PAPER • OPEN ACCESS

The Environmental Effects of Financial Market Development in East Asian and Southeast Asian Countries

To cite this article: S Oktavilia *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **448** 012082

View the article online for updates and enhancements.

The Environmental Effects of Financial Market Development in East Asian and Southeast Asian Countries

S Oktavilia[1], Firmansyah[2], I F S Wahyuningrum[1], A Setyadharma[1] and Erma[1]

[1] Faculty of Economics, Universitas Negeri Semarang, Semarang, Indonesia
[2] Faculty of Economics and Business, Diponegoro University, Semarang, Indonesia

oktavilia@mail.unnes.ac.id

Abstract. This study aims to examine the effect of financial market development, investment, and trade openness on the environmental quality of East Asian and Southeast Asian countries from 1991-2017. Differences in the influence of the East and Southeast Asian region on environmental quality indicators are accommodated by using the dummy variable of the region. All data is sourced from World Development Indicators - World Bank. The results of this study reinforce the notion that per capita income (GDPCap), the environmental effects of financial market development (FMDev), Foreign Direct Investment (FDI), trade openness (TL), influence according to the hypothesis. The Empirical Kuznets Curve (EKC) hypothesis was empirically proven in both regions. Capital inflows and trade openness negatively affect environmental quality, while financial market development (FMDev) has a positive effect on environmental quality in both regions

1. Introduction

Convergence in sustainable finance can be understood through related concepts, including some that were developed before the idea of sustainable finance began to be used. A number of institutional investors have emerged looking for socially responsible investment approaches. This is done through a negative list screening approach to exclude investment in certain sectors (for example, tobacco and alcohol).

Sustainable finance can be understood as a broad concept that is defined by the use given to resources collected and allocated. Although the impact of investment depends on the approach used to select investment and investor objectives, the definition of sustainable finance and concepts such as climate and green finance refers to the use given to financial resources. Now the definition of sustainable finance is a new concept that will still undergo development.

Macro and microeconomic factors associated with emissions in a country are very diverse [1], [2], [3]. Some of the factors analyzed in this study are income, square of income to identify Environmental Kuznets Curve (EKC), Foreign Direct Investment, financial market development, and trade openness. EKC shows the effect of income on the environment. The effect of financial market development in influencing the environment is considered to have an effect on environmental quality [4]. Many studies state that financial development and trade liberalization do not help reduce the impact of

environmental degradation. Even these two aspects are considered responsible for the increase in ecological damage. However, in the study of Shahbaz et al. [5]; Adams and Klobodu [6] financial market development effects show a positive relationship with environmental quality. This means, when a country experiences economic growth and the development of the financial system it will be possible to reduce emissions or environmental degradation, even though it has minimal impact.

This study analyzes financial factors, including foreign direct investment, trade liberalization and per capita income in influencing environmental quality. Environmental quality is measured mathematically by using CO2 emissions as a denominator in mathematical equations ($1/CO_2$) [7]. This study also considers the research of Xiaong et al. [8] primarily to investigate regional differences in observing the effects of financial market development on the environment. This study focuses on observations of countries in two regions, namely East and Southeast Asia. The two regions were chosen because some of them had moved up to the level of developed countries that were originally developing countries and some were still developing countries, whose economic levels continued to increase. This study uses a panel model to accommodate dummy variables to observe differences between the two regions in influencing the environment.

2. Literature review

Foreign direct investment can have a strong influence on pollution through the production process. Thorbecke and Salike [9] in their research stated that the existence of regional production networks, FDI in East and Southeast Asia became very specific and increased trade relations in the region. In both regions, production and trade are specialized in manufactured products that are easy for the environment. Because trading activities are fragmented, the total costs of these transactions are service costs and production costs while the quality of the physical market, financial market and institutional infrastructure is also important.

Economic development and increased energy consumption are other factors that are considered to have a strong influence on environmental degradation is the Development of Financial Markets. Financial markets according to Frankel and Romer [10] are mentioned influential in increasing economic development, but on the other hand will also increase demand for a cleaner environment. Financial market development is considered to have an effect on increasing pollution, through the effects of increased investment loans and working capital that finance production, as well as household consumption loans. Zhang's study [11] shows that financial market development can have a dual effect, although positive effects on the environment are more expected. The research from Sadorsky [12] also supports previous studies, which suggest financial development can contribute to reducing carbon dioxide emissions.

The development of the stock market helps public companies reduce financial costs, but also creates resource allocations that ultimately increase energy consumption and carbon dioxide emissions.

Although several studies have shown the effect of financial market development on the environment, several studies [13], [14], [15] have found an insignificant effect of financial development on carbon dioxide emissions. Some research also includes the effect of financial market development in analysing EKC in several countries [4], [16], [17] which results show that the development of the financial sector actually decreases environmental quality, or increases the rate of air emissions.

