


## Article

# How Environmental Performance Affects Financial Performance in the Food Industry: A Global Outlook

Yifan Xie <sup>1</sup>, Yingkai Fang <sup>2,\*</sup> and Dengjun Zhang <sup>3</sup> 

<sup>1</sup> Department of Agricultural and Resource Economics, University of California, Davis, CA 95616, USA; xyfxie@ucdavis.edu

<sup>2</sup> Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601, USA

<sup>3</sup> Business School, University of Stavanger, 4036 Stavanger, Norway; dengjun.zhang@uis.no

\* Correspondence: fangy@uapb.edu

**Abstract:** The impacts of environmental performance on the financial performance of food firms are investigated in this paper using a sample of 6064 food companies from 51 countries. The financial performance is measured through sales and internal funds, and environmental performance is based on whether firms have adopted standards related to environmental management. The empirical results show that, for the full sample, food firms' sales are positively associated with environmental performance, while environmental performance does not impact internal funds. In subsample analyses, this paper finds that the environmental performance of firms in lower-middle-income and upper-middle-income countries has a more significant impact on sales than firms in high-income countries. Moreover, desirable environmental performance significantly increases the internal funds of food firms in most country groups except for high-income countries. Grouping countries by region, we find that environmental performance significantly influences sales in all regions except for Africa. However, for internal funds, it is only substantial in Africa. The results also imply the significance of expanding firm size and adopting foreign technology for food companies to achieve better financial performance.



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## 1. Introduction

The growth of the human population has led to increasing concerns about the sustainability of the food industry [1]. Growing food demand requires extensive product development in the food industry, thus adding significant environmental pressures. Production expansion will increase emissions of greenhouse gases [2] and the use of chemical fertilizers and pesticides [3–7], causing land degradation and waste. While many developing countries still struggle with insufficient food supply, undernourishment, and food insecurity [8], environmental impacts due to increasing food production to supply more populations have become a global concern. This is because of the globalization of the food supply chain and the increasing trade of agricultural products. Accordingly, an increasing number of consumers, particularly in developed countries, expect healthier food, care about the credibility of food sources [9,10], and show a higher willingness to pay for sustainable food [11]. Moreover, some countries have advocated for less unnecessary food intake and encouraged healthier food choices [9,10,12]. These consumption-based approaches for fewer environmental burdens are popular with increasing environmental awareness in the demand market, also urging a green transition of food firms on the supply side.

A substantial number of studies have investigated firms' environmental performance and financial benefits [13–16]. Theoretically, the natural-resource-based view indicates that environmentally responsible firms develop rare and inimitable organizational resources, resulting in a competitive advantage and superior financial performance [14,17,18]. However, the relationship between resources, competitive advantage, and financial performance

depends on resource bundles rather than single resources, indicating the ambiguous impacts of environmental performance on financial performance. In previous studies, some find a positive influence of environmental performance on economic performance [19–23], implying that an improvement in the production process will increase the firms' profit, largely due to an increasing green demand [24]. However, many studies indicate an ambiguous association between environmental and financial performance [25–27]. This is because many other factors, such as firm size, firm age, and location, can also significantly affect firms' performance [28–31]. While this has been a widely investigated topic, the previous literature shows a research gap of food firms, particularly from a global perspective, comparing food firms' eco-friendly management operations. However, an international comparison of food firms is important to enhance global awareness of sustainability and improve the greenness of the worldwide food industry.

Improving environmental performance is time-consuming and costly for firms [32,33]. Committing to environmentally friendly practices for firms thus requires economic viability. Therefore, the impacts of environmental performance on food firms' financial performance can provide the necessary references for firms' decision-makers. If they are positively associated, food firms will have strong motivations to adopt eco-friendly practices, significantly reducing the environmental pressures of growing food production. This study is first motivated by the lack of multiple-country studies investigating how environmental performance and other firm characteristics affect the financial performance of food firms.

Besides the increase in demand for eco-friendly products and willingness to pay for greenness [34–37], eco-friendly food products may have longer product lifespans than regular food products and lower costs along the supply chain [38]. In addition, consumers show different preferences between eco-friendly food products and other regular products, resulting in lower substitutability between those two types of products [39]. The aforementioned benefits of eco-friendly products through the customers' channel consequently improve the financial performance of environmentally responsible food firms. However, pro-environmental consumption is subject to economic development, demographic features, and social and cultural characteristics [40]. Thus, an essential empirical issue is whether the correlation between environmental and financial performance varies across countries of different income levels and regions. This also reflects the importance of agricultural trade in the food supply chain [41–43].

This study evaluates the impact of environmental performance on food firms' financial performance by controlling for other financial performance determinants, such as firm size, firm age, etc. The sample is composed of 6064 food firms from 51 countries during 2011 and 2020. We further investigate whether the relationship between environmental and financial performance varies across countries of different income levels and by region. The measure of environmental performance is widely discussed and critiqued by its diverse choices in literature [44,45]. Considering the characteristics of the food industry and data availability, this paper follows previous studies [23,46–48] and evaluates the environmental performance based on whether investigated food firms have adopted international standards related to environmental management such as the ISO 14000. Financial performance is represented by sales and internal funds, which represent the impacts of environmental performance in the short term and long term, respectively.

Our empirical results show environmental performance significantly affects food firms' sales while the impact varies across countries of various income levels and regions where food firms are located. However, for the full sample and most of the regions, a significant association between environmental performance and the internal funds is not found. The results also imply the significance of firm size and foreign technology in motivating food firms to improve financial performance.

The rest of this paper is organized as follows: A description of sample data and the measurement of food firms' environmental and financial performance is given in Section 2. Afterward, the models of different financial performance are introduced in Section 3, followed by the regression results by model in Section 4, which also compares the impacts

of other factors on sales and internal funds of food firms. Finally, concluding remarks and implications are discussed in Section 5.

## 2. Data and Measurement

To investigate the impacts of environmental performance on food companies' financial performance, we use the data of World Bank Enterprise Surveys, which provide firm-level information and reflect the business environment of different countries. This dataset functions aptly in analyzing questions relevant to firms' financial and environmental performance [23,48,49].

After removing firms with missing values for variables included in the model specifications, we obtained a sample of 6064 food firms from 51 countries from 2011 to 2020. To differentiate the impacts of income at the country level on environmental and financial performance, we divided the countries into four groups by the classification set by the World Bank, namely high-income, upper-middle-income, low-middle-income, and low-income countries. Moreover, we divide those sample countries by region according to different social and cultural backgrounds, such as Europe and Central Asia (ECA), Africa (AFR), Latin America and the Caribbean (LAC), the South Asia Region (SAR), East Asia and the Pacific (EAP), and the Middle East and North Africa (MNA).

Several measurements for food firms' environmental performance have been widely used in literature, such as greenhouse gas emissions, food waste management, and soil impact indicators [50–55]. The applications of these indexes vary by food sector as the production process is different across sectors. This study compares food firms' environmental performance of different sectors using international standards related to environmental management such as the ISO 14000 standard. The ISO 14000 guideline, a work collaborated by 90 standard-setting groups and over 100 countries, has become an international standard and delineated the requirements for environmental management systems [56]. Moreover, the ISO 14000 sets specific and easy-to-conduct guidelines for implementation in practice, including planning, implementing operation, checking errors, correcting behaviors, and reviewing processes [32]. Hence, food firms have desirable environmental performance in this study if they have adopted international standards related to environmental management.

We apply firms' annual sales and internal funds to measure financial performance. In the literature, returns on assets or investment (ROA or ROI) are widely used to represent financial performance [57,58]. This study applies sales to reflect the impact of consumers' demand for greenness in the short term, and internal funds to reflect the long-term impact of environmental behaviors. These measures can complement other measures used in the literature, as also indicated by [59]. For data comparability, firms' total sales are divided by the mean of annual sales by country. The internal funds variable refers to the share of the establishment's working capital financed by internal funds or retained earnings. Eco-friendly food firms may set higher prices for green products as the costs are higher. Moreover, investment in green practices may have a long payback period, indicating the possible connection between environmental performance and retained earnings. Table 1 presents a summary of the financial performance and sample distribution by country. As shown in Table 1, green firms have substantially greater sales than conventional firms for most of the sample countries; however, only several mean differences for internal funds are significant.

