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Do Environmental Investments for Production Pay Off? A Study in Vietnam's Small and Medium-sized Enterprises

Tung Nhu Nguyen[1]*, Gerald Goh Guan Gan[2], Seyed Mehrshad Parvin Hosseini[3]

[1]Vietnam National University of Ho Chi Minh City, Vietnam, [2]Multimedia University, Malaysia, [3]Sohar University, Oman.
*Email: nhutung@gmail.com

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ABSTRACT

Environmental preservation is one of the top priorities of the United Nations' sustainable development goals (SDGs). Environmental investments for production not only demonstrate corporate commitment to these universally accepted goals but also create a safe and healthy work environment for workers. However, previous studies have shown positive and negative effects of environmental investments for production on firm-level labor productivity. This paper aims to investigate how environmental investments for production influence labor productivity in Vietnamese manufacturing small and medium-sized enterprises (SMEs). An analysis of 1176 valid responses by business owners or managers in Vietnam's manufacturing SMEs shows that environmental investment costs are positively associated with labor productivity. The results also confirm that labor productivity is affected by capital intensity, firm size and firm age. We realize that the impact of environmental investments for production on labor productivity is more advantageous in SMEs with higher capital intensity. Based on these research findings, SME-supporting policies should enable SMEs to get more capital to implement workplace environment investments, which lead to labor productivity and contribute to pollution control.

Keywords: Environmental Investments, Labor Productivity, Small and Medium-sized Enterprises, Vietnam
JEL Classifications: Q01, Q53, D24, D25

1. INTRODUCTION

Humans are facing serious environmental challenges. The world has warmed by 1.1°C since the Industrialization Revolution and the global average temperature is expected to rise 1.5°C in all scenarios by 2050, worsening negative impacts on lives, economies and food sources worldwide (UNEP, 2021). For the past centuries, uncontrolled production activities for global economic growth have increased energy consumption at the expense of environment (Ullah et al., 2021). Given environmental problems, the United Nations Sustainable Development Goals emphasize environmental preservation (Ullah et al., 2021). To balance economic growth, energy consumption and environmental preservation, sustainability should be used. The concepts of sustainability involve depletion of resources, ecological aspects, and quality of life (de Kerk and Manuel, 2008). These three elements are critical to developing a sustainable society, where every human being is able to live a healthy, clean and safe environment, use non-renewable resources in a responsible way and contribute to a sustainable world (de Kerk and Manuel, 2008). To work towards a sustainable society, the international community is calling manufacturers for adopting green production and environment-friendly technologies (Ozturk and Yuksel, 2016). Moreover, green production is critical when manufacturers are now facing supply risks related to sustainability issues including resources scarcity, limited availability of water and land, environmental pollution, climate change affecting yield patterns (EY, 2016).

Environmental investments for production not only satisfy environmental regulations but also create a safe and healthy work environment, which minimizes occupational accidents for employees (Rydell and Andersson, 2019) and implies higher organizational productivity, profitability and reputation (Niemelä et al., 2002; Njå and Fjelltun, 2010). Manufacturers can contribute to reducing carbon dioxide emission by using cleaner and more environment-friendly production processes (Sartal et al., 2020; Ullah et al., 2021). Environmental investments for production not only satisfy the environmental requirements of customers but also demonstrate corporate commitment to the Ten Principles of the United Nations Global Compact on environmental protection for sustainable development goals (EY, 2016). To create a safe and healthy workplace, an organization implements environmental investments for production to prevent workers' physical and psychological problems (Westgaard and Winkel, 1997). Some producers attempt to implement research and development activities for green innovations (Ullah et al., 2021), whereas others invest in technologies and equipment for clean production. Investments in environmental equipment for clean production include the installation and operation of machinery and processes for controlling pollution, reducing waste and recycling materials (Klassen and Vachon, 2003) and state-of-the-art technologies including smart and green manufacturing equipment (Ullah et al., 2021). For instance, about 67% of European manufacturing firms have invested or plan to invest in equipment to reduce carbon emissions (Gereben and Wruuck, 2021). For manufacturing firms, environmental investments for operations also improve workers' performance and quality of life (Lankoski, 2006). Such investments involve installation and operation of equipment and processes to control illumination, noise, temperature, humidity and air quality in their factories (McCoy and Evans, 2005).

