Master thesis

Environmental Sustainability and Firm Performance

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ABSTRACT

The presence and magnitude of business opportunities via becoming more environmentally sustainable is expected to vary greatly between firms. This study examines these differences by analysing the interaction effect of firm characteristics and sustainability on the dependent variable profit development. There are no negative relationships found between the sustainability proxy and the profit development of the firm, in fact, a significant positive relationships is detected. Furthermore, only a few interaction effects were found. Firms that communicate within the company about their sustainability efforts, and doing process innovation perform relatively better in terms of profit development. Furthermore, the results from this sample indicate that communicating towards the costumers about their sustainability efforts is especially beneficial for firms producing computer and electronics related products and companies producing electronically equipment and machinery. Given the exploratory purpose of this paper, additional research is advised in order to further interpret these results.

1 Introduction

Conventional wisdom dictates that being or becoming more sustainable means incurring costs. Indeed, many economic agents are assumed to focus on short term profits rather than on a long term change towards environmental sustainability which they associate with increasing costs and a loss of previous investments. The increasing societal attention for sustaining the environment has moderated this belief, however, also created profitable business opportunities. The presence of these business opportunities however strongly differs per firm. The business environment a firm is operating in and the firm specific characteristics are likely to have an influence on the frequency and magnitude of profitable business opportunities in becoming more sustainable. Orlitzky et al. (2003) conclude that the sustainability issue may be an organizational resource that provides internal or external benefits, or both. This implies that even though companies are striving for profit only, being more sustainable can actually aid them in doing so. However, it remains unclear what role the characteristics of the firm play in profitably exploit a sustainability business.

This paper will focus on the following research question:

> *Which types of firm experience a more positive relationship between sustainability and profit development,, and what is the role of the communication of sustainability in this regard?*

The type of firm referred to in the research question is categorized by size, innovativeness, age, target group, communication of sustainability and country of origin. In scientific literature relatively few empirical studies have been published concerning these specific characteristics (the issue is a highly complex one, which makes it difficult to adequately measure sustainability at the firm level). The majority of papers in scientific journals approach this topic from a theoretical point of view. In this paper, relevant theories will be presented and, when possible, theories will be empirically tested. Given the diversity and frequent opposition of the pertinent theories, this study can to some extent be seen as exploratory in nature.

The geographical focus of this paper is towards the coastal zones of Shanghai and Rotterdam. For that purpose, data from 338 Chinese and Dutch companies has been collected which represents the center of the empirical research of this paper.

The paper is organized as follows. First, the general externality framework will be elaborated upon which describes the environmental sustainability issue from an economic perspective. This will lead up to the conceptualization of the term (environmental) sustainability used in this paper. Second, the general relation between environmental sustainability and financial performance will be discussed. Thereafter, empirics and theories will be given on which types of firm may be more likely to exploit being sustainable more profitably. Fourth, the empirical data and methodology underlying this study will be explained followed by the estimation of the results. Lastly, the results will be discussed and conclusions will be drawn followed by limitations, directions for further research and policy implications.

2   Concept of sustainability

In the last decades many different concepts concerning environmental sustainability have been constructed and promoted, with minor to significant differences in meaning and scope. This multitude of definition, which is believed to be more than 300 (Ehrenfeld, 2008), clearly indicates the complexity of the topic. In the following paragraphs a descriptive overview is given on the most relevant aspects of this issue. Furthermore, a distinction is made between ecological-economical perspectives and macro-micro perspectives.

Most definitions and frameworks surrounding environmental sustainability view the world from a macro perspective. However, the underlying study of this paper is aimed at a firm level, implying a micro perspective. Note that, because of the interconnectedness of various aspects in macro and micro dimensions, a combination of global perspective and firm perspective is necessary in order to obtain a holistic and more complete view on the topic (Ariff, 1995).

2.1   Economists versus Ecologists

"Ecologists look at sustainability from the point of view of an ecological system of which humans are just one part... Human interests are not regarded as paramount." (Perman et al., 2003, p. 93). Ecologists tend to view the ecological world as a stock of resources which has a 'natural growth' (i.e. a renewable resource). If in a certain period the harvest is lower than the natural growth, stock size will increase and vice versa. A 'sustainable yield' is obtained when the amount of harvest equals the natural growth. Ceteris paribus, this can be sustained indefinitely.

The maximum sustainable yield is, according to many ecologists, the ideal rate. In economics however, this is often not efficient. Economists, contrary to ecologists, regard human interest

(i.e. human utility) as the ultimate goal and ecology as a considerable constraint on human utility.

The economists' emphasis on human interest implies that, from a purely economic perspective, zero pollution does not necessarily have to be efficient, and is often arguably inefficient (Perman et al., 2003). Instead, the optimum amount of pollution can be determined in an externality framework which will be explained in the following section.

2.2 **Externalities**

The general paradigm related to environmental sustainability states that the market does not redistribute all resources in the most efficient way due to the lack in ownership rights on resources like air and water, resulting in an externality. The most often used definition of an externality is:

"An external effect, or an externality, is said to occur when the production or consumption decisions of one agent have an impact on the utility or profit of another agent in an unintended way, and when no compensation/payment is made by the generator of the impact to the affected party." (Perman et al., 2003, p. 134)

Note that this externality can be both of positive as well as negative nature and accordingly we speak of positive or negative externalities. When concerning the issue of environmental sustainability this is mostly in the context of a negative externality.

Lacking ownership rights can result in the usage of these resources at zero cost even though the actual costs are larger than zero. Here no single individual will burden the cost, but a collectivity of individuals burdens the costs. This leads to an over usage of the resource rather than a socially optima consumption.

What makes this phenomenon even more troublesome and complex is the fact that this burden often has to be carried by future generations. e.g.: The costs incurred by resource depletion will have an impact on the ability to exploit resources for future generations rather then on the generation that is creating the costs. This inter-temporal dimension of the externality makes the situation not only more complex but it also becomes an ethical issue since one has to value the future generations somehow.

The conventional solution to an externality problem is the internalization of the externality. This internalization can take place when property rights are assigned and transaction costs are not prohibitively high (Coase, 1960). These conditions are however hard to meet in the

environmental externality context. The assignment of property rights on resources like water and air would not only be unfeasible, it can also be considered immoral to own and sell resources essential to human life. In addition, since basically all people are involved in this manner, bargaining costs would be exceptionally high, making it most likely not worthwhile to internalize the externality at all. Finally, the future generations that are burdening the costs obviously are not actively able to compensate the producer of the externality.

It can thus be stated that the internalization of the sustainability problem can not take place through the conventional path. There is a substantial number of scientific papers arguing that the internalization will go by technological innovations and support a more laisser-faire policy (Anderson and Leal, 1991; Beckerman, 1974; Taylor, 1994). However, most economists acknowledge the necessity of government intervention (Weitzman, 2007). In addition, Bakel et al. (2007) states that the issue is too complex and interconnected to be solved by individual firms.

2.3   Uncertainty, irreversibility and discounting

When determining which actions to undertake in order to internalize a particular environmental externality, many complications arise. One of the most apparent issues is the anticipation of future scenarios. The ecological system is evidently an extremely complex mechanism with many interdependent factors. Scientists are not aware of many (some might argue most) of the workings of the ecological system at the current moment. Besides projections with risk there are also many consequences and situations where the outcomes are completely unknown (Knight, 1921).

It can be stated that among both scholars and managers there is very little consensus about the effect that resource depletion has on the environment (Redclift, 1989). In addition, valuing amenities like the existence of polar bears besides their role in the ecology is both practically difficult and most probably economically inefficient (one would have to inquire the value that every individual places on these amenities).

Another aspect that complicates an accurate valuation of the environment is irreversibility and the uncertainty that surrounds it. For example, when a certain species is extinct this is considered to be irreversible. Likewise, it is believed that the emission of anthropogenic greenhouse gasses can reach a threshold level after which the expected consequences are irreversible (Lyytimäki and Hildén, 2007).

As argued in Penn State (2005): *"Think about the situation where you are in a canoe on a river with a waterfall. You may want to know the location of the waterfall early enough to be able to avoid going over the waterfall. The situation for climate thresholds is similar. One may want to see early warning signals before it is too late to avoid the threshold response."*

When translating uncertainty and irreversibility to a firm perspective one could argue that the uncertain outcome of becoming sustainable mitigates the propensity of firms to actually become more sustainable. The motivation for firms to become more sustainable is however not per se profit maximization but could very well be to internalize the externality. In this line of reasoning, a firm could be willing to incur additional costs or uncertainty in order to become more sustainable. From a research perspective it is difficult to distinguish between a profit maximizing motivation and a motivation to decrease environmental impact. In section 3 a further elaboration will be given on the incentives of firms towards becoming more sustainable.

2.4 Conceptualization

As mentioned before, there are many differing conceptualizations surrounding sustainability and the environment. This may partially be attributed to the fact that it is a new normative concept (Ehrenfeld, 2008). In addition, Ehrenfeld argues that due to the ethical dimension, sustainability concepts can be seen as 'essentially contested concepts' which entails that there is *"...an ongoing, never-ending dispute about both the meaning and the degree to which one can attain whatever is named by the concept."*(Gallie, 1956, p. 97)

Given the multitude of available conceptualizations, an extensive overview is not the aim of this paper. The general externality framework as presented above is applicable to the majority of definitions. In the following part, a descriptive overview will be given of certain valuable and applicable concepts that are relevant to the scope of this research.

It can be stated that the '3P' approach (People, Planet and Profit) which describes the interdependence between social, environmental and economical aspects, is the most popular and commonly used definition to describe the sustainability externality (Kemp and Martens, 2007). In fact, from a theoretical point of view, this concept clearly encompasses the holistic and interdisciplinary approach needed for 'the sustainability problem'. However, the 3P approach has an equiproportional focus on social aspects, which is not part of the scope of this paper. Therefore the 3P approach is not suited for this study. It is being acknowledged that

social factors are interrelated (as indeed the concept of the 3P approach reflects) and this is accepted as a limitation of the study.

Goodland and Daly (1996) clearly distinguish between social sustainability, economic sustainability and environmental sustainability. While recognizing an overlap and linkages between the concepts, they maintain that the three concepts are best addressed separately. Goodland and Daly (1996) have constructed the following concept of 'environmental sustainability':

"...holding waste emissions within the assimilative capacity of the environment without impairing it. It also means keeping harvest rates of renewables to within regeneration rates." (Goodland and Daly, 1996, p. 1003).

