

Identifying High Resource Consumption Supply Chain Points: A Case Study in Automobile Production

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The Pareto principle posits that roughly 80 % of a problem is due to 20 % of the causes, allowing for the targeting of specific efficiency solutions. This paper examines whether the resources used in production are consistent with this principle and then seeks to develop a method to identify those supply chain entities that account for a disproportionately high level of resource consumption compared to other supply chain entities. A novel multi-factor approach is used where resources examined include time, cost, labor, environmental impact, and depreciable assets. The method utilizes data from the BEA 2007 Benchmark make and use tables, Annual Survey of Manufactures, Survey of Plant Capacity Utilization, Manufacturing Energy Consumption Survey, RS Means construction cost data, and an environmentally extended Input-Output database for Life Cycle Assessment (LCA). The approach facilitates the identification of economy-wide opportunities for efficiency improvement in manufacturing, a topic that has limited research devoted to it. Those production activities that consume high levels of resources provide a strong opportunity for efficiency improvement, affecting multiple stakeholders. This method is illustrated by examining automobile manufacturing as a case study. The results suggest that the cost distribution is consistent with the Pareto principle where 20 % of supply chain entities account for 89 %, 89 %, and 91 % of value added, labor hours, and environmental impacts from automobile manufacturing, respectively. Additionally, sixteen supply chain entities were above the 90th percentile in value added, environmental impact, and labor hours for automobile manufacturing, implying efficiency improvements could be obtained across multiple resources simultaneously. For those supply chain entities that would, traditionally, be considered a supplier (i.e., those that manufacture intermediate parts, components, and materials as opposed to those that provide services), the environmental impact, flow time, labor hours, and depreciable assets were above the 90th percentile for one supply chain entity and an additional two are above the 80th percentile.