1.1. Research Problem and Objective

Sustainability issues not only attract policy-makers but also researchers who are paying increasingly close attention to the sustainability paradigm, which is based on the Anthropocene Epoch (Ste et al., 2016). According to this paradigm, the Holocene Epoch when manufacturing was not bounded would be replaced by a new era called the Anthropocene Epoch (Ste et al., 2016). Under this new approach, excessive production would worsen environmental issues such as carbon dioxide emission. The current concepts of planetary boundaries of the Earth System set a limit on human activities as "safe operating space" of the Earth, which should not be surpassed to ensure sustainable development (Rockström et al., 2009). For example, regarding the challenge of climate change, the boundary is that carbon dioxide concentration in the atmosphere should be less than 350 ppm (Rockström et al., 2009). Therefore, a puzzle for manufacturers is to seek a model which not only minimizes environmental impacts but also raises productivity within the allowable production boundary (Rockström et al., 2017). However, our review of previous studies has found both positive and negative effects of environmental management practices on firm-level labor productivity. These different results may be attributed to measurement errors, heterogeneity bias or variable omission (Jaffe et al., 1995; Lannelongue et al., 2017).

Motivated by the above mentioned research gap, this paper aims to investigate how environmental investments for production influence labor productivity in Vietnamese manufacturing SMEs. Capital intensity is used as a moderator which explains the relationship between environmental investments for production and labor productivity. This moderating relationship has not been exploited for the small-and-medium sized enterprises (SMEs) in Vietnam.

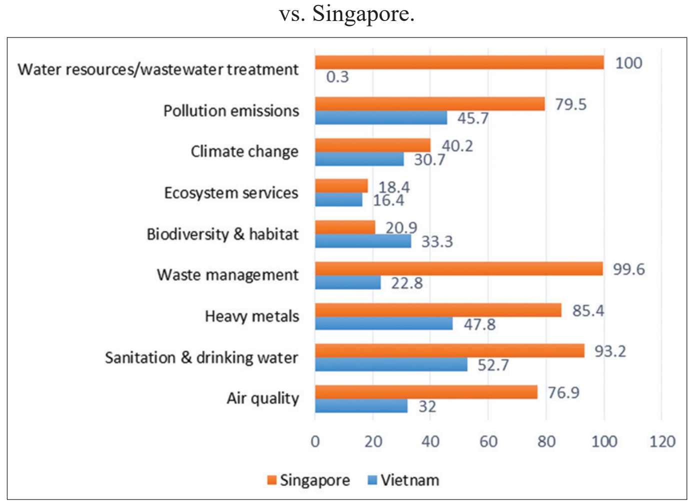
1.2. Environmental Issues in Vietnam

Environmental sustainability is now a basic goal for any economy because of its connections with economic, social and political issues (Ullah et al., 2021). For the past decades, Vietnam, a developing nation, has implemented an industrialization strategy which has significantly reduced poverty and improved the livelihood of its population but production activities for the industrialization objective have caused negative impacts on the natural environment (Ortmann, 2017). According to a World Bank report, up to 310,664 kilotons of carbon dioxide were emitted in Vietnam in 2012, an increase of over 200% over the period from 1990 to 2012 (Ortmann, 2017). Air and water pollution has caused a reduction of approximately 12% of gross domestic product (GDP) in Vietnam (Ortmann, 2017). Figure 1 shows the gaps in environmental performance index scores (0 = worst; 100 = best) between two ASEAN countries: Vietnam and Singapore. Singapore has outperformed Vietnam in all environmental performance index scores, except biodiversity and habitat (Wendling et al., 2020).

Another study on environmental pollution in three ASEAN countries (Thailand, Vietnam and the Philippines) using the dataset from the World Bank and the Global Economy for the period of 1995 to 2017 has shown the declining quality of environment in these countries and its negative effects on their economies (Sutiah and Supriyono, 2020). The government of Vietnam has issued environment-related regulations for enterprises to comply with environmental standards related to energy consumption, waste treatment, and recyclable materials in the production processes (Huynh, 2020).

