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Firms' Export Activities And The Adoption of Environmental Actions in High- And Low-Income Countries.

Master's Thesis

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AME	Average Marginal Effects
BRICS	Brazil, Russia, India, China and South Africa
EI	Environmental innovation
FDIs	Foreign Direct Investments
GDP	Gross Domestic Product
GI	Green Technology Innovation
GNI	Gross National Income
IPCC	Intergovernmental Panel on Climate Change
R&D	Research and Development
WBES	World Bank Enterprise Surveys

Abstract

This paper examines the relationship between the export activities of firms in the manufacturing and service sector and the adoption of environmental actions in high- and low-income countries. Using multi-country data at the level of the firms, the empirical results show that firms involved in international trade are more likely to adopt the tools of green management in their production processes. Based on the heterogeneity of countries used in this study, I provide evidence that firms involved in export activities in low-income countries are likely to adopt green management techniques compared to firms that export in high-income countries. Taken together, the results suggest that export activities can significantly hasten the pace of green economic transformation by the countries involved.

1. Introduction

As contained in the 2014 report of the Intergovernmental Panel on Climate Change (IPCC, 2014), a 60 per cent reduction in the carbon intensity of global GDP is required to effectively stabilize the global carbon emissions in the year 2050 on the condition of a 2.5 per cent annual GDP growth. This radical attempt to decarbonise the world economy in the long term will certainly require a change in the energy production and consumption mix of technologies used. Consequently, a huge investment in innovative technologies such as Green Technology is inevitable. According to Rubin (2011), the concentration of greenhouse gases and the effects of climate change are on the increase, particularly carbon dioxide, methane and nitrous oxide. These harmful occurrences have negatively impacted the world ecosystem and these have led to rising sea levels, extreme weather conditions and biodiversity losses for many years. These challenges have created concern among environmentalists and social activists. Triggering numerous public and online protests around the world and also intense debates amongst scholars on the best way to mitigate the effect of climate change on the environment. However, since the Intergovernmental Panel on Climate Change (IPCC, 2014) reports on a worldwide effort in stabilizing global carbon emissions, low-carbon innovation technologies have become a high priority for policymakers and international organizations. There is widespread agreement that any process, product, or service that reduces negative environmental impacts through significant energy efficiency, with the potential of facilitating the sustainable use of resources, and environmental protection activities should be adopted in addressing the crucial challenge posed by climate change. Hence, great focus has been placed on firms environmental actions and the role they can play by their adoption of a green management unit in their organisation that supports the creation of environmental awareness and places standards on the use of energy resources, clean technologies, reuse of wastes, and recycling activities starting from the production stage of the organisation to packaging and supplying to consumers to reduce the harmful impacts

of their production activities on the environment and hence make their business practices more sustainable.

There have been diverse researches by scholars on factors that can induce firms to adopt environmental actions as per the acceptance of environmental innovation (EI) in the form of putting in place innovative clean technology that could support the mitigation of these challenges posed by climate change by way of accelerating decarbonisation, delivering techniques that would drastically decarbonise carbon-intensive sectors, which comprises mainly the transport, energy, industry and agricultural sector that together contribute huge emissions of carbon globally. Hence, scholars like Peñasco, Del Río, and Romero-Jordán (2017); Keshminder and Del Río (2019) have emphasized the importance of foreign demand-pull on a firm's EI adoption decision (Hanley and Semrau, 2022). Even Newman et al. (2018) empirically show that domestic stakeholders' preferences can be shaped by their entry into foreign markets. Thus, they find out that higher demand for sustainability in foreign markets can compel exporters to these markets to boost their Corporate Social Responsibility activities which are in turn beneficial to the environment. However, there can only be a foreign demand-pull of a firm's product when such a firm is involved in exporting in international trade. Hence, this research paper will be looking at the role exporting activities can play in shaping an organization's environmental actions in their adoption of green management.

This research paper will be using the data from the World Bank Enterprise Surveys (WBES) database on the survey conducted in 2019 to empirically analyse the role of export in green management adoption. The research will be concentrating on firms in the 23 countries in Eastern Europe, Central Asia and North Africa. Hence, this paper will assess the usefulness of firms' environmental actions in combating climate change. The paper also intends to examine how the export activities by firms can influence the implementation of green management. In addition, comparing the role of export on the adoption of environmental actions by firms in the manufacturing and service sectors in high- and low-income countries. Consequently, this paper will be answering the follow-

ing research questions: Are firms in export activities more likely to adopt environmental actions? What is the role of export activities in firms' adoption of environmental actions in high- and low-income countries? Does the adoption of environmental actions by firms useful in the fight against climate change? The paper is structured as follows; Section 2, Literature Review; Section 3, Methodology – shows the data collection, the specification of the empirical model and the data summary of the descriptive statistics use in the empirical analysis; Section 4, Empirical Results – this includes the baseline result for direct and indirect export on firms' green management and the countries' heterogeneity result outcome by income level; Section 5 bothers on the discussion and recommendations from the empirical findings; and Section 6, gives the Conclusion.

2. Literature Review

There have been several studies on Green Technological Innovation (GI) by researchers like Mowery et al. (2010); Dong et al. (2014); Kozluk and Zipperer (2015); Dhar and Marpaung (2015); Haselip et al. (2015); Watson et al. (2015); de Jong et al. (2016); and also recent research by Asif Razzaq el at (2021); and Obobisa, Chen, and Mensah. (2022) on how existing green technology and government policies have contributed to easing the impact of climate change. These researchers were able to examine the progress in the development and diffusion of these green technologies and their success in mitigating the effect of carbon emissions on the environment.

