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Fiscal Policy, Urbanization and Education: Analysis of EKC Porvince in Indonesia

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Abstract

This study investigated the EKC hypothesis for Total Suspensed Solid (TSS) and Fecal Coli (FCOLI) pollutants in Indonesia with a quadratic model and several control variables (fiscal policy for natural resources revenue sharing, foreign investment, urbanization and education). Using a pool data of 33 provinces in 2011-2014. The results of the study support the EKC hypothesis significantly for TSS pollutants and not significant for FCOLI pollutants. Foreign investment, urbanization and education tend to increase pollutants even though they are not significant. Fiscal policy is significant for reducing TSS pollutants but does not apply to FCOLI pollutants. The government must increase inclusive green growth and environmental competencies in education.

Keywords: TSS, FCOLI, Urbanization and Education, Fiskal, EKC

1. Introduction

Environmental degradation is difficult to avoid in line with development progress, especially in developing countries. Colole et al. (1997). Nature as one of the factors of strategic production, has not been calculated proportionally or is considered external cost, so its availability decreases. This condition is in line with Asici (2013) finding that the current paradigm of economic growth is not sustainable, especially in middle-income countries. Therefore, one of the important agenda of the 2030 Suitanable Development Goal (SDG's) is to preserve the environment and UNDP (2016) asserts that water resources have economic, social and ecological strategic significance.

Classical economists are pessimistic that long-term economic growth will be stationary along with the limitations of natural resources. The World Bank (1992) reports that the pattern of relationships between development and environmental degradation (air pollutants) follows an inverted U pattern. That is, degradation increases at the beginning of growth to a certain point, then decreases in tune with the increase in income. This statement is supported by the findings of Cropper and Griffith (1994) for deforestation in Africa, Latin America and Asia. This relationship model was later popularly known as EKC (Environmental Kuznet Curve)

The Indonesian government is very committed to improving the environment and has scheduled in the Medium Term Development Plan (RPJMD, 2015-2019). As an effort to realize sustainable development, through the Ministry of Environment and Forestry is programmed, that the final environmental quality index of the RPJMD will reach the intermediate level.

Indonesia's economic growth in 2011-2014 is relatively high (5.7%/year). This condition is related to the contribution of the industrial sector that continues to grow on average (21.30%). The strategy of developing capital-intensive industrial sectors has become a prima donna, because it is able to provide large and fast added value compared to the relatively traditional and less productive agricultural sector.

Changes in economic structure to industrial sectors located in urban areas, causing

the population to continue to increase. The city becomes an attraction for the workforce, because it not only provides employment, but social status, lifestyle and opportunities.

Unbalanced increase in facilities and infrastructure has driven urban areas to become less healthy, because Total Suspensed Solid (TSS) solid waste caused by industrial activities and Fecal Coli (Fcoli) parasite waste from households continues to increase, causing a decrease in water quality and can threaten human life.

As an institution that is obliged to preserve the environment, the government has formulated regulations in a fiscal manner, so that environmental costs become a mandatory part of the production process. Strict requirements for foreign investment, reducing business and improving education are policies that are expected to improve the environment.

Environmental degradation is not only related to economic growth, but many factors so that the pattern of inverse U relations between degradation and development is very diverse (Roka et al. 2001). Therefore the contribution of this research is:

First, investigating the pattern of TSS and Fcoli reverse U relationships which are two water pollutants causing silting and sources of various diseases. The model used is the square that is added by several control variables. Secondly, investigating the impact of the policy of migration in the field of fiscal, foreign investment, urbanization and education as an instrument to reduce environmental degradation.

Some studies use quadratic models with several control variables such as: Cropper and Griffith (1994), Antle (1995) Andreoni and Levinson (2001). This study was arranged in a format, section 2 contains a literature review, section 3 methodology, section 4 Analysis and discussion and final conclusions and recommendations.

2. Literature Review

Economic Growth.

Economic growth is a necessary condition for development. In terms of production, economic growth illustrates the increase in GNP. Some factors that cause growth according to Samuelson and Nordahus (2005) summarize into 4 factors, namely: 1. Human resouce, 2. Natural Resource, 3. Capital formation, 4. Technological. Whereas Mankiw (2007) summarizes into: physical capital, human capital, natural resource and technological knowledge, as a system to produce output.

Barro (1996) explains, economic growth in 100 countries in 1960-1990 was caused by factors of education, life expectancy, government consumption, legal improvement and inflation and trade. Capolupo (2009) economic growth is caused by a combination of institutional, geographic, socio-cultural factors. The role of technology in the production process, making growth can take place continuously and the complexity of variable relations to produce output, indicates that degradation is not only caused by growth.

Sustainable Development and EKC

Sutainable Development was first introduced by the Brundtland commission 1987. World Bank (1992) explains, Sustainable development is a development activity to meet the needs of the present generation without sacrificing the interests of future generations. These concerns are reasonable because some environmental indicators are deteriorating (degradation) along with the increase in output in developing countries and the world.

