



Life Cycle Environmental & Energy Impacts of Transportation Under Extended Producer Responsibility (EPR) Practices

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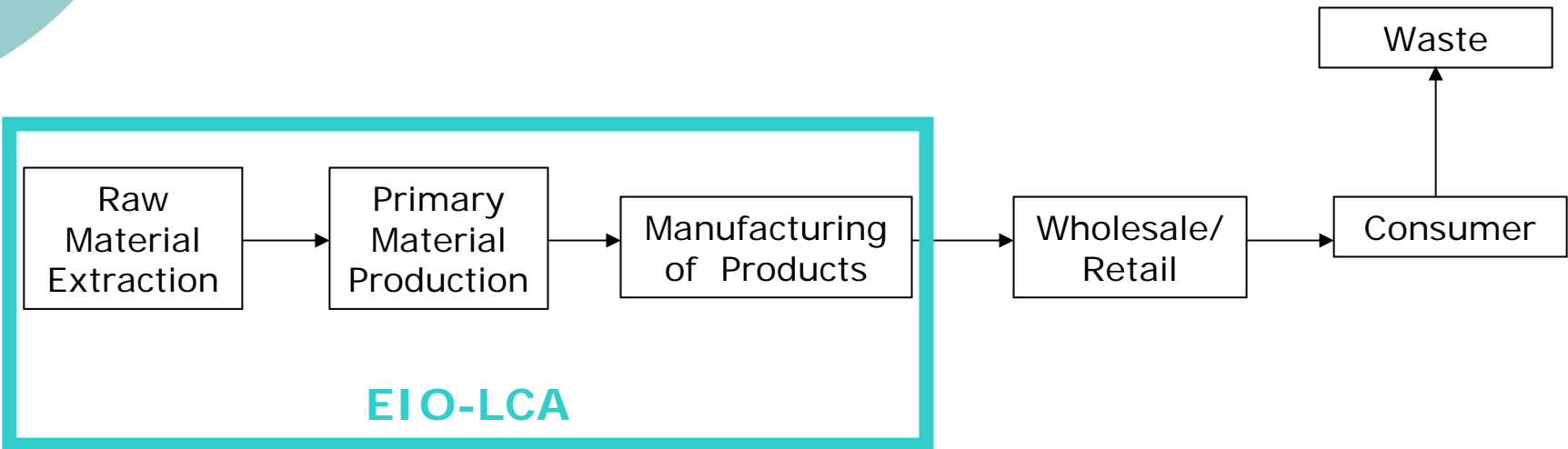
InLCA 2007, Portland, OR



EPR Background

- Extended Producer Responsibility (EPR) policies in Europe and Asia, but not popular in U.S.
- Producers, rather than municipalities, are financially or physically responsible for product end-of-life
- Goals: encourage design for environment (DfE), save material & energy resources, reduce landfill waste
- Existing EPR: electronics, automobiles, batteries, packaging, etc.

Life Cycle of a Product





Economy-Wide Assessment

- Economic Input-Output Life Cycle Assessment (EIO-LCA) model
- Systematic way to assess potential energy and environmental impacts of product take-back
- Compare embodied energy vs. transportation/delivery energy
- Focus on end-of-life reverse logistics



Method

- Data: U.S. Bureau of Economic Analysis (BEA) use table and transportation margin data
- Input \$1M in the EIO-LCA model for each of the 500 sectors
- Obtain environmental and energy impacts profiles from model outputs for each sector

