The relation between Technical Standards and Coopetitive Alliances Formation.

An empirical analysis from the World Emission Standards

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ABSTRACT

In this paper, we study technical standards as drivers of coopetition in international markets. In particular, we analyse to what extent and under which conditions emission standards are drivers of coopetition strategy for commercializing new products in the world and, we survey 457 coopetitive alliances in 59 countries. We perform a logit regression analysis to test the probability that standards affect significantly on the coopetitive alliance development in international markets.
Our findings clarify that the entry into force of a standard leads companies to develop similar or compatible technologies, which practically enable technological convergence and that regulatory standards lead coopetitive alliances' partners to innovation when they are engaged into a mutual technology transfer.
This research provides three contributions. First, it describe standards as driver of coopetition. Second, it provides a deeper understanding of the standard effect on the probability of developing coopetitive alliances into domestic and international markets. Finally, when conforming to standards requires cross technology transfer between partners, this increases the likelihood of developing coopetitive alliances in international markets.

Keywords: Standards, Coopetition Driver, Coopetitive Alliances, Internationalization, Innovation.

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INTRODUCTION

The drivers of coopetition has constituted an important issue for different field of research (Dowling et al. 1996; Khanna et al., 1998; Park, Zhou, 2005; Dagnino and Rocco, 2009; Ansari et al., 2015; Le Roy and Czakon, 2016). Generally, firms collaborate with competitors for many reasons: for developing products that require technological expertise (Emden et al., 2006), for adopting innovative technologies (Gnyawali, 2006) and for setting industry standards (Bengtsson et al., 2016; Gnyawali and Park, 2011; Luo, 2007), industrial concentration, sectorial maturity or international markets (Sanou, 2012).

Gnyawali and Park (2009) introduced a debate on the antecedents of coopetition, which has been progressively expanded by literature (Gnyawali and Park, 2009; Gnyawali and Park, 2011; Choi et al., 2010, Sanou, 2012; Czakon and Czemek, 2016). Recently, Czakon and Czemek (2016) argue this debate to add that coopetition drivers are mechanisms that explain inter-firm relationships and network value creation and appropriation (Ritala et al., 2014). This debate requires a specific attention since firms increasingly adopt coopetition as a strategy to answer to the challenges of national and international markets (Le Roy and Czakon, 2016). Literature highlights the opportunities of this strategy, but also stresses the risks of coopetition among firms in competition. However, opportunities and risks become more critical as firms operate internationally, commercializing products abroad or developing partnerships for joint productions.

In this international context, coopetition is a risky strategy, which requires a reconsideration of the drivers. Firstly, institutions or governments define norms or regulations that may favour or inhibit the commercialization or production abroad. They have to be taken into account when considering internationalization and may constitute drivers for alliances to overcome the barriers. Secondly, allying with foreign partners requires the sharing of knowledge, resources and competences, which may suppose technological transfer. This raises the question of property rights appropriation that has to be evaluated as an antecedent before engaging in coopetition. Finally, the risk of opportunism that is depicted under such expressions as "swimming with sharks" (Katila et al., 2008) and "sleeping with the enemy" (Gnyawali and Park, 2009) is difficult to evaluate between partners who do not share the same culture. For this reason, considering the partner's nationality may constitute an important criterion to decide or not to engage into coopetition.

Our objective is to add knowledge on the drivers of coopetition in the context of internationalization. We define a driver as a factor that influences a decision or which set favourable configuration for the pursuit of a strategy. This factor is not necessarily under the control of the firm. We specifically intend to evaluate the role of standards as drivers of coopetition when firms target to enter into a foreign market. The standards we consider here are technical standards: they are protocols or solutions established by institutions to guarantee information, variety reduction, compatibility and quality (Farrell and Saloner, 1988; Blind, 2013). Technical standards become regulatory when public authorities impose their requirements. Because of their importance in defining the environmental conditions, literature has emphasized their role as barriers to entry; nonetheless, it has not considered that they could constitute vectors of coopetition to overcome these barriers. For this reason, we study to what extent and under which conditions standards drive coopetition. We observe coopetitive alliances that are defined as alliances between partners that simultaneously cooperate and compete (Bengtsson and Kock, 2000; Dagnino and Padula, 2002) and we focalize on alliances that suppose a legal formalization through joint ventures (Deming, 1993, Bouncken and Fredrik, 2012).