In the literature there is still no consensus about whether to address the concept as 'sustainability' or 'sustainable development'. Ones in favor of the sustainability concept argue that sustainability should be attained and not managed (Ehrenfeld, 2008). Simply put, sustainability is a final state where consumption is not higher than growth. Even though this is the final goal, it can be argued that in order to reach this final state, many innovations and developments must take place that enable the characteristics of the 'final goal' to be unknown. Since it is unknown what the final sustainable state is exactly, it cannot be used as a practical goal. In contrast, sustainable development can be used as a target. This concept of sustainable development is most commonly defined as:

"Sustainable development is development that meets the need of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environmental Development, 1987, p. 1).

Even though the term sustainable development can be seen as a contradiction in terms (either one sustains or develops), the explanation of the term is not a paradox. It is generally accepted that the current state of the earth is unsustainable (Ehrenfeld, 2008). In this context, sustainable development would simply imply the development towards being more sustainable. Accordingly, the majority of the participating firms in this study (and around the world) are not fully sustainable. Instead, specific actions of firms towards being more sustainable have been surveyed. Thus, activities of sustainable development were measured and not whether firms are fully sustainable or not. In this context it would therefore be more appropriate to use the concept of sustainable development.

Given the purpose of this paper, a combination of the concepts 'environmental sustainability' and 'sustainable development' is most applicable. Within this configuration, which could be called 'environmental sustainable development', there is a focus on the development towards a more synergetic interdependence between the environment and the economy.

3   Firm performance and sustainability

Whether or not sustainability is an issue that humanity should be wary about and what the exact impacts on the earth are, is to some extent irrelevant when viewing strategic actions of individual firms. The fact of the matter is that sustainability is being valued by society, which enables being more sustainable in some occasions a preferred strategic action for firms (irrespective of what the actual consequences are in sustaining the planet). Society is increasingly willing to pay a premium for more sustainable products creating opportunities for businesses to increase their performance.

In this manner performance can be measured in several ways. Financial performance is commonly used as a general measure of a firm's overall financial health over a given period of time. Although there are multiple measures of financial performance (Capon et al. 1990), in this study financial performance will be measured solely by the profit development of the firm.

As Waddock and Graves (1997) displayed, there are three perspectives explaining the relation between environmental and financial performance: (1) A "negative association", where superior environmental performing firms incur a competitive disadvantage due to a higher cost that is required for enhanced environmental performance; (2) a "neutral association", where there is no causal linkage between environmental performance and financial performance; and (3) a "positive association", which suggests that there is a financial reward to superior environmental performance.

3.1   A negative association

Given the theoretical externality framework it can be seen as surprising that there is a relatively limited amount of empirical results indicating a negative association between environmental and financial performance. Jaggi and Freedman's (1992) study of 13 pulp and paper companies found a relatively small negative, but significant, relationship between environmental and financial performance in the short run. Wagner et al. (2001) found a significant negative relationship as well.

The most straightforward barrier towards environmental sustainable development of firms is the fact that many wasteful and polluting goods seem relatively inexpensive because ecological costs are not incorporated. If the firm has the opportunity to purchase either a good that has incorporated the ecological costs or a good that has not incorporated these costs, ceteris paribus, it is obviously not profit maximizing for the firm to purchase the good for the 'full' price. In fact, it might not even be profitable at all to incorporate these costs.

When assumed that everyone values the sustainability of the environment, it is possibly Pareto optimal if everyone would implement the new activity/policy. However, when these actions are decreasing the financial performance of the firm, every individual firm has to some extent the incentive to deviate and not implement the activity/policy.

It is also being stated that the mindset within firms is a significant barrier for environmental sustainable development (Porter and Van der Linde, 1995). They argue that companies should not see the environment as "an annoying cost or a threat able to postpone" (Porter and Van der Linde, 1995, p. 114). A lack of knowledge and information in this matter encourages the firms to remain at the status quo. The lack of information blurs the outcome of potential activities towards being more sustainable and thus increases the risk of these activities. In this context, sustainable activities which are actually profitable might not have a positive NPV due to the high discount rate resulting from high uncertainty.

Currently a profitable strategy for firms is to maintain what can be referred to as a 'throw-away' economy, which is somewhat at odds with a sustainable economy since it involves creation of a substantial amount of waste. Businesses in this economy have an incentive to maintain this type of industry since it generates repetitive purchases that lead to profit maximization (Hirschman and Holbrook, 1992). This generates a significant barrier for firms to move towards being more sustainable. Another barrier that could prevent this transition is the fact that a significant adaptation in the organizational structure is often necessary, which is accompanied by high costs (Shrivastava, 1995).

3.2   A positive association

A vast amount of studies support the notion that (environmental) sustainability helps reducing costs and risks and improves market position. A firm can, by being environmentally sustainable, differentiate their products, save resources on regulatory costs, and save on costs of resources, capital and labor (Orlitzky et al., 2003, Porter and Van der Linde, 1995).

At the moment, the market for environmentally sustainable products can be seen as a relative niche market (though it is expanding). Many consumers prefer sustainable products and a certain fraction of consumers is even willing to pay a premium for these kinds of products. Differentiating your products can therefore be a profitable business strategy.

The vital role of the government in the internalization of the sustainability externality is clearly illustrated by the increasing regulations on pollution and waste towards firms. An environmentally sustainable strategy might create first-mover advantages for firms. Since many more strict regulations can be expected to be implemented in the upcoming years, a firm can attain a competitive advantage on the reduction of pollution. As an example, Dupont has lobbied to ban CFC's because the firm had superior technology concerning substitutes to this polluting chemical (Reinhardt, 2000). Especially when regulations with market incentives, like in the case of tradable permits on CO_2 emissions, are being implemented, firms can attain a competitive advantage by being relatively more sustainable.

There are numerous examples of firms that have saved on resources by becoming more sustainable. Firms like Ford and M3 British Petroleum have saved more on materials, energy and/or services than the level of initial investment costs. Porter and Van der Linde (1995) stated:

"Reducing pollution is often coincident with improving productivity with which resources are used." (Porter and Van der Linde, 1995, p.98).

This statement is however often criticized, especially by economists, on the assumption that these 'win-win' situations are only marginally present. Ambec and Barla (2006) provide an overview of empirical studies on this statement and conclude that there is more evidence against than in favor of the statement, but suggest more research should be done in order to draw a valid conclusion.

It can also be argued that a better environmental performance may decrease the costs of capital and labor. Banks nowadays often screen firms on their environmental performance and therefore, more sustainable firms can attain credit more easily. Montel and Debailleul (2004) argue that this assessment serves as an indicator of the level of risk of the firm through a mitigation of regulatory and legal risks.

A decrease in the costs of labor can occur through a better image of the firm. Lankoski (2006) argues that an increase in environmental performance reduces the costs of illness, absenteeism, and recruitment. Since a certain fraction of the population values the

environment, it is not unreasonable to assume that employees value the extent of sustainability of their own firm. A more sustainable image may increase the productivity of employees through a better morale and motivation. Working at a sustainable firm can increase the utility of the employee. Therefore, in a case of similar compensation, employees might often prefer to work for the more sustainable firm (possibly the worker is even willing to accept a lower wage (Orliztky et al. (2003)).

The increased societal attention towards environmental sustainability has led to an increased consumer demand for products with a relatively low impact on the ecological environment. Consumers are negatively valuing the impact that firms, products and humans have on the environment, and therefore are willing to pay a premium for products with a lower impact on the ecology. This new market has created new business opportunities making it increasingly more profitable to be more sustainable for firms. Even though it is increasing, at the moment this market can be seen as a relative niche-market. It can be argued that the market continues to increase and that it eventually becomes the rule instead of the exception to be sustainable. Such market projections produce possibilities for first mover advantages among firms. Especially given the existence of many complex workings in sustainable business, being early in this market enables the firm to gain knowledge about the market and create a competitive advantage. In contrast, it can be argued that second-mover advantages might be present through learning effects and relatively high development costs of new production methods.

The relative overrepresentation of empirical studies displaying positive relationships between environmental and financial performance can be seen as peculiar. Possible explanations for this could be the desirability of researchers to find and support a positive relationship. A more theoretically embedded explanation however could be that firms will only actualize certain activities when confident it will have a positive influence on financial performance. Given the substantial amount of risk and uncertainty embedded in activities to reduce environmental impact, projects will be executed only when the expected gains will be high enough to cover the risk of a financially negative outcome.

4   Firm Characteristics

Whether being or becoming more sustainable is a performance enhancing activity is not certain and is expected to depend on various aspects. For some firms it might be a desired and profitable strategy while for others it is not. The focus of this study is to shed light on which types of firm can (more) profitably exploit being environmentally sustainable. The type of

firms will be categorized using data on their size, age, communication of sustainability, target group, and country of origin. Relatively few empirical studies have been executed on these specific characteristics.

It is expected that the presence of profitable business opportunities differs strongly per sector and even within sectors (Shrivastava, 1995; Walley and Whitehead, 1994; Marron, 2003). It is argued by Lankoski (2006) that becoming more sustainable is more likely to be profitable in sectors with high regulation. This statement is supported by several empirical studies (El Bizat, 2006; Reinhardt, 2000). Given the relative consensus concerning sector differences, this paper will not focus on that. In the following sections, some empirical studies and theories will be presented concerning the relationship between sustainability and the fore mentioned aspects.

4.1 **Size**

Small firms can not be characterized as little big firms (Dandridge, 1979; Welsh and White, 1981). Consequently, differences can be found in the way small and larger firms deal with sustainability. There are however contradicting studies in this regard. Taylor and Walley (2003) argue that smaller and more entrepreneurial firms can better incorporate the moral dimension of sustainability since smaller firms operate with an individual motivation (an entrepreneur) in contrast with the multiple stakeholders at larger firms. Conversely, Lepoutre and Heene (2006) argue that small businesses experience more barriers in becoming sustainable due to the fact that they have a relative lack of financial resources. Sustainability arguably does not yield returns immediately; therefore a financial resource constraint might prevent firms in becoming to become sustainable.

4.2 **Innovation**

With respect to environmental sustainability, the more progressive and innovatively insistent a firm is, the more expectations born for environmentally sustainable policies (Arora and Cason, 1996). According to Arora and Cason (1996), innovative firms are more pioneering and inventive not only in product innovation, but also in process innovation, which means that they take on extensive effort to carry out new manufacturing systems.

