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**Centre d'Analyse Théorique et de  
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**THE IMPORTANCE OF THE  
STAKEHOLDERS' INVOLVEMENT  
IN BUILDING INDICATORS.  
THE CASE OF ENVIRONMENTAL  
REGULATION IN FRANCE**

Anne MUSSON

# The importance of the stakeholders' involvement in building indicators. The case of environmental regulation in France.

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## Abstract

The purpose of this study is to investigate the usefulness of stakeholders' involvement, through surveys in the construction of indicators. In this paper, we deal with the case of environmental regulation and its impact on competitiveness. We first underline the disregard or lack of even a critical consideration of competitiveness' indicators regarding environmental regulation. We explain that the literature does not justify this assumption. Focusing on the French case, we then examine the following question: Is environmental regulation detrimental to employment? Using an exploratory study involving semi-structured interviews with 36 business leaders, we reveal heterogeneity in entrepreneurs' perceptions. Far from being a consistently heavy burden for companies, environmental regulation can be a source of opportunity and innovation, and may lead to job creation. Using empirical data on French industries, we present evidence of non-linear relationships between environmental regulation, FDI outflows, and employment in France over the period 1996-2006. We emphasize the positive impact of environmental regulation on the level of employment depending on trade liberalization. We conclude on the need to involve stakeholders in the construction of indicators.

Keywords: *Employment; Environmental Regulation; FDI; Indicators; International Trade; Perception; SME; Sustainable Development; Computer-assisted Textual Analysis.*

# 1 Introduction

Since Kuznets said in 1934 “the welfare of a nation can scarcely be inferred from a measurement of national income”, more and more scientists rise up against the supremacy of production indicators as a measurement of wealth (Kuznets, 1934 and see, for example, Nordhaus and Tobin, 1973; Costanza et al., 1997 and 2009, Daly and Farley, 2003). The irrelevance of GDP for the measurement of wealth has been demonstrated; alternative indicators considering sustainability, social, and environmental aspects of economic growth, have been proposed (Costanza et al., 2014; Costanza et al., 2009; Stiglitz Commission, 2009<sup>1</sup>; EESC, 2008.) While several corrections to GDP (adjusted economic measures, as Genuine Progress Indicator or Human Development Index) have been proposed or changes to the measurement of well-being (Greendex or World Values Survey) have been made, the question arises as to which variables are worthwhile and the best way in which to measure them. This situation creates a dilemma for the measurement of wealth. The first option is to use available statistical data as the United Nations Development Programme (UNDP) does in order to calculate the Human Development Index (HDI). The UNDP combines life expectancy at birth (index of population health and longevity); the adult literacy rate (index of knowledge and education); the rate of school enrolment; and standard of living (natural logarithm of gross domestic product per capita at purchasing power parity). We note that relevant factors are selected following the literature. The second option concerns the collection of survey data directly, using for example, National Geographic and Globescan data and construct the *Greendex*, a sustainable consumption index, across 17 countries <sup>2</sup>. Statistics usually come from recognized organizations and are considered quite robust. However, such data is often lacking, especially regarding developing countries. Furthermore, it can be difficult to describe complex concepts such as wellbeing or sustainability with only these types of statistics. In contrast, surveys offer an ideal means to describe perceptions, mental representations, concepts, and phenomena. They also suffer limitations as surveys introduce subjective biases and answers are often influenced depending on the questions’ wording (Berg and Cazes, 2007). Thus the two approaches for the calculation of wealth seem to enrich each other. The first is entirely objective and the second integrates the views of stakeholders. But is it *interesting* or *necessary* to use them together? Can indicators be calculated using purely objective

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<sup>1</sup>i.e., Commission on the Measurement of Economic Performance and Social Progress, established in France in 2007 and chaired by J. Stiglitz and A. Sen, later referred to as the Stiglitz Commission, 2009.

<sup>2</sup><http://www.nationalgeographic.com/greendex/index.html>

statistical data or should they directly integrate stakeholders' points of view? This paper addresses this question through an example: the role of environmental regulation in sustainable competitiveness. Focusing on France, we will analyze how this regulation is currently considered, through the use of competitiveness indicators, and how it is considered by: the literature, French entrepreneurs, and using a specific empirical analysis. Stiglitz Commission (2009) insisted on the need to construct surveys in order to capture people's life evaluations, hedonic experiences, and priorities. Following this recommendation, the French administrative region of Pays-de-la-Loire organized a debate campaign with more than 160 debates. This campaign involved all of the territories' actors in order to identify the definition of the quality of life, according to their residents. Some results are more unusual than unexpected. The confidence in people, the knowledge of regional heritage by teenagers, the number of diversity charters... are some of the different indicators which constitute part of the final 27 indicators of regional wealth<sup>3</sup>. If measures of well-being and empirical studies sometimes meet people's expectations, without their prior consultation, it is however possible to miss some essential aspects. That is why checking to see if empirical studies on the impact of environmental regulation on employment have the same conclusions as entrepreneurs' discourses, is necessary. Moreover, do both conclusions correspond with the assumptions made by the current indicators? The indicator should also be clear with regard to goals and objectives (Stiglitz Commission, 2009; Perret, 2002, Gadrey and Jany-Catrice, 2005; Ifen, 2008). It has to be "capable of informing policy and decision making within a given governing system"(Hezri and Dovers, 2006). A good way to identify priorities for government actions and improvement seems to be deliberative (or discursive/associative) democracy (see Sneddon et al., 2006). All actors (e.g., citizens, associations, firms, local organizations) thus should be involved at least in the evaluation process (Musson, 2013). This point is particularly crucial if an indicator points out the negative impact of environmental regulation in the sustainable attractiveness path, in this case it encourages governments not to regulate. This phenomenon is currently in application for the competitiveness indexes, we will develop this point in the first part of this paper. Then, we check if these indicators give the right advice to French decision makers. Interestingly, if French company directors (CEO) consider environmental regulations as a cost constraint; they also, and mainly, regard it more as an opportunity rather than a threat. Obviously, one may suspect a difference between "espoused theory" - what Small and Medium Enterprises (SME) managers say they do or their intentions -

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<sup>3</sup><http://boiteaoutils-richessespd1.fr>

and their "theories in use" - the way SME managers act in practice (Argyris and Schön, 1978, 1996).

In order to take this into account, we analyze links between environmental regulation and employment in French industries and we show that the relationship is mainly positive. These two results challenge the foundations of some indicators and prove the necessity of using both empirical studies and survey data.

If it is "time to leave GDP behind"(Costanza et al., 2014), new indicators must consider the sustainability issue. Consequently, to reduce environmental damage, environmental regulation appears crucial. But regulation, in general and especially that which concerns the environment, is still considered as a holding competitiveness indicators back, a point on which the literature does not agree. The first part of the article concerns this issue of competitiveness indicators, sustainable development, and environmental regulation. In the second part, we examine the following question: is sustainable development perceived as a constraint for French entrepreneurs, especially for those with an international dimension? Considering that, we decide to check our results, through the reinvention of the Pollution Haven Hypothesis (PHH). Its impact on Foreign Direct Investment (FDI) and employment has been discussed separately. In the third part of the paper, our aim is to explain both FDI outflows and employment with respect to environmental expenditures in France. We present empirical findings using parametric, semiparametric, and non-parametric estimators. Finally, section 4 concludes.

## **2 Indicators of competitiveness, sustainable development and environmental regulation**

### **2.1 Environmental regulation and competitiveness, the indicators do not agree...**

Every year, countries receive assessments by consulting groups and international organizations, using criteria ranging from economic attractiveness to sustainable development. Both topics are widely researched and broadly applicable in practice. As explained in the introduction, economists agree that gross domestic product cannot measure the true wealth of a country, and the measurement of competitiveness can no longer be reduced to economic variables. Economic development must be sustainable, taking into account the quality of life and the environment (Stiglitz Commission, 2009). Accordingly, an in-

indicator of competitiveness must consider sustainability, in the same way as an indicator of sustainable development must include the economic aspect. Thus sustainable competitiveness enables a territory to attract investments perpetually, based on its perennial innovation and dynamism, as well as its supportive business climate. That means that competitiveness indicators must include an environmental regulation variable, which will contribute to building a sustainable (competitiveness) model. According to the International Energy Agency, carbon dioxide (CO<sub>2</sub>) emissions, the primary greenhouse gas emitted through human activities<sup>4</sup> attained record levels during the year 2010. Laws are necessary to reduce and stop environmental damage. This issue also has an important political aspect.

Today, despite a growing world citizen attitude<sup>5</sup> expressed through concerns with the social and environmental consequences of globalization, people prefer to not to see dirty firms “in their backyard”<sup>6</sup>. Moreover, the dilemma of national policy makers is to protect the environment without harming current activities. Imposing more stringent environmental rules seems essential for climate change (Heal (2008)), but without international coordination, it raises the issue of polluting firms creating pollution havens in underdeveloped or developing countries. Table 1 shows how competitiveness indicators react to environmental regulation. It only appears positive in the World Competitiveness Index - leaving less than 0.2% of the final score, and in the Sustainability-adjusted GCI - which is a Global Competitiveness Index, considering sustainability. In the other cases, environmental regulation appears to be either neutral or detrimental to competitiveness.

Table 1

Consequently, policy makers seem to face a dilemma between the social and economical objectives of sustainable development (employment and economic growth) and environmental objectives. Following competitiveness indexes, more stringent environmental

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<sup>4</sup><http://www.epa.gov/climatechange/ghgemissions/gases/co2.html>

<sup>5</sup>From the late 1990s, this attitude was growing in all developed countries. In 1999, 60% of Americans believe that policies regarding globalization do not take into account environmental problems seriously enough (see Canel-Depitre, 2000). In France, a survey carried out by IPSOS in 2004 shows that Europeans are more sensitive to production processes and to the product’s origin, now than before. See also Yakita and Yamauchi (2010) who declare that “the degree of environmental friendliness of a good’s production process may affect the demand for the good by appealing to consumer’s environmental awareness”

<sup>6</sup>See Markusen et al. (1995) for a theoretical work. For the first evidence, see for instance Fredriksson and Millimet (2002) who find a positive relationship between U.S. states environmental regulations and their levels in neighboring states

norms without worldwide coordination, could increase the issue of offshoring and outsourcing in developed countries, where polluting firms create pollution havens in developing countries. This Pollution Haven Hypothesis (PHH) has been discussed throughout the literature: we now explain its main conclusions.