We apply our analysis to the automotive industry. It is international from production to sales and is traditionally regulated by standards. A critical issue concerns obligatory worldwide emission standards, which regulate the new vehicles acceptable levels of CO^2 rejection. We survey 457 dyadic coopetitive alliances in 59 countries (Asia, Europe, North America and Pacific Asia). They account for 85% of the total worldwide automotive alliances from 1990 to 2017. We reconstruct the list of the worldwide emission standards in force from 1986 to 2017 in Europe, USA, Canada, Mexico, Japan, China and Pacific Asia, Australia and Brazil. We perform a logit regression to test our hypotheses on the probability that standards impact significantly on the international coopetitive alliance development.

The article provides three main contributions. First, while extent literature on coopetition driver does not mention standards at exogenous industry level, our findings assert their role as driver. Second, our research provides a deeper understanding of the standard effect on coopetitive alliances for targeting domestic or international market. We show that USA and China standards increase the probability of developing coopetitive alliances for domestic markets and we interpret this situation in considering that they constitute a protection to their local markets. Third, when conforming to standards requires cross technology transfer between partners, this increases the likelihood of developing coopetitive alliances in international markets.

This paper follows this structure. After examining the key literature on the topic, we develop our hypotheses about the extent to which standards affect coopetitive alliances for internationalization or domestic markets. Then, we test our hypotheses through a regression analysis and discuss the main results. Contributions and limitations are developed in the final sections.

1. LITERATURE REVIEW

1.1. STANDARDS AS DRIVERS OF COOPETITION

According to Farell and Saloner (1988) a standard is an established norm or requirement concerning technical system established to safeguard the collective interest. It is usually a formal document establishing uniform technical criteria, methods, processes and practices. Standards emerge through two mechanisms, markets and committees. Literature distinguish two types of standards: "De facto" and "De jure" standards. Standards issued from the firms' initiative and by a selection process operated by the market are called "de facto" standards. Instead, "De facto" standards are ones that are widely accepted and used, but lack formal approval by a recognized standards organization. They generally result from widespread consensus on a particular product or protocol that has a large market share. "De jure" standards are set through negotiation between stakeholders within institutional standard organizations. Both types of standards differ from regulation, as conforming to standards is not legally compulsory. However, there are some cases when regulation refers to standard and, consequently, conformance becomes a legal requirement. Sriram (2005) suggests calling these specific types of standards, regulatory standards. As the name implies, regulatory standards are created by regulatory agencies to ensure uniformity in processes that are not driven by market forces. Typical applications are safety standards and environmental standards such as those published by the Occupational Safety and Health Administration (OSHA) or the Environmental Protection Agency (EPA). The worldwide emission standards, which are legal quantitative requirements concerning the air pollution release into the atmosphere, belong to de jure standards; they have been defined by ISO, and become regulatory in the countries where governments and institutions have imposed them as national legal regulation.

In this contribution, we delimit our analysis to these standards, build on the idea that they can be considered as drivers of coopetitive alliances because they set commercialization rules, and regulate the market environment where firms cooperate and/or compete. Indeed, complying with standard requirements may drive firms to define new strategies and engage in strategic alliance making to answer the requirements and avoid the risk of been excluded from the market (Yami et al., 2015). Coopetition is a strategy to answer such challenges for some reasons. Coopetition permits obtaining faster entrances in new markets (Hagedoorn, 1990, 1993), enabling the discovery of new outlets (Helfer et al., 1991) and expanding activities abroad (Lu and Beamish, 2001). These reasons explain why rivals may work together to comply with standards requirements and why it is important to see deeper in which way standards act as antecedents of coopetition. Specifically, we aim to explore specific questions on which type of standards drives the probability of developing coopetitive alliances to target domestic or international market. We consider two hypotheses.