We focus our study on small and medium-sized enterprises (SMEs) because based on previous studies SMEs have had financial constraints to adopt environmental management practices (Beck and Demirguc-Kunt, 2006; Mahanty and Dang, 2013). If an SME does not recognize the link between environmental investments for production and firm performance, they are not convinced to use their limited budget for such investments. The expected result of this study is that an SME with strong capital is more likely to have a higher impact of environmental investments for production on labor productivity. This discovery is useful for policy-makers to consider SME-supporting policies which provide more assistance

Figure 1: Environmental Performance Index Scores in 2020: Vietnam vs. Singapore.



Source: https://epi.yale.edu

on financial capital for SMEs who are implementing workplace environment investments, which lead to labor productivity.

The next section will review literature related to the impacts of environmental investments for production on firm performance. In the section of methodology, the author constructs a testable model and describes data sources. The section of results indicates critical factors affecting firm-level labor productivity and finally, in the conclusion section, the author draws major conclusions based on the study findings and suggests implications for future research.

2. LITERATURE REVIEW

2.1. Impact of Environmental Investments for Production on Firm Performance

There have been mixed empirical results on the impacts of environmental practices on firm performance. Walley and Whitehead (1994) argued that environmental practices necessitate high costs and risks, leading to lower productivity. Environmental investments for production involve costs for waste reduction, recycling materials, pollution prevention (Klassen and Vachon, 2003). Others have discovered that environmental regulations have negative impacts on firm performance. For example, Gollop and Roberts (Gollop and Roberts, 1983) have found that restrictions on sulfur dioxide emissions reduce productivity growth rate. Pollution abatement costs (capital, labor and materials expenditures) are likely to decrease productivity by 5.3% in paper plants; 3.1% in oil refineries and 7.6% in steel factories (Gray and Shadbegian, 1993; Shadbegian and Gray, 2005). This productivity decrease is attributed to the changes in production processes as regulated by environmental standards. Riillo (2013) has argued that the implementation of environmental management practices generates non-productive investments, which negatively impact labor productivity. Non-productive investments are referred to as expenditures to modify the existing production processes to meet stricter environmental practices and the inclusion of greener technology "displaces more productive investments" (Christainsen and Haveman, 1981). Delmas and Pekovic (2013) showed that the adoption of environmental ISO standards is positively correlated with firm labor productivity. Calza et al. (2018) found that Vietnam's manufacturing SMEs with the adoption of international management standards are more productive than non-adopters. The findings show that by acquiring international standard certification, these firms are obliged to follow stricter management practices hence more productive processes are generated. Adoption of environmental standards eliminates costs to fix consequences that arise from non-compliance with environmental protection and creates a safe and healthy workplace (Delmas and Pekovic, 2013). Healthy workforce would be more likely to be more productive because they are less likely to get sick so the workforce has less absenteeism (Ambec and Lanoie, 2008).

Despite the above-mentioned costs and risks, multiple benefits of environmental investments for production have been revealed. Environmental investments for production aim to enable firms to comply with strict environmental standards and implement good practices in this area. Some studies have found that investments in environmental management generate environmental competitiveness, efficiency and green profitability (Ambec and Lanoie, 2008; Lanoie and Tanguay, 2017; Porter et al., 1995). Firms can gain environmental competitiveness by adopting environment-friendly practices which lead to more effective resource utilization (Porter and der Linde, 1995). Environmental standards ensure that firms adopt environmental practices, which trigger the redesign of production processes, innovation and technologies that improves a firm's efficiency (Delmas and Pekovic, 2013). Environmental practices help firms in generating more, reduce costs, differentiating products, getting more market access, reduce wastes and avoid liability costs (Ambec and Lanoie, 2008). A recent study in Vietnam has revealed the positive influence of environmentally managerial accounting on economic performance at the firm level (Huynh et al., 2021). Table 1 indicates the benefits of environmental practices adopted by a firm.

Based on these above arguments, we propose the following hypothesis:
Hypothesis 1 (H1): Environmental investments for production will increase a firm's labor productivity.

