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Technical efficiency and technological change of value chains in five Nigerian states

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Value chain development projects focusing on agricultural commercialization have been shown to improve production, income, and assets. However, the extent to which these types of projects contribute to improved technical efficiency and technological change of small-scale producers participating in value chains is largely understudied. In our study, we analyse the impacts of value chain development on technical efficiency (TE), technological levels, and agricultural productivity of rice and cassava production in Nigeria. Further, we investigate whether the effects on the various performance indicators vary significantly between male and female farmers. Our dataset comes from a survey of 1,784 households (879 treated and 905 control) conducted during February and March 2020 in five states: Anambra, Benue, Ebonyi, Niger, and Ogun, representing distinct cultural regions and gender norms. We use a combination of propensity score matching with a stochastic production frontier model to correct for selection bias (SC-SPF). First, we pre-process the dataset to ensure that treatment and control households are statistically comparable and have an adequate common support. Then, we explore the impact of value chain investments on two key productivity components: technological change (TC) reflected, by a shift in the production frontier, and TE, which captures managerial performance. We then analyse frontier output, TE, and technology gaps using a stochastic meta-frontier (SMF) framework, which provides the common benchmark required for meaningful comparisons. Preliminary results indicate that treated and control households are statistically comparable based on a number of observable pre-intervention characteristics. Project impact estimates indicate that value chain investments lead to higher productivity in rice production, while no significant impact is detected for cassava farmers. Our study makes two key contributions to the literature. First, we complement recent studies on gender gaps in agriculture, as driven by women's empowerment and differential access to inputs and resources. Our focus is on how value chain development could potentially alter underlying factors driving gender gaps in agricultural productivity by using a different methodological approach that would allow direct comparison of gender-specific TC and TE. Second, our study complements the small though increasing number of studies that extend the SC-SPF methodology under the SMF framework to compare TE levels between treated and control groups using a common benchmark.

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