## 2.2 ...with the literature

Seminal papers regarding FDI outflows rejected the PHH (Duerksen and Leonard, 1980) and until recently evidence was scarce. For instance Hanna (2010), using the variation in outward FDI across sectors (following the Clean Air Act Amendments), does not find statistically significant results. Maybe one of the first studies to find evidence of the PHH is Xing and Kolstad (2002) for outward FDI from heavily polluting U.S. industries. Cole and Elliot (2005) confirm their results by showing that U.S. outward flows vary positively with pollution abatement costs once control on capital intensity is included. Wagner and Timmins (2010) analyze how externalities associated with FDI agglomeration can bias results and wrongly lead to reject the PHH if omitted. The data is on outward FDI in the German manufacturing sector. Importantly for our analysis, by controlling for agglomeration economies, Wagner and Timmins (2010) find evidence of the PHH in the chemical industry. Regarding employment, Berman and Bui (2001) developed an interesting strategy based on direct measures of regulation and plant data. They constructed comparison groups for each industry affected, or not, by the South Coast Air Quality Management District, air quality regulators in Los Angeles. They find little evidence of the impact of regulation on employment and consider that this may be the due to:

1. polluting firms being more capital intensive;
2. regulation affecting all competitors in the same way;
3. an existing complementary relationship between abatement inputs and employment.

Greenstone (2002) even asserts for the U.S., that the non-respect of norms concerning air quality has a negative effect on employment. The European Commission (2004) also studied the impact of clean production on employment in Europe, using surveys and case studies. The overall conclusion was that ecological modernization does not go against the labor market policy. Lately, Cole and Elliott (2007) tested the UK case. Considering the measurements of each industry's environmental protection expenditures as a proxy of



environmental regulation, they find no evidence of a trade-off between jobs and the environment. Environmental regulation costs appear to have a statistically insignificant effect on employment whether such costs are treated as being exogenous or endogenous. In the same way, Rutqvist (2009) has studied the effects of environmental regulations on the competitiveness of six pollution intensive U.S. manufacturing industries in the 48 contingent states. The competitiveness variable was measured by differences in industrial employment development between high-cost and low-cost states. No significant impact of environmental policies is found. Then, are competitiveness indicators giving the wrong advice to policy makers? To face climate change, environmental norms are crucial (Stern, 2004; Heal, 2008) and governments have started to implement several policies. Even in countries initially reluctant, such as the U.S., legislators have started to propose radical changes<sup>7</sup> In Europe, there are, *inter alia*, the Danish and German experiences in ecological tax reforms, the French's environmental policies<sup>8</sup> or the UK Statement of Intent on Environmental Taxation (see Jackson, 2009). However, economic downturns are periods during which environmental regulations are less attractive. For instance in 2011, the British Social Attitudes (BSA) survey argues that the number of people who are willing to pay for the fight against climate change has decreased in comparison with surveys in 1993 and 2000. Since the economic trauma due to the 2008 financial crisis, a change in government's priorities seems to have occurred. Environmental regulation becomes harder to implement, the bigger issue being first to get economic growth back, that means competitiveness, and that also means following competitiveness indicators to postpone environmental regulation.

According to the literature, environmental regulation does not seem to be a threat for firms' competitiveness and employment in fact it is necessary for sustainable development. In the next section we go on to add a case analysis to the debate, focusing on France. We first underline the French entrepreneurs' point of view, before an empirical analysis of the impact of environmental regulation to employment in industries in order to answer the following question:

Are competitiveness indicators giving the wrong advice to French policy makers?

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<sup>7</sup>The Kerry-Boxer proposal or the Waxman-Markey bill, even if they were blocked by the Senate, reflect these changes.

<sup>8</sup>In French jargon, the "Grenelle de l'Environnement".

### 3 French entrepreneurs' point of view

To analyze the French entrepreneurs' point of view regarding environmental regulation, we created a survey covering a one-year period (July 2010- July 2011). We interviewed 36 French SME <sup>9</sup>directors. This exploratory study involved semi-structured interviews with CEOs to reveal their current insights into the topics of sustainable development and territories' attractiveness. With our approach, we try to understand relevant issues and identify the mechanisms linking sustainable development, regional development, and the role of the local government in promoting these goals. The semi-structured interviews were supplemented by a short questionnaire, limited to closed questions. Interviews were conducted face-to-face, except for one interview conducted through Skype. We used ALCESTE software (version 2010) for the textual analysis of the interviews (Reinert, 1993). This software focuses on the similarities and dissimilarities in the vocabulary and identifies the presence of utterance, or classes, that are similar in terms of the significant co-occurrence (Chi-square) of the vocabulary that constitutes each class. The classes of utterance thus describe different profiles, defined by their vocabulary, representative context units, and illustrative variables (Capdevielle-Mougnibas et al., 2004). The methodology is the same as Musson (2012) who analyses the build-up of local sustainable development politics. Here we extend the sample and analyze new questions that shed new light on past results. Here we emphasize the business leader's ability to adapt to new regulation concerning sustainable development. In the next section we go on to study new globalization and regulation issues<sup>10</sup>.

#### 3.1 Main results

To determine indirectly <sup>11</sup> if entrepreneurs integrate environmental economics in their planning, we asked the following question:

"How do you imagine the company's future? In 5, 10, 15, years time?"

In many responses, the role of employees in the firm's level of competitiveness appears decisive. The human capital of workers, motivation and creativity, are essential for

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<sup>9</sup>Between 10 and 500 employees.

<sup>10</sup>Musson (2012) shows that corporate managers feel implicated concerning issues of sustainable development and their perceptions underline the importance of its components relative to employees, companies' image, innovation, business continuity and long-term performance.

<sup>11</sup>this is inherent to the semi-structured interview methodology

entrepreneurs. But when we talk about the future in terms of profitability, sustainable development also appears as a recurrent factor for the future. Business leaders feel implicated in the parameters surrounding sustainable development and they note a growing importance of these issues. However, the overview continues to be clouded.

Furthermore, transport costs appear to be a significant determinant of future competitiveness. According to company directors, market access can be improved by environmental regulation for transporting goods. There is hope that regulation will help managers to rethink the production process as well how to transport goods.

Then, we refine the analysis to find out whether sustainable development is used as a marketing strategy, a financial pressure, an important issue, or a strategic challenge? To answer these questions, we analyze the following open questions:

“What is sustainable development for you?”; “Do you have information concerning how to measure it, or any collective actions about it?”; What is the link between firms and sustainable development?”.

All business leaders have their own definition of sustainable development but each offers a different explanation. Some directors mention three themes (economy, social, environmental), others add the societal one; but many entrepreneurs only mention the environmental aspect.

According to the textual analysis, we identify three kinds of discourses. Answers to close-ended questions should discriminate and classify the different kinds of discourses identified through the textual interview analyses. In this way, we determine if the representation of sustainable development differs, according the following parameters:

- Whether or not the company is a subsidiary. This allows us to tackle the international dimension of firms (related to FDI and openness).
- Whether or not the company is affected by the French regulation “Installations Classified for the Protection of the Environment” This ICPE law refers to specific norms applied to firms presenting environmental risks.
- Whether the catchment area of the company is local, national or international. It helps to discriminate exporter firms.

With a descending hierarchical classification, the software was able to analyze 78% of the corpus.

Figure 1

The text processing identified the presence of different discourses, each identifying a class that reflects different profiles of respondents. These classes are represented by colored circles, whose shapes are dictated by the positioning of the speech relative to the axes of the graph (Figure 1). The larger area the circle has above the left horizontal axis, the more the group establishes a concrete perception. The further it moves along the horizontal axis towards the right, the more frequently the interviewees evoke abstract notions. Words in black indicate the speech of each class, followed by the name of the class, in italics.

Evidently, company directors all have an idea of what sustainable development is, but with the exception of class 3 (accounting for 62% of classified statements), their perception is generally speaking muddled. Class 3 people, called the "Academic Depiction" class, announce a global and common definition of sustainable development through its three pillars ("environment", "social", "economy"), these being the source of "balance" for "society" as a whole, with no one pillar gaining supremacy over the others ("it is development with shared objectives assuring a fair balance between matters environmental, social and economics"). Generally speaking, these CEOs seem to have a global vision of and for the company, as contacts with stakeholders regarding sustainable development are one of their significant characteristics.

We have to underline that business leaders from this group manage a firm working on an international scale, and are often subsidiary companies. They differ from members of class 1 along the horizontal axis, because they have a depiction of sustainable development that is altogether more abstract: this is the "Individual Depiction" group. Indeed, they explained their personal vision of sustainable development individually, far from the common definition that uses the three pillars notion. This is illustrated by the following quote:

I don't really know the true definition of sustainable development. So I'll picture it. [...]It's about creating, developing things by trying to take the future into better account for what we call "the planet", rather for what is left of the planet

Explanations are then rather abstract with specific vocabulary, words like "do", "thing", "really", etc. Respondents use examples to explain the notion of sustainable development.

Lastly, class 2, the "Business Depiction", differs from the others along the vertical axis: the definition is focused. As the group's title suggests, these business managers see sustainable development through the economic pillar, using words such as "price" and

“expensive”. They do not consider it just as an obligation, but also as an opportunity and an innovation factor. They used the following vocabulary: “research”, “growth”, “skills”, “model”, “improvement”. These words evoke the necessity of a business to work in favor of the environment, and as a proof of this, these business directors often supervise companies under the French regulation “Classified Installations for the Protection of the Environment” (the ICPE law).