For instance, Razzaq et at (2021) study draw the interlinkages between green technology innovation (GI) and carbon emissions for consumption-based and terrestrial emissions in Brazil, Russia, India, China and South Africa (BRICS) countries using monthly data from 1990 to 2017. They find that green technology innovation (GI) could help mitigate carbon emissions when a country is embodied with a higher level of emissions. Furthermore, Obobisa, Chen and Mensah. (2022) research on green technological innovation and institutional quality on CO2 emissions in 25 African countries find that green technological

innovation and renewable energy consumption have a negatively significant impact on CO2 emissions. In contrast, institutional quality, economic growth, and fossil fuel energy consumption have a positive impact on CO2 emissions. By these findings, they proposed that African countries should increase investment in green technological innovation and renewable energy projects to achieve sustainable development targets.

Hence, it could be agreed from the above mentioned empirical findings that the acceptance of Environmental Innovation (EI) of putting in place innovative clean technology in industries can indeed go a long way in mitigating the effect of climate change on the environment.

It is, however, also argued that having industries carrying the cost associated with the adoption of climate mitigation technologies alone could affect their productivity and competitiveness (Hsin-Ning, and Igam. (2017); Porter and van der Linde. (1995)).

Several scholars like Ambec and Lanoie (2008); Ganotakis and Love (2010); Bustos (2011); Batrakova and Davies (2012); Girma and Hanley (2015); Holladay (2016); Richter and Schiersch (2017); Forslid et al (2018); Tavassoli, (2018); Elliot et al (2019); Barrows and Ollivier (2018, 2021) has looked into the complex nature between trade and Environmental innovation (EI) on firms' productivity and competitiveness. In line with the Melitz (2003) model that proposes that the most productive firms self-select into export markets, most of these researchers also explore the role export trade could play in encouraging the adoption of green technology that could foster energy efficiency, pollution reduction and CO2 efficiency, while at the same time bringing about revenue increase due to productivity by the firms involved.

According to Ambec and Lanoie (2008), to better access new markets and the rising demands for new products, the formalized mechanism of Porter predicts that export activities for firms can significantly increase through the induction of green innovations based on environmental regulations. Although there is a scarcity of investigation on how green management has supported export performances, there is useful insight from the analytical framework provided by

the research on exporting activities and innovations in general, and green innovations in particular. According to Krugman (1979), the explanation of international trade based on the model of product-cycle is premised on the exports of industrialised countries being propelled by innovations and green management. Using the data from the United Kingdom as its case study, Wakelin (1998), reported a correlation that is statistically significant and positive between green innovations and export activities at the level of firms. Also, Bleaney and Wakelin (2002) empirically find that firms that are more likely to export are those in the Research and Development Intensive (Including green innovative) sectors. Using statistical data from firms in Spain's manufacturing sector, Cassiman, Goloovko and Martinez (2010), opine that although the innovation process does not improve the propensity to export, the innovation associated with products, and by extension, green innovation, does improve a firms tendency to export. Providing further evidence from Spain's industrial sector, Cassiman and Golovko (2011) report that export participation by firms is strongly linked with green innovation in the production process. Using firms in Germany as a case study, Becker and Egger (2013) report that innovations based on the products and the process has a higher propensity for export. On the contrary, the data from firms in Belgium used by Van Beveren and Vandenbussche (2010) shows that the export propensity of firms is not significantly helped by product or process innovation of firms. For Pla-Barber and Alegre (2007), evidence from the French biotechnological industry indicates that the intensity of firms is positively and significantly affected by innovations that are based on green technology. In a more recent study of firms in the French manufacturing sector, Elliot et al (2019), also find a positive correlation between innovative green technology and exports. Also, as reported by Ganotakis and Love (2010), the use of new technology which includes green technology and energy was found to improve productivity and thus make firms likely to export more or even enter the export market for beginners. Finally, using evidence from Sweden, Tavassoli (2018) examined the relationship between the propen-

sity to export and green innovations and reported that there is a positive relationship between both the propensity and intensity to export and the use of green technology.

In this research, having examined the extant literature concerning the topic under review, my contribution to the knowledge on export and green management shall be twofold. First, I shed more light on the under-researched relationship between export activities and green management including green technology innovations. Second, by using data from both developed and developing countries, I go beyond the focus on export and green management from the perspective of advanced economies alone (Ganotakis and Love. (2010); Tavassoli. (2018); Elliot et al, (2019)).

3. Methodology

Firstly, I will present the data I applied in the analysis and then followed with the hypotheses before turning to the empirical model I will use to test the hypotheses.

3.1. Data Collection

In the empirical analyses, I will be using the data from World Bank Enterprise Surveys (WBES) database on the survey conducted in 2019. This survey includes a module on the Green Economy, which provides the outcome variables of interest in green management. The data sample consists of over 8,000 firms from 23 countries in Eastern Europe, Central Asia and North Africa. The analysis comprises the manufacturing and service sectors of the countries' firms that are involved in Export activities. Furthermore, in place of environmental actions by firms, I will be relying strictly on the information on whether the firm has a 'green manager' or not. This aspect of green management is so important since it focuses not just on the efficiency and performance of environmentally friendly innovation technologies used by the firms but also on the impact of firms' activities on the environment (Ginsberg and Bloom (2004); Bloom, Genakos, Martin, and Sadun (2010)).

Hypothesis 1: Firms that are directly involved in export activities, and those firms whose products are indirectly exported by third parties, are more likely to adopt environmental actions.

Hypothesis 2: Export firms based in high-income countries are more likely to adopt environmental actions than export firms based in low-income countries.