1.2. HYPOTHESES

Standards may have a specific influence on industry competition. The choice of specific regulatory requirements may constitute a barrier protecting the local industry and a way to support the development of national technology expertise. The present announcement of zero emission standards in the Chinese automotive market constitutes a direct support to the electric technology and a protection to European explosion motor industry. When authorities set regulatory standards, they cannot ignore their impact on the competitiveness of domestic firms. This is why we consider that standard setting may impact the international dimension of alliances. In oligopolistic international markets, the same few rivals compete in the global market. However, standards may delimitate zones with specific requirements. In that case, competitors may find a mutual advantage in cooperating to overcome these barriers and simultaneously pursue competition in the market they entered. Standards thus define pre-competitive conditions that regulate competition at national and international level (Weiss and Sirbu, 1990; Djelic and Andersson, 2006). These conditions tend to protect national industries or favour the intensity of international competition and, consequently, inhibit or foster coopetitive alliances among international groups of firms.

We define domestic markets to describe the situation where the product is sold in the same country where it is produced. Conversely, when products are sold in countries that are different from the country of production, the markets can be considered international. In line, we consider domestic coopetitive alliance when partners perform production and commercialization in the same country market, whatever is their nationality. Imposing regulatory standards could constitute a mean to sustain the national economy by promoting the domestic dimension of coopetitive alliances. Worldwide emission standards can constitute a barrier to entry for foreign firms. They are described as regulatory constraints, exerting a common pressure on the automotive players because they represent "contracts" that should be respected. These standards may lead foreign automotive firms to make direct investments in other countries or to coopete with local partners in order to overcome this type of institutional barrier, by producing and commercializing new vehicles in compliance with the requirements set by technical standards in the regulated markets. Thus, we expect that when markets are regulated by standards, coopetitive alliances are likely to be domestic. Therefore, the hypothesis related to technical standard as driver of coopetition is framed as follows:

> ***H_1. The adoption of technical standards increase the probability to develop coopetitive alliances in domestic markets.***

As the requirements of standards are increasing over time, firms are expected to keep up with the evolution of the rules. To satisfy them they are induced to find partners, or ally even with competitors, to share R&D costs and risks of innovation. As noted by Axelrod (1997) and Shapiro and Varian, (1999), firms operating on the same level of the value chain, or groups of firms on various levels of the same cooperate for innovation as to rapidly access to resources and competences necessary to develop new products and accelerate their commercialization (Gnyawali et al., 2006).

At industry-level the variables, which explain standards as antecedent of coopetition, concern innovation development. Gnyawali et al. (2008, 2000) specifically show the importance of the lifecycle of products technological convergence while Gnyawali et al. (2006) analyse the R&D costs and Helfer et al. (1999) observe the technological risks related to innovation. Other authors (Hagedoorn, 1990, 1993; Lu and Beamish, 2001) study the effects of coopetition on fostering the commercialization of innovative products in new markets or in expanding activities abroad.

At international level, firms may find partners to gain resources enabling to conform to the standard requirements. Conformity to standards represents a threat and a common goal. From the rivals view, cost raising, including by the means of higher standards requirements, has been identified as an aggressive predation strategy (Salop and Sheffman, 1987) to eliminate those firms that cannot afford it. On the other hand, standards compliance constitutes a strategic window to enter a market. Standards inform about the level of requirements and firms have room to define the way to perform it by themselves or in allying. In case of alliance, a technology transfer between both partners constitutes a solution to enable them to target a regulated market. Thus, standards drive international coopetition when their requirements lead both partners to share their proprietary rights (licences, patents).