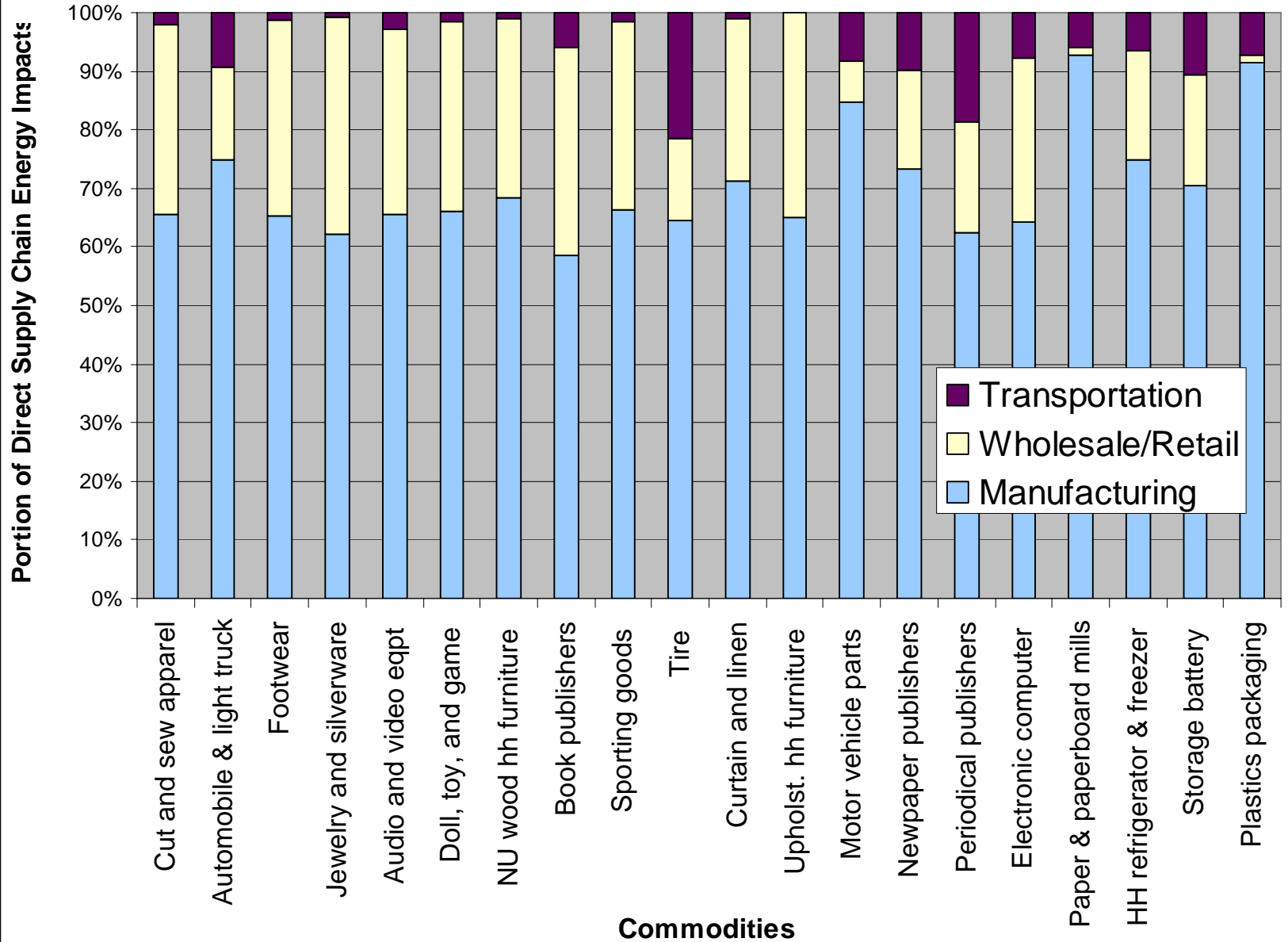


Criteria for “Potential” Items

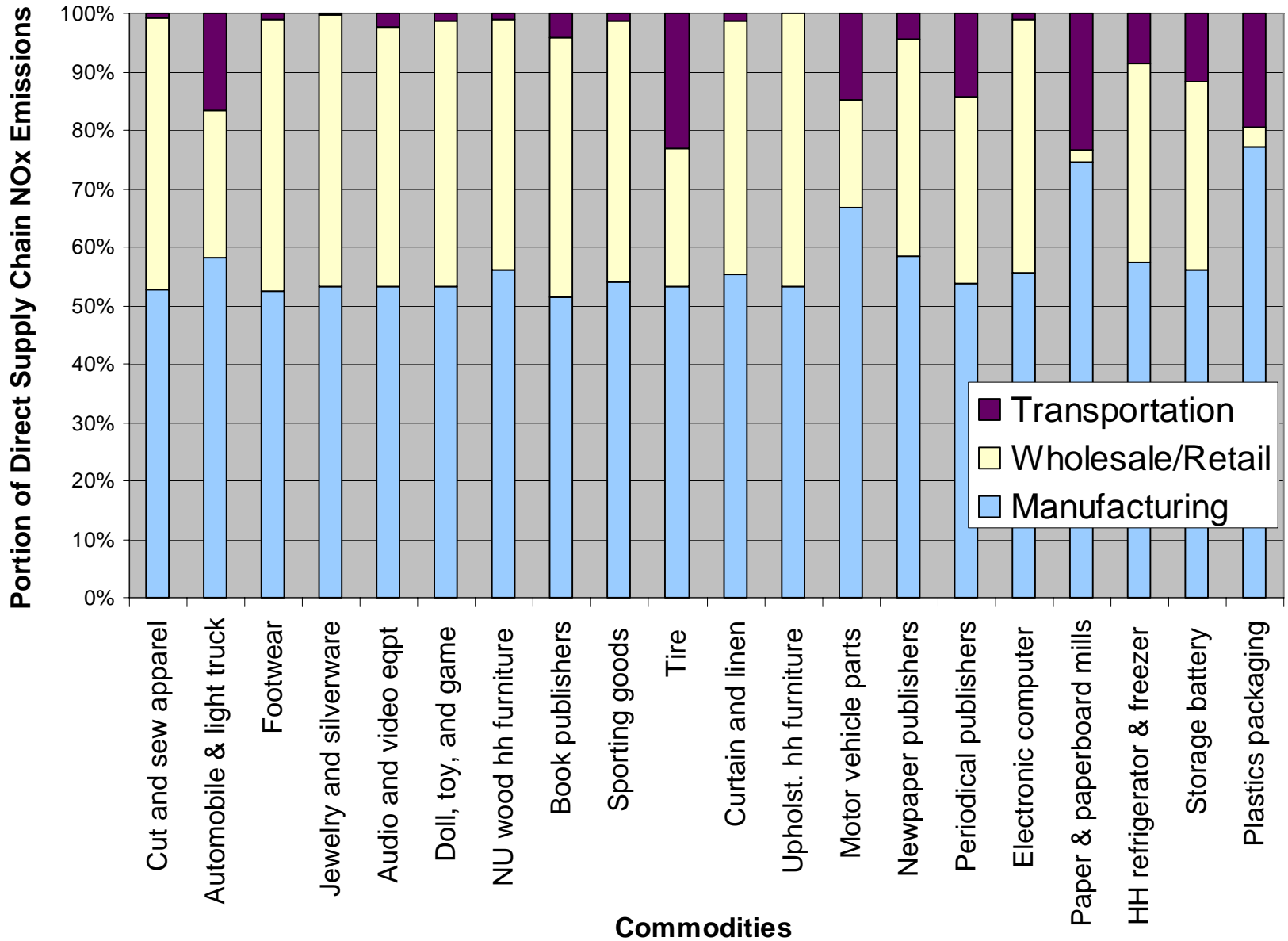
- Purchased by consumers
- Physical goods (exclude services)
- Not consumable (not edible)
- Not expendable (e.g. chemicals)