3.2. Empirical Model

I will be applying a logit estimation to evaluate the correlations between direct and Indirect Export on firms' green management. The equation is specified below:

$$green\_management_j = \beta_0 + \beta_1 DEXPj + \beta_2 IDEXPj + \beta_3 X_j + \varphi + \gamma + \epsilon_j \quad (1)$$

The $green\_management_j$ is the dependent variable of a binary outcome that indicates that the firms adopt green management or have a green manager; I am using this variable in the place of firms' environmental actions. It takes the value of one if firm j has a green manager and zero if otherwise. $DEXPj$ is a binary variable equal to one if the firms are involved in export activities. $IDEXPj$ is a binary variable equal to one if the firm product is exported indirectly through a third party. X_j Captures different aspects that may influence the likelihood of firms to have a green manager that is responsible for environmental and climate change issues. It includes both standard firm characteristics as well as external drivers of green management tools. This include firm characteristics like firm size (micro and small, medium, or large enterprises), labour productivity (log of sales over employees), a dummy variable for R&D expenditures, and a dummy for Foreign direct Investment (FDI) of 10% or more foreign ownership with survey question of whether a firm is owned by Private Foreign/Individuals, Company or Organization. Furthermore, variables that capture external drivers of firms' adoption of green management tools will be included. This includes, whether a firm acquires external knowledge, whether customers require an environmental certification, whether environmental regulations are seen as an obstacle, and whether health and hygiene regulation are

seen as an obstacle too. To control for location-bound effects, I include a dummy of the information on whether firms experienced any losses due to bad weather and pollution occurrences. φ and γ are sector and country fixed effects, respectively and inter alia, encapsulate government or industry pressure.

In line with Hypotheses 2 and in order to provide insights on the distinction between export firms based in high-income countries and those based in low-income countries that are more likely to adopt environmental actions, I will run a logit regression for both categories of countries using the same variables (in equation one) in line with World bank categorization of high- and low-income countries.

HIGH INCOME COUNTRIES	LOW INCOME COUNTRIES
Croatia	Albania
Czech Republic	Bosnia and Herzegovina
Estonia	Bulgaria
Hungary	Georgia
Latvia	Kazakhstan
Lithuania	Kyrgyzstan
Poland	Moldova
Slovenia	Morocco
	Romania
	Russia
	Serbia
	Tajikistan
	Turkey
	Ukraine
	Uzbekistan

Note: World Bank classification based on per capita GNI in 2018.

Table 1: Country coverage.

However, the World Bank categorizes countries' income levels into four groups (Low-Income economies, Lower-middle-income economies, upper-middle-income economies and High-income economies) due to limited data on the total number of countries available, I categorize it into two groups (High-income and Low-income countries/economies). Those countries with a gross national in-

come (GNI) per capita less than $12,695 are classified as low-income economies, while those that have a GNI per Capital income of $12,696 or more, are classified as high-income economies. These can be seen in Table I above.

3.3 Descriptive statistics

	Count	Mean	SD	Min	Max
Direct Export (D) = 0					
green management	12660	.08	0.271	0	1
Size = 1 Medium	12660	.324	0.468	0	1
Size = 2 Large	12660	.175	0.380	0	1
Log (Labor Productivity)	5925	.528	0.546	-2.121	2
R&D (D)	12660	.074	0.261	0	1
FDI (D)	12660	.061	0.239	0	1
External Knowledge (D)	12660	.106	0.307	0	1
Obsta: Env. Regulation (D)	12660	.453	0.498	0	1
Obsta: H&H Regulations (D)	12660	.439	0.496	0	1
Losses: Pollution (D)	12660	.026	0.158	0	1
Losses: Extreme Weather (D)	12660	.074	0.262	0	1
Env. Certification (D)	12660	.122	0.328	0	1
Direct Export (D) = 1					
green management	4349	.216	0.412	0	1
Size = 1 Medium	4349	.346	0.476	0	1
Size = 2 Large	4349	.378	0.485	0	1
Log (Labor Productivity)	2963	.062	0.600	-2.493	2
R&D (D)	4349	.221	0.415	0	1
FDI (D)	4349	.255	0.436	0	1
External Knowledge (D)	4349	.206	0.404	0	1
Obsta: Env. Regulation (D)	4349	.51	0.500	0	1
Obsta: H&H Regulations (D)	4349	.448	0.497	0	1
Losses: Pollution (D)	4349	.044	0.205	0	1
Losses: Extreme Weather (D)	4349	.116	0.320	0	1
Env. Certification (D)	4349	.241	0.428	0	1

Table 2 Summary statistics: By Direct Export

Table 2 and 3 shows the summary statistics of all firms that are involved in export activities (Direct and Indirect Export = 1) and all firms that don't involve in export activities (Direct and Indirect Export = 0) in the empirical data, respectively. The results in the descriptive statistics are in line with hypothesis 1. The majority of all firms that are involved in export activities are likely to adopt environmental actions on average, compare to firms that do not involve in export activities. The summary results show that firms with green management that are involved in Direct and Indirect Export are 21.6% and 20.2%, while

firms that do not involve in Direct and Indirect Export are 8% and 9.9% on average, respectively.

	Count	Mean	SD	Min	Max
Indirect Export (D) = 0					
green management	14420	.099	0.299	0	1
Size = 1 Medium	14420	.327	0.469	0	1
Size = 2 Large	14420	.205	0.404	0	1
Log (Labor Productivity)	7268	.422	0.595	-2.493	2
R&D (D)	14420	.094	0.292	0	1
FDI (D)	14420	.086	0.280	0	1
External Knowledge (D)	14420	.119	0.323	0	1
Obsta: Env. Regulation (D)	14420	.451	0.498	0	1
Obsta: H&H Regulations (D)	14420	.424	0.494	0	1
Losses: Pollution (D)	14420	.023	0.150	0	1
Losses: Extreme Weather (D)	14420	.078	0.267	0	1
Env. Certification (D)	14420	.135	0.341	0	1
Indirect Export (D) = 1					
green management	2589	.202	0.401	0	1
Size = 1 Medium	2589	.345	0.476	0	1
Size = 2 Large	2589	.345	0.476	0	1
Log (Labor Productivity)	1620	.15	0.601	-2.039	1.699
R&D (D)	2589	.208	0.406	0	1
FDI (D)	2589	.247	0.431	0	1
External Knowledge (D)	2589	.202	0.401	0	1
Obsta: Env. Regulation (D)	2589	.563	0.496	0	1
Obsta: H&H Regulations (D)	2589	.537	0.499	0	1
Losses: Pollution (D)	2589	.071	0.256	0	1
Losses: Extreme Weather (D)	2589	.124	0.330	0	1
Env. Certification (D)	2589	.252	0.434	0	1