Environmental degradation can be reduced, if the government applies consistent environmental policies. Therefore Dinda (2004) asserted, a green growth strategy is a prerequisite for sustainable development, namely growth by taking into account the reduction of pollution, waste, greenhouse gases, depletion of natural resources, energy

efficiency, protection of biodiversity and local ecosystems.

The relationship between environmental degradation and per capita income is known as the EKC (Environmental Kuznet Kurve) hypothesis. That is, at the beginning of the degradation development tends to increase along with the increase in income to a certain point (peak point), then decreases along with the increase in income or resembles an inverted U letter. This pattern is like the Kuznet hypothesis, about the relationship between income and inequality (Kuznet, 1955), so EKC is the analogy. (Taguchi, 2012), (Kasman and Duman, 2015).

Asici (2013) the relationship between income and natural pressure (CO2) is stronger, in the middle and low income groups, than in the group of high income countries. Uchiyama (2016) the EKC pattern is naturally in accordance with the level of economic growth of each country, there is no consensus on the level of turning point for environmental improvement. Cole et al. (1997) the relationship between per capita income and environmental quality cannot be avoided. Lim (1997) some pollutants deteriorated and then improved with economic growth.

The study of the relationship between economic growth and environmental pollution generally investigates several problems: Does EKC really exist, what factors other than income, the relevance of cross-country data statistics, the implications of damage and the role of environmental policy (Panayotou, 2003). Dasgupta et al. (2002) the inverse U relationship only applies to some pollutants and regulation is the dominant factor to reduce pollution, Kasman and Duman (2015). Divide the relationship pattern to 3. First, the EKC pattern. Second, income and energy. Third, the combination of both and focus on emissions, energy consumption and income.

The basic model of the relationship between income and environmental degradation by Shafik and Bandyopadhyay (1992) is divided into 3, namely: linear, square and cubic log. Kijima et al. (2010) EKC models in the form of: dynamic and static; macroeconomics and microeconomics; short and long term and deterministic and stochastic. Uchiyama (2016) First, country-based. Second, data-based and estimation methods. This study uses a static quadratic model with several control variables and adopts the Kahuthu (2006) research pattern. Estimation method uses Fixed Effect and Random Effect.

3. Research and Methodology

Types and sources of data

The data in this study uses secondary data, in the form of a combination of time and cross (pool data), covering 33 provinces throughout Indonesia, within the period 2011-2014 and sourced from the Ministry of Environment and Forestry and the Central Statistics Agency (BPS).

Empirical Model

The analysis model used is:

$$Ln\ (TSS) = \beta o + \beta 1\ ln\ (GRDP) + \beta 2\ (ln\ (GRDP2)2 + \beta 3\ ln\ (INVAS) + \beta 4\ ln\ (FISCAL) + \beta 5\ (EDU) \quad \ldots\ldots (1)$$

$$Ln\ (FCOLI) = \beta o + \beta 1\ ln\ (GRDP) + \beta 2\ ln\ (GRDP2)2 + ln\ \beta 3\ (URBAN) + \beta 4\ (ULITERA) + \beta 5\ ln\ (FISCAL) \quad \ldots\ldots (2)$$

Theoritically, the EKC hypothesis Inverted U accurs when:
β1> 0, β2 <0 and, the peak point will be obtained for - β1 / 2 β2,Taguchi (2012).
(*, **, ***, significant, 10%, 5%, 1%)

Table 1. Definition and Expectations of Variable Relations

No.	Name Variable	Notation	Units	Expected
1	Polutan TSS	TSS	Mg/l	Dependent var.
2	Polutan Fecal Coli	FCOLI	Num/100ml	Dependent var.
3	GRDP per Capita	GRDP	million Rp	+
4	GRDP per capita quadrat	GRDP2	million Rp	-
5	Foreign Investment	INVAS	million $	-
6	Funds for sharing natural resources	FISCAL	million Rp	-
7	Population of City	URBAN	person	+
8	School Enrollmen Ratio (19-240	EDU	Percen %	-
9	Number of Illiterates (15-44)	ULITERA	Percen %	+

4. Results and Discussion

The results of the regression analysis of TSS and FCOLI are presented in Tables 2 and 3.

Table 2. Results of TSS Regression Analysis

Variabel	Fixed	Prob	Random	Prob
Constanta*	-35.17094	0.0284	-6.252580	0.0912
GRDP**	20.48937	0.0209	4.981642	0.0163
GRDP2**	-2.507127	0.0441	-0.602311	0.0270
INVAS	-0.111277	0.2933	0.057356	0.3695
FISCAL**	-0.018806	0.8959	-0.128071	0.0482
EDU	-0.002806	0.9446	0.021710	0.1007
R Square	0.629328		0.096070	
F	3.670921	0.00000	2.380674	0.0430

