

LUISS 

Department  
of Business and Management

Course of International Operations and Supply Chain

# The relationship between Green Practices and Offshoring Strategies: an empirical study

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Academic Year 2019/2020

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## 1. Introduction

One of the most widespread problems in today's industries is how to cut costs that appear to be heavy for the firms. In a world characterized by companies looking at expanding intercontinentally and creating a complex network of participants in their supply chain, one of the most frequently used strategies to reduce costs is to offshore some business activities. At the same time, there is an increasing trend in paying attention to what exists around us. Many different firms are dedicating much of their time at understanding how to be sustainable, in order to preserve the surrounding environment, but also to advantage their customers. These two arguments seem to be diametrically opposite, since one is a strategy to have a better economic outcome and the other represents more a mindset, a vision, something that lies at the basis of every activity of a business. It is right at the crossing point between these two arguments that our curiosity has been awakened. How is the relationship between these two distant elements shaped depends on several factors. Our idea is to understand which are the main determinants for a firm to decide to offshore or not. To do this, we have made use of an environmental questionnaire of 2015, to which the supervisor Pietro De Giovanni has contributed. This is perfect for us, because takes into consideration more than 150 big firms from Europe, linking offshoring and environmental concerns. Starting from the dataset retrieved from the survey, we will be able (by using a statistical software) to relate offshoring decisions to four main elements (which are sections of the questionnaire): Legislation Pressure, Supplier Pressure, Firms' Environmental Practices and CSR. These four topics, alongside with offshoring in general, will be the boundaries of our literature review. We are going to understand what scholars have analyzed about the main reason why a firm may decide to delocalize, reshore or outsource in order to have a broader view of the rationales pushing to follow these strategies. Obviously, there are several factors a firm considers in making the choice, as, for instance, Chang (2012) lists in his paper "The economics of offshoring". Besides this, our focus will be on some pressures made on companies by governments to become green and how these may impact on the economic outcome. An important example of this is supplied by Lopez-Gamero et al. (2010) in "The potential of environmental regulation to change managerial perception, environmental management, competitiveness and financial performance". Deeply analyzing literature, we came to the conclusion that there is a missing point that scholars did not underline so much precisely, i.e. it is true that pressures and practices to go green do exist, but what is the weight of these factors with respect to an offshoring decision, taking into consideration issues related to location production plants? Which of the four factors cited above is the most relevant for firms evaluating an offshoring strategy? As already said, our conclusions will be captured through

a deep study of an empirical research made with a well-suited algorithm. With the results got, we are going to try to interpret what we found out in realistic terms.

The paper is divided into four main chapters. Chapter 2 is about literature review, in which ten papers about offshoring strategies will be presented; then, we will take into consideration works made by scholars about the four cited determinants (Legislation Pressure, Supplier Pressure, Firms' Environmental Practices and Corporate Social Responsibility), everything related to green strategies. In the third chapter there will be a very precise and deep explanation of the research and calculation methods utilized for getting the results. Chapter number 4 will be the most robust, in which results will be presented, with the aid of tables and data, to understand what we can obtain from our study. The last important part will be about the interpretation of these results, in order to give the reader the main findings of the research. Everything is going to be framed by this Introduction and a Conclusion chapter.

## 2. Literature review

### 2.1. Offshoring strategies: original motivations and future trends

The term “offshoring” is today widely used in economics, because there exists a long-lasting trend to move towards this idea. In general, we refer to a firm moving production abroad to a subsidiary plant, owned by the firm itself – so, without including other enterprises or manufacturers in the process. The literature defines offshoring in different ways. Sako (2005) defines it as situations in which firms or governments import intermediate goods/services, already obtained domestically, from another country. This paper refers to imports, foreign direct investments and disintegration of domestic production. One of the most used definition is given by Garner (2004), who describes offshoring as a relocation of production systems to foreign countries. Over the paper, we will refer to this definition to describe and refer to an offshoring strategy. Offshoring should not be confused with outsourcing. As explained by Grossman and Rossi-Hansberg (2006), outsourcing refers to some tasks previously carried out by the firm that are now purchased from another industrial party; in contrast, offshoring refers to practices and processes performed in-house that are now moved abroad. Given its exchanging nature, offshoring is able to make resource allocation more efficient throughout the whole global economy and may improve living standards.

The literature presents several controversies regarding the pros and the cons of offshoring, whose decision is influenced by many factors.

Chang (2012) investigates what are the main determinants that bring firms to offshore and outsource. With different models, the study illustrates how it is possible to save costs through offshoring strategies adopted by firms. Then, the aim of the research is to explain which factors and incentives have more weight in making the decision to offshore. The finding is that firms mostly offshore or not basing their choice on production-related reasons.

Ancarani et al. (2015) base their analysis on a dataset of 249 firms which have ended their experience with offshoring. Their research’s scope is to have a better understanding of the rationales leading firms to come back to domestic countries. Characteristics of an industry, firms’ size, domestic/foreign countries have a heavy specific weight on the decision-making process. A smaller period of offshoring may be caused by a small size of a company, remoteness from domestic country, an industry based on technology and diminishing cost differentials.

Ancarani et al. (2019) made an analysis of fundamental priorities related to competition, likely to push firms following backshoring strategies to embrace newer technologies. The research is based on a 495 companies' sample, through secondary data. The answer is that firms looking for higher quality and cost reduction (linked to non-conformance) as primary objectives are more prone to backshoring related to Industry 4.0. Again, the probability of this adoption is increased by the presence of strong innovation.

Bivens (2005) points out how benefits of offshoring are overvalued and how drawbacks are undervalued – or ignored – by studying three researches, conducted by McKinsey Global Institute, Global Insight and Catherine Mann. Bivens finds out the exaggeration of the results provided by the studies, underlining that, yes, offshoring can boost GDP, but at the expense of its redistribution. Firms are favored and workers not, so they have the whole right to be against offshoring. Policymakers should not ask workers to care about national income and not their own.

Tate et al. (2014) aim at understanding trends affecting US firms' decisions to backshore or reshore, taking care of the most important location factors about manufacturing. This survey covered 319 offshoring firms. An interesting result came out from this study, that is how firms involved in reshoring activities are so much concerned about consumers' characteristics and the possibility to expand their customer base. Besides this, the 40% of surveyed firms are facing a reshoring trend in their industries.

Tate et al. (2017) try to contextualize the needed re-evaluation of offshoring decisions, not being negligent about additional cost measures and risk. The study concerns also rationales behind the "rightshoring". An important finding is that geographical and governance issues worth a lot in deciding whether to "rightshore" or not. This means that one of the biggest problems concerning offshoring – and the other correlated elements – is how context is regulated and location's characteristics.

Ancarani et al. (2018) explore the relationship that may exist between manufacturing reshoring and technologies developed by Industry 4.0. The main finding is that the adoption of them is limited to just a part of reshoring firms. Despite the possibility to use innovative techniques, manufacturing production center is still going to remain in Asia, especially for components. Industry 4.0 technologies are used much more when there is a product innovation, for a firm following a reshoring strategy.

Moretto et al (2019) examined the relationship existing between the type of reshoring strategy a firm decides to follow and its main drivers, with an outlook at the role of purchasing. This role has not been studied so deeply, so it is not easy to assess its contribution. Findings reveal that operational and brand reputational reasons are important drivers for reshoring. So, as reshoring increases, offshoring's rationales have to be revised as drivers have changed.

Dachs et al. (2013) based their research on a database of more than 3000 European manufacturing firms to get a score linked to innovation and R&D activities for both offshoring and non-offshoring players. The crucial finding is that delocalizing production tasks has a strong positive effect on the cited activities. As a consequence, this research shows us a positive correlation with process innovation, which, in turn, is influenced by offshoring strategies.

Ellram et al. (2013), starting from a survey's data, made a multiple regression analysis to understand the drivers of manufacturing location decisions and the movement to/from a particular region. The main findings are three: factors affecting a region's attractiveness are dynamic and tend to change over time; factors related to supply chain are getting more and more importance; firms are beginning to consider more factors, other than cost savings, like customers' value, in making location decisions.

According to the literature review on offshoring, we identified a research gap that we aim at fulfilling. The literature has most likely focused on economic motivations pushing firms to offshore. An example can be that of W. W. Chang (2012), who states that less barriers between countries may influence firms to delocalize production. Better taxation may be another important factor. What literature does not study so deeply as we want is the direction of the link (if existing) between strategies based on offshoring and green sustainability. So, we aim at understanding the type of relationships existing between environment and offshoring, with a particular focus on four driving forces, which are: legislation environmental pressure, suppliers' environmental pressure, firms' green strategies and Corporate Social Responsibility (CSR) targets.

## 2.2. Offshoring strategies and legislation environmental pressure

Offshoring strategies may be influenced by different factors, as we said. To become green, a firm has to face and balance pressures from different sources. These forces might be positive or negative, incentives or deterrents: in other words, they are the drivers of “greening” a firm.