**Table 1.** Sample distribution by countries and mean difference tests for sales and internal funds.

| Country         | Obs. | Share of Green Firms | Sales       |                    |           | Internal-Funds |                    |            |
|-----------------|------|----------------------|-------------|--------------------|-----------|----------------|--------------------|------------|
|                 |      |                      | Green Firms | Conventional Firms | Diff      | Green Firms    | Conventional Firms | Diff       |
| Full sample     | 6064 | 30.9%                | 2.117       | 0.501              | 1.616 *** | 0.737          | 0.759              | −0.022 **  |
| Argentina       | 159  | 20.75%               | 4.015       | 0.210              | 3.805 *** | 0.513          | 0.670              | −0.157 **  |
| Armenia         | 51   | 25.49%               | 2.458       | 0.501              | 1.957 *** | 0.744          | 0.812              | −0.068     |
| Bangladesh      | 126  | 14.29%               | 1.687       | 0.885              | 0.802     | 0.739          | 0.761              | −0.022     |
| Belarus         | 83   | 51.81%               | 1.793       | 0.148              | 1.645 *** | 0.744          | 0.761              | −0.017     |
| Belgium         | 71   | 60.56%               | 1.565       | 0.132              | 1.432 *** | 0.675          | 0.753              | −0.078     |
| Bhutan          | 5    | 20.00%               | 1.788       | 0.803              | 0.905     | 0.300          | 0.675              | −0.375     |
| Bulgaria        | 105  | 59.05%               | 1.416       | 0.401              | 1.015 *** | 0.670          | 0.793              | −0.123 **  |
| China           | 127  | 69.29%               | 1.325       | 0.267              | 1.058     | 0.913          | 0.888              | 0.025      |
| Colombia        | 150  | 28.00%               | 3.029       | 0.211              | 2.818 *** | 0.394          | 0.417              | −0.022     |
| Egypt           | 675  | 21.19%               | 3.412       | 0.352              | 3.061 *** | 0.882          | 0.861              | 0.020      |
| El Salvador     | 70   | 4.29%                | 8.081       | 0.683              | 7.399 *** | 1.000          | 0.676              | 0.324      |
| Ethiopia        | 56   | 10.71%               | 3.982       | 0.642              | 3.340 *** | 0.933          | 0.732              | 0.201      |
| Georgia         | 81   | 24.69%               | 2.469       | 0.518              | 1.951 *** | 0.805          | 0.741              | 0.064      |
| Ghana           | 35   | 11.43%               | 0.338       | 1.085              | −0.748    | 0.700          | 0.665              | 0.035      |
| Greece          | 109  | 74.31%               | 1.290       | 0.161              | 1.129 **  | 0.736          | 0.786              | −0.050     |
| Hungary         | 103  | 72.82%               | 1.312       | 0.164              | 1.148 **  | 0.844          | 0.879              | −0.034     |
| India           | 473  | 31.71%               | 2.427       | 0.337              | 2.090 *** | 0.705          | 0.614              | 0.092 ***  |
| Indonesia       | 148  | 17.57%               | 4.761       | 0.198              | 4.563 *** | 0.805          | 0.789              | 0.016      |
| Iraq            | 80   | 3.75%                | 1.012       | 1.000              | 0.012     | 0.933          | 0.896              | 0.037      |
| Israel          | 77   | 37.66%               | 2.250       | 0.245              | 2.005 *** | 0.692          | 0.771              | −0.079     |
| Italy           | 80   | 95.00%               | 1.047       | 0.103              | 0.945     | 0.653          | 0.625              | 0.028      |
| Jordan          | 38   | 18.42%               | 4.109       | 0.298              | 3.811 *** | 0.500          | 0.845              | −0.345 *** |
| Kazakhstan      | 179  | 23.46%               | 1.263       | 0.920              | 0.343     | 0.888          | 0.846              | 0.042      |
| Kenya           | 211  | 43.60%               | 1.659       | 0.490              | 1.169 **  | 0.761          | 0.626              | 0.135 ***  |
| Lebanon         | 160  | 26.88%               | 3.294       | 0.157              | 3.137 **  | 0.691          | 0.745              | −0.054     |
| Malaysia        | 118  | 28.81%               | 1.819       | 0.668              | 1.151     | 0.590          | 0.716              | −0.126 **  |
| Morocco         | 76   | 23.68%               | 2.616       | 0.498              | 2.118 *** | 0.606          | 0.674              | −0.069     |
| Mozambique      | 75   | 8.00%                | 3.048       | 0.822              | 2.227     | 1.000          | 0.848              | 0.152      |
| Nigeria         | 80   | 12.50%               | 0.358       | 1.092              | −0.733    | 0.840          | 0.766              | 0.074      |
| Pakistan        | 94   | 19.15%               | 3.596       | 0.385              | 3.210 *** | 0.828          | 0.860              | −0.032     |
| Peru            | 98   | 26.53%               | 3.207       | 0.203              | 3.003 *** | 0.444          | 0.473              | −0.029     |
| Philippines     | 93   | 12.90%               | 3.959       | 0.562              | 3.397 *** | 0.975          | 0.891              | 0.084      |
| Poland          | 75   | 20.00%               | 2.060       | 0.735              | 1.325 *   | 0.730          | 0.787              | −0.057     |
| Portugal        | 96   | 27.50%               | 2.167       | 0.300              | 1.867 *** | 0.601          | 0.774              | −0.173 **  |
| Romania         | 116  | 46.55%               | 1.576       | 0.499              | 1.077 **  | 0.617          | 0.652              | −0.035     |
| Russia          | 214  | 10.75%               | 4.744       | 0.549              | 4.195 *** | 0.676          | 0.763              | −0.086     |
| Senegal         | 83   | 4.82%                | 5.475       | 0.773              | 4.702 **  | 0.775          | 0.833              | −0.058     |
| Slovak Republic | 68   | 33.82%               | 2.287       | 0.342              | 1.945 *** | 0.719          | 0.840              | −0.121     |
| South Africa    | 42   | 28.57%               | 0.512       | 1.195              | −0.683    | 0.958          | 0.977              | −0.018     |
| Sri Lanka       | 81   | 16.05%               | 4.849       | 0.264              | 4.584 *** | 0.600          | 0.670              | −0.070     |
| Suriname        | 13   | 61.54%               | 1.219       | 0.649              | 0.570     | 0.506          | 0.530              | −0.024     |
| Tanzania        | 40   | 30.00%               | 2.756       | 0.248              | 2.508 *   | 0.554          | 0.700              | −0.145     |
| Thailand        | 74   | 39.19%               | 2.501       | 0.033              | 2.468 *** | 0.806          | 0.887              | −0.080     |
| Tunisia         | 107  | 42.99%               | 1.177       | 0.867              | 0.310     | 0.581          | 0.650              | −0.069     |
| Turkey          | 191  | 45.55%               | 1.595       | 0.502              | 1.093 *** | 0.733          | 0.765              | −0.032     |
| Uganda          | 54   | 29.63%               | 3.174       | 0.084              | 3.090 **  | 0.470          | 0.685              | −0.215 **  |
| Ukraine         | 211  | 29.86%               | 1.125       | 0.947              | 0.178     | 0.802          | 0.855              | −0.053     |
| Uzbekistan      | 144  | 31.25%               | 1.534       | 0.757              | 0.777 **  | 0.901          | 0.878              | 0.022      |
| Vietnam         | 90   | 25.56%               | 3.549       | 0.125              | 3.424 *** | 0.785          | 0.698              | 0.086      |
| Zambia          | 102  | 17.65%               | 1.715       | 0.847              | 0.869     | 0.792          | 0.839              | −0.047     |
| Zimbabwe        | 177  | 44.07%               | 1.348       | 0.726              | 0.621     | 0.822          | 0.770              | 0.052      |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

### 3. Models

The model specifications for the two financial variables, i.e., Sales (Model A) and Internal-Funds (Model B), are expressed as follows:

Model A

$$\text{Sales}_i = a_0 + a_1 \text{EnvironmentPerformance}_i + \sum_{k=1}^m b_k X_{k,i} + \text{Country Effects} + \text{Time Effects} + U_i \quad (1)$$

Model B

$$\text{InternalFunds}_i = a_0 + a_1 \text{EnvironmentPerformance}_i + \sum_{k=1}^m b_k X_{k,i} + \text{Country Effects} + \text{Time Effects} + U_i \quad (2)$$

where, as discussed above, Sales are firms' annual sales divided by the annual average sales by country, Internal-Funds refer to the share of working capital financed with internal funds or retained earnings, and Environmental-Performance is a proxy of the adoption status of international standards related to environmental management. The fixed effects of countries and years control for firm heterogeneity in these two dimensions.  $X$  is a vector of other control variables, and  $U_i$  is the error term.