Obviously, entrepreneurs’ depictions are heterogeneous, and not only through their opinions concerning sustainable development. When we asked about a territory’s attractiveness factors for companies, some business leaders mention the quality of life and the territory’s image; while others evoke the personal attachment to a place. Different CEOs put emphasis on the workforce and others insisted on a set of rational factors.<sup>12</sup> In particular, what we discovered in this study is that the CEOs who highlight the workforce as the major attractiveness’ factor, are running subsidized companies, operating in the international area. Moreover, when we asked about business performance improvement priorities, CEOs with subsidiaries emphasize facing all competitiveness constraints (with environmental regulation being one of them), whereas CEO’s working at an international level develop around the theme of innovation<sup>13</sup>

We may imagine that beyond their environmental and civic awareness, if entrepreneurs consider “ecological modernization”, firstly as a cost, therefore leading to a possible source of job destruction, it is also a long-term investment (for the same assessment about CEOs from UK SME, see Petts, 2000). Currently, regulatory strategies can encourage the adaptation of firms to new business issues and innovation challenges i.e, sources of job creation, achieving environmental protection at the same time (Petts, 2000, Flynn and Baylis, 1996; Hajer, 1995; Weale, 1992). Lastly, the role of government also has different aims depending on the business leaders’ perception, from a mere public service to a strong partner (Musson, 2012). Three results are particularly relevant to our question (is environmental regulation detrimental for employment?):

1. Business leaders discourses concerning sustainable development and territories’ attractiveness are heterogeneous;
2. Business leaders working at an international level have a convergent point of view regarding sustainable development that converges toward the academic point of

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<sup>12</sup>Details of textual analysis available upon request.

<sup>13</sup>Details of textual analysis available upon request.

view (class 3). They also associate, more than others CEOs, attractiveness and competitiveness with the quality of workforce and innovation.

### 3. Business leaders seem to be ready to support more environmental regulation.

The first result is problematic for public policies, at least from a theoretical point of view. Since Arrow (1951), economists assert that optimal public choice is hard to reach in the presence of heterogeneous preferences. About the empirical analysis (next section), this heterogeneity implies that non linear relationships between attractiveness and environmental norms can be found by aggregating different points of view.

The second result is maybe the most interesting since it reveals that entrepreneurs working in firms with a multinational market have the most general view of sustainable development and are also open to the idea of regulation. This leaves room to introduce environmental norms in sectors which are often considered by policy makers as being too footloose to be regulated. The last result confirms this statement.

These results raise environmental issues. If some entrepreneurs claim "to expect more environmental regulation" in order to introduce sustainable development into their organization,<sup>14</sup> at the same time, they complain about administrative constraints. Thus, it appears crucial for public choices to check to what extent environmental regulation can be a source of relocation or job creation.

## **3.2 Environmental reputation and profitability: non-linear relationship**

Here we investigate how the reputation/image of the firm matter for entrepreneurs. The idea behind this investigation is to evaluate if regulation by improving environmental reputation can be recommended.

We find that even entrepreneurs from very small businesses, consider that reputation and image affect their profitability, but once again, in several ways. Some spontaneously evoke sustainable development and corporate strategies. Many other emphasize the image of "territory" and "close neighborhood reputation". In this way, 22 business leaders out of 36 (our sample) state that the presence of polluting firms can be an obstacle to their settlement choice. However 30 out of 36 affirm that the presence of companies who are involved in sustainable development is an attractiveness factor. It seems from

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<sup>14</sup>They explained that without laws, they wouldn't do it, either because they don't have time, due to lack of information, or due to other priorities.

entrepreneur's discourses that there are external economies of scale in terms of environmental reputation which generates a virtuous circle in terms of attractiveness. Here we find the Marshallian industrial district idea applied to sustainable development.

When we asked the 36 entrepreneurs to what extent, on a scale from 1 to 7, the image and the reputation of their company affected their profitability, they indicated a strong link but answers appear heterogeneous (Figure 2). That is particularly the case with environmental and social issues; due to consumers' susceptibility, even small businesses have to taken an interest above and beyond existing norms<sup>15</sup>.

Figure 2

Mark five is the most frequently given mark, followed by 6 and then 4. Results follow a bell-shaped distribution (bold curve). In the same way, we asked business leaders about the links between a territory's image and the firms' profitability. Answers appear heterogeneous. For a large majority, entrepreneurs devoted a great importance to the image of their location choice, excepted for one kind of discourse arguing the corporate image is the most important. Generally speaking, the territory's image, as the sustainable development issue, appears preponderantly problematic for business leaders as they meet with difficulties to have a real sustainable development behavior. In particular business leaders may be restrained by the cost and personal involvement required: "sustainable development in my company, yes...but as long as it doesn't cost too much".

## 4 Empirical analysis

### 4.1 Strategy

We now want to test the truth of these statements with an empirical and exhaustive study on French industries. In particular it has been shown from a group of 36 CEOs that sustainable development is increasingly relevant when it comes to the competitiveness and attractiveness of territories. However, we also underlined the heterogeneity of business leaders' points of views and show that entrepreneurs, as a group, may support environmental regulation but up to a threshold. This was particularly suggested by the illustration of bell-shaped relationship between reputation and profitability.

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<sup>15</sup>For example, following the 2013 horse meat contamination scandal in Europe, the French company Spanghero had to do away with 240 jobs in May 2013. This example is all the more noteworthy in that the Spanghero characteristics meet our criteria used to build our judgment sample.

The following analysis is useful in terms of extrapolation to generalize results. Furthermore, one can suspect that the discourse of managers (espoused theory) differs from their choices in practice (Argyris and Schön, 1978, 1996). Thus, it seems interesting to test previous results in light of a large dataset.

To guide our empirical analysis we rely on the New Economic Geography (NEG) which seems to fit well with particular results obtained in the previous part. An important contribution of the NEG is to assert that the spatial organization of individuals can generate an agglomeration rent. This rent comes from increasing returns and a large market where pecuniary externalities and product differentiation are prevailing. The NEG emphasizes the market access as a central element of the agglomeration rent. Many of these features are characteristic of the imperfect competition in which the 36 CEOs interviewed evolve. The previous section has shown that the market access was indeed a serious concern for entrepreneurs. The reputation of the territory also seems to be viewed as a rent by many entrepreneurs.

The existence of this rent has many implications regarding public policies. For instance Baldwin and Krugman (2004) show that classical results regarding tax competition can be challenged.<sup>16</sup> Indeed the presence of this rent allows rich countries to maintain a higher tax rate on mobile activities than on the periphery. This result has obvious implications for the Pollution Haven Hypothesis (PHH), higher environmental norms can be set in rich countries without fear of relocation,<sup>17</sup> at least if trade integration between the core and the periphery is not too deep. Indeed another contribution of the NEG is to show that this agglomeration rent follows a bell-shaped relationship with trade integration.<sup>18</sup> This means higher environmental regulation can have no effect on activities in the first step of trade integration but on the other hand, if trade openness is too high, can lead to relocation of firms in pollution havens. We do not test this theory here, however we take it as an indication that environmental regulation and trade integration can have non linear effects on employment and FDI outflows. This seems all the more relevant that the previous section based on the CEOs' interviews emphasizes the idea that entrepreneurs have

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<sup>16</sup>See Baldwin et al (2003) and Candau (2008.a) for surveys of the literature regarding public policies in the NEG.

<sup>17</sup>See Zeng and Zhao (2009) who demonstrate that agglomeration forces can alleviate the problem of relocation in to polluted sites.

<sup>18</sup>Candau (2008.b) derives conditions of this agglomeration rent in a model with urban features. It demonstrates that the hump-shaped agglomeration rent holds when urban costs are not too high. Otherwise the agglomeration rent is declining with trade integration which echoes to relocation of firms from Japanese big cities described by Fujita et al. (2004).



heterogeneous points of view regarding environmental regulation. Thus the aggregation of their reactions in terms of employment and relocation can be non linear.

Employment and relocation of firms were at the heart of many of the entrepreneurs responses. As a result we choose to analyze the ratio of French employment at date  $t$  in the industry  $k$  to FDI from  $i$  to  $j$ . In short, our dependant variable is  $EMP_{itk}/FDI_{ijt}$ . This ratio is very interesting regarding policy reforms such as environmental regulations that bring about high level of employment and simultaneously few FDI outflows are interesting. However one can remark that FDI outflows are not necessarily detrimental. Indeed, studies that only focus on relocation toward polluted sites may miss the link that employment and FDI's can be complementary. The relocation of capital can create specialization opportunities and new jobs by creative destruction.<sup>19</sup> In brief, the increase of this ratio allows the analysis of cases where environmental regulations create more employment than FDI outflows and/or cases where they reduce sharply relocations in comparison with employment.

Regarding explanatory variables, the market access is required both by the theory and by individual interviews. However introducing environmental regulation in the estimation raises problem of endogenous bias, indeed environmental norms can be endogenous to globalization. Furthermore trade costs and environmental norms are hardly distinguishable from a theoretical point of view (see Appendix A for an illustration). To face these issues, we use these two variables in interaction. Quite naturally, our estimation takes a gravity form to explain employment on bilateral capital outflows by environmental and bilateral trade integration. These variables enter multiplicatively in a quadratic way in this equation to test the bell-shaped curve predicted by the theory:<sup>20</sup>

$$\begin{aligned} \ln \frac{EMP_{itk}}{FDI_{ijt}} = & \beta_1 POP_{it} + \beta_2 POP_{jt} & (1) \\ & + \beta_3 REG_{itk} \phi_{ijtk} + \beta_4 (REG_{itk} \phi_{ijtk})^2 \\ & + \beta_5 \ln REG_{itk} + \beta_6 \ln REG_{jtk} \\ & + \beta_7 Z_{ijtk} + \alpha_j + \alpha_t + \alpha_k + \varepsilon_{ijtk} \end{aligned}$$

where  $POP_{it}$  and  $POP_{jt}$  are population in countries  $i$  and  $j$ , considered as exogenous prox-

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<sup>19</sup>This is not too far from Grossman and Rossi-Hansberg (2008) where relocation of low-skilled tasks can provide productivity gains *via* specialization on comparative advantages.