There are a substantial number of scientific papers arguing that the internalization of the environmental problem externality must proceed by technological innovations and support a more laisser-faire policy (Anderson and Leal, 1991; Beckerman, 1974; Taylor, 1994). In order to improve environmental sustainability, innovation is crucial (Heaton, 2000; Vollenbroek, 2002).

Heaton (2000) argues that a large proportion of newly introduced innovations are in fact enhancing environmental performance (i.e. ICT) due to less pollution and usage of resources. Innovations obviously do not automatically imply a better environmental performance. It can however be argued that a better environmental performance often proceeds through innovation since one often has to change the production process implying a process innovation. When assuming this, it can be argued that more innovative firms are better able to implement sustainability policies successfully and therefore innovation could be an interaction variable with respect to the relationship between sustainability and performance.

An innovation that enables the firm to move towards a more sustainable business can go through both product and process innovations. Process innovation will more likely decrease the costs of a firm and therewith its profitability. One could therefore expect that firms that apply process innovations have a stronger relationship between sustainability and profit development compared to firms that apply product innovations.

4.3 Age

The increased attention towards the environment and accompanied business opportunities has made both existing as well as new firms increasingly inclined to be more sustainable. It can however be argued that older firms explicitly have to change their company structure in order to become sustainable. The change of this company structure often entails that firms have to invest money, time and effort. Arguably, the amount of this investment is comparatively larger for older firms then younger firms since the latter are known to have a more flexible company structure which makes it easier to adapt (Prahalad and Bettis, 1986). Obviously start-ups will not have to incur this investment cost at all. In addition, it can be argued that, given the increased attention towards sustainability in the last years, in the start-up period of relatively young firms there were more incentives to start a sustainable firm compared to older firms. This line of reasoning would imply that younger firms would have a competitive cost advantage towards being/becoming sustainable. No empirical research has been found that specifically studies the presence of this relationship.

4.4 Target group

It is generally accepted that the environmental performance of a firm can improve the company image and thereby increase the number of sales. A certain segment of costumers is willing to pay a premium for more sustainable products. There is however no strong empirical evidence that customers are influenced by the "green" image of a firm (Ambec and Lanoie, 2008). This lacking empirical evidence might be due to the fact that consumers may be aware

of the environmental products, but most likely not aware of the environmental performance measured through the effective impact of their production process on the environment. One could argue that often the firms themselves are not even aware of these figures.

As mentioned earlier, the increased societal attention for sustainability is being enforced by the government. Governments have been known to increasingly engage in 'green public purchasing' (Kunzik, 2003) which entails that governments asses the environmental performance and use this as criteria when determining their suppliers for goods and services. Purchasing by the government often consist of a substantial amount of a countries GDP.

The third target group included in this study is the business to business oriented. Intuition tells that the increasing attention for sustainability nowadays should reach the full length of the supply chain. However, to what extent the business to business category is affected by the sustainability issue is unknown. No empirical research has been found that specifically studies the presence of this relationship.

4.5 Communication of sustainability

Increasingly consumers are demanding that firms produce products and services that are consistent with environmental values. As a result, firms have become more concerned with the corporation's overall environmental reputation. This concurrent requirement to improve environmental development encourages firms to seek innovative ways to utilize environmental marketing, and management as a source of enhancing reputation and competitive advantage, and therewith financial performance (Miles et al., 2000). Shane and Spicer (1983) subsequently discovered that negative environmental information had a negative effect on returns due to changes in investors' future income projections.

By the act of communicating, a firm attempts to establish publicly that the company is committed to the environment. However, communicating environmental commitment does not necessitate that the firm is actually performing well on environmental aspects. Environmental marketing can and is being used as a profit maximizing tool in order to gain market share or a higher margin. A firm could a priori invest a small amount in environmental activities in order to use this in a marketing campaign and thus increase its profit. In this context, investing in (a small amount of) environmental activities which would be profit decreasing can be made profitable when one is able to communicate these aspects and thereby increase revenue or profit. The opportunity to increase one's profit by communicating environmental activities without actually applying a similar strategy is illustrated clearly by

Ambec and Lanoie (2008): *"Consumers may be aware of a company's environmental performance through its offer of green products, but they are less likely to be familiar with its environmental performance as measured by its emissions in water or the atmosphere."* (Ambec and Lanoie, 2008, p.47).

Besides being a business opportunity, communicating your environmental impact to customers can also be a necessity when a firm is more sustainable. In order to recoup the investment costs that might have been incurred in becoming more sustainable, customers have to be made aware of this fact in order for them to pay a premium or buy in larger quantities.

As mentioned in section 3.2, the environmental performance of a firm can also have an effect on the productivity and recruitment of employees. Communicating the environmental performance within the firm can therefore be beneficial. No empirical studies have been found that attempt to test this statement.

4.6 Country of origin

Whether or not profitable opportunities are present is expected to differ significantly depending on the country where the firm is operating. The present business environment in a country can have a severe effect on the presence of business opportunities. A business environment is often defined using the Political, Economic, Social and Technological (or PEST) forces (Brooks et al., 2004). When looking at the countries China and the Netherlands, big differences can be distinguished when concerning these aspects.

Political: For the scope of this paper an extensive description concerning the differing political systems is not offered. However, as noted earlier, the government can be seen as a crucial player in the internalization process of the sustainability externality problem. Therefore a tentative elaboration on the consequences of differing political systems on the environmental externality is in place.

In China the government has comparatively more direct and immediate power, which makes unpleasant government intervention less subject to negotiations. Therefore policies to internalize the externality could be more easily implemented. In addition, it can be argued that sustainability goals and policies are long term goals and therefore supersede and compromise temporal governments (Kemp en Martens, 2007). The Netherlands will incur this problem to a larger extent since the Dutch governmental system expects a reelection every 4 years, in contrast to The People's Republic of China.

It can be argued that a barrier for imitation of sustainable activities enhances the probability of profitable exploitation (Reinhardt, 1999). Becoming more environmentally sustainable often means one has to innovate. If these innovations can be imitated more easily, there will be a smaller chance that the innovation will create a competitive advantage and thereby ex-ante decrease investments to create these innovations. It can likewise be argued that the system for the protection of Intellectual Property Rights (IPR) is less developed in China compared to the Netherlands (Feng, 2003), which decreases the number of profitable business opportunities in becoming sustainable. However, China is currently the second largest investor in research and development in the world could which indicates that a less developed IPR system does not necessarily influence investments substantially.

Economic: The political system of the People's Republic of China has prevented the enlargement of the economy for a long time, but from 1976 onwards, the death of Emperor Mao and the subsequent reorganization of the country, paved the road for the exceptional economical growth experienced in the recent history. The Netherlands on the other hand has been growing at a relatively lower pace, but for a much longer time period. In appendix A table 1 illustrates, among other macro-economic data, that China had almost four times the GDP of the Netherlands in 2007. In contrast, their GDP per capita, and hence the indicator of the level of development for a country (Bernhardt, 2007), is 18 times smaller than the GDP per capita of the Netherlands. This relationship is also shown in the productivity per person employed which can be translated into relatively high value-added industries in the Netherlands and low value-added industries in China.

It can thus be stated that concerning economical performance significant differences are present. The 'environmental Kuznets curve' states that this has an influence on the perceived valuation of the environment (Kuznets, 1955). This theory states environmental degradation shows an inverted U-shaped correlation with economic development (i.e. GDP per capita). In the early stages of economic growth, degradation and pollution increase, but beyond some level of GDP per capita the trend reverses. Relatively high economic growth levels leads to environmental improvement. The environment can here be seen as a luxury good. When assuming that the environmental Kuznets curve is correct, it can be assumed that China will value the environment less than the Netherlands, given their lower GDP per capita.

Social: The less developed economic state in China relative to the Netherlands mentioned in the latter section also influences the social characteristics of both countries. Given the larger necessity of employment in China compared to the Netherlands (China has poor national

social security legislation) the bargaining power of employers is arguably higher in China resulting in less health conscious employment and less strict regulations on safety. This aspect could create less pressure of the Chinese society to change towards a more sustainable business strategy (i.e. via legislation). In contrast, Ambec and Lanoie (2007) argue that when emissions affect the health of the workers, this creates opportunities to decrease the cost of labor (as mentioned in section 3.2) by becoming more sustainable. In addition, the recent development in Chinese social security legislation is noteworthy. Perhaps the recent introduction of a new Chinese Labor Law, giving the Chinese workers more rights, is such a movement in the direction of sustainability.

Technology: Developing countries such as China are often characterized by a lower technological state and therefore can, to a larger extent, take advantage of the present and newly invented technologies developed in other countries. China can thus experience relatively more transitional economic growth by implementing innovations made elsewhere. Parris and Kates (2003) argued that this reasoning enabled the Chinese economy to grow substantially from 1997 until 2000 while decreasing the usage of fossil fuel. This effect is however decreasing since the technological state of the country is increasing rapidly. Currently China has the second largest R&D budget in the world, which is a clear indication of the strategy of the country towards developing new technology themselves. Given the vital role of innovations in the internalization of the externality, one could argue that given the current circumstances China would have less opportunity to profitably exploit a sustainable business. However, no empirical studies have been found to support this statement.

5 Empirical analysis

5.1 Sample selection

In order to gather data, a questionnaire has been constructed which is supplied in appendix B. In order to obtain a sufficiently large sample, the scope of this study was limited to the manufacturing sector, which represents a relatively large amount of firms in both China and the Netherlands. The conduction of questionnaires was executed by 23 Master students from the Erasmus University Rotterdam. The Chinese respondents were approached by e-mail (via a digital questionnaire) and during visits to certain companies on site. The Chinese company visits included two kinds of interviews. Where possible, in-depth interviews were conducted; otherwise a general questionnaire was filled in. Where necessary, the interviews were conducted in English using translators. The questionnaire was furthermore translated into

Chinese in order to increase the response rate and to obtain a more representative sample. Accordingly, the Dutch questionnaires were conducted via telephone interviews. In the end, the sample consists of 177 manufacturing firms in the region of Shanghai and 160 firms in the Rotterdam manufacturing sector.

