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ORIGINAL PAPER

A theoretical basis for the relationship between the industrial pollutant generation, abatement, emission and economy

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Abstract This paper attempts to explain the changes of industrial pollutant generation, abatement and emission with economic growth, technology innovation, and industrial structure. All the model variables are assumed as a function of time. Three factors, industrial scale, structure, and generation technologies are considered in pollutant generation model, which together determine the change of pollutant. The average abatement rate, influenced by abatement technologies and the percentage of pollutant generation in each department, is equal to the weighted sum of abatement rate. The change of pollutant emission is commonly determined by the change of pollutant generation and unabatement rate. Particularly, it's determined by both factors that influence the pollutant generation and abatement rate. The decisive factors of pollutant emission vary with the object investigated.

Keywords Pollutant generation · Pollutant abatement · Pollutant emission · Environmental Kuznets curve · Industrial structure · Industrial scale · Technology

Abbreviations

EKC	Environmental Kuznets curve
$IPG_j(t)$	The industrial pollutant generated by department of j in year t
$f_j(t)$	The function expressing the pollutant-specific generated by per gross domestic product in industry j in year t
$g_j(t)$	The function expressing industrial output in industry j in year t
$IPG(t)$	The industrial pollutant generated by all departments in year t
$TIGOV(t)$	The total industrial gross output value in year t
$RGOV_j(t)$	The radio of gross output value for department j to TGOV in year t
$IPG'_j\ (t)$	The first derivation of $IPG_j(t)$
$In(f_j(t))'$	The first derivation of $In(f_j(t))$
$In(S(t))'$	The first derivation of $In(S(t))$
$In(CI_j(t))'$	The first derivation of $In(CI_j(t))$
$IPG'(t)$	The first derivation of $IPG(t)$
$AAR(t)$	The average abasement rate of pollutant-special in year t
$k_j(t)$	the percentage of pollutant-specific in industry j in year t

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