<sup>20</sup>In Appendix A we made a simple exercise to illustrate theoretical findings and to justify this empirical equation.

ies for market sizes and market crowding effects.<sup>21</sup>  $EMP_{itk}$  and  $REG_{itk}$  denote respectively the level of employment and environmental regulation in France (represented by subscript  $i$ ) in industry  $k$  at time  $t$ .  $\phi_{ijt}$  is an index of trade integration between  $i$  and  $j$  in the industry  $k$  at date  $t$  (or equivalently an index of trade costs,  $\tau_{ijt}$ , depending on the data used).  $REG_{jt}$  is a proxy for environmental regulation in country  $j$  and date  $t$ .

Since our estimated equation looks like a gravity equation, we follow this literature by introducing fixed effects to control for partners, time, and industries characteristics ( $\alpha_j, \alpha_t, \alpha_k$ ).<sup>22</sup> Lastly,  $Z$  is a vector of controls, including the numbers of firms by sectors in France, denoted  $n_{ik}$ , to control for competition; the numbers of cities in  $j$ ,  $c_j$  and standard dummies reflecting variables that impact FDI flows such as colonial links,  $col_j$ , and common language,  $lang_j$ .

Regarding the bilateral trade costs we chose to approximate it successively by three kinds of variable. First, by an indicator of trade openness directly computed from trade flows:<sup>23</sup>

$$\tau_{ijk} = \left( \frac{x_{iik}x_{jjk}}{x_{ijk}x_{jik}} \right)^{1/[2(\widehat{\sigma}_{ik}-1)]} - 1, \quad (2)$$

where  $x_{ijk}$  are bilateral trade flows between France ( $i = France$ ) and  $j$  in industry  $k$  (at year  $t$  but the subscript has been dropped for convenience). The parameter  $\widehat{\sigma}_k$  is the French trade elasticity of substitution estimated by Broda and Weinstein (2010). The term  $\tau_{ijt}$  measures bilateral trade costs relative to domestic trade costs.

This indicator measures trade integration by sectors and by partners. The obvious drawback is endogeneity bias since this index can be correlated with environmental regulations and omitted variables. As a robustness check we used distance between partners which have the advantage to be exogenous. Lastly a broader definition of trade costs is

<sup>21</sup>According to the NEG more population favors demand (market access effect) but fosters competition (market crowding effect).

<sup>22</sup>In other terms we control for country specific characteristics invariant in time. By definition, we have no heterogeneity on  $i$  because  $i = France$ . Furthermore, heteroskedasticity is suspected and thus the errors may be not IID. Consequentially we use clustering standard errors at the sectoral level as recommended by Moulton (1990) when data are aggregated (which is the case here) because it is likely that the error terms for firms inside the same sector can be not independent.

<sup>23</sup>This indicator of trade frictions has been proposed by Head and Ries (2001) to analyze trade between Canada and the USA while Head and Mayer (2004) used it to analyze the link between firms' agglomeration and trade liberalization in France, Germany, Canada and the USA. Such a measure has also been used to study the relationship between trade liberalization and tax competition by Exbrayat (2009). Lastly, Novy (2009) obtained a similar trade costs indicator based on Anderson and Van Wincoop (2003), Helpman et al. (2008), Melitz and Ottaviano (2008) theoretical models.

taken by a measure of market access derived from gravity equations. More precisely we use two different indices of the Real Market Access (RMA) proposed by Redding and Venables (2004) and Head and Mayer (2004). These variables are computed from estimation of partners' fixed effects explaining bilateral exports. Theoretically the RMA captures the capacity of country  $i$  to export in  $j$  considering incomes and price index. To compute these indicators, authors made particular assumptions regarding internal flows. Redding and Venables (2004) used internal distance while Head and Mayer (2004) used the border effects estimation. The data is presented in the following subsection.

## 4.2 Data choice

Let's start by the measure of environmental policies abroad (in  $j$ ) that inevitably brings comparability problems between countries as well as methodological issues. Indeed one needs an indicator that is exogenous to a) regulation in country  $i$ , b) to FDI from  $i$  to  $j$ . All the literature on environmental competition makes the former point practically unachievable while the literature on bad governance rejects the latter i.e. the possibility that environmental regulation is not influenced by FDI (e.g. see Cole and Fredriksson, 2009). To reduce these problems we use a broader definition for regulation than environmental regulation: the "rule of law" variable from the Worldwide Governance Indicators<sup>24</sup> available from 1996 to 2011 for 215 countries.<sup>25</sup> This variable has the advantage of respecting point a) previously presented and in the following empirical analysis we consider point b) via GMM estimators. Furthermore, this institution indicator improves the explanatory power of the model because of its significant impact on FDI<sup>26</sup>. Lastly, it is necessary to include this variable according to Smarzynska and Wei (2004) who show that the governance indicator is an important control to test the PHH. Indeed, they find that lax environmental rules are often associated with indicators of bad governance which can lead, if omitted, to misleading conclusions.

Bilateral distance and other controls (e.g. common language and colony) come from the GeoDist database of the CEPII. Trade flows come from the Trade and Production databases of the CEPII that collects international trade and measures internal flows for

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<sup>24</sup><http://info.worldbank.org/governance/wgi/resources.htm>

<sup>25</sup>According to Kaufmann et al. (2009) "rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts".

<sup>26</sup>A large literature has shown that rules of law play strongly and significantly on FDI. See Nunn (2007) and Defever and Toubal (2007) who use rules of law to control for contractual frictions.

each country from 1980 to 2006 (see Mayer and Zignago, 2011). These data sets concern 26 industrial sectors in the ISIC Revision 2 (International Standard Industrial Classification) 3-digit industry level. The country's coverage varies with production and trade (181 countries in Prod\_cepil and 231 exporters & importers in Trade\_cepil).

The indicator of trade costs is calculated from equation (2) using these two databases and is defined at the ISIC rev2 3-digit industry. Trade elasticity of substitution necessary in the calculation of (2) comes from Broda and Weinstein (2006)<sup>27</sup>. Computed in HS3 they have been changed in ISIC rev2 3-digit industry level using John Haveman classification. Bilateral outward FDI comes from Eurostat (in million ecu/euro in Financial account, Direct investment, Abroad). Populations come from the WDI database.

Data of employment and environmental regulations comes from the French industry-level data from INSEE (NES 36 classification), embodied 16 industries' sectors and 10 years (1996-2006). To assess the strength of environmental regulation, we choose to represent it by the industrial expenditures for the environmental protection available from the French Institute for Statistics. this proxy allows the identification, both formal and informal, of environmental regulations<sup>28</sup>.

Because there is no equivalence between trade flows' classification and the environmental data, we build a table of equivalence in order to merge information<sup>29</sup>. With this, the indicator of trade costs is aggregated from the ISIC rev2 3-digit industry level to the NES level by a simple average rule<sup>30</sup>.

The Real Market Access (RMA) of Redding and Venables (2004) and Head and Mayer (2004), hereafter denoted RMA-RV and RMA-HM are freely available at the ISIC rev2 3-digit industry level over the period 1980-2003 from the Market Potential database of the CEPII.

We also use the National Footprint Account, developed by Global Footprint Network, as a dummy which takes a value of 1 when the ecological footprint for a country is not sustainable and zero otherwise. Lastly; an alternative dummy is computed from the Ad-

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<sup>27</sup><http://www.columbia.edu/~dew35/TradeElasticities/TradeElasticities.html>

<sup>28</sup>Such as costs of complying norms, lobbying and petitioning. See Cole and Elliott (2007) Pargal and Wheeler (1996) for more details.

<sup>29</sup>More precisely ISIC code (311, 313, 314) are considered as NES "B0", In a similar way following classifications definitions, we have considered ISIC(322, 324)=NES (C1), ISIC(342)=NES(C2), ISIC(356, 351, 352, 355)=NES(F4), ISIC(323 332 390)= NES(C4), ISIC(384)=NES(D0), ISIC(382)=NES(E2), ISIC(383)=NES(E3), ISIC (369 361 362)=NES(F1), ISIC(321)=NES(F2), ISIC(331 341)=NES(F3), ISIC(371 372 381)=NES(F5), ISIC(385)=NES(F6), ISIC(353 354)=NES(G1).

<sup>30</sup>See Balassa (1965) and Bouet (2000) regarding ways to aggregate trade tariffs.

justed Net Saving, provided by the World Bank that takes a value of 1 when the Genuine Saving indicator is positive and zero otherwise. While the former dummy is a measure of strong sustainability, the latter relies on a globally maintained level of capital stock (substituting kinds of capital). Consequently, if in both cases our dummies aim to treat heterogeneity, the EF is more selective than the GS excluding only a few countries (around thirty countries, e.g. the U.S. and China have a positive adjusted net saving).

To summarize, depending on our variables of trade integration, we have a data set containing employment and environmental regulations from 1996 to 2006 with a measure of trade costs based on trade flows (and distance) and from 1996 to 2003 with market access data.

### 4.3 On the positive impact of environmental regulation

Estimating equation (1) involves obvious multicollinearity problems (between regulation and regulation\*integration). To face these problems, a sequential analysis of this equation is done. Tables in the next subsection reports results focusing on environmental regulation and trade integration (i.e.  $\beta_5 = 0$ ) while here we do not consider this mixed effect (i.e.  $\beta_3 = 0$  and  $\beta_4 = 0$ ) and focus on environmental regulation alone.