On the most relevant drivers influencing the firms’ strategies and decisions is represented by the governmental legislation and regulation. The environmental legislation can be particularly wide and stringent depending on the country and the sectors.

Chiappetta Jabbour et al. (2015) characterize the construct “technological aspects” to measure the firms’ capacity to invest and modernize the production systems to comply with environmental performance. Among the indicators, the authors use a specific variable linked to the technical knowledge about environmental requirements and legislation in the sectors and markets where a company acts. This measure allows them to capture the firms’ knowledge about the legislation pressures and requirements, suggesting for ad hoc actions. By analyzing a sample of 67 Brazilian firms, Chiappetta Jabbour et al. (2015) discover that legislation requirements and pressure plays an important role in defining technological aspects, which has a strong influence on green, operational, and market performance.

Qi et al. (2010) investigate the concept of pressure of government regulation. The latter is measured by analyzing how stringent government regulation is, the predictability, the impact on the contractors’ businesses, the impact on greening the construction processes, and the appropriateness regarding the market. By analyzing a sample of 123 firms, they found that legislation pressure has a significant impact on firms’ green construction practices. Therefore, firms should set their green strategies by properly analyzing the legislation pressures linked to the environment.

Sarkar (2008) tries to investigate literature about environmental behavior of firms, with respect to environmental legislations. The aim is to better understand the transition from environmental management to strategy, to develop corporate tools for protecting surrounding environment. Even very similar firms may respond differently to public policy, also depending on the nature of dialogue between them and regulators. Considering all the external pressure, Sarkar (2007) explains, at last, how today environmental focus has become of a fundamental strategic importance for firms.



Lopez-Gamero et al. (2010) made a research about the link between several types of managers and different environmental regulation styles, not deeply studied in literature. The aim is to understand how much financial performance weighs on environmental management, and the direction of their relationship. Findings show that when regulation stems from voluntary rules, it has a positive effect (not for command-and-control). Moreover, to invest in proactive environmental management helps in increasing firms' competitiveness in the market.

Delmas et al. (2013), based on a 5220 firms survey, made a research to better understand the relationship between environmental standards and labor productivity, focusing on employees' training and interpersonal relationships within the firm. Findings show how adoption of green standards improves work practices within a firm and creates positive interactions among co-workers. This situation fosters knowledge transfer, so, as a result, productivity increases and the firm performs better.

While it is clear that legislation can have an important pressure on firms' strategies, we seek to investigate whether public authorities defining green regulations may influence the firms' decision to go abroad and offshore their production.

### 2.3. Offshoring strategies and suppliers' environmental pressure

Suppliers represent an important factor regarding the decision to adopt a Green Supply Chain Management. Linked to our scope, besides legislation, also suppliers may put pressure on manufacturers to go green.

Gupta et al. (2017) try to create a basis for supplier selection for SMEs. Three main phases; literature review and direct interviews, ranking criteria through a best worst method and ranking suppliers through weights achieved using TOPSIS. Finally, a sensitivity analysis is made, by changing the weights of suppliers of the third phase to understand their effect on the selection method. This technique is suited for firms looking for a new product or that are green-oriented.

Amindoust et al. (2012) investigate the ways in which green suppliers are chosen. Recognizing the importance of a rigorous scientific base, they try to build a selection model. This model is based on the fuzzy inference system (FIS) and is divided into three steps: first stage for each group (economic,

social, environmental), second stage for the three groups as a whole and a third stage for fuzzy ranking. At the end, each supplier is assigned a score, on the basis of which it is preferred to others or not.

Chiou et al. (2011) based their research on a sample of 124 firms from different industries in Taiwan. Analysis uses a structural equation model and that, with the results, is used to assess the significance of relationships. The findings of this study show that greening suppliers helps to make product, process and managerial innovation green, too. And these improvements are positively related to an increase in competitive advantage of the firm.

Hashemi et al. (2015) investigate methods for green supplier selection, proposing a model comprehending both economic and environmental aspects. Analytic network process and Grey relational analysis are used to give selection criteria a weight and then rank suppliers. This kind of model is a new one and permits higher flexibility. This can be done thanks to GRA approach, that allows to add or eliminate experts' opinions at any time, to have a more integrated and adjustable pattern.

Lee (2008) started the analysis from study in South Korea, for 142 suppliers (SMEs). The scope of this research is to understand which factors makes it easier for these types of suppliers to become players in a green supply chain. Joining it or not depends a lot on green practices of purchasers and on how much suppliers are ready to "green" themselves. The more the quantity of slack resources they have the more the willingness to join a green supply chain (De Giovanni, 2019). Finally, government can be an important incentive in increasing motivations for suppliers.

#### 2.4. Offshoring strategies and firms' environmental strategies

As expressed in section 2.2, legislation pressure may be an incentive or a deterrent for implementing green strategies. A favorable framework obviously may be helpful for making a positive decision about moving to a sustainable outlook (Liu and De Giovanni, 2019). Besides this, the major concern of decision-makers is about the impact of innovative green practices on performance and profitability. Trying to predict and analyze what it means to adopt them is the major challenge.

Tang et al. (2018) suggest that existing literature about a positive relationship between green practices and performance of firms is not deep enough. They based their study on 188 Chinese manufacturing

companies. The most important finding is that both green process and green product innovation are positively correlated to firm's performance. Another result is that, maybe due to decreasing returns for high-end firms, the major impact of green product innovation lies in the low-level, besides being easier and cheaper to implement.

Cuerva et al. (2014) aim at analyzing the difference in factors influencing both green and non-green innovation. The research refers to low-tech small and medium enterprises from the Food&Beverage industry in Spain. The main results suggest that the adoption of Quality Management System is very important factor in environmental strategy: firms with high quality concern that implement QMS are more prone to green innovation. A recommendation is that of decreasing financial limitations to foster eco-innovation.

Li (2014) aims at analyzing the relationship among institutional pressure, environmental innovation and firms' performance. Data are retrieved from 148 manufacturers from China. Findings show how pressures from institutions, overseas customers and competitors are positively correlated to green innovation practices. On the other hand, economic incentive from government is not so significant. Finally, the more the resource commitment, the better environmental practices are .

Lee et al. (2015) based the research on a group of several Japanese firms from manufacturing industries – between years 2001 and 2010 – focusing on the relationship between R&D investments regarding green innovation and carbon emission. Outcomes demonstrate that these two factors are not positively linked to each other, while green practices improve the financial performance. The main finding explains how, to maximize their eco-friendly performance, firms should accumulate unique resources and capabilities.

Li et al. (2018), starting from command-and-control, market-based and informal regulations, the linear relationship between environmental regulations and environmental performance. Findings suggest that the link between them is non-linear and positive for the first two, but not significant for the informal one.

## 2.5. Offshoring strategies and CSR targets

Corporate Social Responsibility is today a big concern for the vast majority of firms and offshoring is highly tied to it (De Giovanni, 2020a). Delocalizing production facilities usually represents a

solution to the regulatory framework that puts pressure on waste management. Most of the times, rules and standards to be followed are very restrictive on this subject. On the other hand, moving production activities abroad may impair and disadvantage labor force of a country, in the interest of the firm, which saves money: this represents a non-neglectable problem.

Li et al. (2017) started their research by analyzing data about trade, pollution and production from 8000 firms and 18000 plants in the U.S., over a period of about 20 years. The aim was to understand how much a corporate-level strategy has an impact in reducing pollution. When head companies increase imports from low-wage countries, U.S. plants tend to reduce wastes and save money on pollution abatement. The negative impact of these imports is higher where institutional pressure is stronger and lower where there are more capable firms.

Mefford (2010) states how offshoring due to a search for costs reduction has led to controversial effects and results. In his opinion, when firms offshore, they have to put a lot of attention to the role that this delocalized production plays in the global supply chain. Especially, he is talking about lean supply chain, that has a strong relationship with CSR. In fact, the principles at the basis of lean production and that of CSR go in the same direction: put together, they jointly lead to environmental and competitive sustainability.

Abdelzaher et al. (2013) based their study on 204 U.S. firms, with the aim of better understanding the link that may exist between offshoring and economic performance (financially speaking), taking into consideration two factors in which we are highly interested, employee layoffs and the role of CSR. The finding we are interested in is that firms which tend to pursue an offshoring strategy achieve better financial results. At the same time, they may have more problems with Corporate Social Responsibility.

Schröder (2013), basing his research on offshoring case studies, tries to understand how the moral argument influence (or may do this) economic decisions of a firm. First, moral argument may distort the definition of economically rational. Number two, defining the decision of a manager “immoral” may deprive them of social capital, creating economic pressure on them. Lastly, the same definition of “immoral” can harm the public legitimacy of a firm and impair their reputation, creating not few problems and pressures.

Tesfom et al. (2008) based their study on a 51 U.S. offshoring firms survey, in order to understand how offshore outsourcing companies are committed to training and educating the unemployed or downsized and the difference in the degree of commitment among them. Findings show how firms of eight areas are not so involved in educating and training the cited categories, but, on the other hand, how they are involved in charity activities and put effort on private and public education.