3. Methodology

This study uses panel data of countries in the East and Southeast Asia region, in the period 2000-2018. The panel model is used to overcome data limitations. The adequacy of the data being observed is fulfilled by combining time series data and cross sections [18]. Countries that were observed from this study were 11 countries, five of which were from the Southeast Asia region, and the rest were East

Asian countries. The use of the panel data model is used in order to increase the degree of freedom. This model goes through the feasibility-testing model with the Hausman Test [19], and determines that the analyst is done with the fixed effect model (FEM) approach because it is rated as the best model.

Dependent variables used are environmental quality (EQI) and five independent variables that influence are financial market development (FMDev), GDP per capita, growth in foreign direct investment (FDI), trade openness (Trade). In addition, the empirical model also includes the quadratic variable GDP per capita to observe the phenomenon of the ECC and dummy regional variables, to observe the difference in influence between East and Southeast Asia. The dependent variable in this study is used the opposite of CO2 emissions to describe the environmental quality mathematically ie the environmental quality is equal to $1/CO_2$. The equation of the empirical model used in this study is as follows:

$$LEQI_{it} = \beta_0 + \beta_1 LFMDev_{it} + \beta_2 FDI_{it} + \beta_3 TRADE_{it} + \beta_4 LGDPCap_{it} + \beta_5 LGDPCap\hat{}2_{it} +$$
$$\beta_6 DUMMY_{it} + u_{it} \tag{1}$$

In both models, (L) shows the natural logarithm, (u) and (e) are the error terms, (i) show the observations based on provinces and (t) shows the observations based on the time series.

4. Result and discussion

Based on the analysis using the Panel data analysis test with FEM approach, then it is ensured that the FEM model is the best. Model testing is done by Hausman-test, to choose whether the FEM or Random Effect Model (REM) model is used as an analysis approach. The results of the Hausman test in table 1 show that The Chi-Square statistic 11.36 shows that the REM model may be rejected that FEM is used. Furthermore, the empirical model will be explained using estimates with FEM.

Table 1. Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.365128	5	0.0446

Table 2. Estimation results

Variable	Coefficient	t-Statistic	Prob.
LOG(FMDEV)	0.082491	1.688721	0.0928
FDI	-2.23E-05	1.452526	0.1479
TRADE	-0.001720	-3.294973	0.0012
LOG(GDPCAP)	-1.974415	-11.19735	0.0000
(LOG(GDPCAP))^2	0.098147	9.771164	0.0000
DUMMY	0.854403	2.459889	0.0147
C	14.76216	19.10274	0.0000

The results of panel data regression with FEM approach (table 2) show that all independent variables work according to the hypothesis in influencing environmental quality. Financial market development variable (FMDev) has a positive effect on environmental quality in the empirical model. Variable income per capita (GDPCap), environmental impact of financial market developments (FMDev), Foreign Direct Investment (FDI), trade openness (TL), have a negative effect on environmental quality in both regions.

The results of this study indicate that the development of financial markets in Southeast Asian and East Asian countries statistically has a positive and significant effect on the degree of confidence of 90 percent (α 10%) for environmental quality in both countries. The variable coefficient of 0.08 indicates that an increase in the financial market of 1 percent can improve environmental quality (EQI) by 0.08 percent in both regions. Although it has not yet reached a significant level of α 5%, this study was able

to show that the financial sector in both regions began to move to influence environmental conditions that are getting better. The results of the influence of this FMDev variable are in accordance with the results of research by Zhang [11] and Sadorsky [12], which state that financial market development in developing countries towards developed countries has a double effect, and a positive effect on the environment is expected.

The FDI variable in this study shows a negative but not significant relationship. This means that an increase in foreign investment actually reduces the quality of the environment. This result is possible because most of the countries observed are developing countries, which have characteristics as the EKC hypothesis. The variable of trade liberalization and per capita income also shows a negative relationship to environmental quality.

Trade openness has a significant negative effect on α 5%, and has a coefficient of -0.0017. This means statistically, with a degree of confidence of 95%, an increase in trade openness in Southeast Asia and East Asia by 1% has an effect on environmental quality decline of 0.0017 percent. Similarly, the variable income per capita also has a significant effect on α 5%, and has a coefficient of -1.97. This means that an increase in per capita income in both regions by 1% can affect a decrease in environmental quality by 1.97 percent. The trade relations and income per capita are in line with studies in several developing countries as conducted by Ozturk and Acaravci [13], Dogan and Turkekul [14], and Omri, et.al [15] who found that the effects of these variables were negatively affected by the environment.

The square variable per capita income in this study is able to show the characteristics of the ECC in both regions. Negative and significant beta values indicate that the characteristics of development in the countries of Southeast Asia and East Asia as a whole are still at the stage of the Environmental Kuznet Curve namely growth has a negative impact on the environment. Economic activity on a larger scale causes an increase in environmental damage, because of excessive resource exploration and industrialization that is not environmentally friendly [20], [21]. The dummy variable shows the results that are statistically significant at α 5%, which means that the regions of Southeast Asia and East Asia are statistically different in influencing environmental quality. This result is likely due to the majority of East Asian countries including developed countries including China and Japan, while only one country in Southeast Asia is a developed country namely Singapore. In addition, the condition of natural resources in the two regions is relatively different, which causes the conditions of environmental quality in the two regions to be different.