Table 2 presents results without the French trade integration parameter, leaving us without control over bilateral relationships. We then introduce fixed effects on country pairs  $ij$  in each regression to solve this problem.<sup>31</sup> Column 1 shows that the effects of market sizes are consistent. A higher population in  $i$  keeps FDI outflows and/or creates employment while an increase of the foreign population is detrimental, representing either competitiveness gains abroad or the relocation of FDI to a growing market. Control for effective regulation, i.e. rule of law, is, as expected negative, as that obtained in the literature on FDI. The most striking result is the following. A one percent increase in environmental regulation, measured by the firm's environmental expenditures in euros, increases French employment and/or reduces FDI outflows by 0.32 percent.

Heterogeneity of sectors needs however to be considered. To clearly identify and to compare the effects of environmental regulations on different industries, estimations sep-

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<sup>31</sup>Actually we impose fixed effects on  $j$  but because  $i$  is France, this procedure is equivalent to control for pairs' effects  $ij$ .

arating high polluting<sup>32</sup> sectors<sup>33</sup> and low polluting sectors<sup>34</sup> are calculated. Column 2 shows regulation is not positively significant for high-polluting sectors, while Column 3 reveals that the beneficial impact of regulation lies in less-polluting sectors. It can be explained by the progress margin of environmental regulation, more extensive (i.e on many firms not polluting so much) than intensive (on a small number of big polluting firms).

Table 2

Beyond this analysis, omitted variables correlated to the explanatory variable, as well as simultaneity between employment and environmental regulation, may introduce endogeneity bias. The proxy for regulation (environmental expenditures) may be mechanically diminished by the relocation of firms. The same problem of endogeneity is driven by the potential effect of FDI on environmental policies. For instance, Cole and Fredriksson (2009) show depending on the structure of host countries' political institutions, that FDI modify the environmental regulation. While they consider the effect of inward FDI on environmental institutions in the host country,<sup>35</sup> one may transpose the analysis to France and FDI outflows. Indeed FDI outflows may favor stricter environmental rules by reducing the political weight of French lobbies defending dirty industries on the basis of job destruction (see also Cole et al. 2006).

To treat this endogeneity bias without appropriate specific instruments, we use two kinds of Generalized Method of Moments (GMM) for the dynamic panel data model: the first differences GMM estimator (in two-step)<sup>36</sup> and the system GMM estimator (Blundell and Bond, 1998). The former estimates the parametric model by first differences using lagged variables in level as instruments. The latter estimates a system of equations both in first differences and in level, by using for level equations, the first differences of the

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<sup>32</sup>Oil and Gas; Mineral Industries; Steel Industry, Metallurgy, Coke; Wood, Paper and Cardboard; Chemical and Petrochemicals

<sup>33</sup>Distinction is done following industrial atmospheric emission. We obtain a classification consistent with the literature.

<sup>34</sup>Hide and Skins Industry; Home Equipment Industries; Automotive Industry; Shipbuilding, Aerospace and Rail; Mechanical Equipment Industries; Electrical and Electronic Equipment Industries; Textile; Electrical and Electronic Compositant Industries

<sup>35</sup>In Cole and Fredriksson (2009) the PHH is proved when the number of legislative units is small because the government's degree of corruptibility appears easier. In brief, correction of the endogeneity bias proves that environmental policies have a significant effect both statistically and economically.

<sup>36</sup>In comparison to one-step GMM (see Arellano and Bond, 1991) where standard errors can be downward biased when the number of instruments is large, the two-step GMM provides robust standard errors (Roodman, 2009).

lagged variables as instruments. This last estimator is preferable here since the dependent variable (mainly employment) and the independent variables (e.g. rules of law) are persistent (see Blundell and Bond, 1998).

In all regressions we assume endogeneity for regulation (two years lag), weak exogeneity of rules of law (one year lag) and strict exogeneity for population. Moreover time effects are included as well as sectoral fixed effects to treat heterogeneity previously mentioned. Furthermore because too many instruments introduce bias in standard errors and misleading results in overidentification tests, they are automatically collapsed in all regressions (see Roodman, 2009).

Column 1 of table 3 reports results with the two-step difference GMM and shows environmental expenditure instantaneously creates employment (i.e. in the same year  $t$ ) while long term effect are not significant (i.e. expenditure at  $t - 2$  does not impact on employment at  $t$ ).

Table 3

Column 2 confirms these results with the system GMM estimator. Surprisingly the effect of environmental regulation is the strongest here (0.66 versus 0.32 with OLS).

Because rules of laws are not re-defined every year we remove this variable to increase observations (Column 3). This last analysis presents short term effects of environmental regulation on employment by FDI outflows that are quite close to previous estimates.

#### 4.4 Environmental regulation and globalization

In this section our main goal is to present results for both environmental regulation and trade integration since these two variables matter for the understanding of the PHH.

Table 4, first column, presents results with the indicator of trade openness obtained from Equation (2). A reversed U-curve between environmental regulation and employment appears ( $\beta_3 > 0$  and  $\beta_4 < 0$ ).

Obviously, we do not expect this bell-shaped curve to be obtained on average if we control for partners' characteristics. Quite the contrary, we suspect that this relationship is obtained for a subset of countries: developing countries where environmental rules are lax. To treat heterogeneity, we thus make selection sample by constructing a dummy that has a value of 1 when the ecological footprint is positive and zero otherwise. This dummy is then used in interaction with trade openness indicators and environmental

regulations<sup>37</sup>. Column 2 reports results are consistent with previous findings. To check for the last time, we construct a second dummy based on the Genuine Savings indicator (Column 3). Like with the Ecological Footprint, here the main goal is to treat heterogeneity (fixed effects on partner countries are used in the next regression). This variable has the advantage of already being defined for many countries. Column 3 shows the regulation in France, complemented by more integration with countries that display positive Genuine Savings can create jobs until a critical point before verifying the PHH.

Table 4

Results are robust to change in the indicator of openness. Instead of the trade freeness indicator we use distance between France and its partners in Column 4. This change has the drawback of being less accurate, because it is not defined for the industrial sector, but distance in kilometers is exogenous to employment and FDI. Moreover this exogeneity allows the introduction of various controls with few risk of multicollinearity. In particular, we introduce traditional gravity dummies such as common language and past colonial links. We also add the number of firms ( $n_{ik}$ ) to partially control for domestic competition in each industry  $k$ . Lastly, we introduce the number of cities as a complementary and partial control for the size of partners. The negative sign behind the square of regulation and distance is still obtained in Column 4. Column 5 uses the same variables as the previous regression (in particular distance) but restricts the sample to 1996-2003. Surprisingly, the bell-shaped relationship is still detected through this shorter period.

To check once again if our definition of globalization drives our result; we use the market potential computed over the period 1996-2003, instead of using distance.

Regressions presented in columns 1 and 3 of Table 5, where the Real Market Potential is used (see respectively Redding and Venables (2004) and Head and Mayer (2004)), contrast with previous results. Indeed a U-curve is significantly found. From this result, two conclusions arise:

1. The reversed U-curve depends on the measure of globalization;

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<sup>37</sup>The equation estimated thus becomes:

$$\ln \frac{EMP_{itk}}{FDI_{ijt}} = \beta_1 POP_{it} + \beta_2 POP_{jt} + \beta_3 emp_j * REG_{itk} \tau_{ijtk} + \beta_4 \left( emp_j * REG_{itk} \tau_{ijtk} \right)^2 \quad (3)$$

$$+ \beta_7 Z_{ijtk} + \alpha_t + \alpha_k + \varepsilon_{ijtk} \quad (4)$$



2. There are U-curves and bell-shaped curves in the data depending on trading partners.

We studied evidence for the latter argument. Once heterogeneity is treated by using the Ecological Footprint dummy, the bell-shaped relationship is again obtained. Similar results are found with the Genuine Saving Indicator (not reported here).

Table 5

In order to check the bell-shaped relationship between environmental regulation, trade and employment, we use semiparametric estimators. More precisely we compute a Generalized Additive Models (see Hastie & Tibshirani, 1990; Racine, 2008) which are largely used in applied settings when categorical variables are not of interest. This semiparametric estimator is less demanding in terms of observations than nonparametric estimators. According to this characteristic, we estimate the following additive model:

$$\ln \frac{EMP_{itk}}{FDI_{ijt}} = \beta_1 POP_{it} + \beta_2 POP_{jt} + f(REG_{itk} \phi_{ijtk}) \quad (5)$$

$$+ \beta_3 REG_{jt} + \beta_4 Z_{ijtk} + \alpha_j + \alpha_t + \alpha_k + \varepsilon_{ijtk} \quad (6)$$

where  $f()$  is a nonparametric function of regulation and openness. To control for the heterogeneity previously detected fixed effects on partner are used (as well as control on sector and time).

All coefficients in the linear part of this equation are similar to those obtained previously (not reported here but available on demand). Figure 3 presents the nonlinear relationship between employment on FDI and environmental regulation weighted by openness.

Figure 3

As expected, a rise and fall of employment is predicted by simultaneously fostering globalization and environmental regulation.

As a robustness check of the previous subsection where we considered a linear relationship between our dependant variable and regulation alone (using OLS and GMM), we replace  $f(REG_{itk} \phi_{ijtk})$  by  $f(REG_{itk})$  in Equation (5). Figure 4 plots the result.

Figure 4

This approximately linear curve indicates that the nonlinear change of our dependant variable comes from the interaction between globalization and regulation. To maximize

employment and/or to minimize FDI outflows, policy makers need carefully to consider both environmental regulation and trade openness. Environmental regulation can be creative or destructive depending of trade integration.

## 5 Conclusion

This article presents the link between competitiveness and environmental regulation through four points of views:

1. Indicators of competitiveness;
2. Literature about PHH;
3. French Entrepreneurs;
4. Econometrical analysis on French industries.