5.2 Statistical method

To explore the relationship between revenue development and environmental sustainability, a binary logistic model was applied. The binary logistic regression was used since the dependent variable was re-coded into a dichotomous format (variable can take on the values of either 0 or 1) and the independent variables are of the continuous, dichotomous, or categorical type[1].

The statements postulated in section 4 can be characterized as moderation effects, which mean that certain firm characteristics and the extent of environmental sustainability form a relationship with each other that moderates the effect a variable has on a firm's revenue development. Given the fact that a binary logistic regression model is used, computing conventional interaction terms using a multiplication of the independent variables is not valid (Norton et al., 2004). Moreover, using a multitude of interaction terms in a regression model often results in multicollinearity complications. For this reason the sample is divided into sub-samples based on the specific firm characteristics being tested. Separate regressions have been run for firms that either have or do not have these certain characteristics. Thereafter, results of the regressions will be compared with each other by computing confidence intervals of the regression parameters. Should the confidence intervals in the sub samples not overlap; a statistically significant difference can be concluded.

5.3 Descriptive statistics

In the following section the dependent, independent, and control variables will be elaborated upon. In order to give an indication of the characteristics of the variables, their values and corresponding distributions will be displayed.

5.3.1 Dependent variable

The dependent variable used for the research attempts to reflect the company's financial performance. In order to asses a company's financial performance the questionnaire included several measurements. The numerical profit a firm has made would give an applicable indication of a firm's performance. However, since only 62 of the 337 respondents actually

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[1] Qualitatively it is most likely that the outcomes of Probit and Logit models estimate similar results, but the Logit model is chosen because of its computational ease.

indicated the annual profit as an exact number, using this variable would possibly not give a representative indication for the complete sample size. In stead, the variable indicating if the firm had higher-lower- or the same profit as the year before will be used; which can be named *'Profit Development'*. When assuming inflation, firms that have equal profit compared to the previous year indicate a decrease in the purchasing power. This variable has therefore been recoded into a dichotomous variable indicating increase of profit (1) or stagnation/decrease of profit (0). The profit development of a firm can be used as an indicator of firm growth, which can be recognized as a goal for a substantial amount of firms. Table 2 below contains the descriptive statistics of the dependent variable in relation with the selection variables used in the separate regression models.

In total 302 observations are indicated, which is roughly equally distributed over the two possible answers. Although the answers were expected to be strongly skewed towards positive profit development, the large number of manufacturing firms with equal or even lower profit than last year might well be caused by the widespread economic downturn of the past year.

Table 2: Descriptive statistics

# of firms	Profit Development	
	Higher	Lower/ Same
Total sample	155	147
Selection Variables		
Size: 1-5 Employees	58	52
Size: 6-100 Employees	70	63
Size: 101-250 Employees	27	32
Product Innovation	90	87
No Product Innovation	63	59
Process Innovation	116	113
No Process Innovation	33	31
Age: < 10 Years	54	52
Age: < 25 Years	47	53
Age: > 25 Years	52	42
Business to Business	137	127
Business to Consumers	51	39
Business to Government	29	20
Communication within the company	57	45
No Communication within the company	98	102
Communication towards customers	58	65
No Communication towards customers	97	82
China	80	82
The Netherlands	75	65
Sector 1	31	29
Sector 2	16	33
Sector 3	32	28
Sector 4	36	31

This table presents the different sample sizes from the empirical dataset used for this research, with each created sample their distribution in frequency of the dependent variable profit development. Note the almost 50/50 distribution in the total sample indicated in the top of the table.

5.3.2   Independent variables

As mentioned in section 2.4, there is no universally accepted definition of environmental sustainability and none of the existing definitions is wholly adequate for this research. Data is collected from the most common applications which can represent indicators of environmental sustainable development. In total 8 questions attempt to indicate the environmental performance of a firm (questions 21 till 28 in Appendix B).

There are three questions which provide information on the time when certain policies were implemented. Interpreting results from these variables is however difficult. A firm with a younger policy is likely to be more effective due to more modern techniques. Conversely, sustainability policies are often thought to yield returns after a certain period of time arguing that older techniques would be preferred to younger ones. Furthermore, it is unclear whether this new policy is an improvement of an older existing policy or whether this is a firm's first policy. These contrasting effects make it impossible to interpret these results correctly.

Additionally, there are two questions concerning the usage of resources and their corresponding policies. Designing a consistent index of environmental sustainability based on these variables poses considerate complications for several reasons. First, there is a lack of commensurability of water, gas, electricity and other inputs on environmental level. Different resources have a different degree of depletion characteristics and polluting impact. Also, policies on different resources have different capacity for effectiveness and their outcomes are incomparable. Available data does not differentiate between any of the former mentioned factors and since it is binary, also does not differentiate between strictness of policies and level of usage even within the respective input categories. The existence of a policy on a resource only makes sense when that resource is actually used requiring the resources and their corresponding policies to be connected. It is not possible to distinguish between firms that have a certain policy on a resource and firms that do not use the resource at all.

The most valid indicators of sustainability are: whether the firm has a policy on 1) the reduction of pollution, 2) the recycling of waste, and 3) whether additional pollution efforts are executed. However, having sustainable activities is to some extent subjective and can be interpreted differently per firm (i.e. how does one make a distinction between a policy and a company culture). Besides that, it is not possible to draw a distinction between the differing magnitudes of policies and activities. It can thus be stated that it is uncertain to what extent the variables in the dataset are valid since it cannot be assumed that the variables are correct predictors of the environmental sustainability of a firm.

Using the three aforementioned indicators of sustainability, a Principal Component Analysis (PCA) has been executed in order to obtain one or more scale variable(s) that designates the presence of the three variables. Tables 3.1 till 3.6 in appendix C provide an overview of the outcome of the PCA. As commonly applied in scientific studies, factors with an Eigenvalue greater then 1 will be used in this study (Field, 2005). Accordingly, one factor will be used which explains approximately 54% of the variance in the three variables. This newly constructed variable is likely to postulate a crude proxy for sustainability within the sample. The relatively high mean of all three variables indicates that a large proportion of the respondents acknowledged using the treatments. Both multicollinearity and singularity have not been detected given the sufficiently high value of the determinant of the correlation matrix. The Kaiser-Meyer-Olkin measure is above 0.5, as are the anti-image covariance values, which suggests an adequate sampling adequacy (Kaiser, 1974). The reliability (or consistency) of the factor was tested by computing the Cronbach's alpha. A value of 0,568 is arguably sufficient to assume consistency (Norusis, 2004).

Table 4 displays an overview of the characteristics of independent and control variables as well as the variables that have been used as selection variables for the creation of the sub-samples.

Table 4: Independent variables

Variable	Values
Size	1-5 Employees
	6-100 Employees
	101-250 Employees
Innovation	Product Innovation (Yes/No)
	Process Innovation (Yes/No)
Age	< 10 Years
	< 25 Years
	> 25 Years
Target Group	Business to Business (Yes/No)
	Business to Consumer (Yes/No)
	Business to Government (Yes/No)
Communication	Comm. Within (Yes/No)
	Comm. Customers (Yes/No)
Country of origin	China (Yes/No)
	The Netherlands (Yes/No)
Sector*	Sector 1 (Yes/No)
	Sector 2 (Yes/No)
	Sector 3 (Yes/No)
	Sector 4 (Yes/No)
Sustainability	*Scale*

* Sector 2 has been used as the base category. Since the firms in this sector are relatively homogeneous they serve as a useful reference category.

The correlation matrix in appendix D (table 5) illustrates that differences are present concerning the firm characteristics in China and the Netherlands. Chinese firms are on average larger, younger and make more use of innovations; especially product innovations. In addition there appears to be a negative correlation between the target groups Business to Consumers and Business to Business.

5.3.3 Control variables

According to McWilliams and Siegel (2000) and Capon et al. (1990) R&D investment intensity is an important determinant of profitability. However, R&D expenses are not equal to the level of innovativeness. When the concept of R&D investment intensity is expanded with the adaptation of new technology, this finding is applicable and the importance of including the level of innovativeness is clearly present.

As mentioned in section 4, numerous factors influence profit development and/or the level of sustainability. The sales of a firm arguably differ substantially per sector, as with the profit margin. Therefore, the sector the firm is operating in should be included as a control variable. The original dataset mostly describes the products produced by the different companies, which provided the opportunity to divide them according to the "Standard Industrial Classification (SIC)" codes into different sectors as dichotomous variables (0 = not in the sector and 1 = within the sector). In order to avoid numerical complications, sectors were combined in order to create segregation between 4 types of sectors (*'Sector 1', 'Sector 2', 'Sector 3'* and *'Sector 4'*). Table 6 in appendix E displays an overview of this segregation. Furthermore, the general characteristics of the firm like firm size and firm age will also serve as control variables.

In addition, Klomp and Van Leeuwen (2001) found that implementation of process innovation also contributes directly to a firm's overall sales, which ceteris paribus would lead to having a higher profit. Therefore, product innovation has served as a control variable. Process innovativeness has a direct influence on the costs of production, and any changes in the cost function of a firm are crucial for the profitability of the firm. To control for this effect of process innovation, the variable process innovation is being used as a control variable.

5.4 Estimation results

The dichotomous character of multiple variables results in relatively low variance which limits the probability of finding statistically significant result in comparison to variables with more variance. For this reason the following levels of significance have been used. Variables with a significance level smaller than 5% ($p < 0.05$) are treated as highly significant.

Significant levels between 5% and 10% (p < 0.10) indicate a medium level of significance and finally, variables with a significance level between 10% and 15% (p < 0.15) are treated as weakly significant. Accordingly, confidence intervals have been constructed which postulate 95%, 90% and 85% certainty. Variables with higher significance levels than 15% and confidence intervals below 85% are treated as not significant. The overall fit of the model will be measured using Hosmer and Lemeshow Test which computes the goodness of fit. For comparison of the validity of regression results of the models the Nagelkerke R- squared will be used[2]. The model specifications did not show any VIF values in excess values of 10 (Field, 2005). Furthermore, the correlation matrix depicted appendix D also did not give reason to suspect multicollinearity. In the following paragraphs, the main results of the regressions of the different sub samples will be given (table 7.1 till table 7.9).

General model - Table 7.1 contains the regression results of the general model. The Nagelkerke R square shows a value of 0.190, indicating a substantial explanatory power. Furthermore, the Hosmer and Lemeshow Test shows a significance level of 0.347, thus a lack of fit can be rejected. Interesting result is the fact that 5 out of 14 estimated coefficients show a significant p-value.