Table 3: Summary statistics: By Indirect Export

Likewise, the bar graph in Figure 1 shows the distribution of firms by export activities as well as by green management on average. Firms that are involved in export activities are more likely to adopt environmental actions, especially firms involved in direct export compared to firms that do not involve in export activities. While only 62.2% and 37.8% of non-direct and -indirect exporting firms on average implement environmental actions compare to 64.3% and 35.7% on average of firms involved in direct and indirect export, respectively.

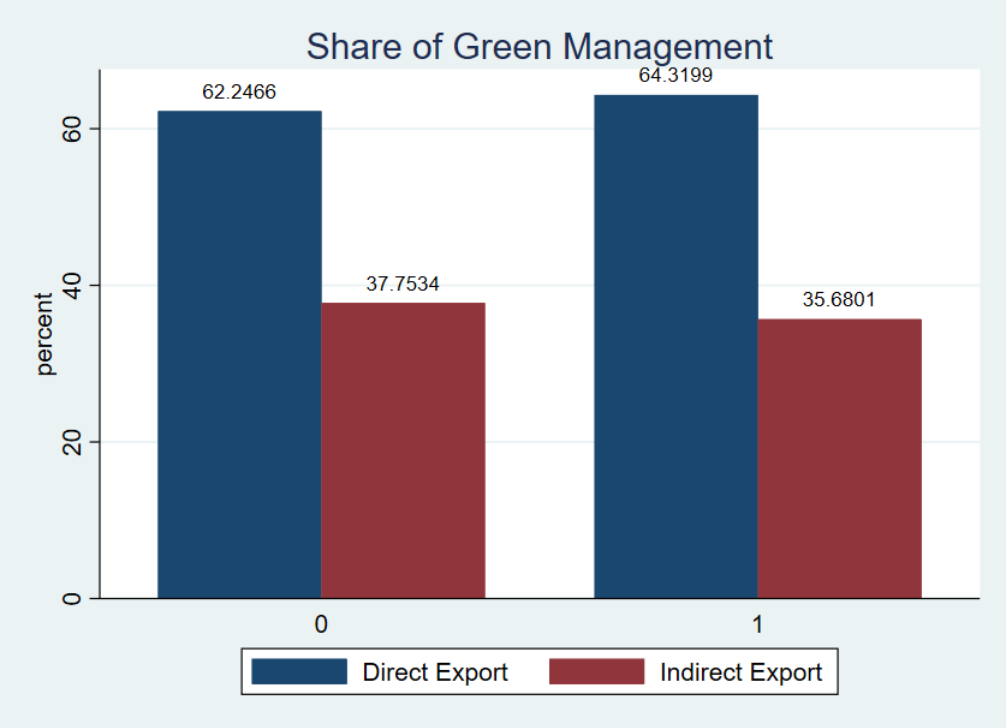

Figure 1: Share of Green Management By Direct & Indirect Export

4. Empirical Results

4.1. Baseline Result – Direct and Indirect Export on Firms Green Management Adoption

Table 4 shows the results from the logit estimations of the outcome variables by the manufacturing and service sector, respectively. The first empirical results corroborate the descriptive insights that Direct Exports, in general, are positively correlated with the adoption of environmental actions by firms. The odds of having a green manager are 1.322 times higher for companies that are directly involved in export activities relative to firms that do not involve in direct exports (Column (1)). Concerning the sector of the firms, there is a difference between the manufacturing and the service sector. The results are driven by the service sector firms (Columns (3)).

	(1) Total Samples	(2) Manufact. Sample	(3) Service Sample
VARIABLES	Green Manager	Green Manager	Green Manager
Direct Export (D)	1.322***	1.239	1.411***
	(0.116)	(0.189)	(0.155)
Indirect Export (D)	1.008	1.301*	0.860
	(0.092)	(0.199)	(0.099)
Size = 1 Medium	1.095	1.236	1.036
	(0.119)	(0.251)	(0.138)
Size = 2 Large	1.067	1.069	1.070
	(0.165)	(0.309)	(0.202)
Log (Labor Productivity)	0.326***	0.322***	0.330***
	(0.034)	(0.061)	(0.043)
R&D (D)	1.416***	1.379**	1.445***
	(0.140)	(0.219)	(0.187)
FDI (D)	1.334***	1.340*	1.360**
	(0.133)	(0.213)	(0.176)
External Knowledge (D)	1.332***	1.164	1.442***
	(0.135)	(0.188)	(0.191)
Obsta: Env. Regulation (D)	1.084	1.080	1.054
	(0.106)	(0.166)	(0.136)
Obsta: H&H Regulations (D)	1.054	0.910	1.163
	(0.102)	(0.138)	(0.147)
Losses: Pollution (D)	2.191***	1.326	2.803***
	(0.409)	(0.427)	(0.671)
Losses: Extreme Weather (D)	1.371**	1.350*	1.412**
	(0.170)	(0.245)	(0.241)
Env. Certification (D)	6.361***	5.179***	7.340***
	(0.514)	(0.710)	(0.757)
Observations	8,873	2,848	5,999
Country FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Pseudo R2	0.283	0.247	0.314

Notes: Odds ratios. See Table A.1 for marginal effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Baseline Results