5. Conclusion

This study generally proves the relationship of independent variables in the empirical model is able to show research hypotheses that have a tendency in accordance with the characteristics of developing countries. The development of integrated and increasingly strong financial markets has proven to be able to increase environmental quality in both regions.

This research also proves that the phenomenon of EKC still occurs in the two areas observed. The quadratic variable on aggregate income is a set of variables used to prove the occurrence of Environmental Kuznets Curve (EKC) in Southeast Asia and East Asia. The EKC hypothesis is carried out using the quadratic function: $E_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 (X_{it})^2 + \varepsilon_{it}$; with Terms: $\beta_2 \neq 0$, If $\beta_2 < 0$ then it forms an inverted U-curve (EKC), whereas if $\beta_2 > 0$ it forms an upward U-shaped curve. The empirical model in this study uses environmental quality variables ($1/CO_2$) instead of using environmental degradation variables (CO_2) as the original model from EKC. So that the EKC phenomenon based on inverse U-shaped theory, in this study becomes U-shaped open up.

References

[1] Behera S and Dash D 2017 The Effect of Urbanization Energy Consumption and Foreign Direct Investment on the Carbon Dioxide Emissionin the SSEA (South and South east Asian) Region *Renew. Sustain. Energy Rev* **70** 96–106.

[2] Jiang L, Folmer H, and Ji M 2014 The Drivers of Energy Intensity in China: A Spatial Panel Data Approach *China Econonic Review* **31** 351–360

[3] Pata U K 2018 Renewable Energy Consumption Urbanization financial Development Income And CO2 Emissions In Turkey: Testing the EKC hypothesis with structural breaks *Journal Clean Production* **187** 770–779

[4] Abbasi F and Riaz K 2016 CO_2 Emissions and Financial Development in an Emerging Economy: An Augmented VAR Approach. *Energy Policy* **90** 102–114.

[5] Shahbaz M, Solarin S, Mahmood H, and Mohamed A 2013 Does Financial Development Reduce CO2 Emissions in the Malaysian Economy? A Time Series Analysis *Econ. Model.* **35** 145–152

[6] Adams S and Klobodu E 2018 Financial Development and Environmental Degradation: Does Political Regime Matter? *J. Clean. Prod.* **197** 1472–1479

[7] Oktavilia S, Firmansyah, Sugiyanto F X, and Widodo W 2017 Environmental degradation trade openness and economic growth in Southeast Asian Countries *Pertanika Journal of Social Sciences and Humanities* **Vol 25** November

[8] Xiong L, de Jong M, Wang F, Cheng B, and Yu C 2018 Spatial spillover effects of environmental pollution in China's central plains urban agglomeration *Sustainability* **10** 994

[9] Thorbecke W and Salike N 2011 Understanding Foreign Direct Investment in East Asia ADBI Working Paper 290 Tokyo: Asian Development Bank Institute Available: http://www.adbi.org/working-paper/2011/06/23/4616.foreign.direct.investment.east.asia/

[10] Frankel J and Romer D 1999 Does Trade Cause Growth? *Am. Econ. Rev.* **89** 379–399

[11] Zhang Y 2011 The Impact of Financial Development on Carbon Emissions: An Empirical Analysis in China *Energy Policy* **39** 2197–2203

[12] Sadorsky P 2010 The impact of financial development on energy consumption in emerging economies Energy Policy **38** 2528-2535

[13] Ozturk I and Acaravci A 2013 The long-run and causal analysis of energy growth openness and financial development on carbon emissions in Turkey *Energy Economics* **36** 262- 7.

[14] Dogan E and Turkeku 2016 CO_2 emissions real output energy consumption trade urbanization and financial development: testing the EKC hypothesis for the USA *Environmental Science and Pollution* Research DOI 10.1007/s11356-015-5323-8

[15] Omri A, Daly S, Rault C, and Chaibi A 2015 Financial development environmental quality trade and economic growth: What causes what in MENA countries *Energy Economics* **48** 242-252.

[16] Salahuddin M, Gow J, and Ozturk I 2015 Is the Long-Run Relationship between Economic Growth Electricity Consumption Carbon Dioxide Emissions and Financial Development in Gulf Cooperation Council Countries Robust? *Renewable and Sustainable Energy Reviews* 51 317–326

[17] Javid M and Sharif F 2016 Environmental Kuznets curve and financial development in Pakistan *Renewable and Sustainable Energy Reviews* **54** 406-414

[18] Baltagi H B 2005 Econometric Analysis of Panel Data *Chicester* **5**.ed

[19] Gujarati N D and Porter D C 2009 Basic Econometrics 5th ed. New York. McGraw-Hill.

[20] Copeland B R and Taylor M S 2003 Trade Growth and the Environment *Journal of* Economic *Literature* **42** (1): 7–71

[21] Oktavilia S and Firmansyah F 2016 The Relationships of Environmental Degradation and Trade Openness in Indonesia *International Journal of Economics and Financial* Issues **6** (6S) 125-129 . Retrieved from https://dergipark.org.tr/en/pub/ijefi/issue/31991/352816