## 2.6. Research hypotheses and conceptual model

Analyzing literature, we have discovered how much pressure firms have from different points of view. Besides this, it is clear that strategies to be followed or corporate policies have to be changed and modeled on the basis of the context they are living and moving in (De Giovanni, 2020b).

In legislation pressure literature review, we have seen how firms are sometimes forced to make new investments in order to keep up with regulation. Innovation, as a matter of fact, is an integral part of going green and cannot be overcome (Jalali et al., 2020). The more this mindset comes from the inside, the better a firm may fit in a new regulatory framework like that. All these factors should be surrounded by a deep technical knowledge of the legislation itself.

As cited above, another source of pressure is that from suppliers' side. Literature has shown how scholars are so much interested in analyzing the scientific methods firms utilize to assess suppliers' fitness with their strategy. It is clear how certain features are heavier than others in supplier selection. This is a crucial part of supply chain construction, given that a green supplier might be an incentive to go toward self- and product/process innovation.

Even if it is not truly an external pressure, the focus of firms deciding whether to adopt green practices or not is mainly on the relationship with financial performance and profitability (De Giovanni and Cariola, 2020). The first concern is about how to find a way to make these elements co-exist together. Literature suggests that, with the right resource commitment, capabilities development and a favorable institutional context, there exist a positive correlation between the adoption of environmentally sustainable practices and economic outcome.

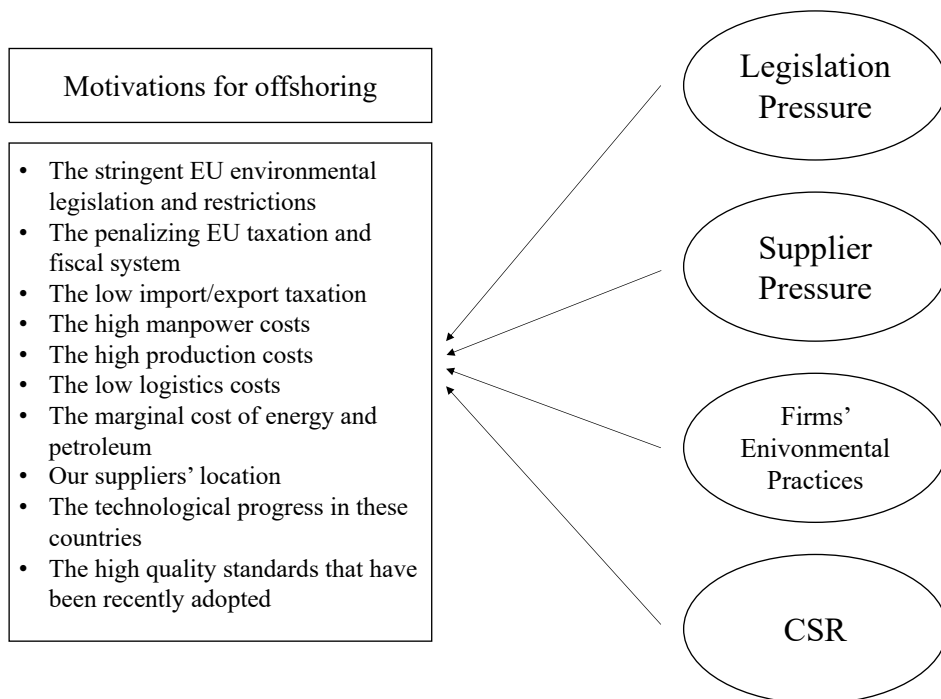
Reviewing literature about Corporate Social Responsibility, the main result we can get is that it is strongly tied to what is considered "moral" and the effects it can have on the firm. Besides this, it is clear that attention should be put on unity of vision among different participants of supply chain, in

order to get satisfactory results in terms of sustainability. The focus is on the social part of CSR, aimed at protecting workers and other stakeholders in offshoring companies.

So, what we have found is that Legislation Pressure, Supplier Pressure, Firms' Environmental Practices and CSR targets have a certain influence on the decision to delocalize production or not. Firms' motivations are shaped by all these four elements, obviously keeping in mind the context in which the company operates. All these reasons could be linked to several factors that can have a weight in choosing whether to offshore or not. The factors are the following:

- the stringent EU environmental legislation and restrictions (as cited above, legislation is a non-negligible factor to take into consideration, given that non-compliance is controlled and punished);
- the penalizing EU taxation and fiscal system (fiscal benefits represent one of the most important deterrent for keeping production in a country, especially where fiscal pressure is much heavier);
- the low import/export taxation (positive for companies following an internationalization strategy)
- high manpower costs (it is a matter of fact that labor force's cost is one of the first reasons to offshore);
- high production costs (as expressed by Chang (2012), the pattern of specialization may lead to cost-cutting in production processes, given the expertise of a country in the manufacturing of a certain good);
- the low logistics costs (different countries may have different costs of logistics, not only in terms of warehouse or suppliers, but also focusing on the target segment of the market they want to serve);
- the marginal costs of energy and petroleum (that, again, may vary from country to country, becoming more easily affordable);
- suppliers' location (important factor that can advantage the exploitation of economies of scale);
- the technological progress in these countries (this is highly tied to what we mentioned above about specialization, because a deeper knowledge and expertise in a certain type of production is useful to optimize workflows and save money);
- The high-quality standards that have been recently adopted (as expressed in section 2.4, a propensity to a good quality management is helpful to foster a performant green innovation strategy).

The conceptual model of our study starts from two main terms: offshoring and green practices. These are the two main concepts on the basis of which we aim to construct our analysis. In our research, we are going to use each of the factors listed above as dependent variables to run a logistic regression and understand their relationship with the four categories analyzed in the literature review. The ten elements are going to be part of our research question about the likelihood that a firm decides to offshore or not. It will be presented as: “Which factors among Legislation Pressure, Supplier Pressure, Firms’ Environmental Practices and Corporate Social Responsibility do influence the probability that firms offshore due to Location Production Plants?”. The last part of this research question refers to the determinants in bullet points. We are not concerned just about the economic outcome of the choice, we aim at understanding the rationale of choice. Here a scheme of our conceptual model is presented.



### 3. Methods

#### 3.1. Questionnaire description

In order to retrieve a dataset to be used for our research analysis, we chose to make use of an environmental questionnaire proposed in 2015. The scope was that of getting data for a study about Agility, Supply Chain and Environmental Management, made in collaboration with ESSEC Business School (France) and University of Calabria (Italy), with the participation of the supervisor Professor Pietro De Giovanni. This project aimed at investigating the influence of environmental issues on firms' agility and the related impact on performance. It considers all the stages, starting from designing for the environment, purchasing raw materials, producing garments, distributing them to channels, stores and also considering their reverse logistics and waste. The answers are presented in a Likert format for the first part. The sample taken into consideration is composed by 172 firms, the vast majority of which comes from Italy (31.4%) and France (22.6%); the rest of them is from western Europe. The most common provenance industries are Electrical and electronics (52 participants), Power generating (29) and Chemical (26), with the others being macroindustries, too. Regarding the size of the companies, we have the 67.4% of respondents with a number of employees between 200 and 799, so we are talking about big-sized enterprises. Finally, it is emblematic to underline the roles, at a corporate level, of people responding to this questionnaire: the major part of them is, in fact, represented by Production Managers for the 27.4%; following, we have the 23.8% of CEO-Presidents and Vice-Presidents and the 21.5% of Purchasing Managers. Clearly, it is very important that participants are directly involved in the main subjects of the questions. This survey is divided into several sections: Legislation Pressure, Supplier Pressure, Firms' Environmental Practices, Agility, Economic Performance, Environmental Performance, Operational Performance, Location, Location Production Plants, Supply Chain Structure, Connection with Asia, Market, Production Effectiveness and Efficiency and Business Information. As expressed in the first part of the paper, we are going to utilize evidences taken from some of these sections to be used as independent variables. It is important to highlight how data about CSR are gathered by mixing Environmental/Economic Performance pieces and a newly created input about the social side. The latter is composed by selected items throughout the whole questionnaire, due to the fact that, actually, it did not exist in the original form (Duhaylongsod and De Giovanni, 2019). Another fundamental part is the one referring to location production plants, which has been used as the independent variable of the logistic regression. We decided to use this type of questionnaire because it was the best fitting example among the ones



considered, because it mixes the “green” element we are focusing on and the offshoring argument which we want to study and understand.