First, we underlined the disregard or the lack of even a critical consideration of competitiveness' indicators regarding environmental regulation. That was our first issue. The paper goes on to explain that environmental regulation is a global need to fight climate change and sustainability issues. To claim that it can be bad for competitiveness or that it can lead to relocation, might be the wrong advice to give decision-makers in a long-term perspective. An even worse claim if environmental regulation turns out to be good for economic dynamism as well as the environment.

To check this hypothesis, we first study the literature, which does not clearly demonstrate the negative impact of environmental regulation, but does sometimes show the positive ones. With this in mind, we decide to focus on one country, France.

To begin our paper we first study the opinions of SME business leaders through semi-conducted interviews. Naturally, these interviews are heterogeneous and the group's discourses can be classed depending on their catchment area. If CEOs of exporters' firms seem to represent sustainable development in a different way from other entrepreneurs, all feel implicated in environmental issues. Better still, they mostly state that they are waiting for information and administrative support to do more to protect environment. Some even state that they are expecting new regulation laws. Actually, far from being a weighty burden for companies, environmental regulation can be a source of opportunity and innovation, and lead to job creation. To check this assumption, we study quantitative data on a French industrial case study. Our analysis illustrates that environmental

regulation can have diverse effects depending on the level of globalization. Considering that globalization is fast changing, both at a company level and at an industrial level,<sup>38</sup> careful studies on the most recent period concerning of our study need to be done by considering non-linear relationships as both theoretically and empirically possible.

In the first section, we ask the following question: are competitiveness indicators giving the wrong advice to policy makers? If we look at the conclusion from our French case study, the answer is yes. Indicators presented in Table 1 will lead to decision-makers being averse to environmental regulation. Indeed, in the best scenario, more rules to protect the environment may have a lesser effect on competitiveness. Nevertheless, we show that entrepreneurs feel concerned with the impact their business has on the environment, but also economic and competitiveness issues. Moreover, quantitative data on French industries prove that environmental regulation can be source of job creation.

We underline the link between environmental regulation and employment which is neither always positive nor negative: it depends on the level of globalization and the industrial sector. In the same way, we insist on the heterogeneous representations of entrepreneurs. What we really demonstrate here is the non homogeneity of answers. It is incorrect to say that environmental regulation is bad for competitiveness, as this is not the case for France. The global impact seems positive for France, but it is not the case for all firms. Then, decision-makers need to think about which firms and what types of competitiveness strategies they want to support. The limitations of the indicators previously described also need to be taken into account: all variables and political advices can not be the same for all countries. That is why involving stakeholders and using surveys are essential in the building process of an indicator. Factors of competitiveness vary across all the different entrepreneurs of the world and in the same way, well-being and happiness also have different representations depending on cultural differences. Knowing what variables to take into account for the definition of competitiveness is required before searching the corresponding relevant statistical data. Both approaches are necessary and need to be used together.

Involving stakeholders leads to a better understanding of their expectations. With the example of French entrepreneurs in mind, let's consider the case of the Red Caps. The so-called Red Caps action is a protest movement which emerged in the French Region of Bretagne in October 2013, reacting to tax incentives for vehicles transporting goods

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<sup>38</sup>At the level of firms, Baldwin (2011) for instance speaks about a revolution of trade via the international fragmentation of the supply chain. At the level of industry, Krugman (2008) shows that inter-sectorial trade is growing and that rich countries trade more and more with developing countries.

("ecotax")<sup>39</sup>. The French government postponed the law project but the Red Caps were not satisfied. At the same time, studies show that entrepreneurs had begun to adjust their strategy concerning transport: for example, some companies, even rivals<sup>40</sup>, started to use the same courier to be more efficient. It appears that 90% of entrepreneurs think that ecotax may be implemented anyway<sup>41</sup>. Finally, Red Caps seem to use the ecotax as a symbol to protest about the loss of competitiveness of the agro-industry, following the end of the European export subsidies. The irony is, the competitiveness of French agriculture needs to be reinvented, and an agriculture respecting the environment is a serious way forward.

## 6 Appendix A

In this Appendix, we present a simple exercise on the Footloose Capital of Martin and Rogers (1995). Since this model is well known and our extension can be resumed in few sentences, we do not explain the model in details but we present intermediate results. Details can be easily found in Baldwin et al. (2004, chapter 3). Our aim is to show that trade costs and regulation can theoretically take a quadratic form.

On the demand side, preferences regarding an industrial good and an agricultural good are represented by a Cobb-Douglas utility function, with  $\mu$  the preference for the industrial good. This industrial good is a composite of different varieties which have a Constant Elasticity of Substitution (CES), denoted  $\sigma$ . Regarding the supply side in the industrial sector (the agricultural good is produced under perfect competition), monopolistic competition à la Dixit-Stiglitz is assumed. We consider that regulations weight on the variable cost (regulations on the fixed costs give similar results available on demand) such as the total cost of producing  $q_i$  is given by:

$$TC_i = \alpha + \zeta_i q_i$$

with  $\zeta_i$  the environmental norm in  $i$  (and  $\alpha$  a fixed cost). To use expression similar to those presented in the text we denote  $REG_k$  the relative cost of norms in  $i$  to produce a good  $k$ , i.e  $REG_k = \zeta_i / \zeta_j$ .

<sup>39</sup><http://www.telegraph.co.uk/news/worldnews/francois-hollande/10450559/>

[Who-are-Frances-Red-Caps.html](#)

<sup>40</sup><http://www.rtl.fr/actualites/info/environnement/article/1-ecotaxe-a-deja-un-impact-sur-le-transport>

<sup>41</sup><http://www.bp2r.fr/?Sondage-bp2r-sur-les-projets-d>

Varieties are exchanged under iceberg trade costs (see Samuelson, 1954) and  $\phi_{ijk}$  is a reversed indicator of these costs representing trade openness. Firms are mobile according to profits in country  $i$  and in country  $j$  and relocation stops when:

$$\pi_{ik} = \pi_{jk}$$

Maximizing the utility function and the profit function we obtain the loss that a capital owner would incur (under the extreme stable equilibrium of capital agglomeration in  $i$ ) by relocating its capital to  $j$  in order to produce a good  $k$  is:

$$\pi_{ik} - \pi_{jk} = \frac{4\phi_{ijk}}{REG_k^{\sigma-1}(\mu(\phi_{ijk}^2 - 1) + 2(\phi_{ijk}^2 + 1))} \quad (\text{Agglomeration Rent})$$

This expression illustrates the "hump shape" of the agglomeration rent that first rise and then decline with trade costs and also justifies the consideration of trade integration and environmental restrictions in interaction in the empirical analysis. One can even remark that the quadratic form is totally justified for a particular elasticity of substitution ( $\sigma = 3$ , which is a lower bound not so unrealistic for some products, see Broda and Weinstein (2006)).

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The importance of the stakeholders'  
involvement in building indicators. The case of  
environmental regulation in France.

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April 29, 2014

TABLES AND FIGURES

Table 1: Competitiveness Indexes

Index	Organisation Involved	Calculation	Rule of Environmental Regulation
World Competitiveness Index <sup>1</sup>	IMD Lausanne	Grouping variables into topics, then weighting variables and themes	A factor among more than 300: "environmental laws". This variable is a part of the subfactor "Infrastructures", having the weight of 5% in the overall consolidation of results, This subfactor aggregate 26 variables. If regulation is assumed to be negative for competitiveness, the environmental regulation has a positive impact through business environment.
Global Competitiveness Index (GCI) <sup>2</sup>	World Economic Forum	Grouping variables into topics, then weighting variables and themes	A factor among 109: "Burden of government regulation" Regulation is assumed as negative for competitiveness
Sustainability-adjusted GCI <sup>3</sup>	World Economic Forum	(GCI*sustainability coefficient + GCI*environmental sustainability coefficient )	Two variables: <ul style="list-style-type: none"> <li>• Stringency of environmental regulation</li> <li>• Enforcement of environmental regulation</li> </ul> Both are part of all 28 variables making together the environmental coefficient. The importance of these 2 variables is really weak but environmental regulation is here something positive.
Doing Business <sup>4</sup>	World Bank	Group variables into 10 topics, then weight the variables.	Environmental regulation is not analysed.
Inward Potential Index <sup>5</sup>	UNCTAD	Average of the values (normalised between 0 and 1) of 12 variables	Environmental regulation is not analysed.

<sup>1</sup><http://www.imd.org/wcc/news-wcy-ranking/>

<sup>2</sup>[http://www3.weforum.org/docs/WEF\\_GlobalCompetitivenessReport\\_2013-14.pdf](http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf)

<sup>3</sup><http://www.weforum.org/content/pages/sustainable-competitiveness/>

Inward Potential Index <sup>6</sup>	UNCTAD	Average of the values (normalised between 0 and 1) of 12 variables	Environmental regulation is not analysed.
Index of Economic Freedom <sup>7</sup>	Heritage Foundation	Average of the values (normalised between 0 and 100) of 10 topics	Environmental regulation is not analysed but laws and taxes are assumed as a burden for competitiveness of a country.
European Cities Monitor <sup>8</sup>	Cushman & Wakefield	Crossing the criteria of attractiveness (relative importance in percentage of settlements in decisions by business leaders) and cities for each criterion.	Companies were asked to think about which factors they consider in deciding where to locate their business and the relative importance of these factors. Appear absolutely essential: <ul style="list-style-type: none"> <li>• The climate governments create for business through tax policies or financial incentives (27%)</li> <li>• The quality of life for employees (20%)</li> <li>• Freedom from pollution (19%)</li> </ul>
Perceived Attractiveness <sup>9</sup>	Ernst & Young	Surveys of the classification criteria of attractiveness and countries for each criterion.	The whole questionnaire is not available but in the report, there is nothing about environmental regulation. However, quality of life is often mentioned.