→ 28% of all 483 commodities

Direct Supply Chain Energy Impacts for Selected Commodities

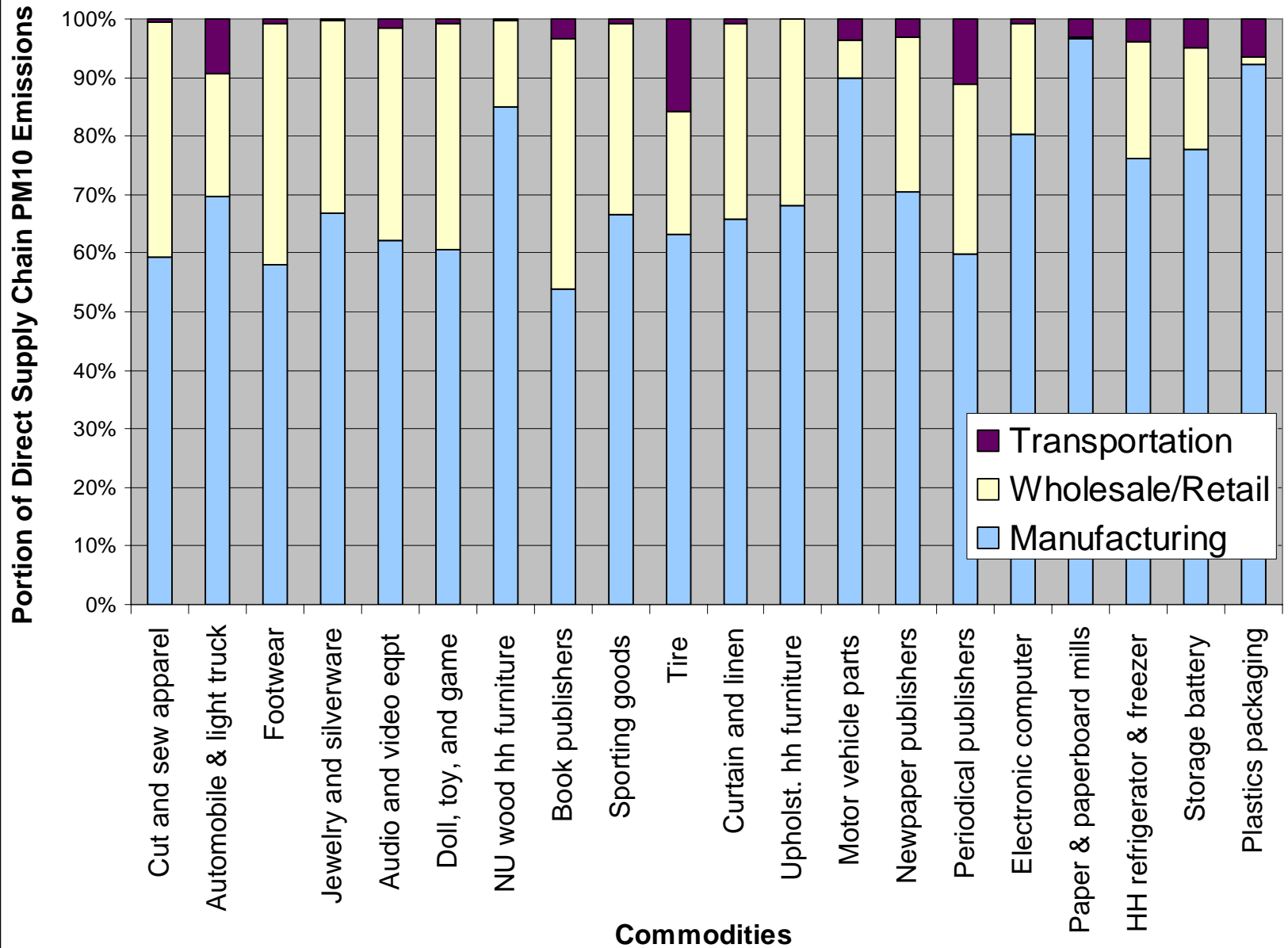


Direct Supply Chain NOx Emissions for Selected Commodities



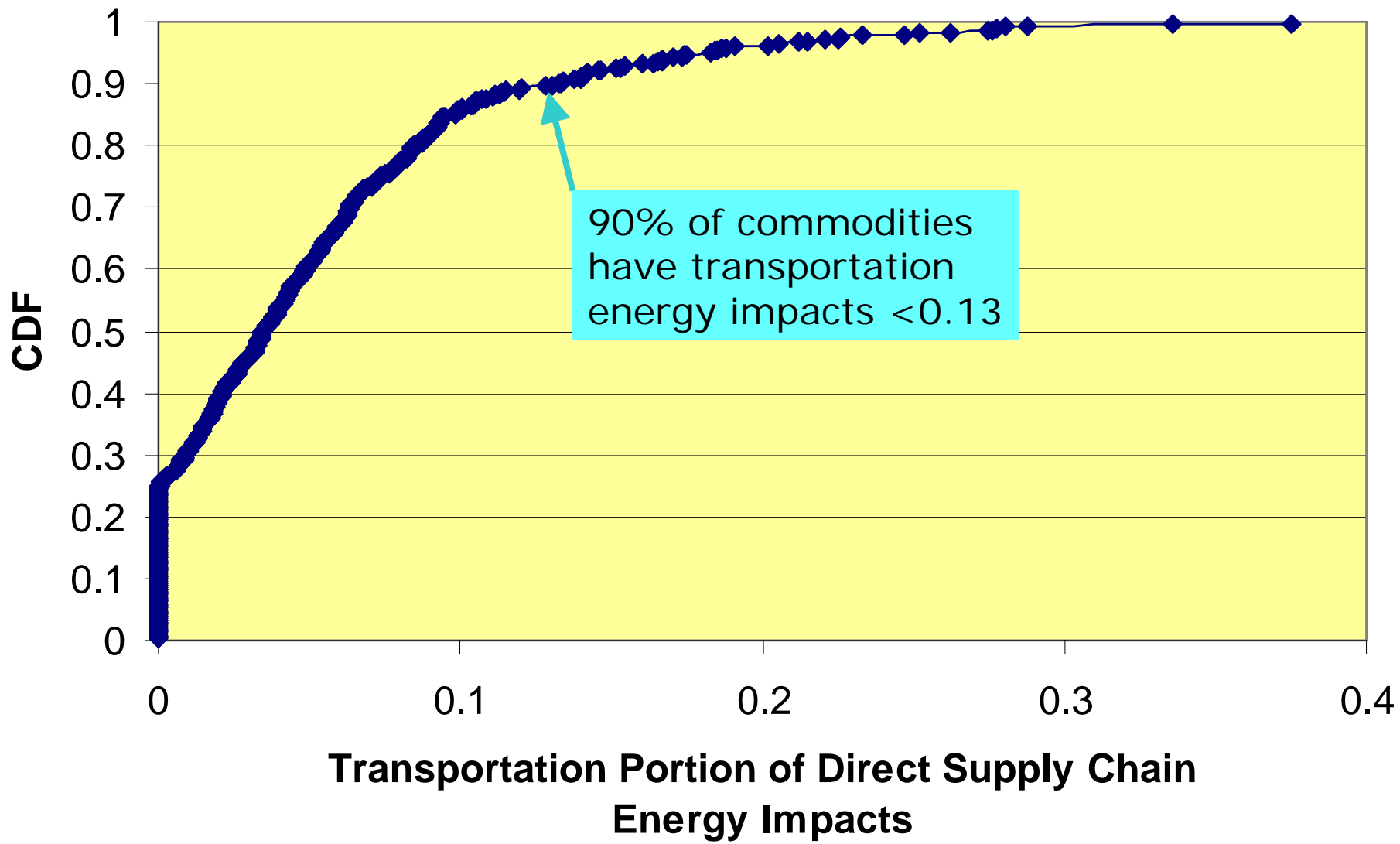
PM10

Direct Supply Chain PM10 Emissions for Selected Commodities