### 3.2. The statistical approach

Starting from this environmental questionnaire, we decided to use the IBM SPSS platform for our advanced statistics analysis. This is due to the fact that it presented an algorithm perfectly suited for running our regression analysis. This algorithm has been prepared by using the data retrieved by the above explained questionnaire, with each of the items put in the group (for example, “EnvRequirements” stands for the first item of the section about legislation pressure and so on). We started our analysis by making a factorial reduction, taking into consideration just the categories we were interested in. Our aim was to check if, for instance, Legislation Pressure items could be gathered in a single dimension, to reduce them to a single element. The Extraction method utilized was that of “maximum likelihood”, then deciding about the eigenvalues. Eigenvalues are the number of dimensions we want to obtain by gathering all the items. In the worst scenario, they are orthogonal, so each one pertaining to a different dimension. So, when we fix the eigenvalue greater than 1, we get one dimension, that is our objective. Setting the Options, we want to get factors sorted by size and to suppress small coefficients ( $<0.4$ , meaning that we do not mind about smaller factors). So, running the Factor Analysis, the scope is to get just one eigenvalue greater than 1 (in the section about Total Variance Explained) (De Giovanni and Vinzi, 2014a). Through this table, we are able to understand how much variance the dimension captures. With the results, we obtain a Factor Matrix that we have to check to see whether some items can be deleted or not (because it may be that one of the eigenvectors do not converge with the direction of the others). Once eliminated the targeted elements, we run a Factor Analysis again in order to check if the variance covered is at an acceptable level and if they go in similar directions. At the end, we are able to run the analysis for the third time, in order to get the scores and save variables as Bartlett. Besides this, we can go through another type of analysis, that is of reliability. This is done by selecting Reliability Analysis (with a check on “if item deleted”) and we get the result about the so-called Cronbach’s Alpha. This number, expressed as a percentage, tells us how much the measure we calculated is reliable and whether we can trust it. The same has been done for Legislation Pressure, Supplier Pressure, Firms’ Environmental Practices and CSR.

Once finished the Factor Analysis, we pass to the Logistic Regression, on the Binary Logistic section. Our aim is to link a dependent variable to some independent variables, in order to estimate the

association between the variables and the output associated to them. Going deeper, we have taken as dependent variables each of the items of Location Production Plants and combined them with the four categories analyzed in the literature review, retrieved from the Factor Analysis. There has been a doubt about choosing between CSR and consider it as three different elements (Environmental/Economic/Social Performance), but it will be discussed later in the Results. So, the equation we are estimating is:

$$LocProd = \alpha + \beta_1 * LegPress + \beta_2 * SupplPress + \beta_3 * FirmEnvPract + \beta_4 * CSR + \varepsilon$$

This equation relates every single element with its beta coefficient, that is the degree of change in the output for every one-point change in the independent variables. Once run the regression, we can go to the section called “Variables in the Equation” and try to analyze which of the elements are significant and what is their sign. At the end, we can retrieve the Correlation Table. It may be useful to understand in which direction a certain relationship between elements goes (positively, negatively, uncorrelated).

## 4. Results

In this section we are going to analyze the results, in numeric terms, obtained by running the Factor Analysis, firstly, and then through the Logistic Regression. Results will be discussed referring to Total Variance Explained, Factor Matrix and Cronbach's Alpha (where available) tables, for the first part; later on, for regression, we will use Variables in the Equation and Correlation Tables.

### 4.1. Factor Reduction and Analysis

We are going to start from Legislation Pressure, the first factor studied. Looking at the Total Variance Explained table, we can see how just one factor has a value  $>1$  in the section Total (we explained in the Methods chapter how the quantity "1" is the minimum level required to be considered as a dimension). This means that here we do not face any issue: we have the single dimension aimed to find. Indeed, Environmental Requirements has a total of 3.418 (largely greater than the minimum), while all the other have less than 1. The former covers the 56.960% of the variance, referring to initial eigenvalues. Here you have the table reported.

#### TOTAL VARIANCE EXPLAINED

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.418	56.960	56.960	3.108	51.793	51.793
2	0.914	15.229	72.189			
3	0.774	12.889	85.087			
4	0.425	7.083	92.170			
5	0.286	4.770	96.940			
6	0.184	3.060	100.000			

Then, regarding the Factor Matrix, we said that the minimum level required to be considered was 0.4 or more. If we look at the table, we discover that a factor, namely "VoluntEnvProg" does not figure at all: the explanation is that it is below 0.4. This means that the item "In the last two years, Legislation Pressure has introduced several voluntary environmental programs" is orthogonal to the other ones and goes in a different direction, so it cannot be unified in a single element with the others. Another

peculiar case is that of item “EUExpRegul”. Despite its value is present – because above 0.4 – we have to evaluate if it is reasonable to include it or not: the final decision has been that of deleting the argument, due to the distance between it and the average value of the whole group. So, at the end, we reduce the articles to just four out of six, in order to be more precise and to have higher reliability from the dataset. The following is an example of a Factor Matrix.

### FACTOR MATRIX

	Factor 1
EnvRequirements	0.879
GreenTechDevelop	0.865
EnvComplAudit	0.827
ISO14001Cert	0.796
EUExpRegul	0.431
VolEnvProg	

The third element we are going to study is the Cronbach’s Alpha, part of the Reliability Analysis. This measure is a proxy of the soundness of the data obtained during the calculations, expressed in percentage: the closer to 1 the more reliable they are. In the case of Legislation Pressure, the result is 0.900, a more than acceptable number. Here the table for Reliability is presented.

### RELIABILITY STATISTICS

Cronbach’s Alpha	N. of Items
0.900	4

The last table we are going to look at is the Item-Total Statistics, that we need to understand the response of the Reliability Statistics to a further elimination of one of the items. What we need to extract from this table is the Cronbach’s Alpha value that we could reach by deleting elements, to check if we can get a sounder research. Looking at it, we discover that it is impossible to have better statistics, so we already arrived at the maximum. We can conclude the first piece about Legislation Pressure. The example reported below is retrieved before eliminating the item “EUExpRegul”.

### ITEM-TOTAL STATISTICS

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EnvRequirements	17.07	28.369	0.759	0.804
GreenTechDevelop	17.17	29.104	0.760	0.805
EnvComplAudit	17.19	28.472	0.752	0.805
ISO14001Cert	17.06	28.616	0.734	0.810
EUExpRegul	17.41	31.133	0.420	0.900

Now we can move to the second category, Supplier Pressure. In studying this one, we decided to delete the seventh item (“Over the last two years our suppliers have been certified GOTS and/or OEKO-TEX®”), because it did not match with our necessities. Like in the first example, here we have six elements and a single dimension, given that the Factor 1 of Total Variance Explained is 2.584 and all the others are below 1. It is about one point less than that of Legislation Pressure, in fact this is mirrored also in a lower value of percentage of variance covered for initial Eigenvalues, that is the 43.059%. So, there are no problems with the number of dimensions. Again, what we did then is to check the Factor Matrix to understand the directions taken by the different variables. The table shows us five elements out of six, meaning that one is below 0.4. The non-considered one is “GreenEvaluatCriteria”, referring to “Over the last two years our suppliers have undertaken green evaluation criteria”. The only doubt was whether to keep “DevelEnvProg”, given that its score of 0.508 is the furthest from the average, but we decided not to cut it. So, if we look at the Reliability Analysis, we can see how – in line with the other results – also Cronbach’s Alpha is lower than with Legislation, with a 74.3%. Lower, but still acceptable: we can rely on this calculation. Also, the Item-Total Statistics confirms this view, because by deleting the first item we can reach a maximum of 0.722, less than our actual value. So, this is the best solution we can get (De Giovanni and Vinzi, 2014b).

We can now study the results for the third category involved, Firms’ Environmental Practices. The items involved in this category are nine, instead of six. As always, we start from the Total Variance Explained and we can see that the factors greater than 1 are two, for the first time. The dimensions are two, as a consequence: not what we were looking for. Here this situation is presented.

### TOTAL VARIANCE EXPLAINED

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.552	39.464	39.464	3.042	33.803	33.803
2	1.105	12.274	51.738	0.516	5.734	39.536
3	0.993	11.038	62.776			
4	0.825	9.170	71.946			
5	0.635	7.056	79.002			
6	0.576	6.401	85.403			
7	0.512	5.684	91.087			
8	0.411	4.561	95.648			
9	0.392	4.352	100.000			

To solve this kind of problem, we have to analyze the Factor Matrix. By doing this, we are able to spot that items 3 and 4 have an eigenvalue  $<0.4$ , so the best thing to do is to try to eliminate one of them and run the Factor Analysis as a whole again. Once done it, the same issue is presented: two dimensions. For the third time, we try to delete another factor less than 0.4 and run the analysis again. Finally, with seven out of nine items we reached our objective of one single dimension. It covers the 48.922% of variance. If we investigate the Factor Matrix, we figure out that a value (“TransportEnergySaved”) is a little bit far from the average, but, given that item 7 has a similar distance, we decided to keep it. The Cronbach’s Alpha confirms our idea, because it gives us a very comfortable value of 0.823. A double-check insurance is given by the Item-Total Statistics, through which we get the impossibility to improve the reliability of the test.

