

学位論文の要旨 (論文の内容の要旨)
Summary of the Dissertation (Summary of Dissertation Contents)

論 文 題 目
Dissertation title

Impact of Energy Efficiency Improvement on Productivity in Indonesia Manufacturing Sector

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As a growing and developing country in Asia with a relatively large but young demographic structure, Indonesia will not only meet domestic policy challenges but also begin to draw international attention after China and India in seeking a future development pathway that is less fossil energy resource dependent. Manufacturing sector is one of the most important sectors in Indonesia due to its large potential for creating job opportunities and its contribution to development. When the roles of manufacturing sector are expected to continuously increase, some considerable obstruction should be confronted, in particular the increasing pollutions and the increasing domestic price of oil commodities. Although economic instruments implemented within climate change mitigation policies such as a carbon tax have not yet been implemented in Indonesia, the recent rising price of domestic oil commodities can be seen as quasi-carbon regulation instrument because it has similar consequences. This study provides useful information for policy makers to discuss the impact of the climate change mitigation and energy related policies on manufacturing sector. Environmental productivity and efficiency improvement are the main issues to be discussed in this study to formulate constructive policy designs to enhance manufacturing sector's performance in the future.

Annual Indonesia's manufacturing survey datasets are employed for the analysis in this study. Because the existence of data quality problems and the missing of key variables, therefore, the cleaned and balanced panel datasets are constructed for only four periods: 1990-1995, 1998-2000, 2003-2006, and 2008-2010. Substantial economic and political events are adopted to describe the contextual background of the present analysis. For these four periods the study provides empirical results from the baseline analysis for productivity measurements, estimation of average carbon abatement cost, and the impact of energy price on environmental productivity change and average abatement cost. To measure the environmental productivity change and average carbon abatement cost, the disposability of CO2 emissions as undesirable outputs are not free activities is firstly assumed to respond the different impact of carbon regulation on manufacturing sector.

From the baseline analysis for productivity measurements it is observed that the TFP with CO2 emissions over time has grown faster than the TFP without CO2 emissions for the period 1, the period 2, and the period 4. The faster growth of the TPF with CO2 emissions over suggested that when accounting for changes in pollutions as undesirable outputs the average productivity growth is higher than the growth ignoring pollutions. The findings provide a clear message to policy makers that environmental damages should be considered in economic and manufacturing developments.

Further, average carbon abatement cost is estimated. When CO2 emissions as undesirable outputs are weakly disposable, the average carbon abatement cost has increased as the price of oil commodities increased, particularly in the period 3 and 4. The fluctuation of these average carbon abatement cost is consistent with the trend of value added and carbon intensity because the measurement of carbon abatement cost is based on forgone profit and the amount of CO2 emissions, even though on average environmental efficiency show improvement.

Moreover, the relationship between energy factors and environmental productivity is analyzed to confirm that the increase in energy costs directly influence manufacturing productivity. The impact of energy factors on average carbon abatement cost is also examined to investigate the relationship of the increase in energy costs and

CO2 emissions reduction. The change of environmental component in productivity measurement is associated with the adjusted energy prices. In addition, energy dependency negatively and significantly influenced average abatement cost for the periods 1 and 3. When energy is still subsidized during periods 1 and 2, the fuel price is significant and has a negative impact on average carbon abatement cost. Whereas energy subsidy started to be removed in the period 3, the fuel price is statistically significant and started to show a positive relationship to the averaged carbon abatement cost. Electricity price has a significantly negative relationship to the marginal abatement cost when energy subsidy is removed.

Finally, several constructive policy recommendations can be proposed to the policy makers as follow: CO2 emissions as undesirable outputs can be considered in measuring manufacturing sector's productivity growth; carbon tax as one of economic instruments to control CO2 emissions can be imposed on manufacturing sector in Indonesia based on the empirical results of this study that most of manufacturing sector show positive TFP environment growth after the increase of domestic oil price; technological improvement, in particular the cleaner technology, has to become a major concern for the manufacturing firms' long-term strategic planning after the changes in prices of oil commodities; the manufacturing sector performance has to continuously be improved; hence, its roles in contributing to Indonesia's GDP and providing more job opportunities can be maintained; to improve environmental productivity as the one of the manufacturing sector performance's indicators, energy efficiency has to be appropriately implemented.

備考 論文の要旨はA 4判用紙を使用し、4,000字以内とする。ただし、英文の場合は1,500語以内とする。

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