2.2. Impact of Capital Intensity on Firm Performance

Capital is a primary input in the production function (Cobb and Douglas, 1928). Numerous literature has identified capital intensity as a significant factor to firm-level labor productivity. Typically, capital-intensive firms not only take the most of economies of scale for greater production but also provide more training for their employees to improve their job skills required to use new equipment and technology (Datta et al., 2005). Datta et al. (2005) argue that firms with high capital intensity tend to exploit their investments, which means that they are concerned about efficiency and labor productivity. We, therefore, propose the following hypothesis.
Hypothesis 2 (H2): The higher capital intensity a firm has, the higher labor productivity it gains.

2.3. Moderating Role of Capital Intensity in the Relationship between Environmental Investments for Production and Labor Productivity

Environmental investments for production at the firm level involve expenditures on processes and technologies to treat wastes, manage pollution, control noise, improve lighting systems and so on. Such investments may create valuable resources for an organization. According to the resource-based theory of competitive advantage, the resources themselves cannot be productive without collaboration and integration of groups to create organizational capability, leading to greater labor productivity and competitive advantage (Grant, 1991). Mechanisms to bridge resources with labor productivity are efficiency in using resources, employees' health, motivation, training, teamwork and collaboration (Ambec and Lanoie, 2008; Delmas and Pekovic, 2013; Lannelongue et al., 2017).

Because sources of competitive advantage are skills and know-how of the human resources, it is critical to awaken these values by motivation and satisfaction strategies (Datta et al., 2005). Environmental investments for production result in organizational changes, such as training for existing workers, which also contribute to labor productivity (Delmas and Pekovic, 2013). In firms with low capital intensity, human resources are key in the

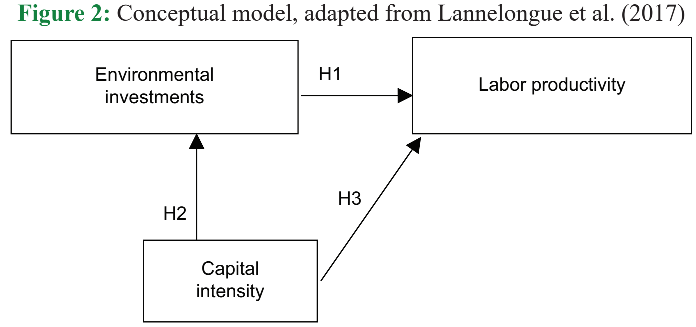
Table 1: Benefits of environmental practices

Benefits	Environmental practices	Sources
Access to more markets and contracts	Greening Public Purchase: – Greening Public Policy (UK) encourages manufacturers and suppliers to develop environmentally preferable goods and services – Regulations for government agencies on purchasing sustainably produced goods (UK Department of Environment, Transport and Regions) – Manufacturers with ISO 14001 certification choose suppliers with green performance (e.g. IBM, Wal-Mart)	Ambec and Lanoie (Ambec and Lanoie, 2008) Barla (2007)
Spurring innovation	Environmental standards trigger innovation, such as green technologies and products (e.g., polyethylene terephthalate (PET) garments, bioreactive dye)	Lannelongue et al. (2017), Reinhardt (1999)
Selling pollution-control technology	Green breakthrough technologies are sold (e.g., green dye of Cibacron LS, new water treatment additives of Allied Colloids Group in the UK, hazardous waste (spent potlining) treatment technology of Alcane)	Ambec and Lanoie (Ambec and Lanoie, 2008) Shrivastava (1995)
Reducing liability costs	Less pollution means lower liability costs. For example, environmental Management System, recognized by ISO14001, is an evidence of due diligence in court in case of environmental incidents	Porter and der Linde (1995)
Reducing material, energy and services	Pollution is associated with material waste or lost energy. Pollution reduction decreases expenditures on raw materials, energy or services.	Porter and der Linde (1995) Reinhardt (2001)
Reducing capital costs	Greener companies get easier access to financial capital through green mutual funds, international banks adopting the Equator Principles[1].	Ambec and Lanoie (Ambec and Lanoie, 2008)
Reducing labor costs	Employees working for companies with ISO14001 certification have higher morale and productivity. This reduces the cost of illnesses, absenteeism, recruitment and turnover	Lankoski (2006)

production processes (Terpstra and Rozell, 1993). Therefore, if these firms implement new environmental practices, they demand more involvement and commitment from human resources. Conversely, for firms with higher capital intensity, environmental management creates the problems of re-routing of capital and displacement of investments. Consequently, the impact of environmental investments for production on labor productivity in firms with high capital intensity is less advantageous than in firms with low capital intensity (Lannelongue et al., 2017). Based on this argument, we propose the following hypothesis.
Hypothesis 3 (H3): Capital intensity moderates the relationship between environmental investments for production and labor productivity