Lastly, we move toward CSR. In this case, it is a little bit more complicated because the analysis is divided into three different steps: the first about Economic performance, the second for Environmental Performance, the third for Social Performance (Genc and De Giovanni, 2018). We are going to talk about them in a single paragraph. For the economic side, we have no problems with dimensions, given that just one factor has a value higher than 1. It covers the 70.753% of variance, very large w.r.t. the previous ones. Also, the Factor Matrix is perfect: all the variables go in the same direction. Cronbach’s Alpha is equal to 79.1% and we could not have it higher. Then, Environmental Performance presents the problem of two dimensions. By deleting item 6, we still have the same problem, so we go ahead doing this. By eliminating “EnergyConsumption” – the furthest from the

average – we get our result of a single dimension, which covers 62.670% of the variance. Now, the trouble passes to the Factor Matrix, which has a value less than 0.4 and far from the middle: the only thing to do is to delete this, too. Now we have a perfect in-line matrix. Regarding the last group of items, we have to be precise: there was not a section called “Social Performance”, so we gathered the items related to this field from the other parts of the questionnaire. In the Total Variance Explained table we find two values above 1, so two different dimensions. Again, we have to look at Factor Matrix to solve this problem. By eliminating “ChangeSuppQuant&ConsOrder” we have the same issue; then, we try to delete “ServiceLevel”, because this time it is too much larger than the others. Doing this, we get our one-dimension group, but the Factor Matrix is not as expected, given that two items of Agility (2 and 21) are below 0.4. We decided to cut off them. Now the variance coverage is 44.938% and the matrix of the factors is homogeneous. We have five elements and a Cronbach’s Alpha of 68.9%. This number is not so comfortable, but we have to remember that we are not talking about a pre-defined section of the questionnaire. The last point is to create a CSR element by unifying these three above always in the same way. What we can see is that we have a single dimension with a variance covered by 45.072%, a good Factor Matrix but a very low Reliability Statistics of 38.9% (the problem is still the same as for Social Performance).

#### 4.2. Logistic Regression

Now, we are able to move toward the Logistic Regression. As already explained, we are interested in studying the Variables in the Equation table. Our research question was about the relationship of Legislation Pressure, Supplier Pressure, Firms’ environmental practices and CSR with offshoring due to certain reasons linked to Location Production Plants. We disintegrate this group of factors into ten elements (already presented in the hypotheses) and will analyze the numeric results of each one. Investigating the table, we focus our attention to the column called “Sig.” (which stands for Significance). It is needed to be explained how we assess the significance or not of an item: we look at the value and if it is less than 0.1 we consider it significant (and vice versa). After having done that, one should pay attention to the direction of the correlation (positive, negative or zero), that is the column called “B”.

The first is “EUEnvLeg&Restr”, which refers to “Over the last two years, we have delocalized our production because of the stringent EU environmental legislation and restrictions”. Here, we can see that just Firms’ Environmental Practices factor is significant with a value of 0.019; all the others are more than 0.1. Now, we look at the coefficient of correlation, that is negative in this case, i.e. -0.382.

This means that, yes, they are correlated but go in different directions. Here an example of the table is presented.

#### VARIABLES IN THE EQUATION

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	LegPressure	-0.078	0.176	0.193	1	0.660	0.925
	SupplPressure	0.262	0.172	2.312	1	0.128	1.300
	FirmEnvPract	-0.382	0.162	5.531	1	0.019	0.683
	CSR	-0.158	0.120	1.723	1	0.189	0.854
	Constant	-0.585	0.165	12.629	1	0.000	0.557

Now, we are going to interpret these results. In this first example, we can see that there is a negative relationship between Firms' Environmental Practices and offshoring. In particular, the more a firm focuses and invests in green practices (meaning, for instance, greening the production processes or paying attention to emissions) the less the probability that the firm is interested in offshoring its activities. What it means in practical terms is that a company may offshore in case it is not able to make its practices sustainable. In this specific case, it is linked to the stringent EU legislation and regulation, i.e. this tough regulatory framework limits the possibilities of a given firm to offshore. Regulation's characteristic is that it is non-negotiable and strict controls over compliance are very common.

In the second item (“[...]”<sup>1</sup> the penalizing EU taxation and fiscal system”) we have two significant factors: Supplier Pressure and Firms' Environmental Practices. The former is positively correlated to “PenalizEUTax&Fisc” with a score of 0.316; the latter, instead, has a negative relationship, valued - 0.476. Again, here we have EU regulatory system creating boundaries for firms: the more a firm makes investments in green practices the more it is not going to offshore its production activities. Correlation is of a medium value. In this case, the rationale is to be linked to taxation and fiscal system, obviously. Besides this, we have to focus on Supplier Pressure: correlation here is positive and lower than the previous one. This means that the heavier the pressure put by suppliers to become greener is the more firms are incentivized to offshore. Reasons should be attributed to taxation and fiscality, again. This time, Supplier Pressure is a stimulus to be more sustainable and to do that delocalizing activities. The main feature of this category is that the objective is to create a green supply chain at every level by imposing contractual agreements to do things in a sustainable way.

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<sup>1</sup> When we use “[...]”, it stands for the initial part of the questions, i.e. “Over the last two years, we have delocalized our production because of...”



Item number 3 has just FirmEnvPract as a significant element (0.003), with a correlation coefficient of -0.497, so inversely related. It refers to “[...] the low import/export taxation”. Again, we have a situation in which an increase in attention to green practices by firms, for sure, leads to a decrease in the probability of a firm to become an offshoring player. The meaning is that firms tend to delocalize just in situations where they are not able to turn their activities into green ones, because of a lower import/export taxation in the hosting country.

“HighManpowCost” is the item related to “[...] the high manpower costs”. It has three significant variables, that are LegPressure (0.023), FirmEnvPract (0.086) and CSR (0.038). All of them have negative relationships with the item n.4, given that the respective values are -0.405, -0.278 and -0.251. Firms’ green practices is again a significant factor, but here we have two new elements to be discussed. First, Legislation Pressure: the less stringent it is to induce firms to green themselves, the higher the probability that they will offshore due to excessive labor costs in their home country. But in this case the interesting factor is CSR, because moving abroad to reduce manpower costs is deeply related to its social dimension. In fact, results are in line with this logic: the greater the focus of a firm on CSR, the less the probability they are going to offshore because of high manpower costs. Companies are put in a situation of trade-off between cutting costs and being socially responsible, everything in a context of possible offshoring: the decision should be based on the economic situation of the company itself (Preeker and De Giovanni, 2018).

The fifth element is the translation of “[...] the high production costs” and has SuppPressure (0.073), FirmEnvPract (0.000) and CSR (0.091). For the first one correlation is positive (0.316), the second (-0.689) and third ones (-0.210) are negative. A mention should be made for FirmEnvPract, because it has the maximum level of statistical significance. As not so usual, now we have the first element, Supplier Pressure, directly related to offshoring: the more the context presents suppliers pushing to go green, the more firms are encouraged to go abroad because of high production costs. This is one of the most common reasons to do that. FirmEnvPract, as always until now, has a negative correlation, so it is a deterrent to delocalize (when production costs are too much). At the same time, firms that do not invest in CSR in this type of situation are more interested in moving production abroad: this makes sense.

Item number 6 (“[...] the low logistics costs”) has just FirmEnvPract as significant factor (0.002) with a very high value, with a coefficient of -0.514. Here, the correlation value is high enough: a 1

percentage point increase in the beta leads to a 0.514 decrease in the output. Translated, it means that companies not interested in or not able to make their practices green are more incentivized to offshore due to lower logistics cost in the hosting country. This can be related to lower inventory costs in the plants, vicinity to the target market segment, smoother supply chain network etc.

“EnerPetrolMC” refers to “[...] the marginal costs of energy and petroleum” and has two elements statistically significant: FirmEnvPract (0.001) and CSR (0.067). Their correlation coefficients are both negative, namely -0.575 and -0.226. This item refers to an externality non-controllable by the participants in an industry, also because it is the result of globalization and internationalization. As almost always, Firms’ Environmental Practices is an element highly correlated to offshoring, but with a negative link: here, the interpretation of data says that the more a firm is focused on green practices, the less it is going to delocalize, due to the (probably larger) costs of energy and petroleum. The same for Corporate Social Responsibility: the more a company invests in it, the less it is interested in offshoring due to costs of energy and petroleum. In this case, we may have the opposite situation and makes sense, given that CSR and a lower usage of fossil fuels go in the very same direction (the same reasoning stands for FirmEnvPract).

“SupplierLoc” is to be attributed to “[...] our suppliers’ location”. It has LegPressure and FirmEnvPract as significant variables, respectively -0.338 and -0.487. The coefficients are -0.338 and -0.487. For the eighth time out of eight items, we have a significant Firms’ Environmental Practices with an inverse relationship. So again, the less the investments in it, the more the willingness to offshore because of better suppliers’ location. For Legislation Pressure, we have that the more it is heavy and stringent about green production, the less the willingness of firms to offshore due to vicinity (or not) of supply chain participants.