In cross technology transfer, both partners get the benefits of being important sources of technology production to be transferred from a country to another (Nepelsky and De Prato, 2015). This is a way to accelerate the process of acquiring international technologies quickly. They are likely to offer a reciprocal interest regarding a common objective. To this regard, Dagnino, Le Roy and Yami (2007) demonstrated the importance of common objectives in coopetition among actors who interact on a basis of a partial congruence of interests and objectives. The advantage of combining competition and cooperation may consist in the possibility to either reach a common objective or give an answer to a common threat, especially if a single firm cannot handle the innovative challenge. Bengtsson and Kock (2000) argued that firms settle coopetitive alliances in order to target a common goal. Complying with a third market regulation can constitute a common objective for both partners. Thus, we expect that when the objective of a coopetitive alliance is to attain a third market, firms share their technology knowledge with cross technology transfer. Therefore, the second hypothesis is framed as follow.

H₂. Technology transfer increases the probability to develop coopetitive alliances in international markets.

In Figure 1, we propose a theoretical model to summarize our hypotheses.

Insert Figure 1 here

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2. METHOD

2.1. Empirical Setting and Data Collection

We conduct an empirical analysis to test our two hypotheses. We apply our study to a large sample of cooperative alliances in automotive industry, which is one of the main drivers of the global economic growth. The automotive industry is often presented as an "exemplary" sector of industrial concentration, characterized by an oligopoly of about ten international industrial groups (Hani and Cheriet, 2013). With reference to the strategic alliances, some empirical studies examine the effect of participation on the relative competitive positions of the allied firms Dussauge et al., 2004). Some researches specifically show the interest of participation in an alliance strategy because of the geographical complementarity of the allies (Garrette and Dussauge, 1995, Christoffersen, 2013). Burger et al. (1993) observed twenty-three competitive partners in the automotive industry and showed that the alliances are a tool to reduce risk and opportunistic attitude.

The increase in alliance activity in the automotive industry is a response to the increased demand and competitive uncertainty. Since the middle of the 90s, the concentration process seems to have undergone a strong acceleration. The automotive industry joined in an inevitable way the logic of the concentration resulting, today, one of the most important world industrial oligopolies. The quantity of vehicles produced each year in the world is mainly by an oligopoly of about ten international industrial groups (Hani and Cheriet, 2013). In designing new vehicles, manufacturers are deeply committed to achieving zero-emission. Among them, Renault-Nissan Alliance is a zero emission leader with about 300,000 all-electric vehicles, some of them incorporating autonomous driver technology (Wang et al., 2016).

We build a dataset issued from Thomson Reuters database 2016, and then added missing information by using archival sources including websites, business publications and other materials produced by institutional sources (World Bank and EU reports). Specifically, we analyse about 457 coopetitive alliances developed in 59 countries (38.4% Asia, 18.9% Europe, 12.3% North America, 8.1% Asia Pacific, 22.3% others). We observe the international strategic alliances (ISAs) with the deal of the CO_2 reduction or zero emission goal and of dyadic type, composed by two partners producing automobile and other motor vehicles, transportation equipment and parts. They account for 85.10%, equal to 457 out of a total of 537, while the number of alliances with more than two partners is marginal (equal to 10.42% with 3 partners, 3.16% with 4 partners, equal to 1.30% with 5 partners, 0.18% with 7 partners). These alliances may be horizontal or vertical partnerships directed to develop R&D projects, new vehicles or part of them, joint design and manufacture common distribution agreements or cross-selling arrangements.

Besides, in order to sell cars or other motor vehicles in nations (Country of Sale) that are different from the countries of production (Nation Alliance), these coopetitive alliances are compelled to comply with anti-trust laws and emission standards existing in European Union, US (USA, California and Australia), Japan, Brazil, PR of China, Pacific Asia and South Korea. For this reason, we reconstruct firstly the list of the worldwide emissions standards. For example, Europe adopts the Euro norms (European emission standards), which regards the acceptable levels for emissions of new vehicles sold in EU and EEA member states; the US Federal employs the Tier II standards while California uses the LEV II and LEV III. Other specific emission standards are adopted by Japan, South Korea, Brazil, PR of China, Taiwan. (Table 1 shows the list of Worldwide emission standards for year and country)