The results (Column (2)) show that the outcome variable cannot be determined by the manufacturing sector since it is not statistically significant. However, the results for Indirect Exports (Column (2)) for a P-value less than 0.1 level of significate show that companies whose products are indirectly exported by third parties exhibit the odds of having a green manager at 1.301 times higher relative to firms that do not get involved in indirect exports in the manufacturing sector. While the service sector in (Column (3)) is not statistically significant in the

indirect export. The marginal effects of the baseline results of the manufacturing and service sector are shown in Table A.1 in the Appendix. Generally, direct export is statistically significant, but it is mainly driven by the service sector (Colum (3)). While the indirect exports (Columns (2)) in the manufacturing sector have a marginal effect on green management for a P-value less than 0.1 level of significate. Hence, these partially corroborate with the first hypothesis that indeed, firms that are directly involved in export activities, and those firms whose products are indirectly exported by third parties, are more likely to adopt environmental actions. In addition, from the results in Table 4, productive firms from the manufacturing and service sector do often implement green management tools. Foreign Direct Investment (FDI) of 10% or more foreign ownership relates positively to green management tools as well. The same is true for firms that spend on R&D and experience losses due to extreme weather. However, the results from firms that acquire external knowledge and experienced any losses due to pollution are statistically significant except in the manufacturing sector (Column (2)). In general, both large and medium firms are not statistically significant. The same is true for manufacturing and service firms that face environmental, health and hygiene regulations as an obstacle while, firms whose customers require an environmental certificate for doing business also more often adopt green management. Therefore, I could identify that there are partially both internal and external drivers of the adoption of environmental actions by firms. Among which are monetary losses, due to external pollution, extreme weather, and the condition of having environmental certifications for doing business and the latter have the strongest effects on the logit regression results. However, the level of insignificant for most of the independent variables could be a result of inadequate data since I could only get data from a limited number of countries.

4.2. Country Heterogeneity – Income Level

Using the Gross National Income (GNI) per capita by World Bank classification, I categorize all the 23 countries used in my statistical analysis into two income groups (High-income and Low-income countries/economies).

	(1) High-Income Countries	(2) Low-Income Countries
VARIABLES	Green Manager	Green Manager
Direct Export (D)	0.970	1.524***
	(0.146)	(0.165)
Indirect Export (D)	1.008	0.975
	(0.153)	(0.113)
Size = 1 Medium	1.180	1.056
	(0.214)	(0.144)
Size = 2 Large	1.100	1.076
	(0.278)	(0.209)
Log (Labor Productivity)	0.301***	0.336***
	(0.057)	(0.043)
R&D (D)	1.379*	1.479***
	(0.231)	(0.183)
FDI (D)	1.414**	1.295**
	(0.239)	(0.166)
External Knowledge (D)	1.170	1.409***
	(0.208)	(0.175)
Obsta: Env. Regulation (D)	1.112	1.080
	(0.173)	(0.135)
Obsta: H&H Regulations (D)	0.825	1.183
	(0.131)	(0.146)
Losses: Pollution (D)	3.568***	1.923***
	(1.439)	(0.410)
Losses: Extreme Weather (D)	1.331	1.431**
	(0.279)	(0.222)
Env. Certification (D)	6.995***	6.045***
	(0.990)	(0.600)
Observations	2,259	6,606
Country FE	Yes	Yes
Sector FE	Yes	Yes
Pseudo R2	0.268	0.281

Notes: Odds ratios. Sector FE and country FE included. See Table A.2 and A.4 for marginal effects and marginal effect at the mean, respectively. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.1

Table 5: Total Sample Split By Income Group

Table 5 shows the total sample split into Income groups. The results show that low-income countries (Colum (2)) direct export-based firms are more likely to adopt environmental actions than high-income countries. While high- and low-income countries (Colum (1) and (2)) are not statistically significant for indirect export. Furthermore, the marginal effects of direct and indirect exports by income group are shown in Table A.2 and A.4 in the Appendix. Table A.2 shows

that it is only firms that are involved in direct exports in Low-income countries (Column (2)) that have a marginal effect on green management. The same is true with the marginal effect at the mean in Table A.4 (Column (3)).

In Addition, Table 6 shows the splitting of the sample into the manufacturing and service sector by income groups. Direct Exports firms in Low-income countries (Columns (3) and (4)) in the adoption of environmental stays highly statistically significant while the effect of Direct Exports in High-income countries for manufacturing and service sector on the adoption of environmental actions turns statistically insignificant. However, indirect export in both high- and low-income countries are not statistically significant in both sectors. Furthermore, the marginal effects of the manufacturing and service sector split by income group are shown in Table A.3 in the Appendix. Only firms that are involved in direct exports in Low-income countries (Columns (3) and (4)) are shown to have a marginal effect on green management. In addition, in Table 6, firms from the manufacturing and service sector in high- and low-income countries that are productive often implement green management tools. Manufacturing and service firms that face environmental, health and hygiene regulations as an obstacle are not statistically significant. While firms whose customers require an environmental certificate for doing business also more often adopt environmental actions and this as well have the strongest effects on the logit regression results.

From this empirical output, low-income countries, in general, seem to be doing well and are more statistically significant than high-income counties in the adoption of environmental actions. However, this may not be true in individual countries' comparison in terms of their adoption of environmental actions between high- and low-income countries. This could be a result of the shortfall of data 8-15 in income group comparison. More than the top 20 high-income countries by GNI per capita in the world are not captured in the number of countries used in this statistical analysis. Nevertheless, based on the logit regression results from this analysis, hypothesis 2 is not in line with the logit results since firms that are involved in direct exports in low-income countries seem to be doing better than firms that are involved in export activities in high-

income countries in the adoption of environmental actions. However, one cannot 100% rely on these results based on the situation as already explained – access to available data for most high-income countries.

