importance-Performance Map Analysis (IPMA) was elaborated and is presented in Fig. 4.

The IPMA emphasizes that the most important construct of the model is the Micro-environment, followed by the Macro-environment, then the Abilities of parties. Regarding performance indicators, all have approximate values, indicating adequate performance in relation to the model.

Table 5 presents a summary of the study's hypothesis testing based on the validations obtained by the structural model.

Discussion

According to the results presented in Table 5, one hypothesis was not supported: the PPP project's quality has a positive influence on its performance (H2). Within the construct of the "project's quality" were the dimensions of "contract", "pre-implementation studies" and "monitoring". On the other hand, TF programmes such as the AEO are based on a compliance-certification logic and inherent quality. Such programmes are

designed bearing in mind a series of guidelines for customs, governments and businesses to undertake to become certified and recognized by other certified authorities.

Since a company that wishes to be certified by a TF programme must follow a specific set of rules within a previously structured programme, it is no surprise to observe that the project's quality is not among the confirmed hypotheses because not all of the participants within such programmes have to decide on its design.

Regarding the hypotheses that were validated by the statistical tool, the "micro-environment" presented the strongest relation with the performance of TF-oriented PPPs (coefficient of 0.432). In it were the "financial capacity" (of the private sector), "business environment" and "private consortium" dimensions. The general idea behind these factors is the coordination of the private sector in regard to engaging businesses in a TF culture. Therefore, initiatives that promote TF programmes, such as workshops, meetings and other events can have an effect on the adhesion of companies to such programmes. Furthermore, the financial capacity of businesses is also an important factor because it affects their capability to meet all of the investments required for implementing a TF programme.

The most influential construct was the micro-environment. Osei-Kyei and Chan (2015) developed a study in which they analyzed the most discussed CSFs in the academic literature spanning from 1990 to 2013 (inclusive). In their paper, "appropriate risk allocation and sharing" and "strong private consortium" were the two most discussed critical success factors in the literature. Both were considered to be micro-environment factors when the research group was developing the conceptual model, which would be validated later. Therefore, it is not surprising that the micro-environment has such a strong relation with the performance of partnerships. Other papers that address specific CSFs regarding the micro-environment can be found in Tables 2 and 3.

The second most influential construct concerning the performance of TF-oriented PPPs was the "abilities of parties" (coefficient of 0.324), which encompassed the dimensions of "communication", "leadership" and "commitment". The latter is among the most discussed CSFs in the literature. Similarly, communication is also an important factor for PPPs in general, but within the TF field, it falls under the "soft" dimension of trade, as opposed to the "hard" dimension (as discussed by the World Trade Organization/OECD, 2013).

The still significant but least influential construct was the "macro-environment" (coefficient of 0.202). In it are the "economy", "government" and "regulation" dimensions. Of these, the government and regulation provided the best questions for measuring this construct, with the latter providing questions with the highest factorial loads, such as "a stable regulatory mark contributes to the consecution of rights and guarantees to partnerships".

Regarding the measurement of the performance of PPPs, all dimensions that formed that construct provided questions with high factorial loads. Such dimensions included "operational gains in time", "operational gains in bureaucracy", "financial gains" and "indirect competitive gains".

Conclusion

Since a model such as this model has never been validated before, the strategy of this research was to create an initial concept of a model that explains which factors have the most influence on a TF-oriented PPP. The reason was to understand the major factors that had the most influence on PPPs to create a "compass" that could lead to further research. This article shows that the use of SEM as a statistical tool is capable of correlating data and finding the strengths and weaknesses in the connections between variables. Examining the final validated model (Fig. 2), it is clear that only some, not all, of the hypotheses were validated and that some had a stronger relation with PPP performance than others. The implication is that, according to the proposed model, the objective of finding which factors had the most influence over TF-oriented PPP performance, here measured by the respondent's perception of the benefits of TF, was reached.

The data presented results with an explanation level of roughly 78%. The model encompasses major factors that, as shown by the results, have an impact on the performance of TF-oriented PPPs. This type of knowledge can be useful for designing TF programmes or diagnosing TF issues. Programmes such as the AEO are well conceived and designed, but as stated at the beginning of this text, participating in a TF programme alone is no guarantee that both parties involved in the partnership will access all of the benefits that TF can provide. The proposed model can contribute to the understanding of factors that may fall beyond the reach of TF programmes, such as the macro-environment. By having an in-depth understanding of how strong factors such as these can affect partnerships, countermeasures or better clauses can be added to the design of TF programmes for them to be increasingly more effective.

The next adjustments to the model should focus on such constructs and expand the understanding of what within the macro-environment has the most influence on performance, thus decomposing the larger construct into its component factors.

Regarding the questionnaire, ideally, it should not contain as much questions as it does because the response rate can drop as a result. However, since the idea of this research was to consider the most factors it could under one single analysis, the decision was to proceed with a lengthy questionnaire. The next step for future studies will be to consider this factor, particularly because, from the 52 original questions, 26 had a satisfactory measurement power, thus streamlining the original list.