Control variables include firm size, firm age, ownership, location, the number of competitors, and foreign technology. The variable definitions are elaborated in Table 2. Among these variables, firm size is a dummy variable, with three categories of Firm-Small, Firm-Medium, and Firm-Large (the base), indicating firms with 5–19 employees, 20–99 employees, and >100 employees, respectively. Firm age is calculated by subtracting the establishment year from the interview year, and a log form is applied in the regression to weaken the heteroskedasticity. Firm ownership is a dummy variable to show whether firms are partly owned by foreign investors, including foreign individuals, companies, and organizations. Firm location is indicated by dummies Location-Small, Location-Medium, Location-Large, and Location-Mega (the base), implying the firms are located in a place with a population less than 50,000, 50,000–250,000, 250,000–1 million, and over 1 million, respectively. Since the intensity of competition is likely to influence firms' motivation to adopt environmental practices, the competition index is considered by the number of competitors. We set the dummy variable (Competitor: Many) to differentiate the firms with many competitors from the other firms, and segment other firms by taking the quantile of the number of competitors. Foreign technology is another dummy, which equals one for firms with foreign technology and zero otherwise.

**Table 2.** Definitions of variables.

| Variable                    | Description   |
|-----------------------------|---|
| Environmental-Performance   | =1 if firms adopt international standards related to environmental management, and 0 otherwise.   |
| Sales                       | Annual sales divided by the annual mean by country.   |
| Internal-Funds              | Proportion of the working capital that was financed by internal funds.  |
| Size-Small                  | =1 if firms have 5–19 workers, and 0 otherwise.   |
| Size-Medium                 | =1 if firms have 20–99 workers, and 0 otherwise.  |
| Size-Large                  | =1 if firms have 100+ workers, and 0 otherwise.   |
| Firm age                    | The logarithm of the number of operation years until the interview  |
| Foreign-Ownership           | =1 if firms are owned by foreign individuals, companies, or organizations, and 0 otherwise.   |
| Location-Small              | =1 if firms in the locations with population less than 50,000, and 0 otherwise.   |
| Location-Medium             | =1 if firms in the locations with 50,000–250,000 population, and 0 otherwise.   |
| Location-Large              | =1 if firms in the locations with 250,000–1 million population, and 0 otherwise.  |
| Location-Mega               | =1 if firms in the locations with population over 1 million, and 0 otherwise.   |
| Competitor: First quantile  | =1 if the number of firms' competitors is in the first quantile, and 0 otherwise (excluding firms with too many competitors to count.)  |
| Competitor: Second quantile | =1 if the number of firms' competitors is in the second quantile, and 0 otherwise (excluding firms with too many competitors to count.) |
| Competitor: Third quantile  | =1 if the number of firms' competitors is in the third quantile, and 0 otherwise (excluding firms with too many competitors to count.)  |
| Competitor: Fourth quantile | =1 if the number of firms' competitors is in the fourth quantile, and 0 otherwise (excluding firms with too many competitors to count.) |
| Competitor: Many            | =1 if firms have too many competitors to count, =0 otherwise.   |
| Foreign Technology          | =1 if firms use technology licensed from foreign companies, =0 otherwise.   |

Table 3 summarizes all variables used in the models and shows test results for the mean difference of those variables between green and conventional food firms. The environmental performance varies across countries. On average, 30.9% of the sample firms adopted international standards related to environmental management. There is a substantial fluctuation

tuation of annual sales among firms, as implied by the value of sales variance ( $SD = 4.113$ ). Comparing the countries by income levels shows that higher-income countries have a greater share of green firms, which are found to have lower self-funds. For instance, the percentage of green firms is lowest in low-middle-income countries (21.97%) and highest in high-income countries (55.67%). Green firms have more self-funds in low-income and low-middle-income countries compared to upper-middle-income and high-income countries.

When it comes to financial performance for the full sample, green firms have higher sales than conventional firms (2.117 vs. 0.501), while green firms have a marginally smaller share of internal funds used to finance working capital than conventional firms (0.737 vs. 0.759). It is also found that the Internal-Funds vary significantly between green and conventional firms in upper-middle-income and high-income countries. For instance, green firms have more self-funds in low-income and low-middle-income countries than in high-income countries. Moreover, the difference between internal funds for these two firm groups is significant in upper-middle-income and high-income countries. However, the results do not apply to the other lower-income countries.

As also seen in Table 3, green firms generally have a larger size, longer operation years, and a higher rate of foreign ownership. It is noticeable that green firms face less competition in the market compared to conventional firms. One possible explanation is that environmentally conscious consumers are likely to be less price-sensitive and more concerned about the quality [60], which increases their loyalty to products once they commit to purchasing.

Table 4 describes the variables by region (i.e., ECA, AFR, LAC, SAR, EAP, and MNA). The sales vary significantly among green and conventional firms for all regions. For each region, green firms have substantially higher sales than conventional firms. Unexpectedly, green firms have a smaller share of internal funds out of working capital than conventional firms for all regions. The mean difference of internal funds for green and conventional firms varies significantly among Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), and the Middle East and North Africa (MNA).

A pairwise correlation matrix for all variables is presented in Table 5, where a positive correlation is found between the environmental performance and sales, while a negative correlation is found between the environmental performance and internal funds. Most of the correlation coefficients are smaller than 0.5, indicating that multicollinearity is not an issue when estimating the models.