An overview of the three proposed hypotheses are presented in Figure 2.

Figure 2: Conceptual model, adapted from Lannelongue et al. (2017)



3. METHODOLOGY

3.1. Measurements

Table 2 shows the definitions of the model variables.

3.1.1. Dependent variable

3.1.1.1. Labor productivity

The dependent variable is labor productivity, measured by the ratio of total value added to total full-time workers of a firm (Delmas and Pekovic, 2013; Salis et al., 2010). Labor productivity, an important measure for firm performance, demonstrates the extent to which a firm's workforce is producing (Datta et al., 2005). In this paper, the measure of labor productivity is transformed into the logarithmic form, consistently with prior research (Ichniowski et al., 1997; Lannelongue et al., 2017)

3.1.2. Independent variables

3.1.2.1. Environmental investments

The independent variable "*environmental investments*" is defined by the amount of investment costs in workplace environment including water, air and soil (Delmas and Pekovic, 2013; Lannelongue et al., 2017). This variable may be measured in the%age of organizational budget allocated to environment projects such as pollution prevention, waste reduction and recycling materials (Klassen and Vachon, 2003). Environmental investments for productions in

1. International banks which adopted the Equator Principles are responsible to ensure that the projects they finance are environmentally sustainable.

a plant not only reduce waste, prevent pollution, minimize soil degradtion but also minimize occupational safety and health risks caused by air quality, temperature, humidity, illumination and noise (Heizer and Render, 2008). In this study, environmental investments are measured by the amounts spent by an SME on air quality, fire, heat, lighting, noise, waste disposal, water pollution and soil degradation (McCoy and Evans, 2005). This variable has been standardized as suggested by Dawson (2014).

Capital intensity, which is the ratio of physical assets to the total workforce in the logarithmic form is key to increasing labor productivity in the productivity models (Crepon et al., 1998; Newman et al., 2016). In this paper, capital intensity has been used as moderating variable that influences the relationship between high-performance operating systems and firm performance (Huselid, 1995; Koch and McGrath, 1996). This variable has been standardized as suggested by Dawson (2014).

3.1.3. Control variables

3.1.3.1. Firm size

Firm size, measured in the total number of workers of a firm, is a barometer for labor input in a production function (Coad et al., 2016; Cobb and Douglas, 1928). In this study, firm size is measured by the natural logarithm of the total physical assets of a firm (Hall and Weiss, 1967). Environmental management requires higher investment capital in related systems. Large-sized enterprises with strong financial capital may have no obstacle in such investments. Moreover, they know that these investments will enable them to increase sales from overseas markets where customers have mandates on environmentally friendly products. Conversely, SMEs normally struggle with financial constraints so they may not be well equipped with environmental management systems (Beck and Demirguc-Kunt, 2006). This variable has been standardized as suggested by Dawson (2014).

3.1.3.2. Firm age

Numerous international and domestic studies confirmed firm age, i.e. number of firm's operating years, as an explanatory variable for the proposed labor productivity model (e.g. Miguel Benavente, 2006; Narayanan and Hosseini, 2014; Pham and Nguyen, 2017). In this study we measure a firm's age as the natural logarithm of the difference between the survey year (2015) and the year of the firm's establishment. This variable has been standardized as suggested by Dawson (2014).

3.2. Models and Moderating Analysis

We have verified the hypotheses by estimating three regression models using ordinary least-squares estimation strategy with labor productivity (*LabProd*) as dependent variable.

