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European Industrial Energy Intensity: The Role of Innovation 1995-2009

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Abstract We investigate the direct role of technological innovation and other influencing factors on industry-level energy intensity based on a sample of 12 industries across 17 EU countries over 1995–2009. We develop an innovative industry-level patent dataset and find compelling evidence that patent stock negatively influences industrial energy intensity. Using a fixed effects estimator, we find a much stronger effect on energy-intensive industries with an estimated coefficient of -0.138 almost double that of less energy-intensive industries (estimated at -0.085). While our results show energy price remains the major determinant of energy intensity, the chemicals industry appears to be more susceptible to energy prices relative to other energy-intensive industries that are covered by the EU Emissions Trading Scheme (ETS). Our study reveals that asymmetric response of energy intensity to energy prices in which price rises between 2004 and 2008 accounts for more change in efficiency than when prices fall. We also explore regional differences, notably that carbon tax policy in Northern European countries, which began in the early 1990s, is responsible for a significant fraction of the decline in energy intensity in Northern Europe.

Keywords Industrial energy intensity, innovation, energy price, carbon tax

JEL Classification O13, C33, Q41, Q55

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