**Table 3.** Summary statistics and mean difference test for country groups by income levels.

| Variable                    | Whole Sample |       |             |             |            | Low-Income Countries |             |            | Low-Middle Countries |             |            | Upper-Middle Countries |             |            | High-Income Countries |             |            |      |
|-----------------------------|--------------|-------|-------------|-------------|------------|----------------------|-------------|------------|----------------------|-------------|------------|------------------------|-------------|------------|-----------------------|-------------|------------|------|
|                             | Mean         | SD    | Green Firms | Other Firms | Difference | Green Firms          | Other Firms | Difference | Green Firms          | Other Firms | Difference | Green Firms            | Other Firms | Difference | Green Firms           | Other Firms | Difference |      |
| Environmental-Performance   | 0.309        | 0.462 |             |             |            |                      |             |            |                      |             |            |                        |             |            |                       |             |            |      |
| Sales                       | 1.000        | 4.113 | 2.117       | 0.501       | 1.616 ***  | 1.817                | 0.636       | 1.181 ***  | 2.705                | 0.520       | 2.185 ***  | 2.040                  | 0.455       | 1.585 ***  | 1.525                 | 0.340       | 1.185 ***  |      |
| Internal-Funds              | 0.752        | 0.316 | 0.737       | 0.759       | −0.022 **  | 0.759                | 0.731       | 0.028      | 0.797                | 0.786       | 0.011      | 0.674                  | 0.718       | −0.044 *   | 0.716                 | 0.793       | −0.077 *** |      |
| Size-Small                  | 0.399        | 0.490 | 0.182       | 0.495       | −0.313 *** | 0.276                | 0.384       | −0.108 **  | 0.133                | 0.563       | −0.430 *** | 0.161                  | 0.413       | −0.252 *** | 0.241                 | 0.575       | −0.334 *** |      |
| Size-Medium                 | 0.377        | 0.485 | 0.379       | 0.376       | 0.003      | 0.285                | 0.454       | −0.169 *** | 0.422                | 0.345       | 0.077 ***  | 0.362                  | 0.402       | −0.040 *   | 0.397                 | 0.346       | 0.051      |      |
| Size-Large                  | 0.224        | 0.417 | 0.439       | 0.129       | 0.310 ***  | 0.439                | 0.162       | 0.277 ***  | 0.445                | 0.092       | 0.353 ***  | 0.477                  | 0.185       | 0.292 ***  | 0.362                 | 0.080       | 0.282 ***  |      |
| Firm age                    | 1.218        | 0.355 | 1.328       | 1.170       | 0.158 ***  | 1.459                | 1.186       | 0.273 ***  | 1.275                | 1.135       | 0.140 ***  | 1.291                  | 1.190       | 0.101 ***  | 1.396                 | 1.293       | 0.103 ***  |      |
| Foreign-Ownership           | 0.082        | 0.275 | 0.146       | 0.054       | −0.092 *** | 0.303                | 0.119       | 0.184 ***  | 0.147                | 0.050       | 0.097 ***  | 0.121                  | 0.040       | 0.081 ***  | 0.098                 | 0.023       | 0.075 ***  |      |
| Location-Small              | 0.195        | 0.396 | 0.249       | 0.170       | 0.079 ***  | 0.184                | 0.043       | 0.141 ***  | 0.152                | 0.137       | 0.015      | 0.187                  | 0.157       | 0.030 *    | 0.553                 | 0.678       | −0.125 *** |      |
| Location-Medium             | 0.212        | 0.409 | 0.221       | 0.208       | 0.013      | 0.114                | 0.153       | −0.039     | 0.228                | 0.254       | −0.026     | 0.183                  | 0.156       | 0.027      | 0.341                 | 0.213       | 0.128 ***  |      |
| Location-Large              | 0.222        | 0.416 | 0.188       | 0.238       | −0.050 *** | 0.237                | 0.315       | −0.078 **  | 0.266                | 0.226       | 0.040 *    | 0.169                  | 0.263       | −0.094 *** | 0.069                 | 0.080       | −0.011     |      |
| Location-Mega               | 0.371        | 0.483 | 0.342       | 0.383       | −0.041 **  | 0.465                | 0.489       | −0.024     | 0.354                | 0.383       | −0.029     | 0.461                  | 0.424       | 0.037      | 0.037                 | 0.030       | 0.007      |      |
| Competitor: First quantile  | 0.147        | 0.354 | 0.165       | 0.138       | 0.027 **   | 0.197                | 0.147       | 0.050      | 0.191                | 0.135       | 0.056 **   | 0.125                  | 0.141       | −0.016     | 0.177                 | 0.133       | 0.044      |      |
| Competitor: Second quantile | 0.114        | 0.318 | 0.136       | 0.105       | 0.031 ***  | 0.136                | 0.115       | 0.021      | 0.123                | 0.091       | 0.032 **   | 0.121                  | 0.120       | 0.001      | 0.183                 | 0.113       | 0.070 **   |      |
| Competitor: Third quantile  | 0.129        | 0.336 | 0.141       | 0.124       | 0.017 *    | 0.132                | 0.125       | 0.007      | 0.080                | 0.111       | −0.031 **  | 0.174                  | 0.131       | 0.043 **   | 0.183                 | 0.179       | 0.004      |      |
| Competitor: Fourth quantile | 0.100        | 0.300 | 0.097       | 0.101       | −0.004     | 0.057                | 0.098       | −0.041 *   | 0.094                | 0.111       | −0.017     | 0.088                  | 0.084       | 0.004      | 0.140                 | 0.116       | 0.024      |      |
| Competitor: Many            | 0.510        | 0.500 | 0.462       | 0.531       | −0.069 *** | 0.478                | 0.515       | −0.037     | 0.513                | 0.552       | −0.039 *   | 0.492                  | 0.523       | −0.031     | 0.317                 | 0.458       | −0.141 *** |      |
| Foreign Technology          | 0.122        | 0.328 | 0.227       | 0.076       | 0.151 ***  | 0.294                | 0.096       | 0.198 ***  | 0.256                | 0.076       | 0.180 ***  | 0.209                  | 0.065       | 0.144 ***  | 0.175                 | 0.083       | 0.092 ***  |      |
| Observations                |              | 6064  |             | 1872        |            | 4192                 |             | 228        |                      | 511         |            | 587                    |             | 2085       |                       | 679         |            | 1295 |
|                             |              |       |             |             |            |                      |             |            |                      |             |            |                        |             |            |                       |             |            |      |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

**Table 4.** Summary statistics and mean difference test for countries by region.

| Variable                    | AFR         |             |            | EAP         |             |            | ECA         |             |            | LCA         |             |            | MNA         |             |            | SAR         |             |            |
|-----------------------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|------------|
|                             | Green Firms | Other Firms | Difference | Green Firms | Other Firms | Difference | Green Firms | Other Firms | Difference | Green Firms | Other Firms | Difference | Green Firms | Other Firms | Difference | Green Firms | Other Firms | Difference |
| Sales                       | 1.735       | 0.728       | 1.007 ***  | 2.377       | 0.334       | 2.043 ***  | 1.602       | 0.590       | 1.012 ***  | 3.367       | 0.299       | 3.068 ***  | 2.865       | 0.417       | 2.448 ***  | 2.620       | 0.440       | 2.180 ***  |
| Internal-Funds              | 0.775       | 0.762       | 0.013      | 0.823       | 0.799       | 0.024      | 0.738       | 0.797       | −0.059 *** | 0.465       | 0.559       | −0.094 *** | 0.761       | 0.819       | −0.058 *** | 0.711       | 0.681       | 0.030      |
| Size-Small                  | 0.271       | 0.440       | −0.169 *** | 0.085       | 0.404       | −0.319 *** | 0.206       | 0.460       | −0.254 *** | 0.143       | 0.497       | −0.354 *** | 0.121       | 0.626       | −0.504 *** | 0.185       | 0.494       | −0.309 *** |
| Size-Medium                 | 0.306       | 0.412       | −0.106 *** | 0.274       | 0.429       | −0.156 *** | 0.401       | 0.359       | 0.042 *    | 0.304       | 0.357       | −0.054     | 0.464       | 0.334       | 0.129 ***  | 0.415       | 0.406       | 0.009      |
| Size-Large                  | 0.422       | 0.148       | 0.275 **   | 0.642       | 0.167       | 0.475 ***  | 0.393       | 0.181       | 0.212 ***  | 0.554       | 0.146       | 0.408 ***  | 0.415       | 0.040       | 0.375 ***  | 0.400       | 0.100       | 0.300 ***  |
| Firm-Age                    | 1.445       | 1.131       | 0.314 ***  | 1.231       | 1.187       | 0.044 *    | 1.300       | 1.127       | 0.173 ***  | 1.441       | 1.273       | 0.168 ***  | 1.345       | 1.179       | 0.166 ***  | 1.299       | 1.209       | 0.090 ***  |
| Foreign-Ownership           | 0.322       | 0.145       | 0.177 ***  | 0.189       | 0.039       | 0.150 ***  | 0.115       | 0.045       | 0.070 ***  | 0.188       | 0.029       | 0.158 ***  | 0.121       | 0.039       | 0.082 ***  | 0.015       | 0.012       | 0.003      |
| Location-Small              | 0.174       | 0.043       | 0.131 ***  | 0.052       | 0.080       | −0.028     | 0.390       | 0.311       | 0.078 ***  | 0.027       | 0.026       | 0.000      | 0.280       | 0.198       | 0.082 ***  | 0.075       | 0.155       | −0.080 *** |
| Location-Medium             | 0.132       | 0.154       | −0.022     | 0.075       | 0.142       | −0.066 **  | 0.276       | 0.207       | 0.069 ***  | 0.071       | 0.103       | −0.032     | 0.284       | 0.266       | 0.018      | 0.260       | 0.304       | −0.044     |
| Location-Large              | 0.244       | 0.307       | −0.063 *   | 0.189       | 0.267       | −0.078 **  | 0.152       | 0.245       | −0.093 *** | 0.116       | 0.146       | −0.029     | 0.190       | 0.239       | −0.049 *   | 0.290       | 0.178       | 0.112 ***  |
| Location-Mega               | 0.450       | 0.496       | −0.047     | 0.684       | 0.511       | 0.173 ***  | 0.182       | 0.237       | −0.055 *** | 0.786       | 0.725       | 0.061      | 0.246       | 0.297       | −0.051 *   | 0.375       | 0.363       | 0.012      |
| Competitor: First quantile  | 0.182       | 0.129       | 0.053 **   | 0.113       | 0.139       | −0.026     | 0.149       | 0.142       | 0.007      | 0.223       | 0.204       | 0.020      | 0.208       | 0.134       | 0.073 ***  | 0.170       | 0.105       | 0.065 **   |
| Competitor: Second quantile | 0.143       | 0.119       | 0.024      | 0.052       | 0.091       | −0.039 *   | 0.142       | 0.121       | 0.022      | 0.223       | 0.169       | 0.054      | 0.159       | 0.067       | 0.092 ***  | 0.105       | 0.083       | 0.022      |
| Competitor: Third quantile  | 0.140       | 0.116       | 0.023      | 0.085       | 0.096       | −0.011     | 0.172       | 0.147       | 0.025      | 0.214       | 0.201       | 0.013 *    | 0.121       | 0.069       | 0.052 ***  | 0.065       | 0.145       | −0.080 *** |
| Competitor: Fourth quantile | 0.054       | 0.059       | −0.005     | 0.061       | 0.068       | −0.007     | 0.115       | 0.090       | 0.025 *    | 0.125       | 0.124       | 0.001      | 0.073       | 0.039       | 0.034 **   | 0.135       | 0.285       | −0.150 *** |
| Competitor: Many            | 0.481       | 0.577       | −0.096 *** | 0.689       | 0.605       | 0.084 **   | 0.422       | 0.500       | −0.078 *** | 0.214       | 0.302       | −0.087 *   | 0.439       | 0.690       | −0.251 *** | 0.525       | 0.382       | 0.143 ***  |
| Foreign Technology          | 0.291       | 0.108       | 0.183 ***  | 0.297       | 0.096       | 0.201 ***  | 0.230       | 0.112       | 0.117 ***  | 0.161       | 0.056       | 0.105 ***  | 0.176       | 0.031       | 0.145 ***  | 0.170       | 0.031       | 0.139 ***  |
| Observations                | 258         | 697         |            | 212         | 438         |            | 801         | 1176        |            | 112         | 378         |            | 289         | 924         |            | 200         | 579         |            |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ . AFR = Africa, EAP = East Asia and the Pacific, ECA = Europe and Central Asia, LCA = Latin America and the Caribbean, MNA = The Middle East and North Africa, and SAR = the South Asia Region.