Model 1:

$$LabProd = \beta_0 + \beta_1 InvirInvest + \beta_2 FirmSize + \beta_3 FirmAge$$

Model 2:

$$\begin{aligned} LabProd = \beta_0 + \beta_1 EnvirInvest + \beta_2 CapitalIntensity \\ + \beta_3 FirmSize + \beta_4 FirmAge \end{aligned}$$

Model 3:

$$\begin{aligned} LabProd = \beta_0 + \beta_1 EnvirInvest + \beta_2 CapitalIntensity \\ + \beta_3 (EnvirInvest) * (CapitalIntensity) + \\ \beta_4 FirmSize + \beta_5 FirmAge \end{aligned}$$

In Model 1, the explanatory variables for labor productivity are environmental investments for production (*EnvirInvest)*, firm size (*FirmSize*) and firm age (*FirmAge)*

In Model 2, the explanatory variables for labor productivity are environmental investments for production, capital intensity, firm size and firm age.

In Model 3, we regard *CapitalIntensity* as a moderator. For moderating analysis, we follow the Dawson methodology (Dawson, 2014). A moderator is defined as a variable that changes the relationship between the independent variable and the dependent variable (Dawson, 2014). We also create an interaction term, which is the product of the moderator *CapitalIntensity* and the independent variable "Environmental investments for production" *(EnvirInvest)*. This is called two-way interaction because it involves one moderator and one independent variable (Dawson, 2014).

If the interaction term (*EnvirInvest***CapitalIntensity*) is significant, after being tested by comparing the ratio β_3 to its standard error, we can conclude that *CapitalIntensity* is a statistically significant moderator of the linear relationship between Environmental investments for production (*EnvirInvest)* and Labor Productivity (*LabProd)*. The coefficients β_1 and β_2 determine whether there is any main effect of *EnvirInvest* or *CapitalIntensity* respectively.

3.3. Data

Secondary data is used for this study. UNU-Wider, in collaboration with the Ministry of Labor, the Invalid and Social Affairs of Vietnam (MOLISA), the University of Copenhagen, the Central Institute of Economic Management (CIEM) implemented the data-gathering process between June and August 2015 in selected provinces in Vietnam. The data were recorded on face-to-face interviews with firm owners or managers. The authors were given permission by UNU-Wider to use the survey data for research purposes. The author uses the data of 2015 because this data has reported information related to workplace environmental investments for production, which are used in this model.

Nine cities and provinces in Vietnam were selected to collect the survey data. Three of them are located in the North; four in the Central Vietnam and two in the South. A stratified sampling method was used to ensure that each province has enough enterprises with different ownership forms in each selected province. A sample size of 2,647 SMEs have been selected. "The sample was drawn randomly from a list of enterprises based on the population of non-state manufacturing firms" (*Vietnam SME Database*, 2015, p. 13). In our regression models, we have processed the data of a total of

1,176 SMEs who have reported their environmental expenditures. Table 3 presents the descriptive statistics of the model variables.

Table 4 shows that labor productivity is positively correlated with capital intensity (H2) and environment investments (H1) at the 10% level ($p<0.1$).

4. RESULTS

4.1. Regression Analysis

The regression outputs for the three models are presented in Table 5. In the column of Model 1, we find that environmental investments for production (β = 0.212, P < 0.01) and firm size (β = 0.374, P < 0.01) have a positive effect on labor productivity while firm age (β = 0.0866, P < 0.05) has a negative effect on labor productivity (R^2 = 5.8%, F = 28.9, P < 0.01).

In Model 2, where capital intensity is added, the regression results show that one% increase of the capital intensity would increase labor productivity by 0.735% at 1% significance level (P < 0.01) and the predictive power of Model 2 reaches the significant value of 16.8% (F = 59.09, P < 0.01), an increase of 11% from Model 1.

In Model 3 we find that firm size has a positive effect on labor productivity (β = 1.109, P < 0.01) while firm age has a negative effect on labor productivity (β = -0.113, P < 0.01). This finding suggests that 1% point of increase in the number of employees increases the labor productivity by 0.13% point at 1% significance level, whereas 1% point of increase in the number of a firm's years of operations decreases the labor productivity by 0.113% point at 1% significance level. Similar findings on the impacts of firm size and firm age can be found in previous related studies (Delmas and Pekovic, 2013; Hayes and Wheelwright, 1984; Koch and McGrath, 1996).

