

Identifying critical supply-chain paths that drive the change in CO2 emission in Japan

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To address the problem of global warming, reducing total emission by managing life cycle CO2 emissions associated with industrial productions has garnered considerable attention. One reason for focusing on life cycle CO2 emissions is because, by requiring downstream and upstream industries (firms) to be directly responsible for both direct and indirect CO2 emissions associated with the supply of raw materials and components, emission reduction can be achieved.

Using the 1990-1995-2000 linked Japanese environmental input-output table at the four-digit commodity classification level, we estimated the effects of structural changes on pollution emissions associated with individual production chains and extracted key production chains with high pollution emissions from the entire economy by using the structural path decomposition technique proposed by Wood and Lenzen (2009). We also compare the results of the case study of Japan with those of Australia.

From the results, we found the production chain that had the largest impact was the path from electricity to household demand. The impact of this production chain accounts for 32% of the total impact (absolute value) relative to the top 60 production chains. However, the change in the commodity composition of final demand and the change in per capita final demand amount, which had a positive contribution to total CO2 emissions, and the change in direct CO2 emissions intensity, which had a negative contribution, offset each other and reduced the overall impact. Moreover, because the volume of CO2 emissions increased as a result of the change in the direct CO2 emissions intensities of the services sector and the agricultural sector, as well as the change in the input structure from the electricity sector of the services sector, the managed cultivation, energy intensification of the service sector, and progress toward the energy dependence of services was more apparent.