Size is negatively correlated with profit development on a significance level of 10%. Business to Consumer companies show at a 5% significance level a strong and positive relation with profit development. Communication within the company about environmental related aspects of the firms' effort to become more sustainable shows also at a 5% significance level a strong and positive relation with profit development.

Companies out of sector 3 appear to show at a 10% significance level to have a positive relation with profit development (these are mainly computer and electronics oriented companies and companies producing electronically equipment and machinery). Further research shows that product innovativeness is the highest among these firms; 75% for firms operating in sector 3 versus 65%, 72% and 41% for the sectors 1, 2 and 4 respectively. Also in terms of process innovativeness the firms in sector 3 score the highest; 83% for firms operating in sector 3 versus 78%, 72% and 81% for the sectors 1, 2 and 4 respectively.

Finally, the last significant estimated coefficient is that of the variable Eco Treatment, showing at a 5% significance level a strong and positive relation with profit development.

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[2] This measurement was chosen over other measurements such as the Cox and Snell R square because it corrects the Cox & Snell R Square in order to make it possible to reach the maximum value of one

Table 7.1: Main Logit model

	Coeff.	(SE)	
Size	-0,627	(0,370)	**
Age	0,279	(0,283)	
Product Innovation	-0,334	(0,472)	
Process Innovation	0,115	(0,497)	
Business to Business	0,142	(0,714)	
Business to Consumers	0,958	(0,416)	***
Business to Government	-0,271	(0,503)	
Comm. Within	0,940	(0,372)	***
Comm. Customers	-0,114	(0,400)	
Country	0,072	(0,612)	
Sector 1	0,105	(0,543)	
Sector 2 *(Base Category)*			
Sector 3	0,826	(0,493)	**
Sector 4	-0,636	(0,520)	
Eco Treatment	0,484	(0,223)	***
Constant	-0,238	(1,280)	
N	158		
Nagelkerke R²	0,190		
-2 Log Likelihood	193,633		
Hosmer and Lemeshow (sig.)	8,954 (0,347)		

* $p < 0,05$		CI sign. at 85%
** $p < 0,10$		CI sign. at 90%
*** $p < 0,15$		CI sign. at 95%

Sub samples Size - As can be seen from table 7.2, 2 out of the 3 sub samples of Size show that the final solution could not be found, most probably due to the low numbers of observations in these sub samples. The results are to be interpreted as unreliable, thus no empirical evidence is available to test for any significant differences between these sub samples.

Table 7.2: Logit models - Size as selection variable

	Size category 1		Size category 2			Size category 3	
	Coeff.	(SE)	Coeff.	(SE)		Coeff.	(SE)
Size							
Age			0,018	(0,475)			
Product Innovation			0,139	(0,624)			
Process Innovation			-0,686	(0,859)			
Business to Business			-0,802	(1,000)			
Business to Consumers			0,856	(0,664)			
Business to Government			0,090	(0,742)			
Comm. Within			0,484	(0,500)			
Comm. Customers			-0,195	(0,511)			
Country			1,117	(0,928)			
Sector 1			0,195	(0,690)			
Sector 2 *(Base Category)*							
Sector 3			1,004	(0,652)	*		
Sector 4			-1,155	(0,895)			
Eco Treatment			0,486	(0,300)	*		
Constant			0,290	(1,518)			
N	45		87			26	
Nagelkerke R²	0,366		0,212			0,623	
-2 Log Likelihood	47,764		105,553			16,963	
Hosmer and Lemeshow (sig.)	16,611 (0,020)		7,684 (0,465)			3,273 (0,859)	

Note: Size categories 1 and 3 columns marked "Final solution not found"

* p < 0,05	CI sign. at 85%	Size 1 =	Firms with 1 - 5 employees
** p < 0,10	CI sign. at 90%	Size 2 =	Firms with 6 - 100 employees
*** p < 0,15	CI sign. at 95%	Size 3 =	Firms with 101 - 250 employees

Sub samples Innovation - The results out of the sub sample with companies that actively innovate new products are somewhat similar to the results of the main model. However, in this sub sample the variable Eco Treatment turns out to have no significant relation with profit development. The Nagelkerke R square is for the model with product innovative firms 0,223 and for the model with firms that do not product innovation 0,380. The significance values of the Hosmer and Lemeshow Test are acceptable on the levels of 0,701 and 0,172 respectively, implying no impression for a lack of fit of the model.

Again size has a significant and negative relation with profit development (on a 10% significance level), as also do the companies in the Business to Consumers category and the companies that actively communicate within the company about their sustainability related efforts show a strong and positive relation with profit development (both at a 5% significance level).

For the sub sample with the companies that do not actively innovate in new products the results are different. Here, it is not the Business to Consumers category that shows a significant relation with profit development, but the Business to Business, and this relation is

highly negative and significant (at a 10% significance level). Furthermore, companies that operate in sector 4 (mixed branches) are doing relatively worse in terms of profit development (at a 10% significance level). In contrast with the sub sample where the companies do execute product innovations, the coefficient of Eco Treatment is in this sub sample strongly significant, showing a positive relation with profit development.

When comparing between the two sub samples the confidence intervals of the estimated coefficients, only the Business to Business category turns out to be significantly different from each other (at a 90% confidence interval), see in table 7.3 the orange marked rows. As mentioned already above, the companies that do not innovate in new products and operate in the Business to Business category, are doing relatively worse in terms of profit development.

With respect to the two sub samples of process innovation, no empirical evidence is available to test for any significant differences between the sub samples. No reliable estimates were found, most probably due to a low number of observations in the sub sample with companies that do not actively innovate in their company processes. The estimated model from the sub sample with companies that do process innovation shows similar results as that of the main model. However, the significance value of the Hosmer and Lemeshow Test is critically low at 0,093. The Nagelkerke R square of this model is 0,198.

The models with innovativeness as selection variables can be found below, in the tables 7.3 and 7.4.

Table 7.3: Logit models - Product innovation as selection variable

	Product inn. Yes			Product inn. No		
	Coeff.	(SE)		Coeff.	(SE)	
Size	-0,817	(0,430)	**	-0,649	(0,934)	
Age	-0,021	(0,432)		0,465	(0,464)	
Product Innovation						
Process Innovation	0,167	(0,791)		-0,108	(0,797)	
Business to Business	0,755	(0,893)		-3,822	(1,986)	**
Business to Consumers	1,298	(0,580)	***	0,967	(1,009)	
Business to Government	0,027	(0,642)		-0,941	(0,999)	
Comm. Within	1,250	(0,467)	***	0,798	(0,927)	
Comm. Customers	0,043	(0,467)		-0,653	(1,167)	
Country	-0,039	(0,865)		1,786	(1,281)	
Sector 1	0,365	(0,684)		-0,727	(1,215)	
Sector 2 *(Base Category)*						
Sector 3	0,968	(0,593)	*	0,709	(1,162)	
Sector 4	0,064	(0,709)		-1,569	(0,913)	**
Eco Treatment	0,322	(0,283)		1,118	(0,511)	***
Constant	-0,778	(1,624)		2,882	(2,828)	
N	102			56		
Nagelkerke R²	0,223			0,380		
-2 Log Likelihood	121,782			58,605		
Hosmer and Lemeshow (sig.)	5,520 (0,701)			10,295 (0,172)		

*	p < 0,05		CI sign. at 85%
**	p < 0,10		CI sign. at 90%
***	p < 0,15		CI sign. at 95%

Table 7.4: Logit models - Process innovation as selection variable

	Process inn. Yes			Process inn. No	
	Coeff.	(SE)		Coeff.	(SE)
Size	-0,637	(0,407)	*		
Age	0,205	(0,325)			
Product Innovation	-0,355	(0,503)			
Process Innovation					
Business to Business	0,103	(0,755)			
Business to Consumers	1,150	(0,503)	***		
Business to Government	-0,392	(0,543)			
Comm. Within	0,764	(0,395)	**		
Comm. Customers	-0,058	(0,434)			
Country	0,036	(0,669)			
Sector 1	0,226	(0,577)			
Sector 2 *(Base Category)*					
Sector 3	0,734	(0,536)			
Sector 4	-0,743	(0,588)			
Eco Treatment	0,438	(0,242)	**		
Constant	0,152	(1,361)			
N	132			26	
Nagelkerke R²	0,198			0,580	
-2 Log Likelihood	161,085			20,747	
Hosmer and Lemeshow (sig.)	13,590 (0,093)			17,717 (0,013)	

Final solution not found (in the Process inn. No column)

*	p < 0,05		CI sign. at 85%
**	p < 0,10		CI sign. at 90%
***	p < 0,15		CI sign. at 95%

Sub samples Age   -   As can be seen below in table 7.5, only sub sample Age 1 is providing an estimation of the model; sub sample Age 2 has a significant Hosmer and Lemeshow Test, implying a lack of fit, and for the sub sample Age 3 a reliable estimation of the model is not available. The estimated model of sub sample Age 1 has a Nagelkerke R square of 0,200 and a critically low significance level of the Hosmer and Lemeshow Test of 0,083.

The youngest category of firms in the dataset shows a negative and significant relation with profit development (at a 10% significance level). Young firms that operate Business to Business show a substantial negative relation with profit development (15% significance level). Young firms that do product innovation have a higher probability of having a better profit development (15% significance level). Note that these results cannot be interpreted with respect to older firms.