Insert Table 1 here

Secondly, we examine all the coopetitive alliances between domestic and/or foreign firms set in the world. In addition to the date of each coopetitive alliance we identify: the "Alliance Nation", that is the nation of production; the "Alliance Country of Sale", that is the nation where cars or other vehicles will be sold and whose emission standards the alliance partners must take into account; the "Nation of the Alliance Participant", that is the home country of each partner. Thirdly, for each typology of alliance we check for the partners' nationality compared to the alliance nationality ("Participants' Country of Sale) to see whether cooperative alliances are domestic or different from the home country of each partner. Finally, we consider the coopetitive alliances in which one or both participants transfer technology to another partner or to the alliance (Cross Technology Transfer) in order to examine its impact on the nature of the alliance. We also look at the dates of the worldwide emission standards introduction and, then, match them with the dates of the alliances to observe whether the launch of a standard may impact on the coopetitive alliance formation. Since the central hypothesis is to verify that technical standards are coopetition vectors, in this way, we observe the effects of standards on the probability that a coopetitive alliance emerges and whether it is domestic or international. Finally, we conduct a logit regression to test our hypotheses.

Dependent Variables

Our dependent variable is **the probability to develop an international coopetitive alliance in the automotive industry**, that is the probability that a firm choices a domestic or a foreign partner to develop new products according to the world emission standards in force in the correspondent countries of sale. To measure this probability, we use a *dummy* variable based on the number of coopetitive alliance developed between two automotive partners from 1990 to 2016; we assess that international coopetitive alliance = 1 if partners come from different countries; and domestic coopetitive alliance = 0 if partners have the same nationality.

Independent Variable

As independent variables we use the following ones.

Nationality of Technical Standards. It is a nominal variable, which describes the presence of standards in force in a country of sale at the date of the alliance creation. Given the specificity of standards by category, by country and by year of introduction, we used multiple information sources (Asif et al., 1996) to match the date of alliance and alliance country of sale with the List of World Emissions Norms, the list of Countries and the year in which the WESs come into force in that country. For countries that do not have a standard, the variables are defined as zero.

Year of Alliance Creation compared to the Year of Standard Introduction. It is a binary variable, which identifies if the year of alliance creation is the same or not of the year of the standard introduction. We asses that the year of alliance creation is = 1 if it coincides with the year of the standard introduction; it is = 0 otherwise.

Cross technology transfer. It is a binary variable, which indicates if more than one participants transfer technology to another partner or to the alliance (Cross Technology Transfer). We assess that it is = 1 if both partners transfer technology; it is = 0 otherwise.

Control variables

Participant Industry Code. It is the partner primary US SIC Code to observe the number of horizontal partnerships compared to the other forms of coopetition (supplier-buyer alliances, or other agreements with complementary or substitute firms in the automotive industry). We assess that the value is = 1 if participants have the same industry code; it is = 0 if participants have different industry codes.

Finally, we consider other variables, such as innovation deal, alliance duration, alliance industry code, to control their effects on the probability that an international coopetition alliance emerges.

3. RESULTS

3.1. The regression analysis

We performed a logit regression to test our hypotheses and 8 associated variables. Table 3 summarizes the results for each hypotheses and corresponding variables. The regression model shows the robustness of the overall results (R^2 of Nagelkerke = .341), confirming the explanatory value of the model for measuring the probability to develop a coopetitive alliance. Three independent variables are no statistically results; 2 are validated at the 1% level; 2 at the 5% level, and 1 is significant at the 10% level.

Insert Table 2 here

Technical Standard Nationality impacts on the probability of coopetitive alliance formation. In particular, US norm and China are strongly significant ($p < 0.01$) and negative. They decrease the probability to develop international coopetitive alliance and, thus, increase the probability to develop domestic coopetitive alliance. Japan, Brazil and Euro norm standards are not significant ($p < 0.05$). Therefore, H_1 (*technical standard as driver*) is accepted for US and China standards.