Table 3. Results of FCOLI regression analysis

Variabel	Fixed	Prob	Random	Prob
Constanta**	-399.8095	0.0338	13.29337	0.2686
GRDP	24.07729	0.2372	-14.87915	0.0214
GRDP2	-3.800769	0.1812	1.948275	0.0233
URBAN	25.17642	0.0519	0.995926	0.0049
ULITERA	0.101121	0.8531	-0.180180	0.0166
FISCAL	0,466726	0.1557	0.223072	0.2375
R Square	0.858999		0.156570	
F	12.34899	0.0000	3.972573	0.0024

The results of TSS pollutant regression analysis in Table 3 and FCOLI in Table 4, explain that the reverse U curve does occur both with the Fixed Effect and Random Effect methods because the value of the positive GRDP coefficient and the GRDP2 coefficient is negative, Taguchi (2012). FCOLI is only significant with the Random method. These results have answered Panayotou (2003) question of the existence of an inverse U-shaped relationship between degradation and growth.

Based on the Redundant test the Chi-Square value is 5% significant, while Haousman is not significant, so the TSS model that is feasible to use is REM, Juanda and Junaidi (2001). Whereas for FCOLI pollutants using the FEM method because of the Redundant and Housman tests both are significant at the 5% level.

Research that supported U inverted patterns were significantly like: Shaw et al. (2010) for SO2 pollutants and Particle Deposite, Cole et al (1997), Taguchi (2012), Kahuthu (2006), Shahbaz (2013), Kasman and Duman (2015), Andreoni and Levinson (2001), Liu et al (2007) pollutants in the Dasha river, Xuemi et al (2011) for ESD pollutants (Supphur Dioxide and ES (Soot) but not for EWW and EISW pollutants, Wu (1998) for WE (Water Examination) pollutants

The foreign investment coefficient (INVAS) is positive and insignificant, meaning that an increase in foreign investment will increase the amount of TSS pollutants in an unrealistic manner, this positive sign supports the research of Hakimi and Hamdi (2016) for Co2 pollutants, Halkos and Paizanos (2013), but does not support Wheeler (2000), Dasgupta et al (2002) and Cole et al (1997). Foreign investment is widely used in the industrial sector and tends to produce pollutants that cause sedimentation, such as solids from coal washing and red mud from aluminum industries.

The school enrollmen ratio coefficient (EDU) is positive and not significant, meaning that an increase in the educated population will increase TSS pollutants not significantly. This result supports the Orubu and Omotor research (2011) for OWP pollutants (Organic Water Pollutants) and does not support Wu's research (1998) and Asici (2013), Orubu and Omotor (2011) for SPM (Suspended Particulate Matter) pollutants. The educated workforce generally migrates to urban areas and works in industrial sectors. So that the increase will increase the city population and increase the contribution of the industrial sector which will eventually add pollutants.

The fiscal policy coefficient (FISCAL) has a negative and significant sign, which means that the increase in funds for sharing natural resource can reduce TSS pollutants significantly. These results support the research of Cole et all (1997) Pollution will be reduced in response to policy, (Asici, 2013) Institutionally negative and significant impact on environmental pressure. Dasgupta et al. (2002) Regulation is the dominant factor for reducing pollution, but does not support Taguchi's research (2012) for Asian countries, including Japan. Shafik (1994) most of the environmental costs are external so the pollutants that cause degradation continue to grow.

The population of city coefficient (URBAN) and the number of illiterates (ULITERA) is positive, and not significant, meaning that the increase of city population and illiterate population will increase the number of FCOLI pollutants not significant (unrealistically). This condition illustrates that urbanization and lack of education are still a source of pollution due to limited sanitation and ignorance about a healthy environment. The population of city coefficient (URBAN) results support the research of Mohaputra and Giri (2009) for NO2 pollutants and do not support SO2 and SPM pollutants, while (ULITERA) supports the research of Torras and Boyce (1998) for Sanitation and Fecal Coli and do not support Sulfur Dioxide and Heavy pollutants. particles.

The fiscal policy coefficient (FISCAL) is positive and insignificant, meaning that fiscal policy in the form of an increase in the funds for sharing natural resources can increase in FCOLI pollutants. The results are in line with Taguchi research (2012) for Asian countries, including Japan. Shafik (1994) most of the environmental costs are external so the pollutants that cause degradation continue to grow

5. Conclusions and Recommendations

Conclusions

Based on the analysis and discussion, some conclusions are formulated: First, The EKC hypothesis for TSS and FCOLI pollutants occurs in Indonesia, because the GRDP coefficient is positive and the negative GRDP2 is eligible to produce a significantly inverted U curve for TSS and not for FCOLI.Second, The education variables and foreign investment increase TSS pollutants are not significantly.Third, City population and illiterate variables increase FCOLI pollutants are not significantly. Fourth, Fiscal policy significant impact on reducing TSS pollutants, but does not apply to FCOLI pollutants.Finally, Education cannot yet be a reliable instrument for reducing environmental degradation.

Recommendation

This research has several recomendation as follows: First, improve education competency for the environment. Second, implement strict rules and supervision on the realization of foreign investment. Third, increase allocation and distribution for environmental improvement. Finally,strive for economic growth that remains green and inclusive

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