Table 7.5: Logit models - Age as selection variable

	Age category 1			Age category 2			Age category 3		
	Coeff.	(SE)		Coeff.	(SE)		Coeff.	(SE)	
Size	-1,137	(0,659)	**						
Age									
Product Innovation	1,501	(0,988)	*						
Process Innovation	0,432	(0,888)							
Business to Business	-2,497	(1,663)	*						
Business to Consumers	-0,101	(0,799)							
Business to Government	0,040	(0,876)		Hosmer & Lemeshow is significant			Final solution not found		
Comm. Within	0,385	(0,613)							
Comm. Customers	-0,111	(0,743)							
Country	0,585	(1,283)							
Sector 1	-0,931	(1,116)							
Sector 2 *(Base Category)*									
Sector 3	0,133	(0,774)							
Sector 4	-1,268	(1,004)							
Eco Treatment	0,316	(0,368)							
Constant	2,888	(2,569)							
N	62			53			43		
Nagelkerke R²	0,200			0,538			0,278		
-2 Log Likelihood	72,855			45,947			49,345		
Hosmer and Lemeshow (sig.)	13,969 (0,083)			18,445 (0,018)			5,112 (0,746)		

*	p < 0,05	CI sign. at 85%	Age 1 =	Firms < 10 years old
**	p < 0,10	CI sign. at 90%	Age 2 =	Firms 10 < 25 years old
***	p < 0,15	CI sign. at 95%	Age 3 =	Firms > 25 years old

Sub samples Target Group   -   The target group Business to Government has too few observations for the regression to find a final solution. Therefore a comparison can only be

made between Business to Business and Business to Consumers. The Nagelkerke R square is substantially higher in the Business to Consumers sub-sample compared to the Business to Business sample; 0,430 and 0,222 respectively. Both estimated models display a sufficient Hosmer and Lemeshow Test indicating no lack of fit of the model (significance levels of 0,483 and 0,679, respectively). With respect to the two sub samples, no significant differences of the estimated coefficients are found.

Both target groups Business to Business and Business to Consumers indicate a strong and positive predictive power for Eco Treatment on profit Development (5% significance level). The estimated model of the sub sample with the Business to Consumers operating firms shows no more significant relations. However, the sub sample with the Business to Business oriented firms shows furthermore that communication of sustainability within the firm has a strong and positive relation with profit development (5% significance level). Again, the size of a firm has a negative relation with the profit development (10% significance level). Interesting result is that firms operating in the Business to Business category that are also Business to Consumer oriented are expected to perform better in terms of profit development (5% significance level).

Table 7.6: Logit models - Target group as selection variable

	Business to Business			Business to Consumers			Business to Government	
	Coeff.	(SE)		Coeff.	(SE)		Coeff.	(SE)
Size	-0,709	(0,390)	**	-1,266	(0,897)			
Age	0,330	(0,298)		0,201	(0,798)			
Product Innovation	0,112	(0,529)		0,827	(1,377)			
Process Innovation	0,063	(0,522)		0,572	(1,201)			
Business to Business				1,100	(1,156)			
Business to Consumers	1,189	(0,500)	***					
Business to Government	-0,496	-0,532		-1,240	(1,413)			
Comm. Within	0,959	(0,399)	***	1,093	(0,836)			
Comm. Customers	-0,286	(0,424)		-1,355	(1,140)			
Country	0,465	(0,673)		0,106	(1,772)		Final solution not found	
Sector 1	-0,298	(0,574)		0,272	(1,648)			
Sector 2 *(Base Category)*								
Sector 3	0,836	(0,522)	*	0,592	(1,476)			
Sector 4	-0,883	(0,554)	*	0,532	(1,578)			
Eco Treatment	0,503	(0,235)	***	1,325	(0,676)	***		
Constant	-0,281	(1,063)		0,902	(3,040)			
N	145			42			25	
Nagelkerke R²	,222			,430			1,000	
-2 Log Likelihood	173,570			41,556			,000	
Hosmer and Lemeshow (sig.)	5,720 (,679)			7,508 (,483)			,000 (1,000)	

* $p < 0,05$ CI sign. at 85%

** $p < 0,10$ CI sign. at 90%

*** $p < 0,15$ CI sign. at 95%

Sub samples Communication within the Firm - The two sub-samples of communication of sustainability within the firm have a Nagelkerke R square value of 0,281 for 'yes' and 0,236 for 'no' and a Hosmer and Lemeshow Test significance levels of 0,616 and 0,497 respectively. Statistically significant differences were found between the two sub-samples concerning the process innovativeness of the firms (at an 85% confidence interval), see in table 7.7 below the yellow marked rows. Firms that do communicate within the company about their sustainability efforts seem to be doing worse in terms of profit development when they also do process innovations. The sub sample containing only the firms that do not communicate with the firm shows a positive estimated coefficient for process innovativeness, however this is not significant.

Furthermore, the older firms tend to have a more positive effect of internal communication (at a 10% significance level).

Surprisingly, the empirical results suggest that when communicating sustainability within the firm, the communication towards customers has a negative predictive power towards profit development (at a 15% significance level).

Table 7.7: Logit models - Comm. within the firm as selection varia

	Comm. Within Yes			Comm. Within No		
	Coeff.	(SE)		Coeff.	(SE)	
Size	-0,770	(0,700)		-0,980	(0,533)	**
Age	0,701	(0,381)	**	-0,108	(0,301)	
Product Innovation	0,370	(0,752)		-1,262	(0,718)	**
Process Innovation	-1,736	(1,055)	**	0,774	(0,666)	
Business to Business	-1,002	(1,549)		0,491	(0,938)	
Business to Consumers	1,274	(0,791)	*	1,308	(0,653)	***
Business to Government	-0,487	-0,777		-0,504	0,748	
Comm. Within						
Comm. Customers	-1,361	(0,839)	*	0,639	(0,622)	
Country	0,493	(1,011)		0,127	(0,850)	
Sector 1	-0,035	(0,872)		0,567	(0,809)	
Sector 2 *(Base Category)*						
Sector 3	1,184	(1,006)	*	1,771	(0,769)	***
Sector 4	-1,108	(0,895)		-0,552	(0,750)	
Eco Treatment	1,093	(0,463)	***	0,414	(0,298)	
Constant	1,556	(2,720)		0,301	(1,849)	
N	68			90		
Nagelkerke R²	0,281			0,236		
-2 Log Likelihood	77,321			102,221		
Hosmer and Lemeshow (sig.)	5,359 (0,616)			7,375 (0,497)		

* p < 0,05		CI sign. at 85%
** p < 0,10		CI sign. at 90%
*** p < 0,15		CI sign. at 95%

Sub samples Communication towards Customers - The two sub-samples of communication of sustainability within the firm have a Nagelkerke R square value of 0,309 for 'yes' and 0,272 for 'no' and a Hosmer and Lemeshow Test significance levels of 0,316 and 0,672 respectively. Statistically significant differences were found between the two sub-samples concerning one of the sectors the firm operates in (at an 85% confidence interval), see in table 7.8 the yellow marked rows. Firms that produce mostly chemical related products and communicate towards the costumers about their sustainability efforts seem to be doing better in terms of profit development, relatively to the companies that do not communicate as such. Although this difference is statistically significant, these individual coefficients in the two separate models are not. As the results of the sub sample for communication within the firm shows that providing also communication towards customers has a negative predictive power towards profit development, in this sub sample this negative correlation is being confirmed; firms that do not communicate their sustainability aspects towards the customers appear to have a better profit development when performing internal communication (at a 5% significance level).

Table 7.8: Logit models - Comm. Costumers as selection variable

	Comm. Costumers Yes			Comm. Costumers No		
	Coeff.	(SE)		Coeff.	(SE)	
Size	-1,314	(0,627)	***	-0,292	(0,522)	
Age	0,180	(0,642)		0,460	(0,386)	
Product Innovation	0,418	(0,841)		-0,459	(0,702)	
Process Innovation	-0,761	(1,109)		0,086	(0,632)	
Business to Business	-0,921	(1,087)		2,143	(1,379)	*
Business to Consumers	0,524	(0,780)		1,696	(0,697)	***
Business to Government	-0,612	-0,816		-0,078	-0,736	
Comm. Within	0,568	(0,609)		1,453	(0,644)	***
Comm. Customers						
Country	-0,137	(1,167)		0,602	(0,848)	
Sector 1	1,808	(0,957)		-0,953	(0,802)	
Sector 2 *(Base Category)*						
Sector 3	1,828	(0,894)	***	0,395	(0,756)	
Sector 4	0,179	(0,927)		-1,418	(0,730)	**
Eco Treatment	0,811	(0,445)	**	0,593	(0,306)	**
Constant	1,874	(2,253)		-3,195	(2,022)	*
N	67			91		
Nagelkerke R²	0,309			0,272		
-2 Log Likelihood	75,175			103,719		
Hosmer and Lemeshow (sig.)	8,190 (0,316)			5,781 (0,672)		

*	p < 0,05	CI sign. at 85%
**	p < 0,10	CI sign. at 90%
***	p < 0,15	CI sign. at 95%

Sub samples Country   -   The Nagelkerke R square value for the Dutch sample displays 0,271 and 0,249 for the Chinese sample. The Hosmer and Lemeshow Test significance levels are 0,273 and 0,614 respectively. See for the model estimates table 7.9 below.

No statistically significant differences were found by examining the coefficients with confidence intervals. However, some noteworthy differences between the two models are to be mentioned. Only in the Chinese sample the coefficient of size turns up significant implying a strong and negative relation of the size of the firm with profit development (at a 5% significance level). Also only in the Chinese sample, the coefficient of Eco Treatment turns up significant implying a strong and positive relation of the level of sustainability with profit development (at a 5% significance level).

Table 7.9: Logit models - Country as selection variable

	China			The Netherlands		
	Coeff.	(SE)		Coeff.	(SE)	
Size	-1,014	(0,483)	***	-0,072	(0,691)	
Age	0,078	(0,455)		0,480	(0,426)	
Product Innovation	0,565	(0,782)		-0,642	(0,739)	
Process Innovation	0,240	(0,859)		-0,073	(0,748)	
Business to Business	-1,143	(0,935)		2,243	(1,564)	
Business to Consumers	0,604	(0,589)		1,982	(0,964)	
Business to Government	0,404	-0,657		-1,340	-0,871	*
Comm. Within	0,821	(0,497)	**	1,456	(0,733)	***
Comm. Customers	-0,137	(0,518)		-,269	(0,816)	
Country						
Sector 1	0,052	(0,727)		0,314	(0,909)	
Sector 2 *(Base Category)*						
Sector 3	0,743	(0,602)		0,854	(1,087)	
Sector 4	-0,782	(0,930)		-0,784	(0,716)	
Eco Treatment	0,650	(0,299)	***	0,255	(0,365)	
Constant	1,249	(1,792)		-3,413	(2,136)	*
N	93			65		
Nagelkerke R²	0,249			0,271		
-2 Log Likelihood	107,983			75,354		
Hosmer and Lemeshow (sig.)	6,298 (0,614)			8,725 (0,273)		

*	p < 0,05		CI sign. at 85%
**	p < 0,10		CI sign. at 90%
***	p < 0,15		CI sign. at 95%

6 Discussion

Even though this study serves a relatively exploratory purpose, results were found that are mixed with what one could expect. Given the fact that the underlying dataset is cross-sectional, defining causality based on the regressions results is compromised. Especially given the alleged interlinked effects with respect to sustainability, the interpretation of results should be established with caution. From here on further, the results are being discussed in a similar order as in the previous section.