Cross technology transfer between partners or to the alliance is significant ($p < 0.05$) and with positive effects. It increases the probability to develop international coopetitive alliance, and therefore, reduces the probability of domestic coopetitive alliance. Thus, H_2 (cross technology transfer) is supported.

DISCUSSION

Our results show that firms coopete with partners in order to reach the standard requirements imposed in the targeted foreign market. These results contribute to literature on standards driving coopetition, innovation, and internationalization of markets.

The first hypothesis shows that *standards increase the probability to develop coopetitive alliances in domestic market.* Our first result states that standards constitute a driver for coopetition. It identifies a new factor to the existing description of external drivers. Recognizing the antecedents has constituted an important issue for research on coopetition. Scholars have globally adopted the general frame Drivers-Process-Outcomes (DPO, Bengtsson and Raza-Ullah, 2016) and considered different levels of drivers (industry, organizational and dyadic relation). Gnyawali and Park (2009) work constitutes the first structuring model, which examines the antecedents of coopetition through a dynamic conceptualization. In 2011, these authors integrate their model, specifying the factors underlying the coopetition between giants: challenges and opportunities in the industry and technological conditions, superior and relevant partners' resources and capabilities, strategies and aspirations of the firms. The perspective of coopetition being forced or constrained by environment is successively developed by Czakon and Czemek (2016), who deal with institutional, competitive and customer pressure as exogenous drivers of coopetition (Gimeno, 2004; Mariani, 2007, Peng et al., 2011; Pellegrin Boucher et al., 2013; Fernandez et al., 2014). When considering Bengtsson and Raza-Ullah (2016) review on the drivers of coopetition, we observe that a majority of drivers are exogenous. Indeed, over the 142 articles exposing drivers of coopetition, 42 concerned external context, 26 relationship and 12 for internal context. Particularly, these authors added the external drivers to relational and internal ones; they include industrial characteristics, technological demands and influential stakeholders.

In all of these models, standards do not appear namely. We thus observe the importance of external context as a trigger for coopetition. In our view, standards specifically constitute a key element on defining the external constraints a firm has to adapt to in order to commercialize its product. So, our findings suggest adding standards as driver at industry level. Specifically, we believe that standards impact on two of the three industry-level factors described by Gnyawali and Park (2009)'s model: technological convergence and high R&D costs. Indeed, the entry into force of a standard leads companies to develop similar or compatible technologies, which practically enable technological convergence. Also, standards press firms to invest in R&D activity to innovate in compliance with the requirements. Our findings add force to the environmental pressure for favouring coopetition.

The second hypothesis shows that *engaging in a cross technology transfer increases the probability to develop coopetitive alliances in international markets.* Our second result states that standards lead firms to make a cross innovation for entering into foreign markets. It supports the idea of standards as drivers of innovation. This confirms a new trend in standardization literature challenging the traditional perception of standards restricting innovation due to "freezing technology" and instead developing the idea that standards may in fact open new perspectives and can encourage innovation (Zoo et al., 2017). Following this line, several studies have suggested a positive correlation between standardisation and innovation, whereas others have reported a mixture of positive and negative effects (Blind, 2003; 2004; 2006; Bodewes, 2000, David and Steinmueller, 1994; Egyedi and Sherif, 2010; Katz and Safranski, 2003; Krechmer, 2004; Mansell, 1995; Shapiro and Varian, 1999; Swann, 2000; 2005; Tassey, 2000). The overall picture is confusing (Blind, 2013; Zoo et al., 2017) because different categories of standards and different forms of innovation are concerned.

Concerning regulatory environmental standards, Porter and Vander Linde (1995) argued these standards stimulate innovation. This has been confirmed at a macro-economic level (Blind, 2012), and at sector level (Lee et al., 2011; Popp et al., 2011; Testa et al.,2011). Jaffe and Palmer (1997), however, did not find any statistically significant effects – R&D expenditures slightly increased while the number of patents slightly decreased. Apparently, stricter requirements may trigger innovation to meet the requirements but this advantage has to be balanced with the cost of convergence and compliance. Specifically, De Vries and Vernhagen (2016) explored the case of energy performance standards leading to reduce the CO_2 emission for newly built houses. They showed how changes to these standards have affected the innovation of houses in the Netherlands. Their key findings are that standardization increases the amount of innovation conducted in the industry while achieving energy efficiency. Our findings clarify that regulatory standards lead coopetitive alliances' partners to innovation when they are engaged into a mutual technology transfer.

