

Trade, Technology, and Agricultural Productivity

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This paper examines the contribution of trade to the rise of modern agriculture, taking into account interactions between trade, input requirements, and technology adoption.

We begin by documenting that: (i) the cost share of agricultural inputs rises with GDP per capita, (ii) on average across countries, two-thirds of every dollar spent on the use of agricultural inputs is paid to foreign suppliers, and (iii) according to grid-cell level data from FAO-GAEZ, potential yields of each crop obtainable from modern, input-intensive technologies are considerably larger than those from traditional, labor-intensive technologies.

Motivated by these observations, we develop a new multicountry general equilibrium model that incorporates producers' choices of which crops to produce and with which technologies at the level of grid-cells covering the Earth's surface. The model allows for trade in agricultural inputs (e.g., farm machinery and fertilizers) and its effects on the adoption of modern agricultural technologies.

We bring the model to grid-cell level data on agricultural productivity which varies by crop and technology, estimating model parameters that govern how crop and technology choices react to changes in market conditions.

Simulating our estimated model, we find first that trade cost reductions in agricultural inputs since the 1980s induced large shifts from traditional, labor-intensive technologies to modern, input-intensive ones. The welfare impact was large at the global level and comparable to the welfare impact of reductions in trade costs of agricultural outputs. Second, productivity growth in the agricultural input sector since the 1980s had a large impact on global welfare and technology use, in great part because it transmitted the benefits of this productivity growth from one country to another via lower agricultural input prices. In addition, in both of these cases, we find important distributional implications across low-, middle-, and high-income countries.