Another consideration must be made regarding the sample. Although the number of responses has exceeded the quota and the heterogeneity of the respondents made for a general overview of their opinion (which was the original intention), further research should focus on specific realities to attempt to measure specific variances in the perception of TF-oriented PPP performance.

Conflicts of interest

The authors declare no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.rausp.2017.07.002.

References

Abdul-Aziz, A.-R., & Kassim, P. S. J. (2011). Objectives, success and failure factors of housing public–private partnerships in Malaysia. *Habitat International*, *35*(1), 150–157.

Aerts, G., Grace, T., Dooms, M., & Haezendonck, E. (2014). Public–Private Partnership for the provision of port infrastructure: An explorative multi-actor perspective on critical success factors. *The Asian Journal of Shipping and Logistics*, *30*(3), 273–298.

Agosin, M. R., Alvarez, R., & Bravo-Ortega, C. (2012). Determinants of export diversification around the world: 1962–2000. *The World Economy*, *35*(3), 295–315.

Babatunde, S. O., Opawole, A., & Akinsiku, O. E. (2012). Critical success factors in public–private partnership (PPP) on infrastructure delivery in Nigeria. *Journal of Facilities Management*, *10*(3), 212–225.

Brunet-Jailly, E. (2012). In the increasingly global economy, are borderland regions public management instruments? *International Journal of Public Sector Management*, *25*(6/7), 483–491.

Campos, M. L., Morini, C., de Moraes, G. H. S. M., & Inácio, E. (2018). Public-private partnerships for trade facilitation: a theoretical model. In E. Viles, M. Ormazábal, & A. Lleó (Eds.), *Closing the gap between practice and research in industrial engineering. Lecture notes in management and industrial engineering*. Cham: Springer.

Cheung, E., & Chan, A. P. C. (2011). Risk Factors of Public–Private Partnership Projects in China: Comparison between the water, power and transportation sectors. *Journal of Urban Planning and Development*, *137*(4), 409–415.

Cheung, E., Chan, A. P. C., & Kajewski, S. (2012). Factors contributing to successful public private partnership projects, comparing Hong Kong with Australia and the United Kingdom. *Journal of Facilities Management*, *10*(1), 45–58.

Chin, Wynne W., & Newsted, Peter R. (1999). Structural equation modeling analysis with small samples using partial least squares. *Statistical Strategies for Small Sample Research*, *2*, 307–342.

Chou, J., & Pramudawardhani, D. (2015). Cross-Country Comparisons of Key Drivers. Critical success factors and risk allocation for public–private partnership projects. *International Journal of Project Management*, *33*(5), 1136–1150.

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York: Academic Press., "The Concept of Power Analysis"

Cruz, C. O., & Marques, R. C. (2011). Contribution to the study of PPP arrangements in airport development, management and operation. *Transport Policy*, *18*(2), 392–400.

Duval, Y. (2006). *Cost and benefits of implementing trade facilitation measures under negotiations at the WTO: An exploratory survey. Asia-Pacific Research and training network on trade working paper series*. pp. 3.

Efron, B., & Tibshirani, R. (1998). The problem of regions. *Annals of Statistics*, 1687–1718.

Egger, P. H., & Larch, M. (2013). Time zone differences and trade barriers. *Economics Letters*, 119(1), 172–175.

Engman, M. (2005). The economic impact of trade facilitation. *OECD Trade Policy Papers*, 21, 1–30.

Faul, F., Erdfelder, E., Lang, A. B., & Lang, A. G. (2009). *Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses.* pp. 1149–1160. *Behavior Research Methods, v.41, ed.* (Vol. 4).

Forman, M. M. (2006). Combating terrorist financing and other financial crimes through private sector partnerships. *Journal of Money Laundering Control*, 9(1), 112–118.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39–50.

Grainger, A. (2014). The WTO Trade Facilitation Agreement: Consulting the private sector. *Journal of World Trade*, 48(6), 1167–1188.

Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (2005). *Análise multivariada de dados*.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2013). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Thousand Oaks: SAGE Publications.

Hanousek, J., & Kocenda, E. (2014). Factors of trade in Europe. *Economic Systems*, 38, 518–535.

Helble, M., Shepherd, B., & Wilson, J. S. (2007). *Transparency & trade facilitation in the Asia Pacific: Estimating the gains from reform*. Australia: Department of Foreign Affairs and Trade.

Hellqvist, M. (2003). Trade facilitation from a developing country perspective. Kommerskollegium (National Board of Trade). Retrieved from http://www.cid.harvard.edu/cidtrade/Papers/1598_Trade_Facilitation_from_a_Developing_Country_Perspective.pdf.

Hoekman, B., & Shepherd, B. (2013). Who profits from trade facilitation initiatives. In *ARTNet Working Paper No. 129*

Hwang, B., Zhao, X., & Gay, M. J. S. (2013). Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors. *International Journal of Project Management*, 31(3), 424–433.

Kee, J. E., & Forrer, J. (2012). PPPs: e-SCADs or partners in service? *Public Integrity*, 14(2), 193–202.

