2022

IARIW-TNBS Conference on "Measuring Income, Wealth and Well-being in Africa"

Paper Prepared for the IARIW-TNBS Conference, Arusha, Tanzania, April 14-15, 2022

Agricultural Research Spending in Sub-Saharan Africa (SSA): How important are political economy considerations?

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The agricultural sector represents a substantial portion of employment and GDP in developing countries, and efforts to boost agricultural performance have positive spill-over effects – such as greater food security and higher incomes – into other sectors of the economy (African Center for Economic Transformation, 2017). Extant literature discusses the potential galvanising impact of agricultural Research and Development (R&D) on improvements in agricultural total factor productivity (TFP hereafter) in developing countries (Fuglie and Rada, 2016). Historically, improvements in agricultural output have been achieved by intense cultivation on existing plots or expanding plots under cultivation (Alston and Pardey, 2014). However, the effects of climate change, the natural bounds of agri-climatic geography, and population growth impinge on land availability and fertility (Alston and Pardey, 2014; Beintema and Stads, 2017) leaving agricultural R&D as the main source of improved agricultural Total Factor Productivity (TFP hereafter), hence improved agricultural performance. We posit that domestic agricultural TFP growth and performance can be influenced primarily by knowledge: by investing in knowledge creation and innovation (technological improvements) and implementing mechanisms to assimilate knowledge created elsewhere (Islam and Madsen, 2018; Pardey, Alston and Chan-Kang, 2013). An important prerequisite for investing in knowledge creation and assimilation is concerted government effort. Development stakeholders have begun to avail of the importance of politics in determining development outcomes: where there is political commitment from the 'top brass' of the domestic government, broad-ranging reforms to agricultural knowledge creation and assimilation are attainable. This political economy narrative lends itself to an important drawback of the agricultural sector in Sub-Saharan African (SSA) countries: underinvestment in local agricultural R&D (Mogues and Do Rosario, 2016).

This study attributes low spending on domestic agricultural research to an absence of high-level domestic political commitment towards R&D, with such lack of commitment plausible for three reasons. First, the benefits (outcomes) of agricultural research accrue in the medium to long-term making them less attractive to politicians with uncertain time horizons in

power. As a result, politicians prefer to prioritize overt, albeit less profitable investments (such as infrastructure investments, agricultural input subsidies) whose benefits accrue within a shorter period and whose successes are easily attributable to them (Benin, McBride and Mogues, 2016). Furthermore, the human resource capacity of most of the small African countries is low and declining, with governments investing increasingly less in human resources. This is particularly rife in francophone West and Central African countries. Second, (economic and political) elites' incentives and interests towards agricultural transformation, and how elites bargain among themselves. In developing countries, the economic elites involved in agriculture are typically large-holder farmers although the bulk of farmers are smallholders who are constrained in their ability to leverage their collective power in influencing policy toward agricultural research (Benin and Bingwanger-Mkhize, 2012; Birner and Resnick, 2010). Third, endogeneity of ex post policy impact; with agricultural performance influencing the availability of future resources (Birner and Resnick, 2010). A history of weak agricultural performance reduces government's resources to agriculture, while simultaneously undermining incentives to invest in agriculture.

Agricultural Science and Technology Indicators (ASTI) data for the period 2000 – 2014 shows two key patterns: first, palpable heterogeneity in growth in agricultural research spending with the larger countries recorded substantial growth in said spending. Countries experienced positive (Sierra Leone, Zimbabwe, Uganda), stagnant (Mauritius, Kenya, Cote d'Ivoire), and negative growth (Guinea, Togo, Gabon) over the period. Second, the levels of domestic investment in agricultural R&D have been lagging investments in other agricultural inputs such as training, irrigation and farm support and subsidies (Beintema and Stads, 2017). The biggest spenders on agricultural research for the 2000 – 2014 period were Nigeria, South Africa, Kenya, Ghana, Uganda, Ethiopia, Tanzania, Cote D'Ivoire, Senegal and Burkina Faso while most West and Central African countries spent considerably less. The growth in agricultural research spending amongst the biggest spenders – particularly Ghana, Uganda, Nigeria, and Kenya – was driven mainly by salary increases rather than by investments in research, infrastructure or equipment.

The African Union and United Nations, through the Comprehensive Africa Agriculture Development Program (CAADP) of the New Partnership for Africa's Development (NEPAD), agreed that member countries should spend at least 10 percent of their budget on agricultural investment to achieve 6 percent sectoral growth per year (Lynam, Beintema, Roseboom and Badiane, 2016; Beintema and Stads, 2017). Furthermore, NEPAD set a target for countries to spend 1 percent of their agricultural GDP on research and development (Beintema and Stads, 2017). Agricultural production growth, however, outstrips agricultural research spending in SSA countries. The agricultural intensity ratio – agricultural research spending as a share of agricultural GDP (AgGDP) – has dropped steadily over the years; with approximately 81% of SSA countries (29/36) for which data were available investing less than 1 percent of their

agricultural GDP on research (Beintema and Stads, 2017). We posit that underinvestment is due to political economy factors, as discussed above.

This study will make use of annual data for 45 SSA countries covering the period 1960 to 2016, proceeding in three steps. First, we will estimate a heterogeneous agricultural production function following Griliches (1979), augmented with a measure of domestic R&D (to incorporate private returns to knowledge). We will employ a common factor approach which accounts for cross-country heterogeneity, the presence of genuine agricultural knowledge spill-overs and unobserved common shocks. The focus of this first step is to establish drivers of aggregate agricultural output and obtain unbiased estimates of agricultural TFP (see Eberhardt, Helmers and Strauss, 2013). This allows circumventing the use of standard TFP measures (such as the Malmquist TFP index). Second, we extract agricultural TFP estimates by computing residuals from the macro panel equations – which incorporate distortions created by international business cycles, distortions for which each country is affected independently and has a unique response – and apply novel macro econometric techniques to model alternative mechanisms for agricultural spill-overs (Islam and Madsen, 2018; Ertur and Musolesi, 2017). Third, model heterogeneity is explored further by splitting the sample into economic development groups, geographical groups and by volatility of donors' agricultural research funding (Stads and Beintema, 2015).