Analisis Industri Berkelanjutan: Decoupling Konsumsi Energi dan Emisi CO2 dari Output Industri Manufaktur (Indonesia) = Sustainable Industrial Analysis: Decoupling of Energy Consumption and CO2 Emissions from Output of Manufacturing Industry (Indonesia)

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Abstrak

Disertasi ini dimotivasi oleh issue energi (ketahanan energi) dan issue lingkungan (perubahan iklim), khususnya inefisiensi energi dan emisi CO₂ di industri manufaktur Indonesia. Sektor industri manufaktur harus menerapkan standar yang menitikberatkan upaya efisiensi energi, diversifikasi energi, eco-design dan teknologi rendah karbon. Kebijakan konservasi energi (efisiensi energi) dan diversifikasi energi (pergeseran komposisi energi) yang efektif dan tepat sasaran sangat penting dan modal bagi industri manufaktur berkelanjutan. Target yang akan dicapai adalah eksistensi decoupling, yaitu aktivitas ekonomi industri meningkat, tetapi konsumsi energi bahan bakar fosil dan emisi CO₂ menurun. Sehingga, informasi deskripsi dan eksposisi yang jelas tentang eksistensi decoupling sangat diperlukan.

Disertasi ini terbagi menjadi 2 studi;
Studi pertama, mengidentifikasi eksistensi decoupling di industri manufaktur Indonesia pada periode 2010-2014 melalui pendekatan konsumsi energi dan emisi CO₂. Identifikasi dibedakan berdasarkan kategori karakteristik perusahaan (industri) seperti: sub-sektor, intensitas teknologi, regional pulau, ukuran perusahaan, kepemilikan modal, dan ekspor. Identifikasi menggunakan metode indeks decoupling yang dihitung dari komponen-komponen hasil dekomposisi konsumsi energi dan emisi CO₂.

Metode dekomposisi yang digunakan adalah Logarithmic Mean Divisia Index (LMDI). Aktivitas ekonomi industri merupakan komponen penggerak utama peningkatan konsumsi energi dan emisi CO₂, sedangkan intensitas energi dan struktur komposisi energi merupakan komponen penghambat peningkatan konsumsi energi dan emisi CO₂.

Hasil identifikasi memperlihatkan bahwa tidak terjadi efek decoupling antara konsumsi energi atau emisi CO₂dengan pertumbuhan aktivitas ekonomi industri pada periode 2010-2014, tetapi eksistensi decoupling relatif pada periode 2012-2013 (secara agregat). Eksistensi decoupling relatif di perusahaan dengan intensitas teknologi medium-low dan perusahaan dengan jumlah pekerja 500-999 (disagregasi). Di masa depan, pemerintah hendaknya fokus melakukan perubahan teknologi rendah karbon atau revitalisasi mesin yang tidak efisien pada perusahaan di sub-sektor yang berpotensi decoupling, berteknologi medium atau high, sudah tua, berada di wilayah Jawa-Bali, firm size 200-499, milik PMDN, dan berorientasi ekspor.

Studi kedua, melakukan identifikasi determinan potensial (karakteristik perusahaan) atau insentif harga energi yang dapat menjadi faktor pendorong terjadinya decoupling (emisi CO₂). Identifikasi melalui pendekatan empiris ekonometri regresi data panel perubahan share konsumsi energi, ketika kondisi

pertumbuhan aktivitas ekonomi meningkat atau stagnan. Studi ini menggunakan metode estimasi Seemingly Unrelated Regression (SUR). Pendekatan empiris dimodelkan dengan permintaan faktor input masing-masing sub-energi di industri yang diturunkan dari fungsi biaya translog. Data set bersumber dari data survei statistik industri besar dan menengah Indonesia, yang disiapkan oleh Badan Pusat Statistik Indonesia.

Hasil estimasi memperlihatkan bahwa penurunan pajak/harga pada bahan bakar gas akan mendorong terjadinya decoupling. Tidak ada perubahan teknologi seiring berjalannya waktu. Perusahaan dengan teknologi medium, wilayah Jawa-Bali, ukuran perusahaan semakin besar, milik PMA lebih less polluters dan berpotensi mendorong terjadinya decoupling sedangkan perusahaan yang semakin tua dan berorientasi ekspor cenderung menjadi heavy polluters. Pemerintah hendaknya fokus melakukan peralihan teknologi dari medium-low ke medium, memberikan insentif atau penghargaan serta peningkatan kapitalisasi pada perusahaan yang berteknologi medium, dan memberikan subsidi atau insentif pada perusahaan yang cenderung heavy polluters yaitu yang tua, wilayah luar Jawa-Bali, firm size kecil, milik PMDN, dan berorientasi ekspor.
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This dissertation is motivated by the issue of energy (energy security) and environmental issues (climate change), specifically energy inefficiency and CO₂ emissions in the Indonesian manufacturing industry. The manufacturing industry sector must adopt standards that emphasize energy efficiency, energy diversification, eco-design and low-carbon technology efforts. Energy conservation policies (energy efficiency) and energy diversification (shifting energy composition) that are effective and targeted are very important and capital for sustainable manufacturing industries. The target to be achieved is the existence of decoupling, namely increased industrial economic activity, but the consumption of fossil fuel energy and CO₂ emissions decreases. Therefore, clear description and exposition information about the existence of decoupling is needed.

This dissertation is divided into 2 studies; The first study, identified the existence of decoupling in the Indonesian manufacturing industry in the period 2010-2014 through the approach of energy consumption and CO₂ emissions. Identification is distinguished by the category of company (industry) characteristics such as: sub-sectors, technological intensity, regional islands, company size, capital ownership, and exports. Identification uses the decoupling index method which is calculated from the components of decomposition of energy consumption and CO₂ emissions. The decomposition method used is the Logarithmic Mean Divisia Index (LMDI). Industrial economic activity is the main driving component of increasing energy consumption and CO2 emissions, while energy intensity and energy composition structure are inhibiting components of increasing energy consumption and CO₂ emissions.

The identification results show that there is no decoupling effect between energy consumption or CO₂ emissions with the growth of industrial economic activity in the period 2010-2014, but the existence of relative decoupling in the 2012-2013 period (in aggregate). The existence of relative decoupling is in companies with medium-low technology intensity and companies with 500-999 (disaggregated) workers. In the future, the government should focus on changing low-carbon technology or revitalizing inefficient machines to companies in sub-sectors that have the potential of decoupling, medium

or high technology, are old, in the Java-Bali region, firm size 200-499, owned PMDN, and export-oriented.

The second study, identifies potential determinants (company characteristics) or energy price incentives that can be a driving factor for decoupling (CO₂ emissions). Identification through an empirical approach to econometric regression of panel data changes the share of energy consumption, when conditions for economic activity increase or stagnate. This study uses the Seemingly Unrelated Regression (SUR) estimation method. The empirical approach is modeled by the demand for input factors of each sub-energy in the industry derived from the translog cost function. The data set is sourced from Indonesian large and medium industry statistical survey data, prepared by the Statistics Indonesia.

Estimation results show that a reduction in taxes / prices on natural gas will encourage decoupling. There are no technological changes over time. Companies with medium technology, the Java-Bali region, the size of the company is bigger, owned by PMA, less polluters and has the potential to encourage decoupling while companies that are older and export-oriented tend to become heavy polluters. The government should focus on transferring technology from medium-low to medium, providing incentives or rewards as well as increasing capitalization in medium-tech companies, and providing subsidies or incentives for companies that tend to be heavy polluters, namely the old, regions outside Java-Bali, small firm size, belongs to PMDN, and is export-oriented.