Kohn, J. W., McGinnis, M. A., & Kara, A. (2011). A structural equation model assessment of logistics strategy. *The International Journal of Logistics Management*, 22(3), 284–305.

Lopes, A. I., & Caetano, T. T. (2015). Firm-level conditions to engage in public–private partnerships: What can we learn? *Journal of Economics and Business*, 79, 82–99.

MacCallum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. *Annual Review of Psychology*, 51, 201–226.

Macedo, L. C. L. & Scorza, A. T. S. (2014). Guichê único (single window) e as negociações da OMC sobre facilitação de comércio. Porto, P. C. S. (Org.), *Organização Mundial do Comércio: temas contemporâneos*. Santos: Editora Universitária Leopoldianum.

Mladenovic, G., Vajdic, N., Wündsch, B., & Temeljotov-Salaj, A. (2013). Use of key performance indicators for PPP transport projects to meet stakeholders' performance objectives. *Built Environment Project and Asset Management*, 3(2), 228–249.

Moïsé, E., & Sorescu, S. (2013). Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade. In *OECD Trade Policy Papers, No. 144*.

Moïsé, E. (2013). The costs and challenges of implementing trade facilitation measures. *OECD Trade Policy Papers*, 157, 1–18.

Moïsé, E., Orliac, T., & Minor, P. (2011). Trade Facilitation Indicators: The impact on trade costs. *OECD Trade Policy Papers*, 118, 1–72.

Morini, C. (2014). A facilitação comercial como ferramenta de inserção da indústria nacional nas redes de produção internacionais. Porto, P.C. S. (Org.), *Organização Mundial do Comércio: temas contemporâneos*. Santos: Editora Universitária Leopoldianum.

Ng, S. T., Wong, Y. M. W., & Wong, J. M. W. (2012). Factors Influencing the Success of PPP at Feasibility Stage — A tripartite comparison study in Hong Kong. *Habitat International*, 36(4), 423–432.

OECD (2005). The costs and benefits of trade facilitation. Organisation for economic co-operation and development. Retrieved from: http://www.oecd.org/trade/facilitation/35459690.pdf

Osei-Kyei, R., & Chan, A. P. C. (2015). Review of studies on the Critical Success Factors for Public–Private Partnership (PPP) projects from 1990 to 2013. *International Journal of Project Management*, 33(6), 1335–1346.

Portugal-Perez, A., & Wilson, J. S. (2012). Export Performance and Trade Facilitation Reform: Hard and soft infrastructure. *World Development*, 40(7), 1295–1307.

Rebeiz, K. S. (2011). Public–Private partnership risk factors in emerging countries: BOOT illustrative case study. *Journal of Management in Engineering*, 28(4), 421–428.

Ringle, C. M., Sarstedt, M., & Straub, D. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly (MISQ)*, 36(1).

Ringle, C. M., Wende, S., & Becker, J. M. (2014). pp. 2016. *SmartPLS. Hamburg: SmartPLS* (Vol. 8). Access on Jan. Retrieved from www.smartpls.com

Svensson, B. J. B. G. (2012). Structural equation modeling in social science research. *European Business Review*, 24(4), 320–330.

Swanson, D. R., & Smith, R. J. (2013). A path to a Public–Private Partnership: Commercial logistics concepts applied to disaster response. *Journal of Business Logistics*, 34(4), 335–346.

Tang, L., Shen, Q., Skitmore, M., & Cheng, E. W. (2012). Ranked critical factors in PPP briefings. *Journal of Management in Engineering*, 29(2), 164–171.

Tang, L., & Shen, Q. (2013). Factors affecting effectiveness and efficiency of analyzing stakeholders' needs at the briefing stage of public private partnership projects. *International Journal of Project Management*, 31(4), 513–521.

Turnes, P. B., & Ernst, R. (2015). A framework for transparency in international trade. *Investigaciones Europeas de Dirección y Economía de la Empresa*, 21, 1–8.

Wang, C., Wei, Y., & Liu, X. (2010). Determinants of bilateral trade flows in OECD Countries: Evidence from gravity panel data models. *The World Economy*, 33(7), 894–915.

World Customs Organization (2010). The Authorized Economic Operator and the Small and Medium Enterprise. World Customs Organization. Retrieved from: http://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/tools/~/media/93162547322F462A97F8767D0987A901.ashx.

World Customs Organization (2012). SAFE Framework of Standards to Secure and Facilitate Global Trade. World Customs Organization. Retrieved from: http://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/tools/~/media/55F00628A9F94827B58ECA90C0F84F7F.ashx.

Yuan, J., Skibniewski, M. J., Li, Q., & Zheng, L. (2010). Performance objectives selection model in public–private partnership projects based on the perspective of stakeholders. *Journal of Management in Engineering*, 26(2), 89–104.

Zaki, C. (2008). Does trade facilitation matter in bilateral trade? *CES Working Papers*, 472, 1–38.

Zhang, S., & Preece, R. (2011). Designing and implementing Customs–Business partnerships: A possible framework for collaborative governance. *World Customs Journal*, 5(1), 43–62.