“[...] the technological progress in this country” is the description of item 9, which has, as above, LegPressure (0.039) and FirmEnvPract (0.000) as significant elements. Their correlations are -0.377 -0.632, both negatively linked. Legislation Pressure may in a certain way be linked to innovation and technology, as the State itself may be a promoter of development (through incentives, guidelines to follow, national plants/materials’ usage and so on). So, a nation may be better than others at fostering technological progress. In fact, data show how a lower pressure by the regulatory framework may lead to a higher willingness to delocalize due to a faster technological progress in another country. The very same speech can be done for FirmEnvPract, also in this ninth item. The more firms invest in it, the less they are going to offshore due to technological progress.

The last term is “HighQualityStand”, related to “[...] the high-quality standards that have been recently adopted”. It has just CSR as significant factor, valued 0.001, with a negative correlation coefficient of -0.420. This is the unique situation in which FirmEnvPract is not present as significant. CSR is the only one and correlation is negative: the more a firm is focused on investments in CSR, the less its willingness to offshore. The rationale of delocalizing here is clearly in line with the only significant factor: in fact, respecting high-quality standards is a kind of social responsibility with regard to customers. So, a firm should operate where the top-quality standards (taking into consideration costs) are met, with or without offshoring.

## 5. Discussion

The results just studied in the precedent chapter describe, basically, what the relationship between offshoring and determinants of green practices are. We have done it by using a piece of our environmental questionnaire, that made of Location Production Plants: this section presented ten items related to different reasons that firms may face to decide to offshore (or not). Put in the model as dependent variables, we run the Logistic Regression analysis (with Legislation Pressure, Supplier Pressure, Firms' Environmental Practices and Corporate Social Responsibility as independent variables).

The first thing that comes to mind when looking at the results is that for the vast majority of the items taken into consideration, we have an average of about just two significant elements. This is a fact, because it means that not always all of the four determinants of offshoring are important in the decision to do that or not. It, obviously, depends on the type of item we are studying, among the ten. It is clear that, for instance, CSR may count much more for "high manpower costs" or that FirmEnvPract is more linked to "the technological progress in these countries". So, in the end, we can underline that there may be other factors (or different types of pressures) influencing the choice to offshore or not.

Secondly, if we focus on the elements that are significant, we can discover a very unusual finding: around the 89% (16 out of 18) of determinants are negatively correlated to offshoring, while just the remaining 11% (2 out of 18) are positively linked. In other words, almost every significant environmental-related determinant does not contribute to the decision to delocalize activities. The only two directly linked factors are both from Supplier Pressure category. This means that if suppliers push focal firms to go green, then they are incentivized to go abroad. On the other hand, the most crucial discovering is that the vast majority sounds like a deterrent. So, based on our research, we can state that environmental determinants are not in line with the willingness of firms to offshore.

Lastly, it is clear that we have a determinant that results to be significant in every single item (exception made for the last one): Firms' Environmental Practices. This element is a fundamental factor concerning the decision in the 90% of the cases (9 items out of 10). A reason why this happens may be that this determinant is very wide and general, because the word "practices" could comprehend several elements, from processes to products, from policies to logistics concerns and so on. But there is an even more interesting thing to stress: all of the significant FirmEnvPracts have a

negative correlation coefficient with respect to offshoring. So, this means that – taking into consideration our sample – firms choose whether to offshore or to follow green practices, but do not overlap the two strategies. A rationale for this finding may be that both the activities require a huge monetary commitment, along with deep knowledge retrieved from experience and R&D and a well-established internationalization strategy. Further researches are needed on this argument. Looking at the other determinants, we can see that their frequency percentage is much lower: 40% for Legislation Pressure, 20% for Supplier Pressure and 40% for CSR. Finally, coming back to our research question (“Which factors among Legislation Pressure, Suppliers’ Pressure, Firms’ Environmental Practices and Corporate Social Responsibility do influence the probability that firms offshore due to Location Production Plants?”), we can doubtlessly state that Firms’ Environmental Practices are the most influencing factors in the decision to offshore or not.

Our research presents some limitations. The first one is related to the fact that the questionnaire has been submitted in 2015. Five years are an important time lapse but, environmentally and technologically speaking, we are still in the same era. The result is that we decided to utilize this database even if it is five years old. A second limitation may be linked to the European dimension of the questionnaire. In fact, it is based on a sample of 172 big firms from Europe (as confirmed by the first two Location items, referring to EU regulatory framework). If we think about the huge dimension of offshoring and outsourcing activities from the United States, then we have to underline the boundaries of our paper. The last is about CSR, but it is a technical limitation we already cited above. When we created the category called “Social Performance”, used to run the Factor Analysis (the first part of our calculations), it was us to select the most eligible items to gather and put in the group. We can consider it as a little limitation, because all the other categories were pre-established. The final decision was that of using our homemade group for two main reasons: first, because the selection has been very deep and precise; secondly, given that it is a sub-group to be integrated and mixed with Economic and Environmental Performances to create CSR category.

Lastly, space for future researches is needed. Further studies should be comprehensive of more than our four categories of factors (LegPressure, SupplierPressure, FirmEnvPract and CSR) influencing a green approach, given that they have been not so significant in every item analyzed. A wider base of elements for sure is going to lead to a more precise set of findings and a broader view of the argument. Then, scholars should focus their researches on the reasons why there is an *aut-aut* relationship between green practices and offshoring. These studies should also explain how is it possible to

overcome this kind of problems and make these two fundamental and contemporary strategies co-exist with each other.

## 6. Conclusion

Our research question was about which factors mostly influence the decision of a firm to pursue an offshoring strategy or not, making references to the items of Location Production Plant from the questionnaire. Following a rigid and scientific statistic method, we got the results and findings we were looking for. Starting from the creation of a literature framework about what we were going to study, we have been able to make our inferences about the data retrieved. The main question has got an answer, but not without some controversies. After a deep and reasoned study of all the categories involved, we have been able to quit our initial doubts. Indeed, among the determinants analyzed, Firms' Environmental Practices represent the most important factor influencing offshoring decision. About its importance with respect to the others we have no doubt, given its significant presence in the 90% of the items taken into consideration. At least in the European territory, these activities are to be viewed as the element of deeper study, when deciding whether to pursue this kind of strategies. Besides this, we want to highlight again how these factors may represent a deterrent, given that, in every single case studied, the more the investments in green practices, the less the willingness to offshore. So, we can state that to be sustainable and respectful towards the environment, firms may prefer not to follow a delocalization strategy.

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All the tables presented in the text are created using data retrieved from the analysis made by Professor Pietro De Giovanni and me, using IBM SPSS software.

## 8. Acknowledgments

Concluding this paper, it is a duty for me to say a big “thank you” to many fundamental people in my life, who helped me during this tough period, but also through the rest of my life.

First of all, I want to underline the generosity, patience and dedication of my supervisor, Professor Pietro De Giovanni. He made me fall in love with this interesting subject, that is International Operations and Supply Chain, and has been by my side during the whole drafting of this research.

Right after the working field, I cannot forget what my parents did for me. Beatrice and Stefano, these are the names of the woman and the man who raised me, who fed me, who helped me become the person I am, who have been here with me throughout my whole studying years, with all the difficulties. They never put pressures on me, they did the best to make me enjoy and love my life as it is. They are my strength, simply.

My friends, my support and leisure. The family I chose by myself. I cannot name all of them, they are too many. I do not have any brothers or sisters, but I think I did not feel the lack. You are my refuge, always, but especially in particular moments of my life, when nobody else could have been by my side.

Last but not least, my uncles. They have been my life partners during the difficult lockdown period, when I was far from home because of an internship. They are the closest human beings for me, right after my parents. Like all my other relatives.

All of you, I hope you will always be by my side. For the rest of my life.

Thank you,

Daniele.

## Thesis summary

1. Introduction
2. Literature review
3. Methods
4. Results
5. Discussion
6. Conclusion

### 1. Introduction

One of the most widespread problems in today's industries is how to cut costs that appear to be heavy for the firms. In a world characterized by companies looking at expanding intercontinentally and creating a complex network of participants in their supply chain, one of the most frequently used strategies to reduce costs is to offshore some business activities. At the same time, there is an increasing trend in paying attention to what exists around us. These two arguments seem to be diametrically opposite, since one is a strategy to have a better economic outcome and the other represents more a mindset, a vision, something that lies at the basis of every activity of a business. It is right at the crossing point between these two arguments that our curiosity has been awakened. We based our work on an environmental questionnaire of 2015, to which the supervisor Professor Pietro De Giovanni has contributed. We focused more on four main sections of it: Legislation Pressure, Supplier Pressure, Firms' Environmental Practices, CSR. Deeply analyzing literature, we came to the conclusion that there is a missing point that scholars did not underline so much precisely, i.e. it is true that pressures and practices to go green do exist, but what is the weight of these factors with respect to an offshoring decision, taking into consideration issues related to Location Production Plants? Which of the four factors cited above is the most relevant for firms evaluating an offshoring strategy? Our conclusions will be captured through a deep study of an empirical research made with a well-suited algorithm. With the results got, we are going to try to interpret what we found out in realistic terms.

### 2. Literature review

This work is based on the not-deeply studied relationship between offshoring strategies and green practices. We know how offshoring is today a widespread way firms use for cutting costs and move

towards other different markets and segments. It is clearly fostered by the high level of technology and innovation characterizing the world we are living in.