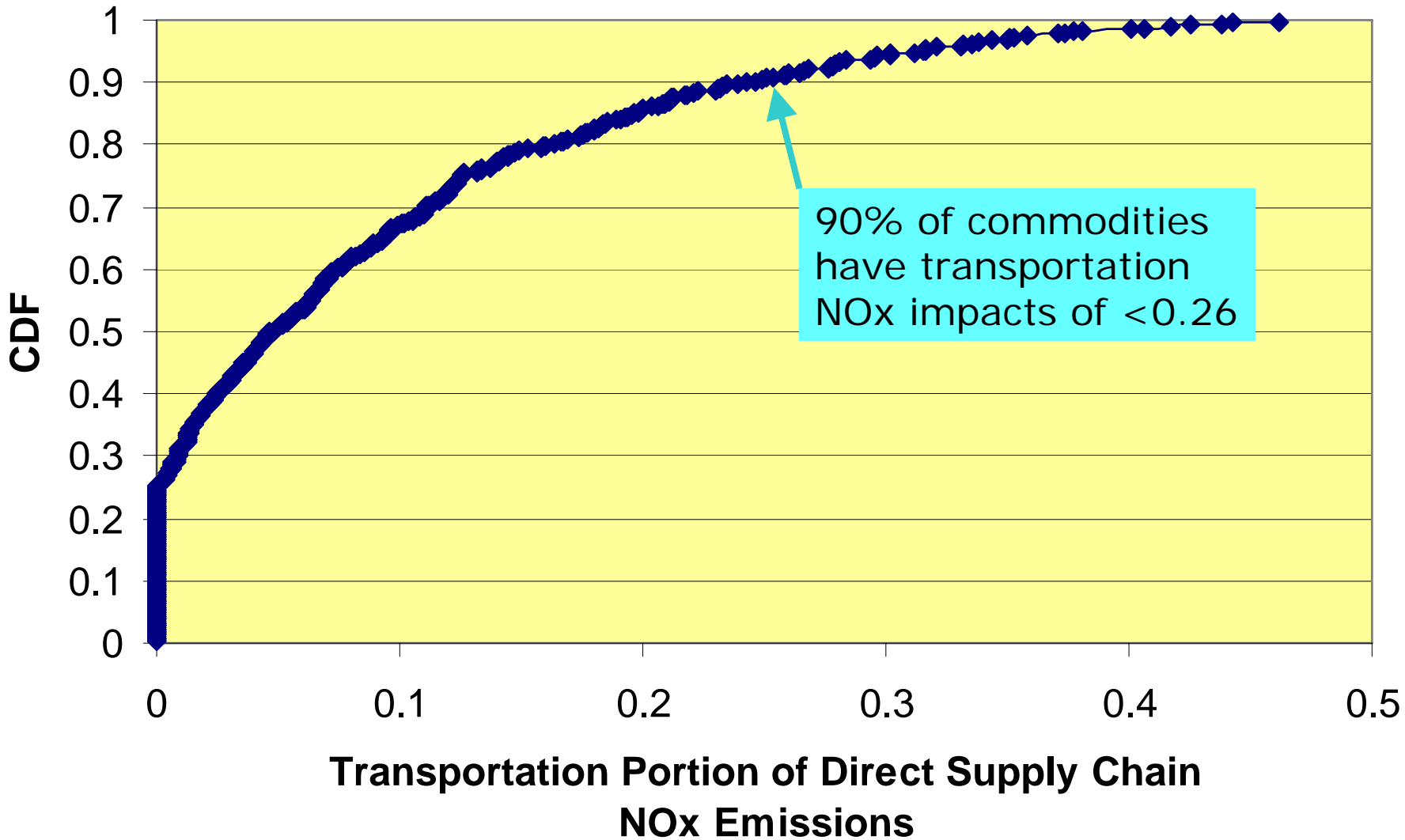
CDF for Transportation Portion of Direct Supply Chain Energy Impacts for 483 Commodities

Energy



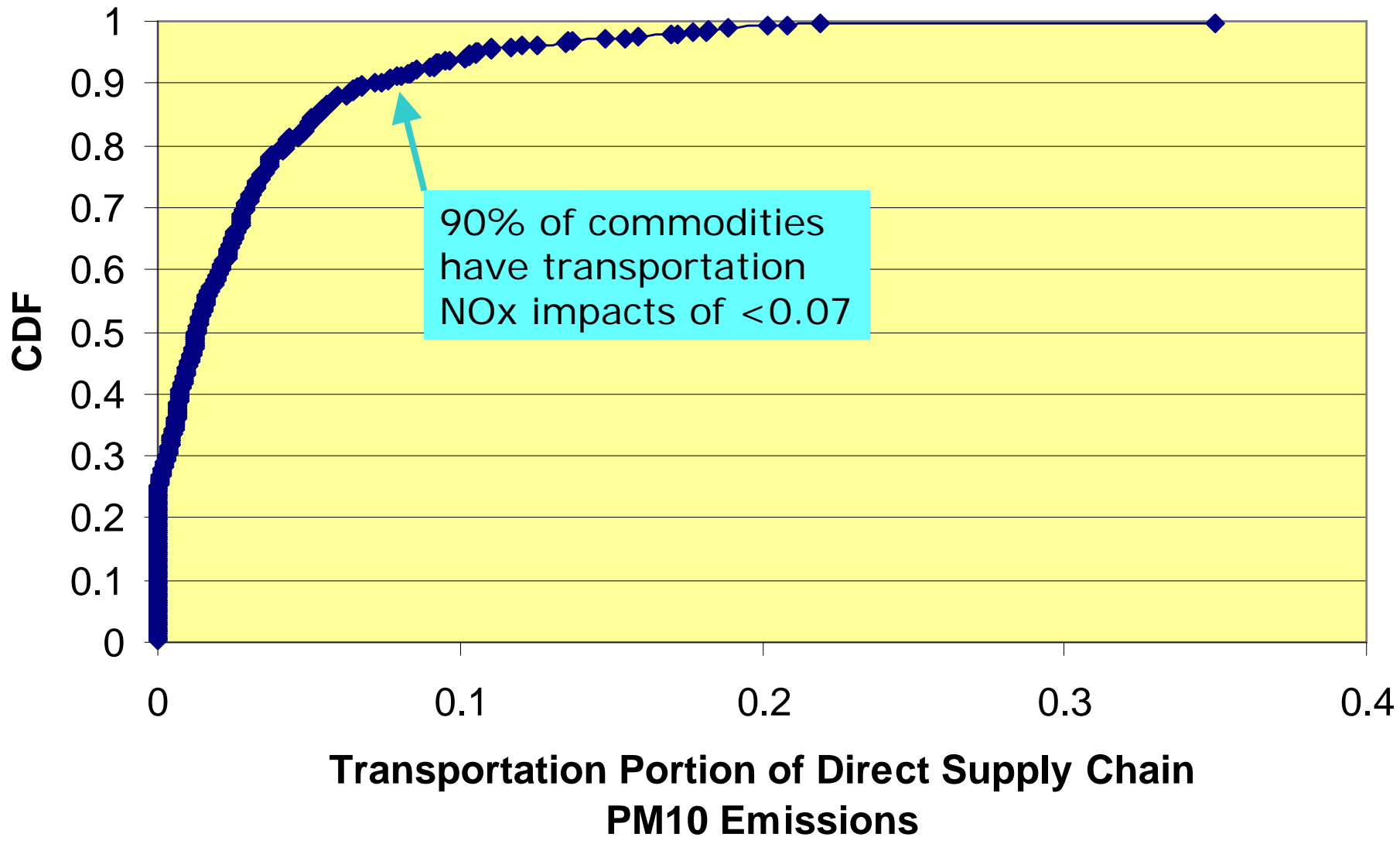
CDF for Transportation Portion of Direct Supply Chain NOx Emissions for 483 Commodities