4.2. Testing the Moderating Effect of Capital Intensity

The regression results for Model 3 show that when we use Capital Intensity as a moderator for Environmental investments for production, the predictive power of Model 3 reaches 17.4% (F = 49.26, P < 0.01) and the interaction term (*Capital intensity*Environmental investments)* has a positive effect on labor productivity (β = 0.126, P < 0.01). Specifically, 1% point of increase in the interaction of environmental investment and capital intensity increases the labor productivity by 0.033% point at 1% significance level (P < 0.01). It suggests that the effect of environmental investments for production on labor productivity is more positive at firms with higher capital intensity.

Based on the regression results, we draw conclusions on our proposed hypotheses as in Table 6.

We followed the procedures suggested by Aiken and West (1991) for the interaction figure which shows how capital intensity interacts with the relationship between the environmental investments for production and labor productivity. Figure 3 shows the three lines for the environmental investments for production: mean investment costs, mean minus one standard deviation and

Table 2: Definitions of variables

Variable	Definitions
Labor productivity	Value added per employee ($/employee)
Capital intensity	Physical assets per employee ($/employee)
Environmental investments for productions	Total environmental investment costs (air quality, fire, heat, lighting, noise, waste disposal, water pollution and soil degradation) ($)
Firm size	Total full-time employees
Firm age	Number of operating years

Table 3: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Labor productivity	11.17	0.803	4.195	16.013
Capital intensity	5.217	1.272	0.175	9.335
Environmental investments	8.798	1.428	6.908	16.543
Firm size	1.852	1.174	0	6.551
Firm age	2.622	0.632	0.693	4.111

Table 4: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) Labor productivity	1.000				
(2) Capital intensity	0.382*	1.000			
(3) Environmental investments	0.203*	0.037	1.000		
(4) Firm size	0.385*	0.105*	0.582*	1.000	
(5) Firm age	-0.170*	0.010	-0.095*	-0.135*	1.000

*** P<0.01, ** P<0.05, * P<0.1

Table 5: Regression results

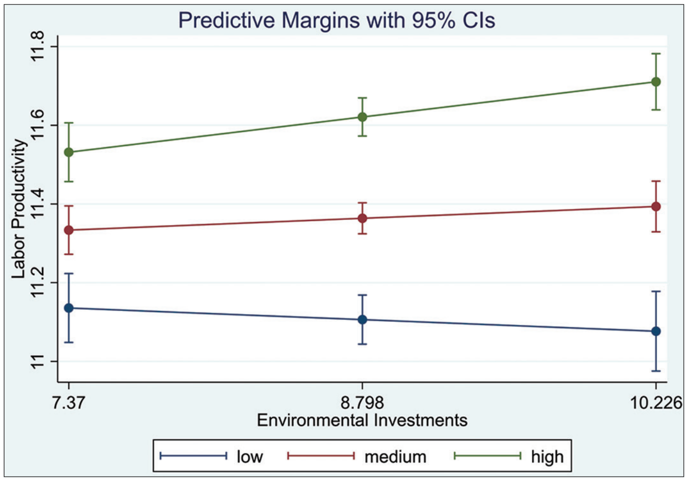
Dependent variable: Labor productivity (log)			
Variables	(1) Model 1	(2) Model 2	(3) Model 3
Capital intensity		0.197***	-0.0859
		(0.0158)	(0.0986)
Environmental investments	0.0613***	0.0345**	-0.150**
	(0.0179)	(0.0170)	(0.0656)
(Capital intensity)×(Environmental investments)			0.0328***
			(0.0113)
Firm size	0.0809***	0.123***	0.130***
	(0.0216)	(0.0205)	(0.0206)
Firm age	-0.0866**	-0.109***	-0.113***
	(0.0349)	(0.0328)	(0.0328)
Constant	10.91***	10.01***	11.60***
	(0.168)	(0.173)	(0.572)
Observations	1176	1176	1176
F-value	28.9***	59.09***	49.26***
R^2	0.058	0.168	0.174
ΔR^2		0.11	0.006