Table 5. Correlation matrix.

| Variable                            | No. | 1          | 2          | 3          | 4          | 5          | 6          | 7          | 8          | 9          | 10         | 11         | 12         | 13         | 14         | 15         | 16         | 17       |  |
|-------------------------------------|-----|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|--|
| Environmental-Performance           | 1   | 1.000      |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |          |  |
| Sales                               | 2   | 0.182 ***  | 1.000      |            |            |            |            |            |            |            |            |            |            |            |            |            |            |          |  |
| Own Funds                           | 3   | −0.032 **  | −0.062 *** | 1.000      |            |            |            |            |            |            |            |            |            |            |            |            |            |          |  |
| Size-Small                          | 4   | −0.296 *** | −0.172 *** | 0.083 ***  | 1.000      |            |            |            |            |            |            |            |            |            |            |            |            |          |  |
| Size-Medium                         | 5   | 0.003      | −0.082 *** | −0.017     | −0.633 *** | 1.000      |            |            |            |            |            |            |            |            |            |            |            |          |  |
| Size-Large                          | 6   | 0.344 ***  | 0.297 ***  | −0.077 *** | −0.438 *** | −0.418 *** | 1.000      |            |            |            |            |            |            |            |            |            |            |          |  |
| Firm age                            | 7   | 0.206 ***  | 0.134 ***  | −0.051 *** | −0.174 *** | −0.011     | 0.217 ***  | 1.000      |            |            |            |            |            |            |            |            |            |          |  |
| Foreign-Ownership                   | 8   | 0.156 ***  | 0.127 ***  | −0.029 **  | −0.156 *** | −0.007     | 0.191 ***  | 0.035 ***  | 1.000      |            |            |            |            |            |            |            |            |          |  |
| Location-Small                      | 9   | 0.092 ***  | 0.005      | 0.003      | 0.015      | −0.015     | 0.000      | 0.071 ***  | −0.025 **  | 1.000      |            |            |            |            |            |            |            |          |  |
| Location-Medium                     | 10  | 0.014      | 0.006      | 0.006      | 0.028 **   | −0.020     | −0.010     | −0.003     | −0.029 **  | −0.255 *** | 1.000      |            |            |            |            |            |            |          |  |
| Location-Large                      | 11  | −0.056 *** | −0.011     | 0.002      | −0.002     | 0.025 *    | −0.026 **  | −0.029 **  | −0.003     | −0.263 *** | −0.277 *** | 1.000      |            |            |            |            |            |          |  |
| Location-Mega                       | 12  | −0.039 *** | 0.001      | −0.008     | −0.034 *** | 0.007      | 0.031 **   | −0.031 **  | 0.047 ***  | −0.377 *** | −0.398 *** | −0.411 *** | 1.000      |            |            |            |            |          |  |
| Competitor: First quantile          | 13  | 0.035 ***  | 0.033 ***  | −0.016     | −0.013     | −0.019     | 0.037 ***  | 0.018      | 0.034 ***  | 0.040 ***  | 0.007      | −0.039 *** | −0.005     | 1.000      |            |            |            |          |  |
| Competitor: Second quantile         | 14  | 0.045 ***  | 0.015      | −0.037 *** | −0.024 *   | 0.002      | 0.025 **   | 0.040 ***  | 0.021      | 0.017      | 0.032 **   | −0.028 **  | −0.017     | −0.149 *** | 1.000      |            |            |          |  |
| Competitor: Third quantile          | 15  | 0.023 *    | 0.008      | −0.046 *** | −0.013     | −0.007     | 0.022 *    | 0.004      | −0.008     | 0.051 ***  | −0.006     | −0.023 *   | −0.017     | −0.160 *** | −0.138 *** | 1.000      |            |          |  |
| Competitor: Fourth quantile         | 16  | −0.007     | −0.020     | −0.065 *** | −0.010     | 0.037 ***  | −0.032 **  | 0.023 *    | −0.050 *** | 0.028 **   | 0.029 **   | −0.002     | −0.045 *** | −0.138 *** | −0.120 *** | −0.128 *** | 1.000      |          |  |
| Competitor: Many Foreign Technology | 17  | −0.065 *** | −0.027 **  | 0.015 ***  | 0.038 ***  | −0.006     | −0.039 *** | −0.054 *** | −0.002     | −0.090 *** | −0.039 *** | 0.062 ***  | 0.053 ***  | −0.423 *** | −0.366 *** | −0.393 *** | −0.340 *** | 1.000    |  |
| Foreign Technology                  | 18  | 0.213 ***  | 0.130 ***  | −0.030 **  | −0.184 *** | −0.006     | 0.222 ***  | 0.044 ***  | 0.156 ***  | −0.003     | −0.015     | 0.012      | 0.005      | 0.017      | 0.010      | 0.018      | −0.014     | −0.022 * |  |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

#### 4. Empirical Results

Models A and B are applied to the full sample to first test the overall impact of environmental performance on financial performance, and the results are shown in Table 6. Then, Models A and B are applied to each country group by income levels and different regions, according to the economic development and social and cultural contexts. Income levels segment the countries into four groups: Low-income countries, low-middle-income countries, upper-middle-income countries, and high-income countries (Tables 6 and 7). Social and cultural background segment regions into Africa (AFR), East Asia and the Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MNA), and the South Asia Region (SAR). Overall, the R-squared value is higher in Model A (for *Sales*) than in Model B (for *Internal-Funds*). We also estimate the models by controlling for the endogeneity of environmental performance and obtain consistent results as the main results. We estimate Heckman selection models to control the endogeneity due to sample selection bias. The instrument variable is the share of firms that adopted ISO 14,000 by country, which reflects environmental regulations and then individual firms' environmental behavior but is not obviously (and directly) related to individual firms' financial performance. Of the 22 total regressions, only 2 provide different estimates of environmental performance compared to the original results. Thus, the remainder of this section will discuss the main results for the full sample, countries of different income levels, and regions.