NOx



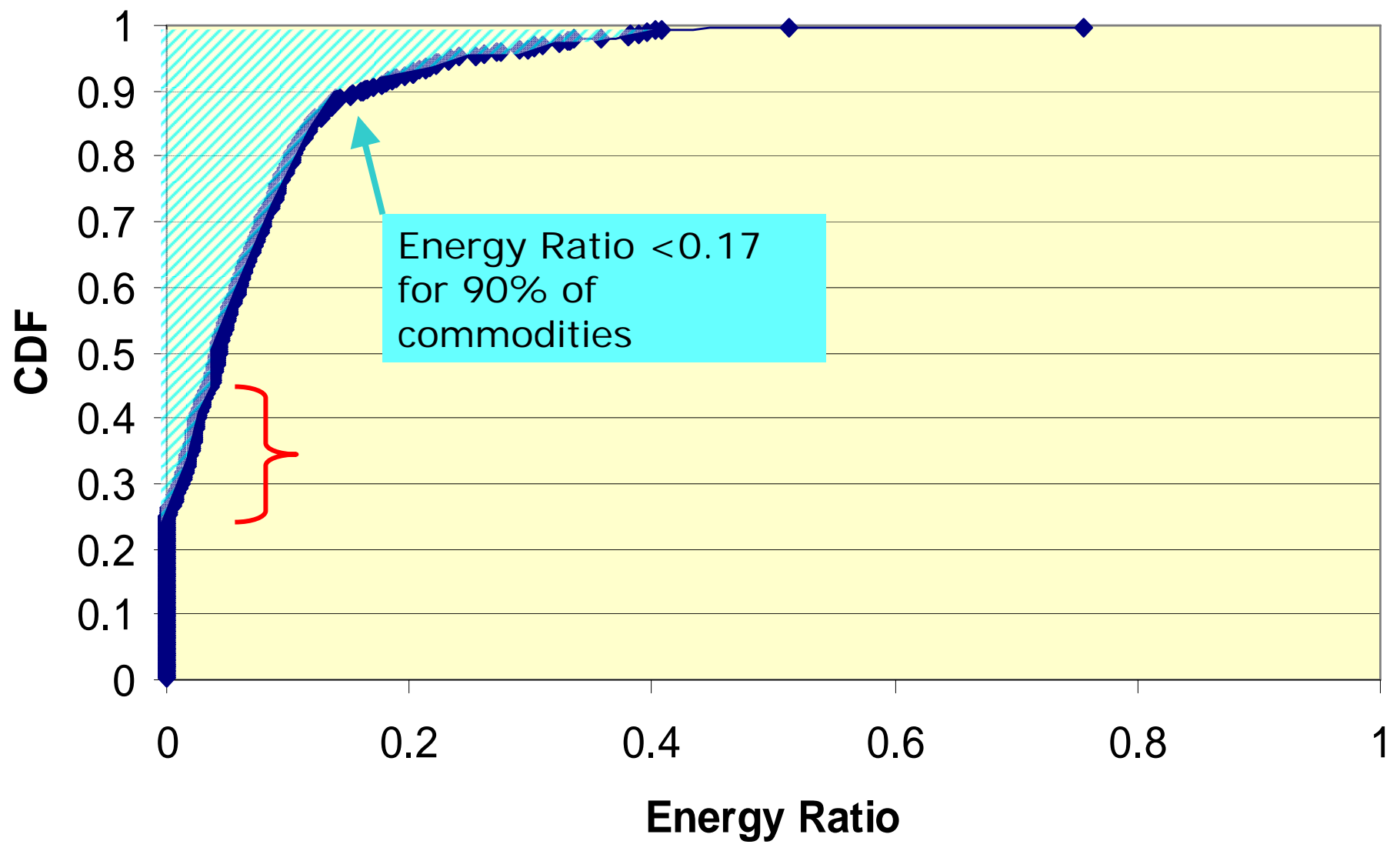
CDF for Transportation Portion of Direct Supply Chain PM10 Emissions for 483 Commodities

PM10



CDF for Energy Ratio of Delivery/Direct Supply Chain Impact

Energy Ratio = Delivery Transportation Energy / Direct Supply Chain Energy Impact



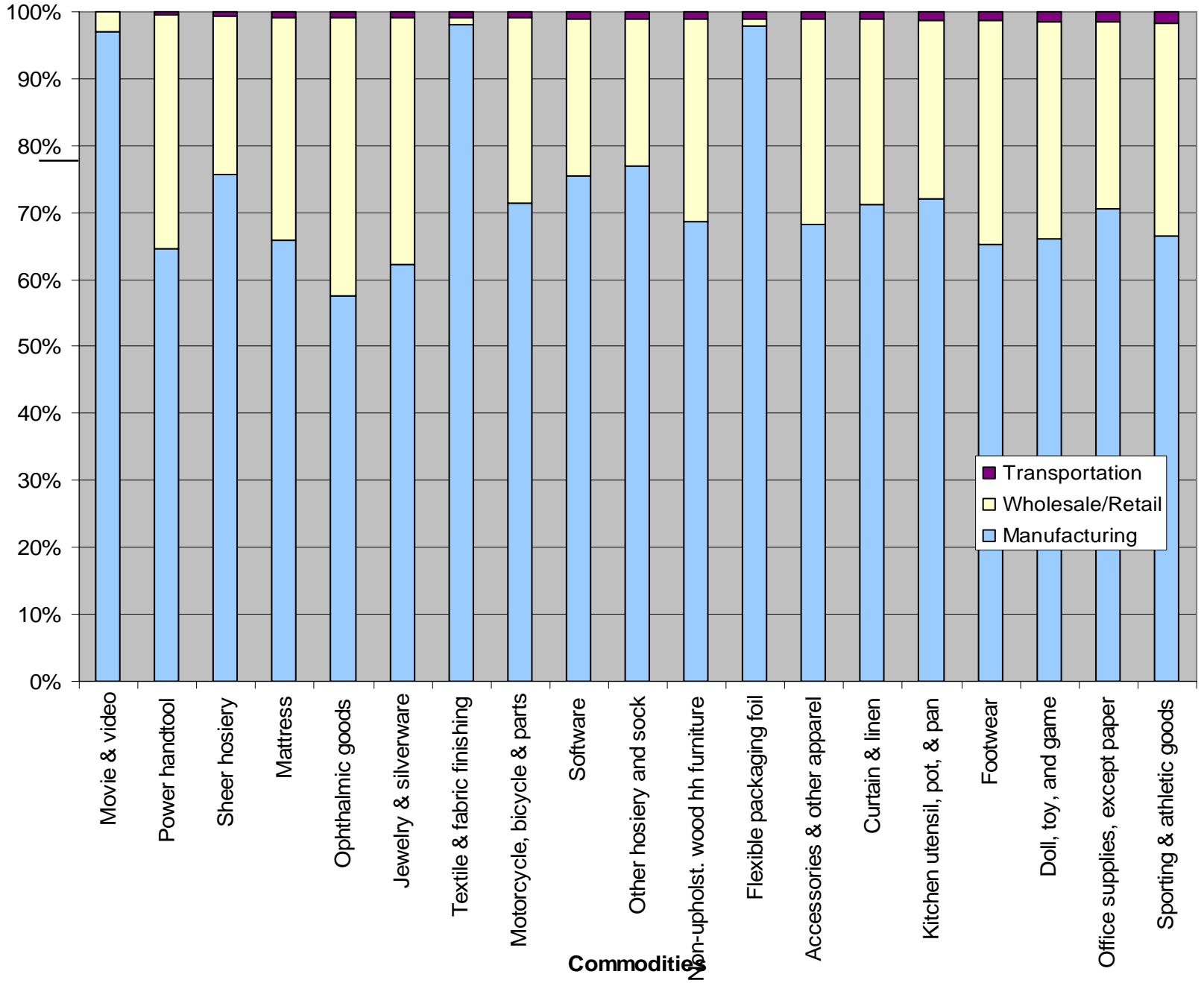


Top Commodities for which transportation/delivery energy impacts are relatively small