	(1) Manufact. Sample (High-Income Countries)	(2) Service Sample (High-Income Countries)	(3) Manufact. Sample (Low-Income Countries)	(4) Service Sample (Low-Income Countries)
VARIABLES	Green Manager	Green Manager	Green Manager	Green Manager
Direct Export (D)	0.809	1.208	1.625**	1.542***
	(0.216)	(0.236)	(0.308)	(0.210)
Indirect Export (D)	1.424	0.790	1.194	0.877
	(0.344)	(0.164)	(0.244)	(0.126)
Size = 1 Medium	2.023**	0.912	0.937	1.136
	(0.722)	(0.205)	(0.242)	(0.188)
Size = 2 Large	1.616	0.858	0.857	1.185
	(0.764)	(0.274)	(0.325)	(0.280)
Log (Labor Productivity)	0.293***	0.302***	0.340***	0.337***
	(0.095)	(0.074)	(0.084)	(0.054)
R&D (D)	1.337	1.538*	1.518*	1.474**
	(0.329)	(0.383)	(0.332)	(0.231)
FDI (D)	1.477	1.564*	1.351	1.290
	(0.378)	(0.375)	(0.293)	(0.210)
External Knowledge (D)	1.293	1.105	1.067	1.623***
	(0.324)	(0.291)	(0.234)	(0.254)
Obsta: Env. Regulation (D)	1.317	0.851	0.923	1.162
	(0.289)	(0.196)	(0.199)	(0.181)
Obsta: H&H Regulations (D)	0.751	0.962	1.046	1.243
	(0.171)	(0.229)	(0.216)	(0.189)
Losses: Pollution (D)	0.754	8.103***	1.639	2.131***
	(0.467)	(4.148)	(0.605)	(0.571)
Losses: Extreme Weather (D)	1.671*	1.014	1.098	1.646**
	(0.464)	(0.327)	(0.282)	(0.336)
Env. Certification (D)	5.344***	10.119***	5.213***	6.566***
	(1.214)	(1.999)	(0.914)	(0.810)
Observations	924	1,306	1,918	4,670
Country FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Pseudo R2	0.260	0.314	0.247	0.311

Notes: Odds ratios. Sector FE and country FE included. See Table A.3. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.1

Table 6: Manufacturing and Service Sector Split By Income Group

5. Discussion and Recommendations

Concerning the empirical findings of this study, several lessons can be learned from which I will also give some recommendations, and they are:

Firstly, firms that directly involve in exports are more likely to adopt green management techniques. Hence, at the firm level, the migration towards the use of green energy in all its processes should be sped up to access more international markets.

For the government and regulatory authorities, effort should be put in place to ensure firms conform to the green standards required in the international market.

Secondly, firms that indirectly export their products through third parties have high tendencies of involving in green innovations in their production process. Hence, third-party firms should encourage the use of green management by indirectly exporting more from these green innovation firms, in addition to monitoring them to ensure green management standards practices are kept.

Thirdly, firms that their customers ask for environmental certificate for doing business has the strongest effect in the adoption of environmental actions on the logit regression results. Therefore, urgent steps should be taken by the government and regulatory agencies to make environmental certificates a basic requirement for manufacturing firms most especially in developing countries to attract more FDIs.

Furthermore, the government and institutions in high- and low-income countries should do more to increase their investment in green technological innovation to achieve sustainable development goals such as, GOAL 3: Good Health and Well-being; GOAL 6: Clean Water and Sanitation; GOAL 7: Affordable and Clean Energy; GOAL 9: Industry, Innovation and Infrastructure; GOAL 11: Sustainable Cities and Communities; GOAL 12: Responsible Consumption and Production; and GOAL 13: Climate Action.

Finally, aside the government and environmental regulatory agencies, firms should take active part in sensitising the population on the need to develop attitudes that are congenial towards the environmental sustainability.

6. Conclusion

In this research, I examine how the implementation of the tools of green management by firms is influenced by their exports. Based on the empirical examination, I find that firms involved in the exportation of their products are more likely to adopt green management initiatives. Hence, the reduction of the environmental footprints of the firms examined is greatly enhanced when their products are traded internationally. This could be adduced to the fact that not only is the use of eco-friendly products being advocated worldwide but the production processes of these products are also demanded to be environmentally friendly and sustainable. Based on the heterogeneity of the countries, and the Gross National income (GNI) per capita used to classify the countries, the outcome shows that firms in the manufacturing and service sector of low-income countries that indulge in direct exports are more likely to adopt green management tools compared to those in high-income countries. The results show that for the firms in low-income countries, the 'green' standard requirements in the international market for goods are making locals adopt green management tools.

Through this research, my contribution to the literature on firms in international trade and how it influences their environmental performance, are in several ways. Firstly, I explore the correlation between a firm's export activities and the use of green management tools. Thus, I produce evidence and added to the literature on how Export activities can improve a firm's environmental performance. Secondly, I extract the data set both from developed and developing countries, thus going beyond the usual focus of most previous studies on green management and export from the narrative of developed economies only. However, due to the structure of the cross-sectional data, data limitation is the major constraint I face in this research. For policymakers, the importance of these findings is numerous. The use of green management tools by firms can be given a big boost when these firms indulge in international trade through export. Hence, in addition to exports providing the needed foreign exchange, it can also

contribute to a rapid green economic transformation in the face of environmental challenges.