Size -   The empirical results of this study show that the size of the firm is negatively correlated with profit development.[3] Profit development is an indication of growth, next to it being an indication of firm performance. Although profit development is a lesser indication for growth than for instance revenue is, firms of reasonably size (or having an well established level of profit) are in general not necessarily growing firms anymore. This may explain the presence of such a negative relation between size and profit development.[4] In addition, this result is not in contrast with the findings by Capon et al. (1990): *"Bigness per se does not confer profitability"* (Capon et al. 1990, p1157). However, there is a substantial amount of studies providing evidence that the relationship is the other way around (Roper, 1991).

Target groups   -   Firms operating in markets with consumers as their target group appear to have a higher probability of having a good profit development. Spreading the market risk of a firm has positive consequences for the financial performance. Indeed, this study shows that firms that spread their company market risk by aiming at different target groups are experiencing a better profit development.

Communication   -   It is somewhat surprising that the communication of sustainability within the firm is more often a positively and significant predictor of profit development compared to the communication of sustainability towards customers.[5] In the literature this form of communication is being recognized as a positive predictor for performance, however,

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[3] Note that over 90% of the top firms in the oldest category (out of 3) are Chinese firms while in the lower category the Dutch firms are represented for more than 80%.

[4] Although not the scope of this research, this result confirms the available evidence that Gibrat's Law does not hold; the growth rate is not irrespective of the size of the firm. Audretsch et al. (2002) discuss that especially for manufacturing firms Gibrat's Law does not hold.

[5] If the firms are in fact more sustainable is not measured, merely the initiative to communicate towards the workforce is put into perspective with respect to profit development

comparatively more focus is being put on the communication towards customers. Possibly the value employees put on the sustainability of their firm is being underestimated.

A surprising and difficult to interpret result is the significant negative correlation between the communication of sustainability within the firm and the communication towards customers. This empirical result suggests that when communicating sustainability within the firm, the communication towards customers has a negative predictive power towards profit development. However, when not communicating within the firm, the communication towards customers has no significant predictive power towards profit development. This result is not robust, since the sub sample with the firms not communicating within the firms showed no significant predictive power of the communication towards the costumers. Fact remains that firms executing both forms of communication performed worse. A possible explanation could be that both forms of communication can be seen as substitutes in the sense that communication towards customers often also reaches the employees. The same reasoning can be proposed concerning the communication towards employees of the firm. This could possibly make the cost of both forms of communication not worthwhile. But it is unlikely that these costs are that high that is has such any significant correlation with profit development. A more appropriate reasoning for this result can be the presence of an underlying factor. For instance, better communication skills are likely to be associated with a better general management of the firm. It may well be that this is the determining factor, suggesting that the relation of communication with profit development may be an indirect effect.

Sectors   -   Firms producing computer and electronics related products and companies producing electronically equipment and machinery turn out to perform better in terms of profit development. In contrast, it was expected that due to the present hard times in the world economy the somewhat more convenience goods oriented firms instead of the search goods oriented firms would be performing better. A search good is a product or service with features and characteristics easily evaluated before purchase, and consumer can easily verify the price of the product and alternatives at other outlets to make sure that the products are comparable. Therefore, these producs are more subject to substitution and price competition. Since in times of world wide economic recession competition will become stronger, this result can be seen as counter intuitive. A possible explanation for this result is the relatively higher product and process innovation that is taking place in this sector, giving the firms a better comparative advantage in both production and market position.

Country differences - It is obvious that there are substantial country differences. Political, Economic, Social and Technological differences determine the opportunities for companies to become more sustainable. The fact that the estimated models of the sub samples of country show no statistically significant differences with respect to the exploitation of sustainable business can be seen as a result. It may indicate that no distinct differences might be present concerning the opportunities in exploiting sustainability to enhance profit. However, this is a too strong conclusion to state as a generalized conclusion.

Eco Treatment - Thus far, throughout this section, the focus has mostly been on explaining the general empirical results. The main focus of this research is however aimed at the sustainability aspects of firms in relation to their financial performance.

An important remark on the empirical results with regard to the sustainability issue is the possibility that only firms that are financially healthy choose to become more sustainable, implying an automatically positive relation between sustainability and firm financial performance. As expected, firms will not invest in sustainability efforts when they assume this will have a negative influence on their financial performance. This empirical study shows not only that being more sustainable has not necessarily a negative relation with profit development, but it has even a strong and positive relation with the profit development of a firm.[6]

When looking at the two separate country samples, only for the Chinese sample the positive coefficient of Eco Treatment turns out to be significant. However, in the main model the coefficient is also significant, with the country dummy included. Furthermore, no statistically significant differences were found between the sub samples. This may indicate that no major difference concerning these types of firm might be present in the opportunity to exploit sustainability in a profit enhancing manner.

7 Conclusion

7.1 Research question

It can be stated that concerning the exploitation of sustainability, it is not unlikely that differences are present between types of firms. Only a few results were found regarding the usage of sub samples. Interaction effects are present on the relation between product innovativeness and business to business orientation: being Business to Business oriented, and doing product innovation has a positive influence on the profit development. Furthermore,

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[6] Note that this study has not examined any causal relationships in this regard.

communication seems to be playing a larger role than expected. Firms that communicate within the company about their sustainability efforts, and doing process innovation perform relatively better in terms of profit development. Finally, communicating towards the costumers is especially beneficial for firms producing computer and electronics related products and companies producing electronically equipment and machinery. The firm characteristics country, age, target group and process innovation indicate no differences between the sub samples.

Investigate the possibility of interaction effects in firm characteristics has been a part of this research. But also the more general effects from the main model can be used for interpretational purposes. Having a smaller firm or the consumers as a target group might create relatively more opportunities to exploit sustainability in a profit enhancing manner. And, with respect to the sustainability aspects of the firm, throughout this research no negative relationships are detected. In fact, in many of the models the estimated coefficient the sustainability proxy turns out to be highly significant, showing a positive relation with profit development.

It can be stated that the exploratory purpose of this paper has indicated possible relationships between the types of firms that are better able to exploit sustainability in a profit enhancing manner. Empirical results that have not been tested in other studies or are in contrast with other studies and theories clearly indicate the complexity of the relationship between performance and sustainability and also indicates the multitude of factors influencing this relationship.

7.2 **Limitations**

One of the major difficulties of the study on the link between environmental sustainable development and financial performance is determining the direction of causality. Moreover, since sustainability can be seen as a relatively new and normative concept, there is no clear consensus on the measurement of both financial and environmental performance. This creates uncertainty concerning the validity of the variables. In addition, it is often to a limited extent possible to differentiate between the magnitudes of sustainability, performance and firm specific characteristics in the sample.

Other important limitation that decreases the validity of the variables is the fact that many variables are dichotomous. In addition, this study is supported by data gathered from companies that participated on a voluntary basis.

A further limitation of the research is the language barrier and cultural differences which may have had an influence on the interpretation of the questionnaire by Dutch and Chinese respondents. This may limit the comparability between the two.

7.3   Directions for further research

Further research should mainly focus on examining the results found in this study to investigate whether these results are consistent over multiple studies. Consequently, if they are found to be consistent over multiple studies, research should focus on interpreting these results. In order to draw more valid conclusion, future research should be aimed on the obtainment of more detailed data concerning the degree of sustainability of firms, performance of firms and firm specific characteristics.

In particular the results about the communication within and outside of the company are to be examined further. It may well be the case that the positive correlation with profit in this empirical study is driven by another characteristic of the firm; the general managerial capability of the firm might result into a higher level of communication. Therefore, further research should be aimed at examining to what extent there is a direct relationship and to what extent it is the general managerial ability of the firm that correlates positively with profit development.

Finally, it is recommended that counter-intuitive results are further examined. Firms producing computer and electronics related products and companies producing electronically equipment and machinery turn out to perform better in terms of profit development, even though these type of products have a relatively higher price elasticity of demand than that of other sectors. Further research is needed to understand what specific factors lead to this result.

7.4   Policy implications

Government intervention is arguably of vital importance in order to internalize the environmental externality. However, given the risk, uncertainty, and irreversibility of environmental problems, it is difficult to determine the magnitude of the intervention from a macro perspective. The impact of resource depletion on the environment is to such an extent unknown that it is difficult to determine the efficient amount of government spending on the internalization of the externality (Weitzman, 2007). Policy should therefore be focused on research to determine the actual consequences of resource depletion and the probability of significant damage to the environment.

From a firm perspective it may be said that there is an increasing valuation for the environment, which enables firms to profitably decrease their negative impact on the environment. It can also be stated that firms are to some extent already being stimulated by the government to reduce their impact on the environment. Given the uncertainty concerning the efficient amount of internalization by the government, it is ambiguous whether firms should be stimulated more. However, given the relatively low abatement costs in developing countries like China (Hettige et al., 1996) a policy implication could be focused on stimulating the environmental impact of firms in these countries. In order to actualize this, collaboration between country governments would be beneficial. The hurdle to overcome here would be the alignment of contradicting goals between countries.