- Motion picture and video
- Power-driven handtool
- Sheer hosiery
- Mattress
- Ophthalmic goods
- Jewelry and silverware
- Textile and fabric finishing
- Motorcycle, bicycle, and parts
- Software
- Other hosiery and sock
- Nonupholstered wood household furniture
- Flexible packaging foil
- Accessories and other apparel
- Curtain and linen
- Kitchen utensil, pot, and pan
- Footwear
- Doll, toy, and game
- Office supplies, except paper
- Sporting and athletic goods

Profile of Direct Supply Chain Energy Impacts for Top Potential Commodities

Portion of Direct Supply Chain Energy Impacts





Findings

- Transportation/delivery energy generally is a small portion of embodied energy from manufacturing
- Existing products under EPR are on the “potential” list
- EPR practices saves resources



Acknowledgment

- Steinbrenner Institute of Environmental Education and Research
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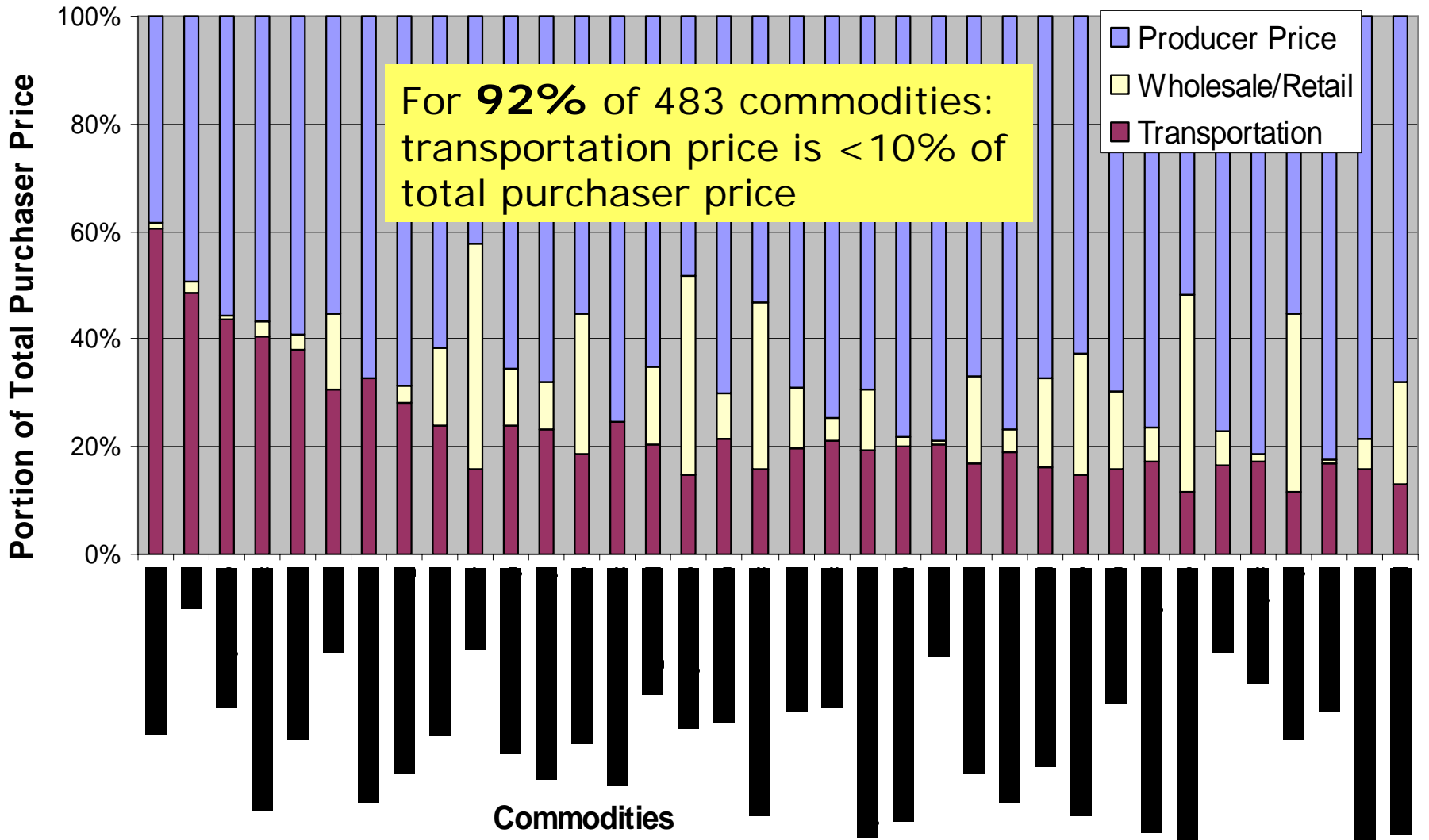
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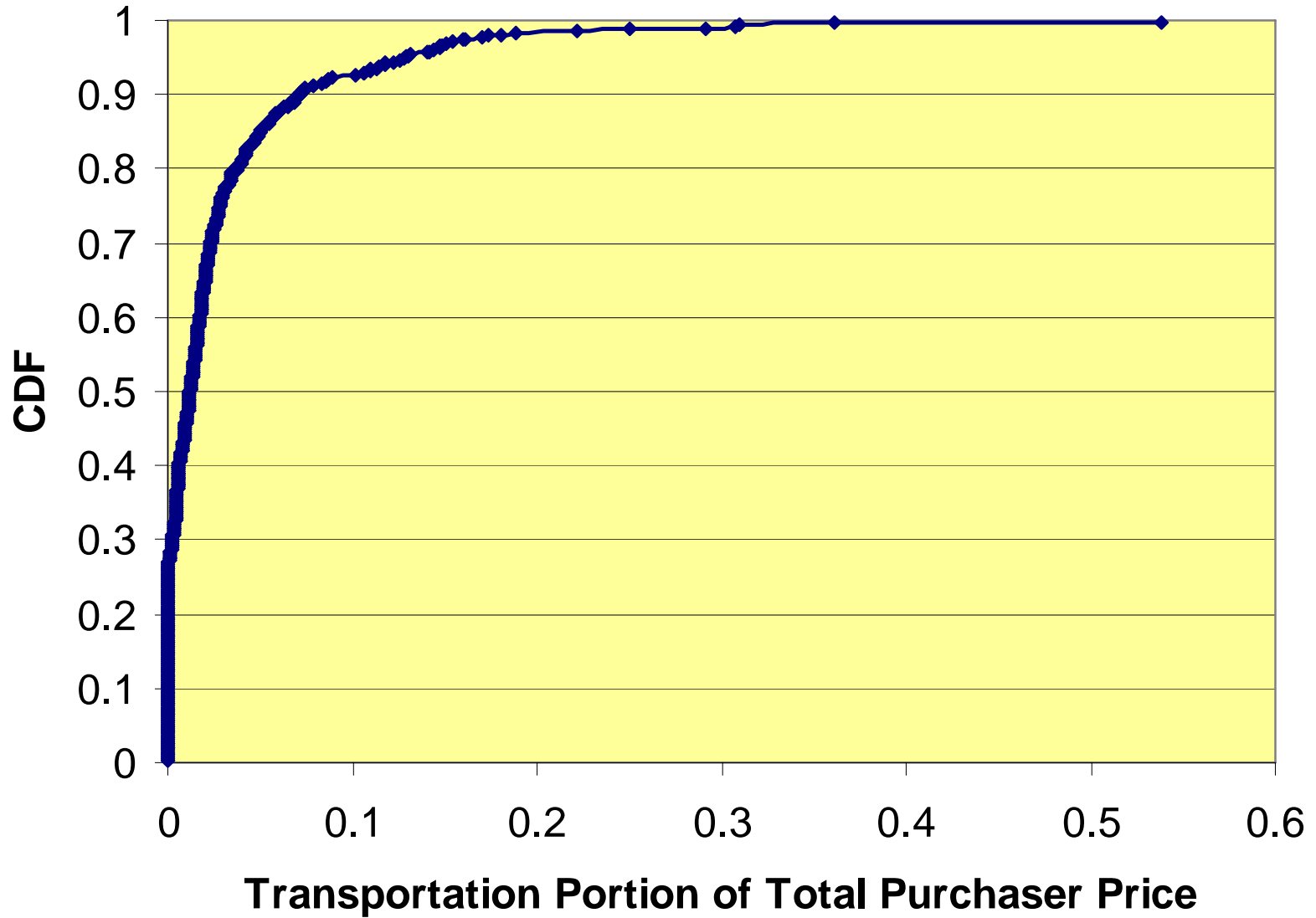
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Commodities for Which Transportation Consists of >10% of Purchaser Price