CONCLUSION

This paper focuses on standards as drivers of international coopetition. We analyse to what extent and under which conditions emission standards are drivers of coopetition strategy for commercializing into a foreign market. We chose this topic – the relation between emission standards and coopetitive alliances – for its actuality (Volkswagen's 2015 emission scandal) and importance. Indeed, these standards can be considered one of the key drivers of the emerging automotive industry. To answer to the innovation challenges firms experiment coopetition with their direct competitors and cross transfer their technologies. Coopetitive alliances are thus used to develop new products and satisfy new market standards requirements. We consider emission standards in force 1986-2017 in Europe, USA, Canada, Mexico, Japan, China and Pacific Asia, Australia and Brazil and, then, we survey 457 coopetitive alliances in 59 countries. We perform a logit regression analysis to test the probability that standards impact significantly on the international coopetitive alliance development. The article's research contributions are manifold. First, it demonstrates standards as drivers of coopetition. Second, our research provides a deeper understanding of the standard effects on the probability of developing coopetitive alliances for domestic and international markets. We show that USA and China standards increase the probability of developing coopetitive alliances for domestic markets. Third, when conforming to standards requires cross technology transfer between partners, this increases the likelihood of developing coopetitive alliances in international markets. Fourth, when the objective of coopetition is to commercialize in a third country, then the probability that partners have different nationality is higher. This sheds light on international coopetition, as a way for the firms to avoid competition on their own markets.

However, this study presents some limitations. At macro-level, we did not consider the economic, social and political indexes of the different countries that may influence the choice of country where to produce and commercialize. At micro-level, we did not consider the differences between partners' cultural frame of mind, which can limit the alliance forming and performing. In addition, we did not control the weight of each partner position within the alliance, which may influence the decision to conform to the standard. Finally, we limit our empirical analysis on dyadic coopetitive alliances. A new perspective would be considering the effects of international standards on multipartite alliances covering different parts of the world.