**Table 6.** Estimation results of Model A for *Sales* and Model B for *Internal-Funds*, for the whole sample.

| Variable                    | Whole Sample          |                      |
|-----------------------------|-----------------------|----------------------|
|                             | Model A               | Model B              |
| Environmental-Performance   | 0.711 ***<br>[0.129]  | 0.012<br>[0.010]     |
| Size-Small                  | −2.654 ***<br>[0.156] | 0.066 ***<br>[0.012] |
| Size-Medium                 | −2.363 ***<br>[0.144] | 0.030 **<br>[0.011]  |
| Firm age                    | 0.881 ***<br>[0.157]  | 0.010<br>[0.012]     |
| Foreign-Ownership           | 1.003 ***<br>[0.195]  | −0.026 *<br>[0.015]  |
| Location-Small              | 0.112<br>[0.187]      | −0.026 *<br>[0.014]  |
| Location-Medium             | 0.113<br>[0.162]      | −0.018 **<br>[0.012] |
| Location-Large              | 0.004<br>[0.149]      | −0.021 *<br>[0.011]  |
| Competitor: First quantile  | 0.299<br>[0.211]      | 0.031 **<br>[0.016]  |
| Competitor: Second quantile | 0.164<br>[0.222]      | 0.010<br>[0.017]     |
| Competitor: Third quantile  | 0.197<br>[0.215]      | 0.014<br>[0.016]     |
| Competitor: Many            | 0.043<br>[0.182]      | 0.053 ***<br>[0.014] |
| Foreign Technology          | 0.611 ***<br>[0.164]  | −0.017<br>[0.012]    |
| Country Effect              | Yes                   | Yes                  |
| Time Effect                 | Yes                   | Yes                  |
| Adj. R-squared              | 0.1569                | 0.8719               |
| Observations                | 6064                  | 6064                 |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

**Table 7.** Estimation results of Model A for Sales, by country groups of income levels.

| Variable                    | Low-Income Countries  | Low-Middle Income Countries | Upper-Middle Income Countries | High-Income Countries |
|-----------------------------|-----------------------|-----------------------------|-------------------------------|-----------------------|
| Environmental-Performance   | 0.192<br>[0.307]      | 0.761 **<br>[0.246]         | 0.797 ***<br>[0.202]          | 0.555 **<br>[0.194]   |
| Size-Small                  | −2.848 ***<br>[0.358] | −3.186 ***<br>[0.299]       | −2.087 ***<br>[0.246]         | −2.459 ***<br>[0.239] |
| Size-Medium                 | −2.714 ***<br>[0.330] | −2.803 ***<br>[0.280]       | −2.029 ***<br>[0.220]         | −1.913 ***<br>[0.216] |
| Firm age                    | 0.895 **<br>[0.346]   | 1.283 ***<br>[0.280]        | 0.637 **<br>[0.272]           | 0.153<br>[0.237]      |
| Foreign-Ownership           | 0.491<br>[0.348]      | 1.589 ***<br>[0.362]        | 0.767 **<br>[0.346]           | 0.232<br>[0.329]      |
| Location-Small              | −0.887<br>[0.556]     | 0.166<br>[0.307]            | 0.065<br>[0.338]              | 0.026<br>[0.458]      |
| Location-Medium             | −0.054<br>[0.383]     | 0.437 *<br>[0.250]          | −0.380<br>[0.314]             | −0.263<br>[0.454]     |
| Location-Large              | 0.286<br>[0.314]      | 0.135<br>[0.247]            | −0.320<br>[0.253]             | −0.051<br>[0.515]     |
| Competitor: First quantile  | 1.009 *<br>[0.522]    | 0.560<br>[0.366]            | −0.605 *<br>[0.367]           | 0.869 **<br>[0.294]   |
| Competitor: Second quantile | 0.093<br>[0.544]      | 0.469<br>[0.397]            | −0.386<br>[0.377]             | 0.717 **<br>[0.299]   |
| Competitor: Third quantile  | 0.779<br>[0.534]      | 0.402<br>[0.388]            | −0.430<br>[0.362]             | 0.422<br>[0.287]      |
| Competitor: Many            | 0.278<br>[0.456]      | 0.340<br>[0.311]            | −0.549 *<br>[0.315]           | 0.078<br>[0.271]      |
| Foreign Technology          | 0.532<br>[0.363]      | 0.187<br>[0.295]            | 1.215 ***<br>[0.275]          | 0.636 **<br>[0.242]   |
| Country Effect              | Yes                   | Yes                         | Yes                           | Yes                   |
| Time Effect                 | Yes                   | Yes                         | Yes                           | Yes                   |
| Adj. R-squared              | 0.2244                | 0.1367                      | 0.1602                        | 0.3735                |
| Observations                | 739                   | 2672                        | 1974                          | 679                   |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

#### 4.1. Estimation Results for the Full Sample

Table 6 shows the estimation results for the full sample. Food companies with desirable environmental performance generally have significantly greater sales than conventional food companies, probably due to a great demand for green food products and price premium for green products [61,62]. However, our findings show that environmental performance does not significantly affect the choice between (or availability of) internal and external financing. Although desirable environmental performance raises earnings ability, it may also affect access to external financing [49,63,64], resulting in an ambiguous relationship between environmental performance and the proportion of working capital financed by internal funds. In addition, the impacts of environmental performance on financial performance depend on the firms' locations, as discussed below.

Several other firm characteristics also significantly affect sales and internal funding. Smaller food companies have lower sales than large firms (as shown in Model A) and a higher proportion of working capital financed by internal funds (as shown in Model B). Firms with foreign ownership have a lower share of internal funds (Model B) but higher sales (Model A). Firm age and foreign technology significantly affect sales (Model A), while competition level and locations are significantly associated with internal funds (Model B). Moreover, food companies in small or large cities have a smaller share of internal funds than those in mega large cities (the base).

#### 4.2. Estimation Results for Country Groups by Income Levels

Table 7 shows the results of Model A, which reveal the impacts of different factors on sales of food firms located in different countries of four income levels. Overall, environmental performance positively affects sales in most countries except for low-income countries. This is probably because consumers from higher-income countries show increasing interest in green food, but consumers from low-income countries might lack environmental awareness. It is also found that food companies in upper-middle-income countries have more significant benefits from environmental practices than those in low-middle-income and high-income countries, indicating an inverse U-shape relationship between environmental and financial performance, in line with the findings in [27,61,65].

Firm size and firm age are also significantly associated with sales. Larger or older firms are found to have higher sales, probably due to their stronger financial capacity and substantial management experience, and such impacts vary by country groups. A positive coefficient of firm age indicates that older firms have greater sales than younger firms, while this finding is not significant in high-income countries, as was also discovered by [66]. Moreover, foreign technology significantly affects food sales in upper-middle-income and high-income countries. This is probably because high-tech food firms cluster in these countries, while traditional food firms are usually labor-intensive and located in lower-income countries. Lastly, foreign ownership positively affects sales in low-middle-income and upper-middle-income countries where foreign direct investment may effectively alleviate credit constraints and contribute to financial performance.