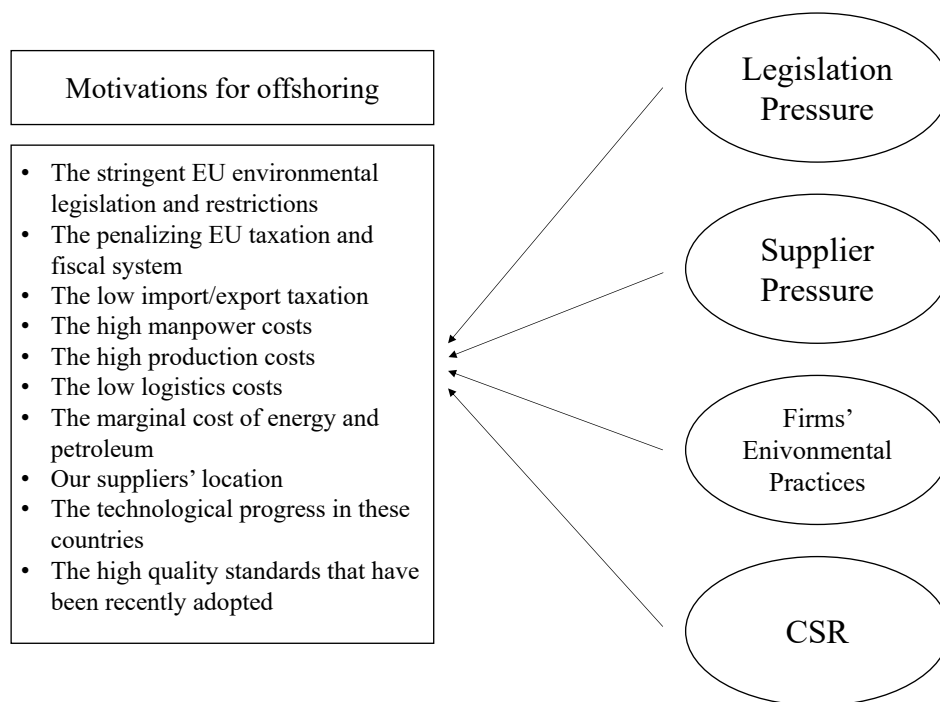
Our paper aims at analyzing what type of relationship exists between these types of strategies and the very contemporary concern about environment. In the first part of the paper we discussed about what literature had reported until now about offshoring in general. Our purpose was to understand the main trends characterizing offshoring today, so in which direction firms are going. Evidence shows that trend to backshore is strong. We reviewed scholars also because it was important to highlight what type of drivers mostly influence the decision to offshore or reshore.

In the second part of the review, we put our attention to four main determinants affecting the decision to offshore or not, linked to the environmental concern: Legislation Pressure, Supplier Pressure, Firms' Environmental Practices and CSR. In Legislation Pressure literature review, we have seen how firms are sometimes forced to make new investments in order to keep up with regulation. Innovation, as a matter of fact, is an integral part of going green and cannot be overcome. The more this mindset comes from the inside, the better a firm may fit in a new regulatory framework like that. All these factors should be surrounded by a deep technical knowledge of the legislation itself. Literature for Supplier Pressure has shown how scholars are so much interested in analyzing the scientific methods firms utilize to assess suppliers' fitness with their strategy. It is clear how certain features are heavier than others in supplier selection. This is a crucial part of supply chain construction, given that a green supplier might be an incentive to go toward self- and product/process innovation. Even if it is not truly an external pressure, the focus of firms deciding whether to adopt green practices or not is mainly on the relationship with financial performance and profitability. The first concern is about how to find a way to make these elements co-exist together. Literature suggests that, with the right resource commitment, capabilities development and a favorable institutional context, there exist a positive correlation between the adoption of environmentally sustainable practices and economic outcome. Reviewing literature about Corporate Social Responsibility, the main result we can get is that it is strongly tied to what is considered "moral" and the effects it can have on the firm. Besides this, it is clear that attention should be put on unity of vision among different participants of supply chain, in order to get satisfactory results in terms of sustainability. The focus is on the social part of CSR, aimed at protecting workers and other stakeholders in offshoring companies.

These four areas analyzed represent the independent variables we have put into our regression model, that will be explained later. Also, they are the four sections of the questionnaire we were looking for to run our research.

Having studied literature exhaustively, we defined which variables would have been the dependent ones in the linear regression. These are ten items collected from the environmental survey related to the section called “Location Production Plants”, in which are listed many reasons for respondent firms to delocalize production or not.

At the end of this chapter we defined the real research question: “Which factors among Legislation Pressure, Supplier Pressure, Firms’ Environmental Practices and Corporate Social Responsibility do influence the probability that firms offshore due to Location Production Plants?”. Here the conceptual model followed is presented:



### 3. Methods

This part explains the methods we have used to gather the data and process them. First, a description of the questionnaire is needed. This has been submitted in 2015 to 172 European firms working in different sectors. The scope was that of getting data for a study about Agility, Supply Chain and Environmental Management, made in collaboration with ESSEC Business School (France) and University of Calabria (Italy), with the participation of the supervisor Professor Pietro De Giovanni. The main purpose was that of getting information about how environmental issues impact on firm’s performance. As expressed above, the sections we were interested in were mainly four (plus one): Legislation Pressure, Supplier Pressure, Firms’ Environmental Practices, Corporate Social Responsibility and Location Production Plant. We have a duty to say that CSR section did not exist in the original survey, but has been created by us. The criteria we followed was that of using the

sections called “Environmental Performance” and “Economic Performance” and then to make another non-existing category named “Social Performance”. In order to have this last section, we decided to group together all the items directly related to the social side of CSR, finding them throughout the whole questionnaire. At the end, we mixed these three groups to get CSR factor.

The second part of this chapter refers to the statistical approach used. We based our study on a software called IBM SPSS to run the regression. By using data retrieved from the questionnaire, we made an algorithm well-suited for our research. At the beginning, we ran a Factor Analysis by reducing the items present in each of the four groups. Our aim was to check if, for instance, Legislation Pressure items could be gathered in a single dimension, to reduce them to a single element (to run, later, the logistic regression). The very first table to look at is the Total Variance Explained, to check if we got a single dimension or not (we have done this by checking if the first column has more than one value greater than 1. If so, we have multiple dimensions and we must adjust the analysis). Results also showed a table called Factor Matrix, useful to understand the eigenvectors of each item. These are fundamental to see whether items are going in the same direction or not. If not, values are deleted. To decide for the elimination or not we looked at the distance of each value from the average of the items (also, if a value was <0.4, we deleted it doubtlessly). Once the Factor Matrix has been cleaned up, we were able to run the analysis again until we got one single dimension for the whole group. An important indicator we studied is also the Cronbach’s Alpha, a measure of reliability of the results. Expressed in percentage, the more it was close to 1 the more reliable the research. Finally, the Item-Total Statistic table is important to understand if reliability value could be improved or not by deleting other items. For CSR, we have done the same by previously studying the three sub-categories already cited and then combining them together.

Once made the Factor Analysis, we had to run the real logistic regression to get a measure of correlation between dependent and independent variables. As independent variables we used the four elements studied above (Legislation Pressure, Supplier Pressure, Firms’ Environmental Practices and CSR); as dependent ones, the ten items of Location Production Plant section. The equation we have estimated is:

$$LocProd = \alpha + \beta_1 * LegPress + \beta_2 * SupplPress + \beta_3 * FirmEnvPract + \beta_4 * CSR + \varepsilon$$

This equation relates every single element with its beta coefficient, that is the degree of change in the output for every one-point change in the independent variables. The regression gives us some results, among which the most important is the table called “Variables in the Equation”. Through this data



we can assess which element is significant and the degree of correlation among the variables (and the direction of it).

#### 4. Results

The following chapter is about the results we got. Here we analyze the numerical outcomes we got from our statistical approach. The first part refers to the Factor Analysis and is about the four categories studied in detail; the second one is about the Logistic Regression.

For Legislation Pressure we have no problems with the number of dimensions, given that there is one single value greater than 1 (and so one dimension), covering about the 57% of the total variance. Here a Total Variance Explained table is presented as an example.

#### TOTAL VARIANCE EXPLAINED

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.418	56.960	56.960	3.108	51.793	51.793
2	0.914	15.229	72.189			
3	0.774	12.889	85.087			
4	0.425	7.083	92.170			
5	0.286	4.770	96.940			
6	0.184	3.060	100.000			

Looking at the Factor Matrix, we have to check the directions of the eigenvectors to decide whether to eliminate some items or not. One factor (“VoluntEnvProg”) is below 0.4, so it should be deleted. Another item, “EUExpRegul” is  $>0.4$ , but not sufficiently close to the average of the group, so we cancel it, too. The following is the cited Factor Matrix table.