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Appendix A: Country Comparison

Table 1: Country Comparison between People's Republic of China and the Netherlands

Categories	Unit	2003		2004		2005		2006		2007	
		China	Netherlands	China	Netherlands	China	Netherlands	China	Netherlands	China	Netherlands
Total GDP	€ (in bn)	1350	477	1589	491	1821	513	2106	540	2480	567
Government expenditure	€ (in bn)	156	211	181	213	210	217	251	235	293	251
Government expenditure	% of total GDP	12%	44%	11%	43%	12%	42%	12%	44%	12%	44%
GDP per capita	€	1.100	29.500	1.300	30.200	1.400	31.500	1.600	33.100	1.900	34.700
Annual rates of inflation	%	1,2%	2,1%	3,9%	1,2%	1,8%	1,7%	1,5%	1,1%	4,8%	1,6%
Energy intensity	€ (per tonne energy consumed)	7700	3700	7800	3700	8200	3800	8600	4100	9400	4300
Primary energy consumption	Mn tonnes of oil equivalent	1200	90	1400	93	1600	95	1700	93	1900	92
Exports	€ (in bn)	307	185	415	223	462	245	533	280	669	334
Imports	€ (in bn)	109	164	127	199	147	217	175	251	205	295
Population	National estimates (in mn)	1285	16	1292	16	1300	16	1308	16	1315	16
Unemployment rate	% of working population	4,3%	4,0%	4,2%	4,9%	4,2%	5,1%	4,1%	4,2%	4,0%	3,5%
Minimum wage per month	€	€ 46	€ 1.300	€ 52	€ 1.300	€ 57	€ 1.300	€ 65	€ 1.300	€ 72	€ 1.300

Source: Euromonitor International

Appendix B: Questionnaire

GENERAL

1

How many employees does your company have? If you don't know the exact number could you give an estimation?	◊ …
	◊ 1 - 5
	◊ 6 - 25
	◊ 26 - 100
	◊ 101 - 250
	◊ > 250
	◊ I don't know

2

Please indicate if, in the past year, your company brought any new products on the market or entered any new markets.	◊ Yes
	◊ No
	◊ I don't know

3

Please indicate if, in the past year, your company implemented improvements in the production process.	◊ Yes
	◊ No
	◊ I don't know

Could you explain what kind of innovations you implemented?

4

In what year was your company established? If you don't know the exact year could you give an estimation?	◊ …
	◊ < 3 years ago
	◊ < 5 years ago
	◊ < 10 years ago
	◊ < 25 years ago
	◊ > 25 years ago
	◊ > I don't know

5

| What type of product in your company mainly producing? | … |

6

Please indicate the target group for the products the company is producing (more than one answer possible)?	◊ businesses
	◊ consumers
	◊ the government
	◊ I don't know

7

What is the market share of your company during 2008? If you don't know the exact number could you give an estimation?	….%
	◊ 0% - 1%
	◊ 2% - 5%
	◊ 6% - 20%
	◊ 21% - 50%
	◊ > 50%
	◊ I don't know

8

Do you communicate aspects of the company activities that are beneficial to the ecological environment? (multiple answer possible)	◊ No
	◊ Yes, within the company
	◊ Yes, towards the government
	◊ Yes, towards the costumers
	◊ I don't know

9

Do you communicate company activities or aspects regarding the social image (i.e. employee benefits) of the company (more than one answer possible)?	◊ No
	◊ Yes, within the company
	◊ Yes, towards the government
	◊ Yes, towards the costumers
	◊ I don't know

EMPLOYEES

10

What is the average percentage of employees of your company that left or was layed off during the last year?	◊ < 5%
	◊ 6% - 10%
	◊ 11% - 15%
	◊ 16% - 20%
	◊ > 20%
	◊ I don't know

11

What is the average percentage of employees of your company that was hired during last year?	◊ < 5%
	◊ 5% - 10%
	◊ 10% - 15%
	◊ 15% - 20%
	◊ > 20%
	◊ I don't know

12

What is the average number of lost days caused by occupational disease, injury and sickness per year per employee?	◊ 0 days
	◊ 1 - 5 days
	◊ 6 - 10 days
	◊ 11 - 15 days
	◊ > 15 days
	………..days

13

What is the percentage of female workers in the workforce of your company?	◊ < 21%
	◊ 21% - 40%
	◊ 41% - 60%
	◊ 61% - 80%
	◊ > 80%
	………..%

14

Is employee satisfaction measured within your company?	◊ Yes
	◊ No
	◊ I don't know

How do you measure employee satisfaction, and with what frequency (daily, monthly, yearly?)

15

How many hours are offered to the employees for training purposes?	◊ Our company does not provide training for its employees
	◊ 0 - 10 hours per year per employee
	◊ 11 - 20 hours per year per employee
	◊ 21 - 30 hours per year per employee
	◊ > 30 hours per year per employee
	◊ I don't know

What kinds of training do you offer to your employees?

16

Please indicate the group-wide employee benefits provided by your company in addition to government schemes (more than one answer possible). Only indicate those that are in addition to the governmental schemes.	◊ Our company does not provide additional benefit
	◊ Child Care for Employees children
	◊ Pension plans
	◊ Health insurance
	◊ Maternity leave
	◊ Flexible working hours
	◊ Other
	◊ I don't know

ECONOMICAL

17

Did your company make profit or loss in the year 2008, and if possible could you give an estimate of this financial result?	◊ yes, ……………….,-
	◊ no, ……………….., -
	◊ I don't know

18

Was the profit or loss of 2008 lower, the same or higher compared to the financial result of 2007?	◊ lower
	◊ the same
	◊ higher
	◊ I don't know

19

| Could you give an indication of the revenue that your company made in 2008? | ◊ ……………………….,- |
| | ◊ I don't know |

20

Was the revenue in 2008 lower, the same or higher compared to the revenue in 2007?	◊ lower
	◊ the same
	◊ higher
	◊ I don't know

ENVIRONMENTAL

21

Does your company use any of the following resources in the production process?	◊ water
	◊ gas
	◊ electricity
	◊ other resource(s)

22

Does your company have a policy regarding the environmental friendliness of the usage of recourses in the manufacturing process? (multiple answers are possible)	◊ no policy
	◊ a general company policy
	◊ a policy focused on water
	◊ a policy focused on gas
	◊ a policy focused on electricity
	◊ a policy focused on other resource
	◊ I don't know

23

If yes, when was the first time you implemented such a policy?	◊ 0 - 2 years ago
	◊ 3 - 5 years ago
	◊ 6 - 10 years ago
	◊ I don't know

24

Is there a treatment applied that makes waste from the production process of your company reusable?	◊ yes
	◊ no
	◊ I don't know

25

If yes, how long ago did your company implement this treatment?	◊ 0 - 2 years ago
	◊ 3 - 5 years ago
	◊ 6 - 10 years ago
	◊ I don't know

What was the motivation to implement these policies? (regulations, cost reduction, sustainability)

If you ever considered policies of this kind, what were the main barriers that made you decide not to implement them.

26

Does your company apply techniques concerning the reduction of the pollution in water, air and/or soil?	◊ yes
	◊ no
	◊ I don't know

27

If yes, how long ago did your company implement this treatment?	◊ 0 - 2 years ago
	◊ 3 - 5 years ago
	◊ 6 - 10 years ago
	◊ I don't know

28

Does your company perform better on water, air and/or soil pollution than the legal minimum?	◊ yes
	◊ no
	◊ I don't know

Do the regulations set by the government affect your business?

Do you get subsidies or does it drive up costs when you try to meet these regulations?

What is your vision and mission statement?

There are governmental aid programs for companies that produce in a sustainable way. Are you aware of this and do you think the government puts enough effort into promoting these programs?

Appendix C: Results Principal Component Analysis

Table 3.1: Descriptive Statistics

	Values	Mean	SD
Reusage treatment	1 = Yes 0 = No	0,67	0,470
Pollution reduction	1 = Yes 0 = No	0,63	0,484
Additional pollution effort	1 = Yes 0 = No	0,80	0,399

Table 3.2: Correlation Matrix

	Reusage treatment	Pollution reduction	Additional pollution
Reusage treatment			
Pollution reduction	0,484 ***		
Additional pollution	0,139 ***	0,264 ***	

Determinant = 0,712
*** p < 0,01

Table 3.3: Sampling Adequacy

KMO Measure	0,544
Cronbach's Alpha	0,568

Table 3.4: Anti-Image Matrix

	Reusage treatment	Pollution reduction	Additional pollution
Reusage treatment	0,536		
Pollution reduction		0,529	
Additional pollution effort			0,632

Table 3.5: Communalities

	Extraction
Reusage treatment	0,614
Pollution reduction	0,714
Additional pollution effort	0,289

Table 3.6 Explained Variance

Component	Eigenvalues	Variance explained
1	1,617	54%
2	0,886	30%
3	0,498	17%

Appendix D: Correlation Matrix

Table 5: Correlation matrix

	Profit Develop.	Size	Product Inn.	Process Inn.	Age	BtB	BtC	BtG	Comm. Within	Comm. Costum.	Country of Origin	Sector 1	Sector 2	Sector 3	Sector 4
Profit development															
Size	0,0														
Product Innovation	0,0	0,3 **													
Process Innovation	0,0	0,1 **	0,3 **												
Age	0,0	-0,2 **	-0,3 **	-0,1											
Business to Business	0,0	-0,1	0,0	0,0	0,0										
Business to Consumers	0,1	0,0	0,1	0,0	-0,1	-0,5 **									
Business to Government	0,1	0,0	0,0	0,1	0,0	0,1	0,1 *								
Comm. Within	0,1	0,1	0,2 **	0,2 **	-0,1 *	0,1 *	-0,1	0,0							
Comm. Costumers	-0,1	0,2 **	0,2 **	0,2 **	-0,1	0,0	0,1	0,0	0,2 **						
Country of Origin	0,0	-0,6 **	-0,5 **	-0,2 **	0,6 **	0,1	-0,1	0,0	-0,2 **	-0,3 **					
Sector 1	0,0	0,1	0,1	0,0	0,0	0,1	-0,2 **	-0,1 *	0,0	0,1	0,0				
Sector 2	-0,2 **	0,0	0,1 *	0,0	-0,1	-0,3 **	0,4 **	-0,1 *	-0,1 *	0,1	-0,1	-0,2 **			
Sector 3	0,0	0,2 **	0,2 **	0,1	-0,2 **	0,1	-0,1 *	0,2 **	0,0	0,1	-0,2 **	-0,2 **	-0,2 **		
Sector 4	0,0	-0,3 **	-0,2 **	0,1	0,1 *	0,1	-0,1	0,1 *	0,0	-0,1	0,3 **	-0,3 **	-0,2 **	-0,3 **	
Eco Treatment	0,1	0,3 **	0,2 **	0,2 **	0,0	0,1 *	-0,2 *	0,1	0,1 *	0,3 **	-0,3 **	0,3 **	-0,2 **	0,1	0,0

** $p < 0.01$

* $p < 0.05$

Appendix E : Sector segregation

Table 6: Sector segregation

	Sub-sector	N
Sector 1	Chemicals Rubbers and plastics Pharmaceuticals Non-metalic mineral products	65
Sector 2	Textiles Food	60
Sector 3	Computer, electronics Electronical equipment Machinery equipment	67
Sector 4	Wood Paper Printing Motor Vehicles Other transport Furniture Repair Other	75