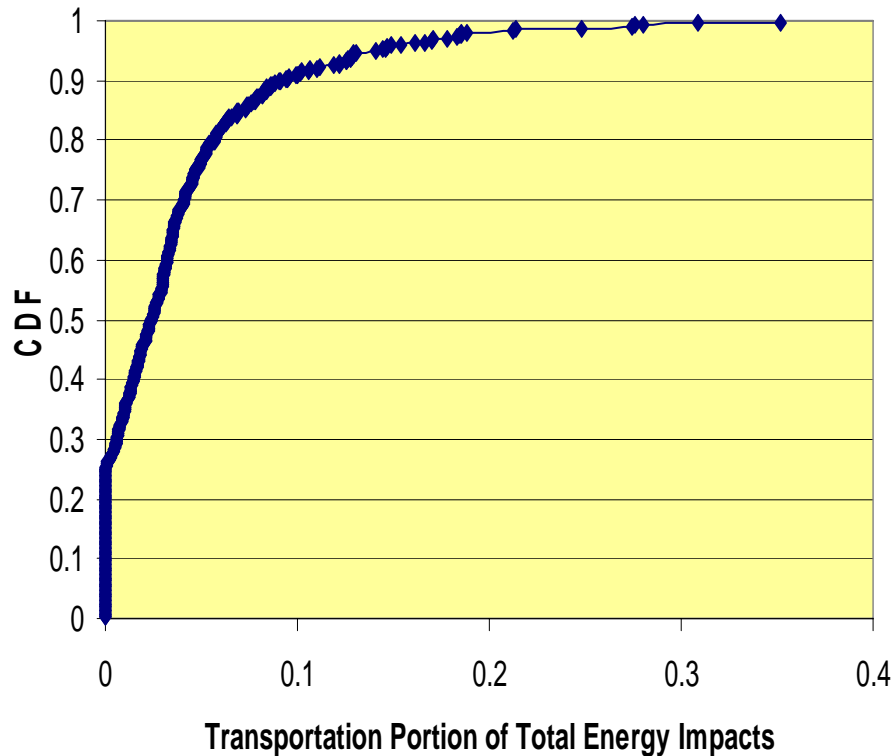


CDF for Transportation Price Portion of 483 Commodities

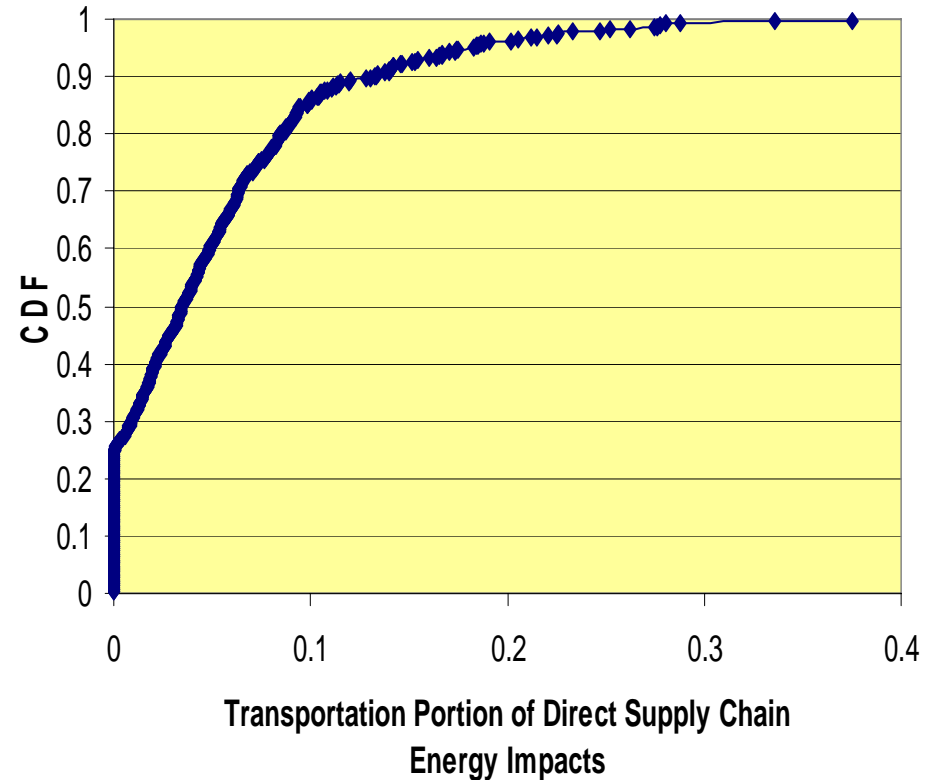


CDF for Energy: Total vs. Direct

CDF for Transportation Portion of Total Supply Chain Energy Impacts

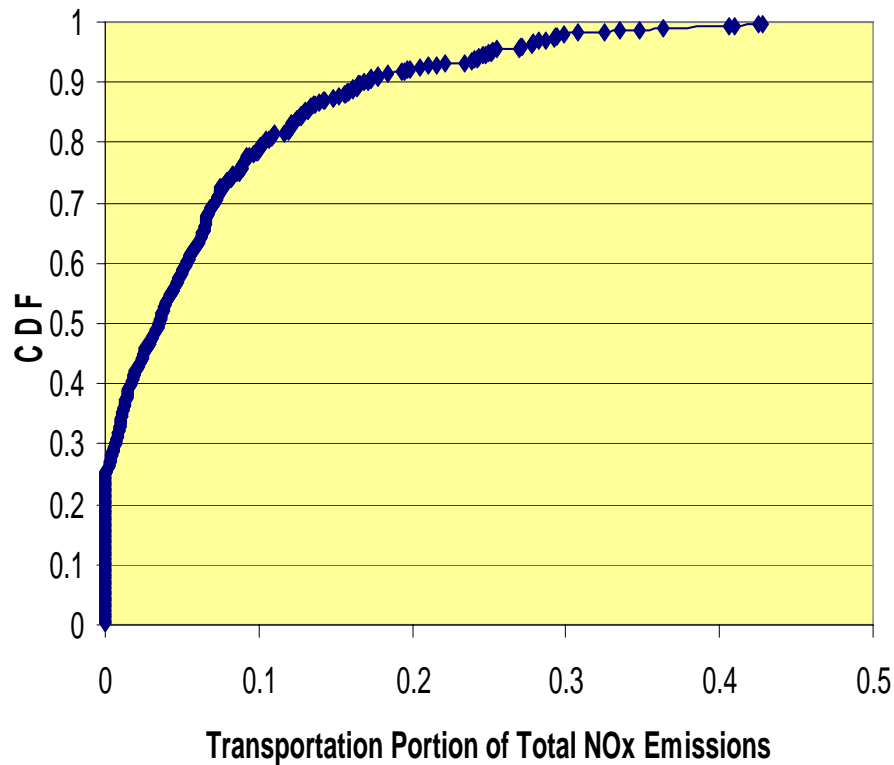


CDF for Transportation Portion of Direct Supply Chain Energy Impacts for 483 Commodities

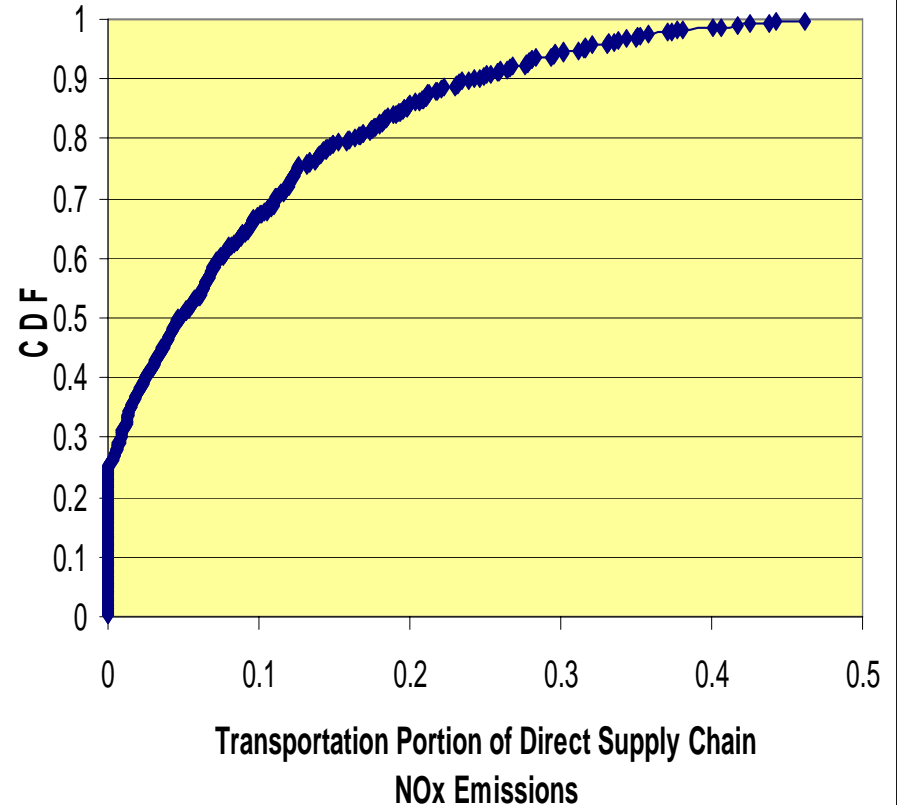