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Figure 1: Theoretical Model

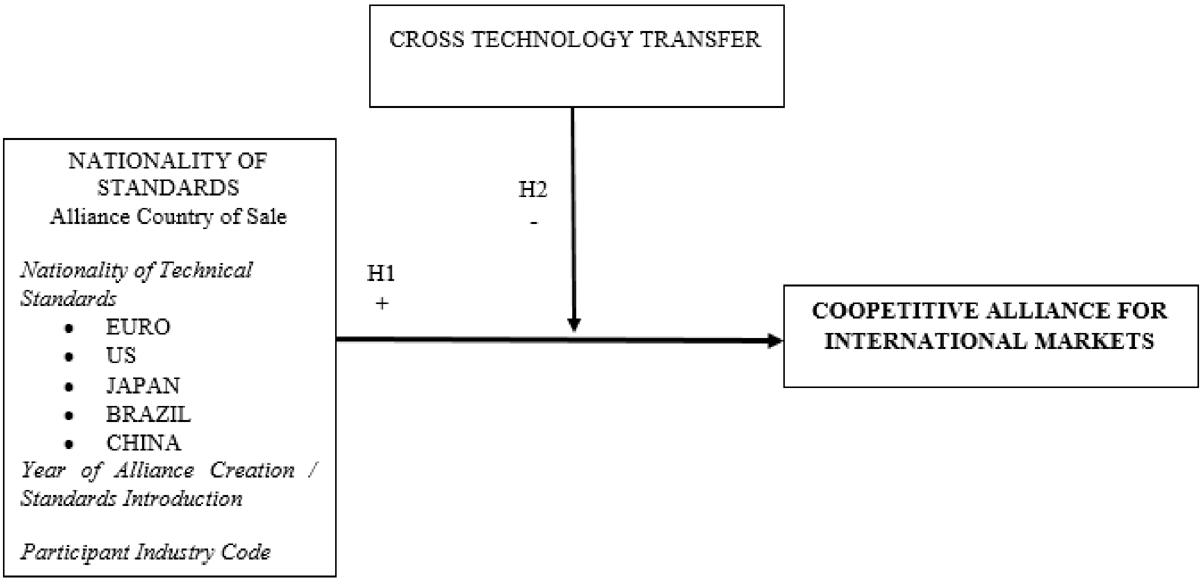

Table 1: World Emission Standards

Country	Year	Standards
EUROPEAN UNION AND ARGENTINA (from 2009); BANGLADESH (from 1996); BUTHAN (from 2001); HONG-KONG (From 1996); INDIA (from 2000); INDONESIA (from 2005); IRAN (from 2014); MALAYSIA (from 1996); NEPAL (from 2000); NEW ZEALAND (from 2009); PAKISTAN (from 2012); PHILIPPINES (from 2003); RUSSIA (from 2008); SINGAPORE (from 1996); SRI-LANKA (from 2003); SOUTH-KOREA (from 2005); THAILAND (from 2009); TURKEY (from 2001); VIETNAM (from 2007)	1995	Euro 1
	1998	Euro 2
	2001	Euro 3
	2005	Euro 4
	2009	Euro 5a
	2011	Euro 5b
	2014	Euro 6b
	2017	Euro 6d-TEMP
	2021	Euro 6d
UNITED STATES AND CANADA (from Tier 3, 2017); CHILE (from 2005); MEXICO (from Tier 2, 2004)	1987	Tier 0 US 87
	1994	Tier 1 US 94
	2000	2000/2001 SFTP/NLEV
	2004	2004-2009 Tier 2
	2015	2004-2009 Tier 2 Level III
	2017	2017-2025 Tier 3
JAPAN	1995	Standards on 10/15+11 Mode Cycles
	2000	2000 New Short Term Standards 10/15+11 Mode Cycles
	2005	2005 New Short Term Standards 10/15+11 Mode Cycles
	2009	2009 New Short Term Standards 10/15+11 Mode Cycles
	2015	2009 New Short Term Standards 10/15+11 Mode Cycles
CHINA AND PACIFIC ASIA	2001	China 1
	2005	China 2
	2008	China 3
	2011	China 4a
	2014	China 5b
	2017	China 5ab
AUSTRALIA	1986	US 75 FPT (United States Standard)
	1997	US 75 FPT (United States Standards)
	2003	UN R83/04 (Euro 2, EU Standards)
	2005	UN R83/05 (Euro 2, EU Standards)
	2008	UN R83/05 (Euro 2, EU Standards)
	2013	UN R83/06 (Euro 2, EU Standards)
	2016	UN R83/06 (Euro 2, EU Standards)
BRAZIL	2009	PROCONVE L5
	2014	PROCONVE L6
	2020	PROCONVE L7 (Expected)

Table 2. Logit regression

Dependent variable: International/ Domestic Coopetitive Alliance

	A	E.S.	Wald	ddl	Sig.	Exp(B)
Nationality of technical standards			19,672	5	,001	
1. Euro norm	-,936	,506	3,419	1	,064*	,392
2. US norm	-3,581	1,107	10,460	1	,001***	,028
3. Japan	20,705	16009,773	,000	1	,999	,000
4. Brazil	-1,534	1,149	1,780	1	,182	,216
5. China	-3,908	1,122	12,130	1	,000***	,020
Cross technology transfer	2,377	1,087	4,782	1	,029**	10,772
Year of Alliance Creation/ Standards introduction	-18,371	6750,998	,000	1	,998	,000
Participant Industry Code	,651	,409	2,533	1	,112	1,917
Constant	-,791	,528	2,245	1	,134	,453

****sign. 1%; **sign. 5%, *sign. 10%*