Table 8 shows the results of Model B, focusing on the impacts of different factors on the internal funds of food firms and comparing the implications for countries of different income levels. Environmental performance significantly increases the internal funds of food firms in the investigated countries except for high-income countries. Implementing environmental practices is costly and time-consuming, and eco-friendly firms are probably constrained by access to external finance for working capital in daily operations. This is consistent with the study of Yakavenka et al. [67] who found that when minimizing the CO<sub>2</sub> emissions, cost and delivery time would increase by 22.33% and 70.37%, respectively. Similarly, to improve the sustainability of the supply chain design of perishable food by 150%, decision makers have to give up 15% of the economic aspect [68]. For firms in high-income countries, desirable environmental performance may improve access to bank loans [49], resulting in a lower share of internal funds out of working capital.

**Table 8.** Estimation results of Model B for Internal-Funds, by country groups of income levels.

| Variable                   | Low-Income Countries | Low-Middle Income Countries | Upper-Middle Income Countries | High-Income Countries |
|----------------------------|----------------------|-----------------------------|-------------------------------|-----------------------|
| Environmental-Performance  | 0.061 **<br>[0.030]  | 0.046 **<br>[0.015]         | 0.046 **<br>[0.015]           | −0.029 *<br>[0.016]   |
| Size-Small                 | 0.071 **<br>[0.035]  | 0.038 **<br>[0.019]         | 0.038 **<br>[0.019]           | 0.083 ***<br>[0.020]  |
| Size-Medium                | 0.042<br>[0.032]     | 0.018<br>[0.017]            | 0.018<br>[0.017]              | 0.028<br>[0.018]      |
| Firm age                   | −0.041<br>[0.033]    | −0.003<br>[0.017]           | −0.003<br>[0.017]             | 0.032<br>[0.022]      |
| Foreign-Ownership          | −0.051<br>[0.034]    | −0.044 **<br>[0.023]        | −0.044 **<br>[0.023]          | 0.009<br>[0.028]      |
| Location-Small             | 0.069<br>[0.054]     | −0.042 **<br>[0.019]        | −0.042 **<br>[0.019]          | −0.031<br>[0.067]     |
| Location-Medium            | −0.082 **<br>[0.037] | −0.007<br>[0.016]           | −0.007<br>[0.016]             | 0.017<br>[0.066]      |
| Location-Large             | 0.035<br>[0.030]     | −0.026 *<br>[0.015]         | −0.026 *<br>[0.015]           | −0.073<br>[0.075]     |
| Competitor: First quantile | 0.056<br>[0.051]     | 0.012<br>[0.023]            | 0.012<br>[0.023]              | 0.019<br>[0.043]      |

Table 8. Cont.

| Variable                    | Low-Income Countries | Low-Middle Income Countries | Upper-Middle Income Countries | High-Income Countries |
|-----------------------------|----------------------|-----------------------------|-------------------------------|-----------------------|
| Competitor: Second quantile | 0.091 *<br>[0.053]   | −0.006<br>[0.025]           | −0.006<br>[0.025]             | −0.029<br>[0.044]     |
| Competitor: Third quantile  | 0.038<br>[0.052]     | −0.004<br>[0.024]           | −0.004<br>[0.024]             | 0.038<br>[0.042]      |
| Competitor: Many            | 0.138 **<br>[0.044]  | 0.025<br>[0.019]            | 0.025<br>[0.019]              | 0.039<br>[0.040]      |
| Foreign Technology          | 0.003<br>[0.035]     | 0.000<br>[0.018]            | 0.000<br>[0.018]              | −0.033<br>[0.035]     |
| Country Effect              | Yes                  | Yes                         | Yes                           | Yes                   |
| Time Effect                 | Yes                  | Yes                         | Yes                           | Yes                   |
| Adj. R-squared              | 0.8513               | 0.8891                      | 0.8570                        | 0.8694                |
| Observations                | 739                  | 2672                        | 1974                          | 679                   |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

The estimation results also indicate that smaller firms have a higher ratio of internal funds to working capital than larger firms. In other words, small firms rely more on internal funds or retained earnings to finance working capital. Foreign ownership is significantly negatively associated with internal funds since it is easy for foreign-owned firms to borrow external capital. Firms' location in small, medium, large, and mega cities affects the performance of internal funds as well, but which location has a more significant impact on internal funds depends on the income levels of countries where food firms are located. For instance, medium-sized cities are ideal choices for food firms in low-middle-income and upper-middle-income countries, while it is not true for other cases. Although internal funds are related to accumulated earnings, firms' access to financing also affects the proportion of working capital financed from internal funds.

#### 4.3. Estimation Results by Region

Tables 9 and 10 show the impacts of different factors on financial performance by region. As shown in Table 9, improving environmental performance can significantly increase sales for firms in all regions except for Africa. However, the marginal increase in sales due to different characteristics of regions varies. For instance, there has already been a high market penetration of green products in the Europe and Central Asia region (ECA); therefore, environmental performance improvement for firms in that region has a lower impact on sales. Green food supply in East Asia and the Pacific (EAP) is growing fast but the demand market remains uncertain, and our results show that a more competitive green market is actually likely to decrease the sales of food firms in the EAP region. Moreover, large food firms tend to have greater sales than small and medium-sized food firms in all regions, and foreign ownership and foreign technology have limited effects on sales in Latin America and the Caribbean, and South Asia regions.

Conducting environmental performance cannot necessarily improve the financial status of food firms with respect to internal funds. As shown in Table 10, it is only significantly associated with internal funds in Africa. This indicates that the impact of environmental performance on financing sources depends highly on income levels rather than regional characteristics. Moreover, smaller food firms are found to have higher internal funds than large food firms in Africa, Europe and Central Asia, Latin America and the Caribbean, and the Middle East and North Africa regions. Firms located in small cities have a substantially different share of internal funds than those in mega large cities in Africa, Latin America and the Caribbean, and the South Asia Region. Less competition among food firms in East Asia and the Pacific, and Latin America and the Caribbean regions are likely to increase the internal funds of firms, and the introduction of foreign technology is only likely to lower the internal funds of food firms in Europe and the Central Asia region.

**Table 9.** Estimation results of Model A for Sales, by region.

| Variable                    | AFR                   | EAP                   | ECA                   | LCA                   | MNA                   | SAR                   |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Environmental-Performance   | −0.179<br>[0.300]     | 0.842 *<br>[0.460]    | 0.414 **<br>[0.158]   | 1.945 ***<br>[0.413]  | 1.017 **<br>[0.326]   | 1.136 **<br>[0.563]   |
| Size-Small                  | −3.024 ***<br>[0.351] | −1.483 **<br>[0.509]  | −2.322 ***<br>[0.193] | −2.316 ***<br>[0.445] | −3.380 ***<br>[0.443] | −3.201 ***<br>[0.697] |
| Size-Medium                 | −2.863 ***<br>[0.324] | −1.641 ***<br>[0.453] | −2.020 ***<br>[0.175] | −2.334 ***<br>[0.435] | −2.717 ***<br>[0.402] | −3.030 ***<br>[0.663] |
| Firm age                    | 1.244 ***<br>[0.326]  | 2.331 ***<br>[0.663]  | 0.518 **<br>[0.210]   | 0.560<br>[0.446]      | 0.192<br>[0.345]      | 1.634 *<br>[0.693]    |
| Foreign-Ownership           | 0.671 **<br>[0.315]   | 1.129 *<br>[0.642]    | 1.273 ***<br>[0.257]  | 1.078<br>[0.669]      | 0.771<br>[0.496]      | 2.029<br>[1.966]      |
| Location-Small              | −0.441<br>[0.543]     | 0.297<br>[0.719]      | 0.236<br>[0.229]      | −0.342<br>[1.297]     | 0.521<br>[0.409]      | −0.268<br>[0.771]     |
| Location-Medium             | −0.118<br>[0.361]     | −0.723<br>[0.627]     | −0.094<br>[0.225]     | −0.197<br>[1.052]     | 0.400<br>[0.332]      | 0.841<br>[0.594]      |
| Location-Large              | 0.040<br>[0.287]      | −0.603<br>[0.490]     | 0.104<br>[0.214]      | −0.564<br>[0.585]     | 0.304<br>[0.339]      | 0.164<br>[0.631]      |
| Competitor: First quantile  | 1.053 *<br>[0.564]    | −1.161<br>[0.810]     | 0.410<br>[0.271]      | −0.334<br>[0.537]     | −0.230<br>[0.614]     | 0.776<br>[0.782]      |
| Competitor: Second quantile | 1.066 *<br>[0.581]    | −1.857 **<br>[0.887]  | 0.113<br>[0.276]      | 0.472<br>[0.548]      | −0.293<br>[0.655]     | 0.137<br>[0.864]      |
| Competitor: Third quantile  | 0.932<br>[0.579]      | −1.807 **<br>[0.859]  | 0.150<br>[0.266]      | −0.356<br>[0.539]     | 1.030<br>[0.663]      | 0.217<br>[0.759]      |
| Competitor: Many            | 0.165<br>[0.507]      | −1.637 **<br>0.688    | 0.221<br>[0.236]      | −0.184<br>[0.517]     | −0.012<br>[0.562]     | 0.624<br>[0.561]      |
| Foreign Technology          | 0.671 **<br>[0.339]   | 1.590 **<br>0.496     | 0.480 **<br>[0.188]   | 0.685<br>[0.583]      | 1.485 **<br>[0.483]   | −1.416<br>[0.922]     |
| Country Effect              | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Time Effect                 | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Adj. R-squared              | 0.2075                | 0.1568                | 0.2206                | 0.2550                | 0.1676                | 0.0858                |
| Observations                | 955                   | 650                   | 1977                  | 490                   | 1213                  | 779                   |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ . Africa (AFR), East Asia and the Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Arica (MNA), and the South Asia Region (SAR).