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Appendix

A.1 Additional Empirical Results

A.1.1 Logistic regression results with marginal effects

Table A.1: Baseline Results: Average Marginal Effects (AME)

	(1) Total Samples	(2) Manufact. Sample	(3) Service Sample
VARIABLES	Green Manager	Green Manager	Green Manager
Direct Export (D)	0.024***	0.021	0.027***
	(0.008)	(0.015)	(0.009)
Indirect Export (D)	0.001	0.026*	-0.012
	(0.008)	(0.015)	(0.009)
Size = 1 Medium	0.008	0.021	0.003
	(0.009)	(0.020)	(0.011)
Size = 2 Large	0.006	0.007	0.005
	(0.013)	(0.029)	(0.015)
Log (Labor Productivity)	-0.097***	-0.112***	-0.088***
	(0.009)	(0.019)	(0.010)
R&D (D)	0.030***	0.032**	0.029***
	(0.009)	(0.016)	(0.010)
FDI (D)	0.025***	0.029*	0.024**
	(0.009)	(0.016)	(0.010)
External Knowledge (D)	0.025***	0.015	0.029***
	(0.009)	(0.016)	(0.011)
Obsta: Env. Regulation (D)	0.007	0.008	0.004
	(0.009)	(0.015)	(0.010)
Obsta: H&H Regulations (D)	0.005	-0.009	0.012
	(0.008)	(0.015)	(0.010)
Losses: Pollution (D)	0.068***	0.028	0.082***
	(0.016)	(0.032)	(0.019)
Losses: Extreme Weather (D)	0.027**	0.030*	0.027**
	(0.011)	(0.018)	(0.014)
Env. Certification (D)	0.161***	0.163***	0.158***
	(0.006)	(0.012)	(0.007)
Observations	8,873	2,848	5,999
Country FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.2: Total Sample Split By Income Group (AME)

	(1)	(2)
	High-Income Countries	Low-Income Countries
VARIABLES	Green Manager	Green Manager
Direct Export (D)	0.996	1.032***
	(0.018)	(0.008)
Indirect Export (D)	1.001	0.998
	(0.018)	(0.009)
Size = 1 Medium	1.020	1.004
	(0.022)	(0.010)
Size = 2 Large	1.011	1.006
	(0.030)	(0.015)
Log (Labor Productivity)	0.868***	0.921***
	(0.019)	(0.009)
R&D (D)	1.039*	1.030***
	(0.020)	(0.010)
FDI (D)	1.042**	1.020**
	(0.021)	(0.010)
External Knowledge (D)	1.019	1.026***
	(0.021)	(0.010)
Obsta: Env. Regulation (D)	1.013	1.006
	(0.019)	(0.010)
Obsta: H&H Regulations (D)	0.978	1.013
	(0.018)	(0.009)
Losses: Pollution (D)	1.161***	1.050***
	(0.055)	(0.017)
Losses: Extreme Weather (D)	1.034	1.027**
	(0.025)	(0.012)
Env. Certification (D)	1.257***	1.145***
	(0.018)	(0.008)
Observations	2,259	6,606
Country FE	Yes	Yes
Sector FE	Yes	Yes

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Manufacturing and Service Sector Split By Income Group (AME)

VARIABLES	(1) Manufact. Samples (High-Income Countries) Green Manager	(2) Service Sample (High-Income Countries) Green Manager	(3) Manufact. Sample (Low-Income Countries) Green Manager	(4) Service Sample (Low-Income Countries) Green Manager
Direct Export (D)	-0.025	1.021	0.042**	1.030***
	(0.032)	(0.022)	(0.016)	(0.010)
Indirect Export (D)	0.043	0.974	0.015	0.991
	(0.029)	(0.022)	(0.018)	(0.010)
Size = 1 Medium	0.085**	0.990	-0.006	1.009
	(0.043)	(0.025)	(0.022)	(0.012)
Size = 2 Large	0.058	0.983	-0.013	1.012
	(0.057)	(0.035)	(0.033)	(0.017)
Log (Labor Productivity)	-0.148***	0.876***	-0.093***	0.928***
	(0.038)	(0.023)	(0.021)	(0.010)
R&D (D)	0.035	1.049*	0.036*	1.027**
	(0.030)	(0.029)	(0.019)	(0.011)
FDI (D)	0.047	1.051*	0.026	1.018
	(0.031)	(0.028)	(0.019)	(0.011)
External Knowledge (D)	0.031	1.011	0.006	1.034***
	(0.030)	(0.029)	(0.019)	(0.011)
Obsta: Env. Regulation (D)	0.033	0.982	-0.007	1.010
	(0.027)	(0.025)	(0.019)	(0.011)
Obsta: H&H Regulations (D)	-0.034	0.996	0.004	1.015
	(0.027)	(0.026)	(0.018)	(0.011)
Losses: Pollution (D)	-0.034	1.260***	0.043	1.054***
	(0.075)	(0.069)	(0.032)	(0.019)
Losses: Extreme Weather (D)	0.062*	1.002	0.008	1.035**
	(0.033)	(0.036)	(0.022)	(0.015)
Env. Certification (D)	0.202***	1.291***	0.142***	1.139***
	(0.024)	(0.022)	(0.014)	(0.009)
Observations	924	1,306	1,918	4,670
Country FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