<sup>4</sup><http://www.doingbusiness.org/>

<sup>5</sup>[http://unctad.org/en/PublicationsLibrary/wir2012\\_embargoed\\_en.pdf](http://unctad.org/en/PublicationsLibrary/wir2012_embargoed_en.pdf)

<sup>6</sup>[http://unctad.org/en/PublicationsLibrary/wir2012\\_embargoed\\_en.pdf](http://unctad.org/en/PublicationsLibrary/wir2012_embargoed_en.pdf)

<sup>7</sup><http://www.heritage.org/index/about>

<sup>8</sup><http://www.europeancitiesmonitor.eu/>

<sup>9</sup><http://www.ey.com/GL/en/Issues/Business-environment/Ernst---Young-attractiveness-surveys>

Table 1: Competitiveness Indexes (3)

Dashboard of French Attractiveness <sup>10</sup>	AFII	Indicators are grouped into 9 themes.	For 2 themes (administrative and laws' environment; tax system), environmental regulation can be a burden for competitiveness, while it can be positive for the themes of quality of life and green growth.
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<sup>10</sup>[http://www.invest-in-france.org/Medias/Publications/1461/TDB%20FR%202011\\_OK.pdf](http://www.invest-in-france.org/Medias/Publications/1461/TDB%20FR%202011_OK.pdf)



Var dep : $\ln(\text{EMP}_{itk}/\text{FDI}_{ijk})$	All sectors	High-Polluting sectors	Low-Polluting sectors
<b>Intercept</b>	-12,35 (0,00)***	3,68 (0,00)***	-12,35 (0,00)***
<b>French Population (POP<sub>it</sub>)</b>	0,06 (0,00)***	0,03 (0,00)***	0,06 (0,00)***
<b>Partner Population ( POP<sub>it</sub>)</b>	-0,13 (0,04)**	-0,17 (0,07)*	-0,13 (0,04)**
<b>Regulation (ln REG<sub>itk</sub>)</b>	0,32 (0,10)**	0,27 (0,18)	0,32 (0,10)**
<b>Rule of Law</b>	-0,26 (0,14)***	-0,78 (0,11)***	-0,26 (0,14)
<b>Past colonial ties</b>	1,59 (0,08)***	1,51 (0,27)***	1,59 (0,08)***
<b>Common official language</b>	-2,29 (0,06)***	-2,63 (0,38)***	-2,29 (0,06)***
<b>Number of cities</b>	-0,80 (0,05)***	-0,70 (0,07)***	-0,80 (0,05)***
<b>Temporal Fixed Effects (t)</b>	YES	YES	YES
<b>Country pair Fixed Effects (ij)</b>	YES	YES	YES
<b>R<sup>2</sup>/ Adjusted R<sup>2</sup></b>	0,78	0,77	0,82
<b>Number of Observations</b>	4117	2080	2037

*OLS estimator. \*, \*\*, \*\*\* critical value of the significance level at 10%, 5%, 1%  
Robust standard errors, adjusted for clusters, in parentheses.*

Var dep: Employment by FDI ( $\text{EMP}_{i,t,k}/\text{FDI}_{i,t,k}$ )	GMM TWO STEP		GMM SYSTEM		GMM SYSTEM	
<b>Employment by FDI, lag 1</b> $\ln(\text{EMP}_{i,t-1,k}/\text{FDI}_{i,t-1,k})$	-0.22	(0.03)***	-0.27	(0.04)***	0.22*	(0.08)***
<b>Regulation (ln REG<sub>i,t,k</sub>)</b>	0.56	(0.18)***	0.66	(0.22)***	0.90	(0.39)**
<b>Regulation, lag2 (ln REG<sub>i,t-2,k</sub>)</b>	-0.30	(0.32)	0.01	(0.44)	-0.45	(0.32)
<b>Rule of Law</b>	-0.09	(0.71)	0.17	(1.05)		
<b>French Population (POP<sub>it</sub>)</b>	-0.18	(0.02)***	-0.15	(0.03)***	-0.01	(0.04)
<b>Partner Population ( POP<sub>it</sub>)</b>	3.11	(0.38)***	-4.44	(4.25)	-0.01	(1.77)
<b>Temporal fixed effects (t)</b>	YES		YES		YES	
<b>Sectoral fixed effects (k)</b>	YES		YES		YES	
<b>Number of obs</b>	931		2294		3066	
<b>Number of instruments</b>	31		37		29	
<b>Number of groups</b>	413		681		681	
<b>AR(1)</b>	-3.84***		-1.84*		-7.45***	
<b>AR(2)</b>	-0.22		-0.78		-0.92	
<b>Hansen test (excl group)</b>	95.71***		105.98***		26.22***	
<b>Sargan test of overid</b>	34.82***		170.12***		34.82***	
<b>Hansen test of overid</b>	109.29***		105.98***		26.22***	
<b>F-test</b>	69.35***		17.80***		11.01***	

*\*, \*\*, \*\*\* critical value of the significance level at 10%, 5%, 1%  
We use two-step difference GMM and one-step system GMM-Estimation. We adopt the assumption of weak exogeneity of law and strong endogeneity of environmental regulation. Instruments are collapsed by following Roodman (2009)*

**TABLE 4**

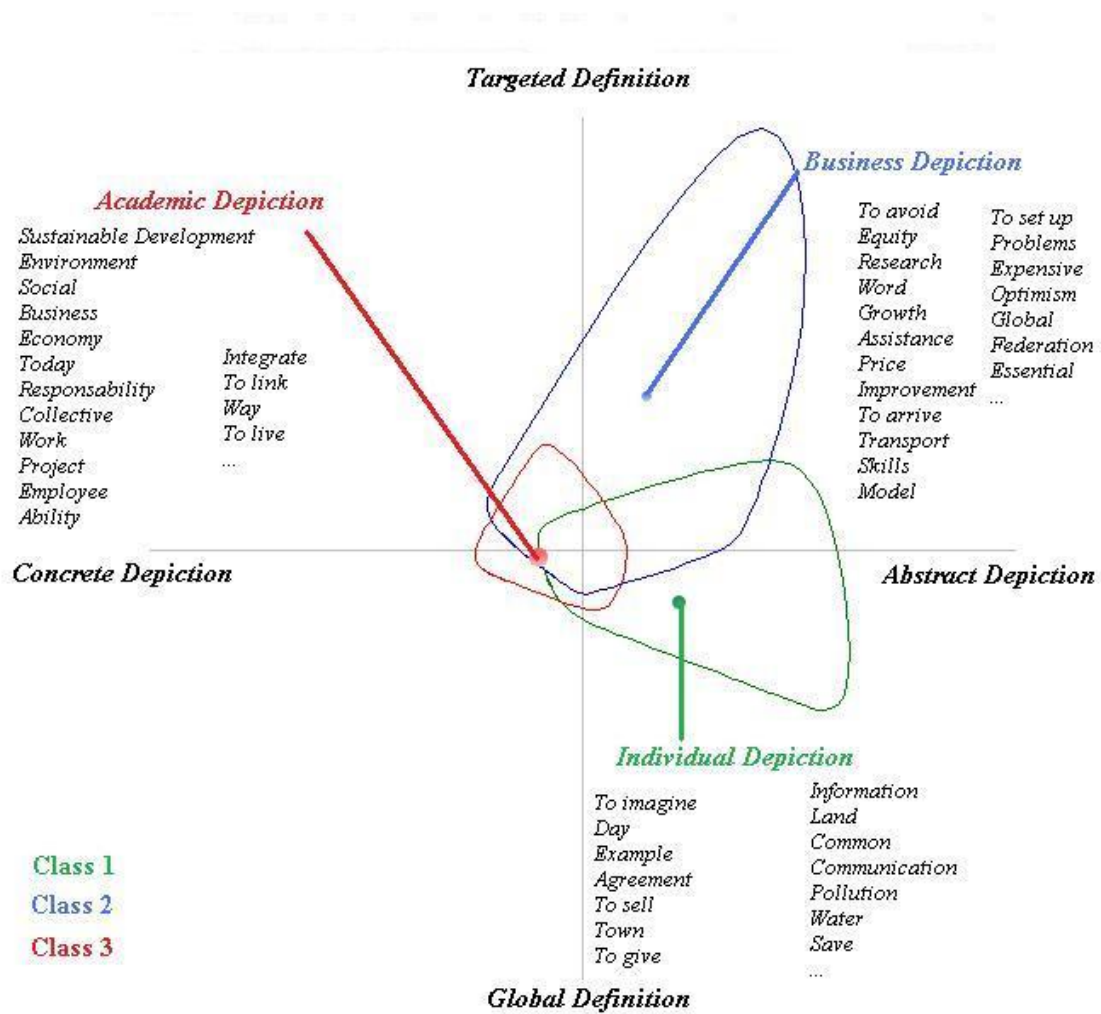
Var dep : $\ln(\text{EMP}_{itk}/\text{FDI}_{ijk})$	1	2	3	4	5
<b>Regulation*Openness</b> ( $\text{REG}_{itk} * \text{phi}_{ijk}$ )	5,15 (0,00)***				
<b>Square of Regulation*Openness</b> ( $\text{REG}_{itk} * \text{phi}_{itk}$ ) <sup>2</sup>	-1,30 (0,10)***				
<b>Regulation*Distance</b> ( $\text{REG}_{itk} * \text{dist}_{ij}$ )				1,00 (0,14)***	0,67 (0,13)***
<b>Square of Regulation*Distance</b> ( $\text{REG}_{itk} * \text{dist}_{ij}$ ) <sup>2</sup>				-0,23 (0,03)***	-0,15 (0,03)***
<b>Ecological Foot-print* Regulation*Openness</b> ( $\text{Eco Foot-print}_i * \text{REG}_{itk} * \text{phi}_{itk}$ )		5,71 (1,11)***			
<b>Ecological Foot-print* Square of Regulation*Openness</b> ( $\text{Eco Foot-print}_i * (\text{REG}_{itk} * \text{phi}_{itk})^2$ )		-2,62 (0,78)***			
<b>Genuine Saving* Regulation*Openness</b> (Genuine Saving <sub>i</sub> * $\text{REG}_{itk} * \text{phi}_{itk}$ )			5,69 (0,39)***		
<b>Genuine Saving * Square of Regulation*Openness</b> (Genuine Saving <sub>i</sub> * $(\text{REG}_{itk} * \text{phi}_{itk})^2$ )			-1,44 (0,13)***		
<b>Firms</b>				-0,08 (0,00)***	
<b>Colony</b>				-0,61 (0,16)***	
<b>Common language</b>				-0,79 (0,15)***	-0,50 (0,17)***
<b>Citynum</b>				0,04 (0,03)***	0,04 (0,02)***
<b>Rule of Law</b>	-1,11 (0,01)***	-1,13 (0,01)***	-1,11 (0,01)***		
<b>Intercept</b>	-70,20 (23,46)**	-117,21 (12,57)***	-88,38 (18,48)***	-158,66 (13,12)***	-44,34*(6,07)
<b>French Population</b> ( $\text{POP}_{it}$ )	0,12 (0,03)***	0,20 (0,02)***	0,15 (0,03) ***	0,26 (0,02)***	0,08 (0,01)***
<b>Partner Population</b> ( $\text{POP}_{jt}$ )	-0,22 (0,00)***	-0,22 (0,01)***	-0,22 (0,01)***	-0,11 (0,01) ***	-0,09 (0,01)***
<b>Temporal Fixed Effects</b>	YES	YES	YES	YES	YES
<b>Sectoral Fixed Effects</b>	YES	YES	YES	YES	YES
<b>R<sup>2</sup>/ Adjusted R<sup>2</sup></b>	0,33	0,32	0,33	0,41	0,39
<b>Number of Observations</b>	4111	4111	4111	3571	2630