**Table 10.** Estimation results of Model B for Internal-Funds, by region.

| Variable                    | AFR                  | EAP                   | ECA                  | LCA                  | MNA                | SAR                   |
|-----------------------------|----------------------|-----------------------|----------------------|----------------------|--------------------|-----------------------|
| Environmental-Performance   | 0.051 *<br>[0.026]   | −0.012<br>[0.028]     | −0.021<br>[0.015]    | 0.021<br>[0.043]     | 0.010<br>[0.024]   | 0.041<br>[0.030]      |
| Size-Small                  | 0.055 *<br>[0.030]   | −0.022<br>[0.031]     | 0.069 ***<br>[0.019] | 0.208 ***<br>[0.046] | 0.062 *<br>[0.032] | 0.040<br>[0.037]      |
| Size-Medium                 | 0.035<br>[0.028]     | −0.037<br>[0.028]     | 0.021<br>[0.017]     | 0.069<br>[0.045]     | 0.052 *<br>[0.029] | 0.044<br>[0.035]      |
| Firm age                    | 0.006<br>[0.028]     | 0.013<br>[0.040]      | 0.026<br>[0.020]     | 0.034<br>[0.046]     | −0.002<br>[0.025]  | −0.023<br>[0.037]     |
| Foreign-Ownership           | −0.073 **<br>[0.027] | −0.059<br>[0.039]     | 0.022<br>[0.025]     | −0.018<br>[0.069]    | 0.031<br>[0.036]   | −0.073<br>[0.104]     |
| Location-Small              | 0.096 **<br>[0.047]  | 0.022<br>[0.044]      | −0.012<br>[0.022]    | −0.235 *<br>[0.134]  | −0.007<br>[0.029]  | −0.185 ***<br>[0.041] |
| Location-Medium             | −0.026<br>[0.031]    | −0.054<br>[0.038]     | −0.012<br>[0.021]    | −0.162<br>[0.108]    | 0.004<br>[0.024]   | −0.042<br>[0.032]     |
| Location-Large              | 0.038<br>[0.025]     | −0.102 ***<br>[0.030] | −0.029<br>[0.021]    | −0.089<br>[0.060]    | 0.017<br>[0.024]   | −0.109 **<br>[0.034]  |
| Competitor: First quantile  | 0.016<br>[0.049]     | 0.121 **<br>[0.049]   | 0.013<br>[0.026]     | 0.114 **<br>[0.055]  | −0.008<br>[0.044]  | −0.008<br>[0.042]     |
| Competitor: Second quantile | 0.020<br>[0.051]     | 0.053<br>[0.054]      | 0.000<br>[0.027]     | −0.010<br>[0.057]    | −0.006<br>[0.047]  | −0.010<br>[0.046]     |

Table 10. Cont.

| Variable                   | AFR               | EAP                 | ECA                  | LCA              | MNA               | SAR               |
|----------------------------|-------------------|---------------------|----------------------|------------------|-------------------|-------------------|
| Competitor: Third quantile | 0.003<br>[0.051]  | 0.076<br>[0.052]    | 0.024<br>[0.026]     | 0.033<br>[0.056] | −0.020<br>[0.048] | −0.025<br>[0.040] |
| Competitor: Many           | 0.067<br>[0.044]  | 0.085 **<br>[0.042] | 0.030<br>[0.023]     | 0.036<br>[0.053] | 0.038<br>[0.041]  | 0.044<br>[0.030]  |
| Foreign Technology         | −0.013<br>[0.029] | −0.012<br>[0.030]   | −0.044 **<br>[0.018] | 0.016<br>[0.060] | −0.002<br>[0.035] | 0.063<br>[0.049]  |
| Country Effect             | Yes               | Yes                 | Yes                  | Yes              | Yes               | Yes               |
| Time Effect                | Yes               | Yes                 | Yes                  | Yes              | Yes               | Yes               |
| Adj R-squared              | 0.8680            | 0.9077              | 0.8881               | 0.7292           | 0.8939            | 0.8267            |
| Observations               | 955               | 650                 | 1977                 | 490              | 1213              | 779               |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ . ECA (Europe and Central Asia), AFR (Africa), LAC (Latin America and the Caribbean), SAR (the South Asia Region), and EAP (East Asia and the Pacific), and MNA (The Middle East and North Arica).

## 5. Conclusions

This study evaluates the impact of environmental performance on financial performance, using a sample of 6064 food companies from 51 countries. With rapid population growth, the world faces great environmental pressures from food production expanded to meet increasing demand. Much attention is given to environmental issues and production efficiency improvement, while there is limited research investigating the environmental–financial performance for the food industry worldwide [44]. The economic incentive is essential for green practices. Therefore, whether environmental performance affects financial performance such as sales and internal funds for food firms provides significant implications for decision makers in the food industry about adopting environmental practices [38].

Our results show that environmental performance significantly improves the sales of food firms. Other characteristics, such as firm size, firm age, foreign ownership, and foreign technology also significantly affect sales of food firms. It is found that large food firms have a higher level of sales, and food firms established earlier, owned by foreign groups, or adopting foreign technology are also likely to sell more than younger food firms, food firms without foreign ownership, or food firms without foreign technology adoption. A different pattern is found for internal funds. For instance, small and medium-sized food firms have higher internal funds than large food firms, and food firms owned by foreign groups, located in places with a lower population, and faced with fewer competitors are likely to have lower internal funds than food firms without foreign ownership, located in mega cities, and with many competitors, respectively.

The association between environmental and financial performance for food firms vary across countries of different income levels and regions. The impact of environmental performance on food firms' sales is more apparent in low-middle-income and upper-middle-income countries than other country groups. Moreover, in Africa, environmental performance cannot significantly increase sales but can increase internal funds. This implies that food firms should consider the regional variation, the characteristics of firms, and the time factor when adopting environmental practices. In addition, applicable marketing strategies targeting environmentally conscious customers and well-designed government support programs may improve the efficiency of environmental practices in the short term, which further fosters economic sustainability in the long term.

This study uses a unidimensional measure of environmental performance to test the relationship between environmental and financial performance for multiple countries. Both environmental performance and financial performance can be measured in different ways. Given the heterogeneity of environmental standards of different countries in the food sector, this is an important topic for future research focusing on various food groups in different countries. The implications of this study are limited to relationships between environmental performance and financial performance with respect to sales and internal



funds, and a comprehensive study with multidimensional measures of environmental and financial performance can also be extended in future research.

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