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TITLE: EVALUATION OF THE IMPACT OF COORDINATION POLICIES ON THE PERFORMANCE OF JOINT PRODUCTION CHAINS

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ABSTRACT:

Increasing pressure on the companies due to environmental regulations imposed by governments forces them to not only innovate their production chains but also change their material and energy use strategies. In such a framework, 3R (Reuse, Recycling, and Remanufacturing) activities gained more importance. They extend the life-cycle of products, reduce the environmental impacts of production processes and create value-added in production chains (PCs). Such activities also create the opportunity for an industrial symbiosis among the various actors in different PCs. Two or more PCs which have no links in terms of material/energy flows can be linked through alternative material/energy use and form Joint Production Chains (JPCs). JPCs can be 3R activity-based (e.g. the use of recycled residuals deriving from marble production in the concrete production) or supply policy-based (e.g. the supply of cultivated sunflower to biodiesel production and the biodiesel supply for machineries in cultivation process). In this paper we model 3R activity-based JPCs using the Enterprise Input-Output (EIO) approach as a planning and accounting tool to foresee the potential impacts of linking PCs on materials/energy flows. Moreover, the coordination of such chains is crucial to increase their economic, environmental and operational performance. However, existence of many technical (e.g. type of waste to recycle, substitution rates of the materials), economic (e.g. recycling costs, discharge costs, existence of a mature market for recyclable wastes), environmental (e.g. landfill occupation, pollutant emissions), operational (e.g. supply continuity, change in the production structure of the utility company), and spatial (e.g. dispersion degree of the alternative material suppliers, rarity of alternative material suppliers) variables makes the coordination of such JPCs more complex. Therefore, we propose some coordination policies varying according to the mentioned variables for the JPC actors. Considering the linear character of the EIO approach, we additionally apply Transaction Cost Theory (TCT) to evaluate the impact of transaction costs, which are not represented by EIO approach, on the performance of each actor. Finally, the proposed coordination policies will be sustained by a case example from concrete-marble JPC.