

Directed Technical Change, Environmental Sustainability, and Population Growth

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Abstract

This paper investigates how to achieve environmental sustainability in a growth model with directed technical change and population growth. In this setup, population growth has two counteracting effects on pollution emission. First, it increases the scale of the economy and thereby pollution emission given the technological level. Second, it increases the research capacity of the economy which might reduce pollution emission per worker. It is shown that the relative strength of these two effects is affected by environmental policy. In the empirically plausible case, neither a temporary nor a permanent research subsidy can ensure environmental sustainability. However, an increasing pollution tax rate can ensure environmental sustainability given that it is sufficiently large initially and grows sufficiently fast.

Keywords: Directed technical change, endogenous growth, environmental policy, environmental sustainability, global warming, population growth

JEL Classification: J11, O30, O41, Q54, Q55, Q58

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