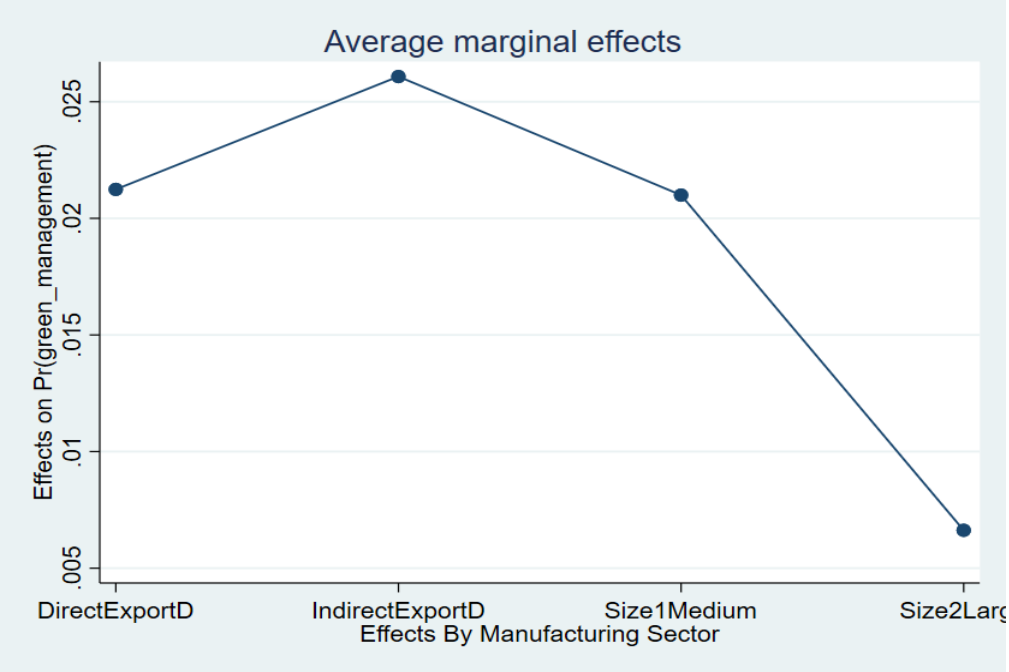
Table A.4: Marginal Effects at the Mean

	(1)	(2)	(3)
	Total Countries	High Income Countries	Low Income Countries
VARIABLES	Green Manager	Green Manager	Green Manager
Direct Export (D)	1.020***	-0.004	0.024***
	(0.006)	(0.019)	(0.006)
Indirect Export (D)	1.001	0.001	-0.001
	(0.007)	(0.019)	(0.007)
Size = 1 Medium	1.007	0.021	0.003
	(0.008)	(0.023)	(0.008)
Size = 2 Large	1.005	0.012	0.004
	(0.011)	(0.032)	(0.011)
Log (Labor Productivity)	0.923***	-0.152***	-0.062***
	(0.007)	(0.023)	(0.007)
R&D (D)	1.025***	0.041*	0.022***
	(0.007)	(0.021)	(0.007)
FDI (D)	1.021***	0.044**	0.015**
	(0.007)	(0.021)	(0.007)
External Knowledge (D)	1.021***	0.020	0.020***
	(0.007)	(0.023)	(0.007)
Obsta: Env. Regulation (D)	1.006	0.013	0.004
	(0.007)	(0.020)	(0.007)
Obsta: H&H Regulations (D)	1.004	-0.024	0.010
	(0.007)	(0.020)	(0.007)
Losses: Pollution (D)	1.058***	0.161***	0.037***
	(0.014)	(0.051)	(0.012)
Losses: Extreme Weather (D)	1.023**	0.036	0.020**
	(0.009)	(0.026)	(0.009)
Env. Certification (D)	1.142***	0.246***	0.103***
	(0.007)	(0.019)	(0.006)
Observations	8,873	2,259	6,606
Country FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes

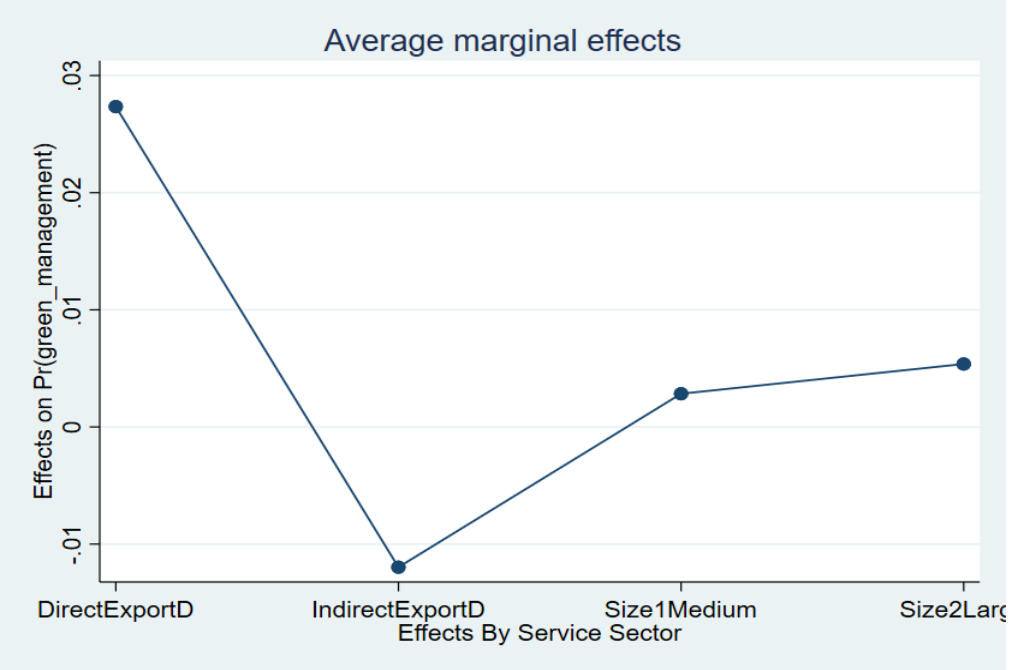
Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A.2. Additional Graphs

Figure A.1: Marginal Effect of Direct Export, Indirect Export, Medium and Large firm by Green Management



(A) Manufacturing Sector By Green Management



(B) Service Sector By Green Management

Affirmation

I hereby declare that I have composed my Master's thesis "Firms' Export Activities And The Adoption of Environmental Actions in High- And Low-Income Countries." independently using only those resources mentioned, and that I have as such identified all passages which I have taken from publications verbatim or in substance. I agree that my thesis may be checked for plagiarism using testing software. Neither this thesis, nor any extract of it, has been previously submitted to an examining authority, in this or a similar form.

I have ensured that the written version of this thesis is identical to the version saved on the enclosed storage medium.

_____ _____

Date Signature