OLS estimator. \*, \*\*, \*\*\* critical value of the significance level at 10%, 5%, 1%. Robust standard errors, adjusted for clusters, in parentheses.

**TABLE 5**

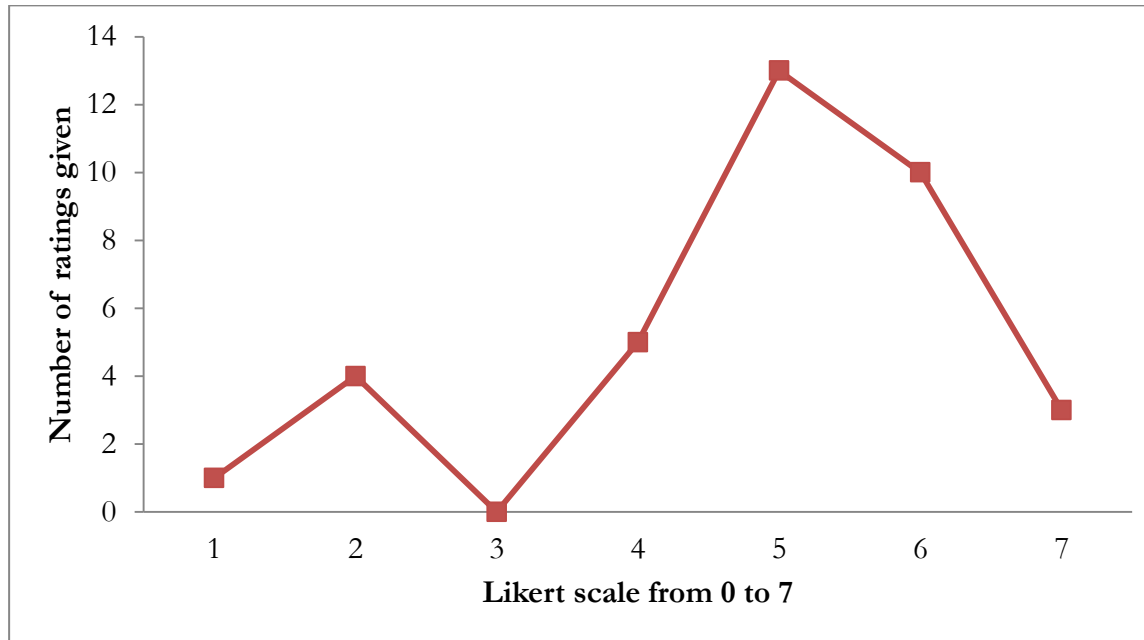
Var dep : $\ln(\text{EMP}_{itk}/\text{FDI}_{ijk})$	1	2	3	4
<b>Intercept</b>	-22,26 (5,99)***	-22,37 (6,71)***	-19,52 (6,56)**	-22,53 (6,89)***
<b>French Population</b> ( $\text{POP}_{it}$ )	0,04 (0,01)***	0,04 (0,01)***	0,04 (0,01)***	0,04 (0,01)***
<b>Partner Population</b> ( $\text{POP}_{it}$ )	-0,07 (0,01)***	-0,06 (0,01)***	-0,06 (0,01)***	-0,06 (0,01)***
<b>Regulation and Openness (Redding Venables)</b> ( $\text{REG}_{itk} * \text{Real Market Potential}_{RV_{itk}}$ )	-44 (1,81)**			
<b>Square of Regulation and Openness (Redding Venables)</b> ( $\text{REG}_{itk} * \text{Real Market Potential}_{RV_{itk}})^2$ )	1,67 (0,62)**			
<b>Eco foot-print*Regulation and Openness (Redding Venables)</b> ( $\text{Eco foot-print} * \text{REG}_{itk} * \text{Real Market Potential}_{RV_{itk}}$ )		0,45 (12,56)***		
<b>Eco foot-print*Square of Regulation and Openness (Redding Venables)</b> ( $\text{Eco foot-print} * (\text{REG}_{itk} * \text{Real Market Potential}_{RV_{itk}})^2$ )		-2,65 (-10,87)***		
<b>Regulation and Openness (Head Mayer)</b> ( $\text{REG}_{itk} * \text{Real Market Potential}_{HM_{itk}}$ )			-0,04 (0,01)***	
<b>Square of Regulation and Openness (Head Mayer)</b> ( $\text{REG}_{itk} * \text{Real Market Potential}_{HM_{itk}})^2$ )			0,04 (0,00)***	
<b>Eco foot-print*Regulation and Openness (Head Mayer)</b> ( $\text{Eco foot-print} * \text{REG}_{itk} * \text{Real Market Potential}_{RV_{itk}}$ )				6,30 (2,42)**
<b>Eco foot-print*Square of Regulation and Openness (Head Mayer)</b> ( $\text{Eco foot-print} * (\text{REG}_{itk} * \text{Real Market Potential}_{HM_{itk}})^2$ )				-9,31 (3,70)**
<b>Rule of Law</b>	-0,95 (0,03)***		-0,96 (0,02)***	-0,97 (0,03)***
<b>Number of french Firms</b>	-0,06 (0,00)***	-0,01 (0,00)***	-0,06 (0,00)***	-0,06 (0,00)***
<b>Past colonial ties</b>	-1,29 (0,26)***	-1,38 (0,26)***	-1,31 (0,26)***	-1,33 (0,26)***
<b>R<sup>2</sup> / Adjusted R<sup>2</sup></b>	0,41	0,42	0,41	0,41
<b>Number of Observations</b>	2367	2367	2367	2367
<i>OLS estimator. RV: Redding and Venables (2004), HM: Head and Mayer (2004)</i>				
<i>*, **, *** critical value of the significance level at 10%, 5%, 1% Robust standard errors, adjusted for clusters</i>				

**FIGURE 1: Depiction of Sustainable Development. Factor Analysis Details.**

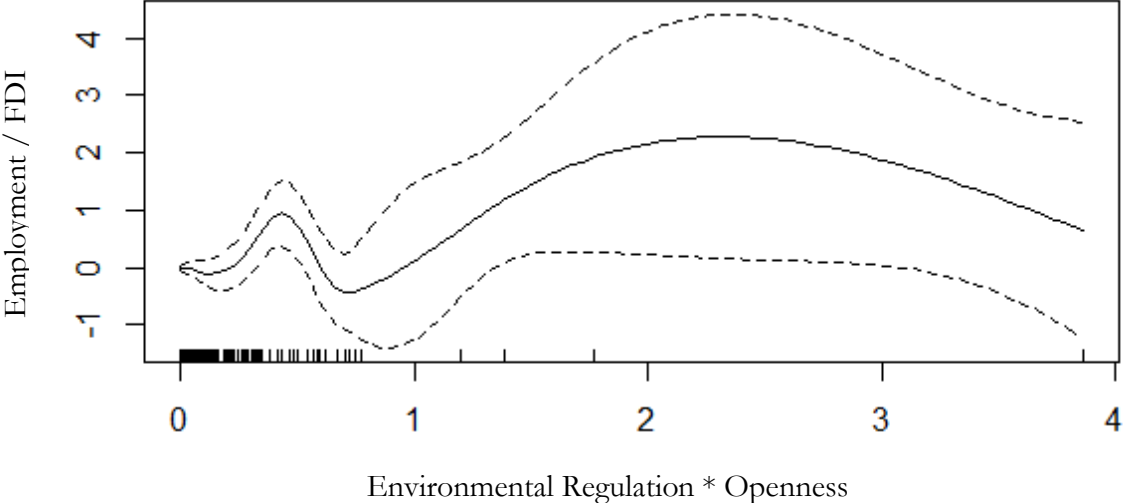


Source: Proprietary data from 16 study survey

**FIGURE 2: Links between corporate reputation and profitability of the company according to business leaders**



**FIGURE 3: Employment, Globalization and Environmental Regulation**



**FIGURE 4: Employment and Environmental Regulation**

