

Title: Energy-Augmenting Productivity and Carbon Pricing:
Evidence from Production Microdata

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Abstract:

How does directed technological change toward energy efficiency shape the effects and design of carbon pricing? We estimate a structural production function that separates energy-augmenting productivity from Hicks-neutral productivity using Indonesian manufacturing microdata. Exploiting energy-price variation from fossil-fuel subsidy reforms, we find that higher energy prices induce energy-augmenting productivity growth. Counterfactual simulations show that heterogeneity in energy-augmenting productivity, rather than Hicks-neutral productivity, drives the welfare advantage of carbon pricing over uniform regulation. When carbon pricing induces energy-augmenting innovation, aggregate emissions fall further, although a rebound effect partially offsets this additional abatement. Effective carbon-pricing design should account for productivity heterogeneity, induced innovation, and rebound effects.