Standard errors in parentheses. ***P<0.01, ** P<0.05, * P<0.1

Table 6: Hypothesis test conclusions

Hypotheses	Conclusions
H1: Environmental investments for productions will increase a firm's labor productivity.	Accepted
H2: The higher capital intensity a firm has, the higher labor productivity it gains.	Accepted
H3: Capital intensity moderates the relationship between environmental investments for production and labor productivity	Accepted

Figure 3: Interaction plot



mean plus one standard deviation. In the vertical axis of Figure 3, the three values for the capital intensity are mean value, mean minus and plus one standard deviation. We can find that SMEs with low capital intensity, higher environmental investments for production reduce labor productivity, whereas SMEs with high capital intensity, higher environmental investments for production increase labor productivity. This finding is consistent with the study results published by Lannelongue (2017).

5. CONCLUSION

The results of the study show that both environmental investments for production and capital intensity have a positive effect on labor productivity. Environmental investments for production refer to a firm's investments in equipment for air quality, fire and heat prevention, lighting, noise reduction, waste disposal, polluted water treatment and degraded soil mitigation. Labor productivity increases in high-capital firms with higher environmental investments. From these results, some important conclusions are drawn as follows.

First, a clear contribution of this study is the provision of empirical evidence of the positive impact of investments in environmental management systems or equipment on a firm's labor productivity, regardless of the size of the firm. It disperses any suspicion that environmental management equipment may reduce labor productivity on the assumption that it reallocates labor from productive operations to unproductivity environmental tasks (Lannelongue et al., 2017). Conversely, this study has found that any expenditure in environmental equipment in production facilities in a firm has a contribution to its labor productivity. This result may be explained by the argument that better environmental protection systems installed in a plant or factory creates trust from environmentally responsible customers, who then place more orders and as a result the firm will have more sales revenue per employee (Ambec and Lanoie, 2008). Other reasons for this result include reduction of any labor hours that are required to repair or replace any products that are rejected by non-compliance with environmental standards (Porter and der Linde, 1995).

Second, our study finding is consistent with other previous studies confirming that higher capital intensity generates higher labor productivity (Datta et al., 2005). With a great number of production machines installed, a production firm can make the most of economies of scale, whereby a large volume of production can be achieved at an optimal production cost, which implies labor cost reduction.

Third, we find that there is a stronger impact of environmental investments for production on labor productivity at those firms with high capital intensity. It is inferred that when a firm has sufficient assets and equipment in place, the effect of environmental investments for production on labor productivity is more advantageous. This result is consistent with previous studies reporting that capital intensity is a critical factor in explaining the impact of environmental performance on organizational productivity (Ambec and Lanoie, 2008; Koch and McGrath, 1996).

Nevertheless, this study cannot avoid limitations. First, the variable of environmental investments for production is measured by the sum of expenditures on environmental management equipment (i.e., equipment for air quality, water pollution, waste treatment, heat, noise, lighting). Environmental investments for production should also include expenditures on environmental management systems such as ISO 14001 certification, sustainability initiatives and so on. Second, the objects of the research are Vietnamese manufacturing SMEs. The research results are more generalized if we broaden the scope of our work to cover larger-sized companies and in other nations. Third, we use only one moderating variable, which is capital intensity. Other contextual indicators may be considered as moderators explaining the association between environmental investments for workplace and organizational departments. Finally, due to the limited available data, the study did not examine other complex methods of measuring productivity like Data Envelopment Analysis (DEA) or the non-parametric method of productivity measurements.

Future research direction should include additional contextual variables as moderators. In addition, mediating analysis may be used to further explain how environmental investments for workplace influence firm performance. When a firm invests in an equipment to ensure safe and healthy environment in a workplace, the impact of this investment on labor productivity may be through the effective work of employees who use the invested equipment. For example, treatment of factory air or wastewater would make workers healthy, thus there would be less disruption to work flow in the factory due to their sickness, fatigue or absenteeism. Future research should example the mediating role of workfoce health in the relationship between environmental investments for workplace and labor productivity. Finally, future studies may consider productivity as organizational productivity where machinery and equipment are also taken into account.

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