Allocating Carbon Responsibilities in the Global Value Chains: A value-added Capturer Responsibility Principle

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Abstract: With the development of global value chains, the â€˜polluter-pays principleâ€™ does not consider the economic benefit structure of production when allocating national carbon emissions responsibilities. All carbon emissions in the value chains of a product serve its end of value creation. However, the distribution structure of economic benefit can be significantly different from that of carbon emissions. A country might capture most part of value-added created in the production of the product in the global value chain of a specific product (e.g., a laptop), whereas it might bear little environmental burdens even it has relatively more resource to deal with them. In the present study, we propose â€˜value-added capturer responsibility (VACR) principleâ€™ to allocate emissions responsibilities from production. Suppose one type of laptop is produced by several countries and its final price is P. And suppose further the production of one such laptop induces E units of carbon emissions globally and firms in country A obtain V units of value-added from participating the production networks of the laptop, then the emissions responsibilities of country A would be E*(V/P) based on VACR principle. V/P is the share of value-added captured by firms in country A which equals the responsibility share in the VACR principle. Based on the World Input-Output Database, we reallocate national carbon emissions inventories of 40 countries and regions based on VACR principle. We first calculate total carbon emissions of each final product (i.e., carbon footprints) and value-added captured by each country, then we reallocate national responsibilities based on value-added shares. The national emissions inventory of each country is obtained by totaling up the emissions responsibilities from every final product. We compare the new inventories with inventories based on â€˜polluter-pays principleâ€™, that is, the â€˜territorial principleâ€™, and â€˜consumer-responsibility principleâ€™ which allocates emissions responsibilities to final consumers. The results show that cumulative emissions responsibilities (1995-2009) of the USA, the EU and Japan based on VACR principle are 7.6%, 24.4% and 30.9% respectively greater than their responsibilities based on â€˜polluter-pays principleâ€™, whereas the new inventories of China, Russia and India are 19.2%, 28.7% and 12.8% respectively lower than their traditional inventories. We have discussed the possible advantages and disadvantages of VACR principle from various respects compared with the â€˜polluter-pays principleâ€™ and the â€˜consumer-responsibility principleâ€™. We donâ€™t suggest replace â€˜polluter-pays principleâ€™ with VACR principle. But like assessment based on â€˜consumer-responsibility principleâ€™, the inventory based VACR principle can be a useful complementary indicator to inventory based on â€˜polluter-pays principleâ€™ in guiding efficiency carbon mitigation and promoting international cooperation of climate policy.