CDF for NOx: Total vs. Direct

CDF for Transportation Portion of Total Supply Chain NOx Emissions

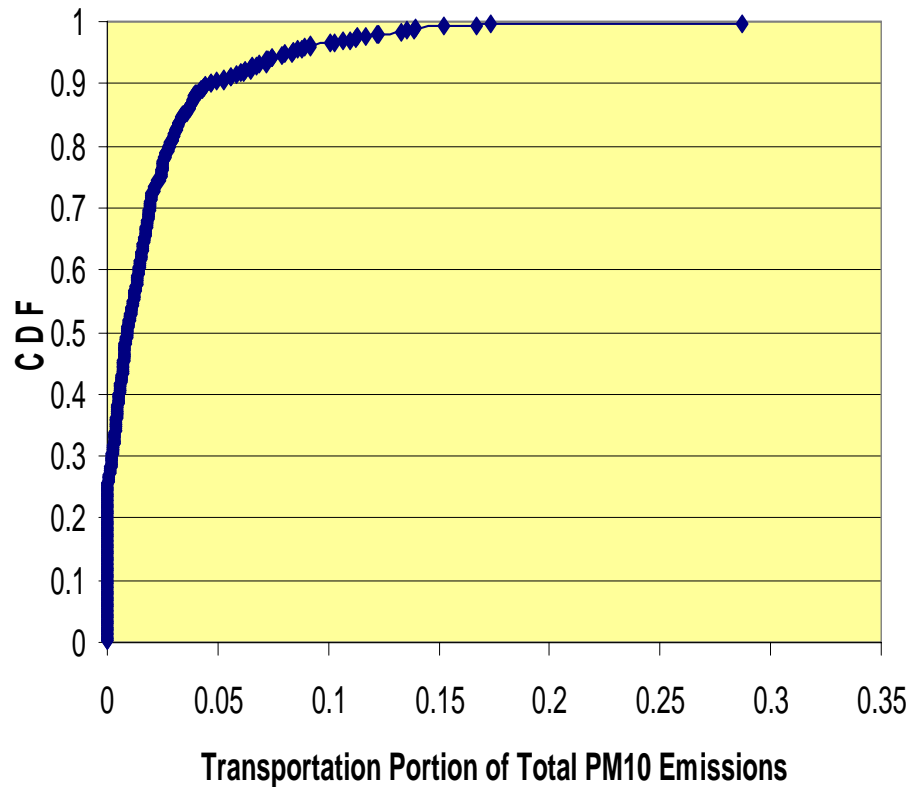


CDF for Transportation Portion of Direct Supply Chain NOx Emissions for 483 Commodities



CDF for PM10: Total vs. Direct

CDF for Transportation Portion of Total Supply Chain PM10 Emissions



CDF for Transportation Portion of Direct Supply Chain PM10 Emissions for 483 Commodities