### FACTOR MATRIX

	Factor 1
EnvRequirements	0.879
GreenTechDevelop	0.865
EnvComplAudit	0.827
ISO14001Cert	0.796
EUExpRegul	0.431
VolEnvProg	

Finally, we got four items out of six. Now, we have to check the reliability statistics, that shows a Cronbach's Alpha of 0.900, so high. This means that we can trust our result. At the end, using the Item-Total Statistics table, we see that there is no chance to improve the Alpha, so our analysis about legislation pressure is over. An example of this table is presented below (it refers to data without having already eliminated "EUExpRegul").

### ITEM-TOTAL STATISTICS

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EnvRequirements	17.07	28.369	0.759	0.804
GreenTechDevelop	17.17	29.104	0.760	0.805
EnvComplAudit	17.19	28.472	0.752	0.805
ISO14001Cert	17.06	28.616	0.734	0.810
EUExpRegul	17.41	31.133	0.420	0.900

Moving to the second group, Supplier Pressure, we see that we have, again, just one dimension, with a variance coverage of about 43%. In the Factor Matrix we have a non-considered element ("GreenEvaluatCriteria") to be eliminated and another item a little bit far from the average, "DevelEnvProg", that we decide not to cut. Cronbach's Alpha is lower than the previous one, 74.3%, but still acceptable. Lastly, it is impossible to obtain better reliability statistics.

The third element is Firms' Environmental Practices. Here, we are in trouble because there are two dimensions. So, what we have to do is to look at the Factor Matrix and eliminate some elements with a low value. By running the analysis without the two items below 0.4, we get a one single dimension,

with about 49% of variance coverage. Here, Cronbach’s Alpha confirms our idea, because the reliability is of 0.823, very high.

Finally, we have CSR. As already said, here we did the analysis first for Economic/Environmental/Social Performance and then for CSR. Looking at the results, we have no problems with the first two. The trouble begins with Social Performance, given that it is a category created by us. In fact, we got two dimensions. By deleting the furthest elements, we finally got a one dimension, with a Cronbach’s Alpha of 68.9%, an acceptable one. Then, we do the very same analysis on CSR, which has a single dimension covering about 45% of total variance and a reliability statistic of 38.9%, very low (but we explained why).

Then, we ran the Logistic Regression. Here, ten regressions are run, because the items taken into consideration are ten. What we are interested about is the Variables in the Equation table, especially the columns called “Sig.” and “B”. The first states if a correlation between variables is significant or not, the second measures the degree and direction of this correlation. An example of it is reported.

#### VARIABLES IN THE EQUATION

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	LegPressure	-0.078	0.176	0.193	1	0.660	0.925
	SupplPressure	0.262	0.172	2.312	1	0.128	1.300
	FirmEnvPract	-0.382	0.162	5.531	1	0.019	0.683
	CSR	-0.158	0.120	1.723	1	0.189	0.854
	Constant	-0.585	0.165	12.629	1	0.000	0.557

Now we analyze each item of Location Production Plant section with the results. The symbol “[...]” refers to the first part of the section, i.e. “Over the last two years, we have delocalized our production because of...”.

- The first item refers to “Over the last two years, we have delocalized our production because of the stringent EU environmental legislation and restrictions”. Here we have just FirmEnvPract as a significant factor, with a negative correlation with respect to offshoring due to tough environmental legislation. In particular, the more a firm focuses and invests in green practices the less the probability that the firm is interested in offshoring its activities.
- Item 2 is “[...] the penalizing EU taxation and fiscal system”. Here, again FirmEnvPract is negatively linked to offshoring. In this case, instead, we have Supplier Pressure as a positively correlated element. This means that the heavier the pressure put by suppliers to become greener is the more firms are incentivized to offshore.

- The third item is about “[...] the low import/export taxation” and, as the first, it has a negative relationship w.r.t. FirmEnvPract. This means that firms tend to delocalize just in situations where they are not able to turn their activities into green ones, because of a lower import/export taxation in the hosting country.
- Item number 4 refers to “[...] the high manpower costs”. Here we have LegPressure, CSR and FirmEnvPract as significant factors, all negatively related to offshoring. Legislation Pressure correlation means that the less stringent it is to induce firms to green themselves, the higher the probability that they will offshore due to excessive labor costs in their home country. Regarding CSR, it is clear that a high manpower cost may lead a firm to offshore and, at the same time, to neglect CSR targets.
- The fifth item is “[...] the high production costs” and has three significant elements: SuppPressure, CSR and FirmEnvPract (that has the maximum level of significance). Supplier Pressure is positively correlated: the more the context presents suppliers pushing to go green, the more firms are encouraged to go abroad because of high production costs. FirmEnvPract, as always until now, has a negative correlation, so it is a deterrent to delocalize (when production costs are too much). At the same time, firms that do not invest in CSR in this type of situation are more interested in moving production abroad: this makes sense.
- Item n.6 is “[...] the low logistics costs”. It has just FirmEnvPract as a significant, negatively related factor. Translated, it means that companies not interested in or not able to make their practices green are more incentivized to offshore due to lower logistics cost in the hosting country.
- “[...] the marginal cost of energy and petroleum” is the text of item 7, which has FirmEnvPract and CSR as negatively correlated significant factors. A mention should be made for CSR, because the more a company invests in it, the less it is interested in offshoring due to costs of energy and petroleum. In this case, we may have the opposite situation and makes sense, given that CSR and a lower usage of fossil fuels go in the very same direction.
- Item number 8 refers to “[...] our suppliers’ location” and we can find FirmEnvPract and LegPressure as negatively correlated elements. As always, the less the investments in FirmEnvPract the more the willingness to offshore due to better location of suppliers. Then, the more stringent legislation pressure, the less the probability a firm decides to offshore.
- The ninth item is about “[...] the technological progress in this country” and has the same negatively related elements of the previous ones: LegPressure and FirmEnvPract. A State may be better than others at fostering technological progress, in fact data show how a lower pressure by the regulatory framework may lead to a higher willingness to delocalize due to a

faster technological progress in another country. The very same speech can be done for FirmEnvPract.

- The last item refers to “[...] the high-quality standards that have been recently adopted”, with just CSR as a significant, negatively correlated factor. The more investments in CSR, the less the willingness to offshore due to high-quality standards. The rationale of delocalizing here is clearly in line with the only significant factor: in fact, respecting high-quality standards is a kind of social responsibility with respect to customers.

## 5. Discussion

This chapter refers to the interpretation of the numerical results to express the main findings of the research. They are mainly three.

1. The first thing that comes to mind when looking at the results is that for the vast majority of the items taken into consideration, we have an average of about just two significant elements. This is a fact, because it means that not always all of the four determinants of offshoring are important in the decision to do that or not. It, obviously, depends on the type of item we are studying, among the ten.
2. Secondly, 89% of determinants are negatively correlated to offshoring decision, while just the 11% is positive. In other words, almost every significant environmental-related determinant does not contribute to the decision to delocalize activities. The 11% is represented by Supplier Pressure to go green, that works as an incentive to offshore. On the other hand, all the others sound like deterrents. So, based on our research, we can state that environmental determinants are not in line with the willingness of firms to offshore.
3. Firms’ Environmental Practices is a significant determinant in the 90% of the regressions. This may be due to the fact that it is very wide and general. But the interesting thing is that it always has a negative correlation with offshoring decision. So, this means that – taking into consideration our sample – firms choose whether to offshore or to follow green practices, but do not overlap the two strategies. A rationale for this finding may be that both the activities require a huge monetary commitment, along with deep knowledge retrieved from experience and R&D and a well- established internationalization strategy. Looking at the other determinants, we can see that their frequency percentage is much lower: 40% for Legislation Pressure, 20% for Supplier Pressure and 40% for CSR. Analyzing these numbers, we can state with no doubt that Firms’ Environmental Practices are the most influencing factors in the choice of whether to delocalize or not.

Our research presents some limitations. The first is about the year of the questionnaire, 2015. Five years are an important period of time but not too much in this field (environmentally and technologically speaking), so we decided to keep it. The second is about the European dimension of the questionnaire we used, but, despite this, it can give us a reliable perspective of the situation. Last but not least, a limitation is represented by the creation of the “Social Performance”, that was not in the original survey. We decided to keep it, because of two reasons: first, because the selection has been very deep and precise; secondly, given that it is a sub-group to be integrated and mixed with Economic and Environmental Performances to create CSR category.

Further studies should be done on the reasons that lead to the creation of an *aut-aut* relationship between green practices and offshoring strategies and about what other determinants are important in making that decision.

## 6. Conclusion

Starting from our research question and following a rigid and scientific statistic method, we got the results and findings we were looking for. After a deep and reasoned study of all the categories involved, we have been able to quit our initial doubts. Indeed, among the determinants analyzed, Firms’ Environmental Practices represent the most important factor influencing offshoring decision. We want to highlight again how these factors may represent a deterrent, given that, in every single case studied, the more the investments in green practices, the less the willingness to offshore. So, we can state that to be sustainable and respectful towards the environment, firms may prefer not to follow a delocalization strategy.