

Can Agricultural Productivity Growth Shape the Development of the Non-Farm Rural Economy? Geographically Localized Evidence from Zambia.

Jason Snyder, Thomas Jayne, Jordan Chamberlin, Paul Samboko, Nicole Mason

Introduction

A longstanding stylized fact from the development economics literature is that agricultural growth is central to the structural transformation process in developing economies. This literature dates back to Lewis (1954), Johnston and Mellor (1961), and Fei and Ranis (1963) and theorizes linkages between agricultural growth and the rest of the economy via consumption, factor markets and production, and wage effects. A practical conclusion from this literature is that policies that discriminate against agriculture are generally counterproductive for structural transformation and for sustained economy-wide growth

However, emerging research has started to question this longstanding consensus about agricultural growth and structural transformation, especially in the context of rapidly changing structural dynamics in sub-Saharan Africa. Some have argued that either cities are the main drivers of rural agricultural growth (Jacobs 2016), or that the rural non-farm sectors in secondary cities are the main drivers of inclusive economic growth (Christiaensen and Todo 2013). Ultimately, the role of agricultural growth as a driver of structural transformation is an empirical question. However, there is not much micro-level empirical evidence for how the structural transformation model plays out in sub-Saharan Africa. Part of the reason for the relative dearth of literature on this topic is that data on agricultural productivity over time has been mostly unavailable.

In this study, we estimate the impacts of district-level multi-year lagged crop productivity on non-farm labor participation, among farm households in rural Zambia. We test the hypothesis that localized farm productivity indirectly stimulates farm household off-farm employment, which would support the view that agriculture matters.

Data and Methods

We use three main sources of data. First is the Rural Agricultural Livelihoods Survey (RALS), a two-wave,

Key Findings

- There is very little micro-level empirical literature estimating farm to non-farm labor linkages from agricultural productivity growth in Africa. Our study helps to fill this gap in Zambia.
- We find that a doubling of district level crop productivity is positively associated with a 14%-17% increase in non-farm labor activity among rural farm households in Zambia
- This impact is even more pronounced for changes in small farm district productivity (<2 hectares), causing a 24%-31% increase non-farm labor activity among rural small farm households.
- There is also some evidence, although it is less robust, that increases in productivity among relatively lower productivity farms (relative to each district), also increases non-farm labor activity
- Overall, these results align with the structural transformation hypothesis with regards to labor linkages, and can be used to help justify support for improvements in small-farm crop productivity

nationally representative panel survey of smallholder farming households, that covers the agricultural years of 2010/11 and 2013/14 (from October – September) and the respective marketing years of 2011/12 and 2012/13 (from May – April). The collection was performed by the Indaba Agricultural Policy Research Institute (IAPRI), collaborating with the Zambia Central Statistical Office (CSO) and the Ministry of Agriculture (MoA) in June through July of 2012 and 2015, respectively. It is from this that we derive the key dependent variables, i.e., number of adults and adult equivalents, as well as all the control variables

The second source of data is the annual Zambia CFS, which is used to derive the district-level lagged measures of

agricultural productivity. These surveys are conducted in late March - April when the crops have reached physiological maturity. Thus, they reported values are what farmers expected to harvest.

Finally, we calculate the rainfall measures using the Tropical Applications of Meteorology using Satellite Data and Ground-based Observations (TAMSAT, which has an approximately 16 square kilometer spatial resolution. We use ArcGIS Model Builder to derive raster (cell based) representations of each measure and to match to RALS household GPS locations.

Our hypothesis is that longer term crop-land productivity is a driver of structural transformation. We want to test whether land productivity drives transitions in labor allocation among rural farm households towards the non-farm sector. Our interest therefore is in deriving unbiased estimates of the β_1^{y-l} 's. Towards this end, we employ a correlated random effects (CRE) Mundlak-Chamberlain model. See the full report for more information on the empirical model and estimation strategy.

Key Results

A couple of key results stand out. First, in the Table 4 long run results, the median and mean results mostly suggest that there is a positive and significant effect of long-run district crop productivity on non-farm labor participation, controlling for the size of the household. The elasticities consistently range from around 0.14 – 0.17, i.e., a doubling of long-run land productivity leads to an increase in non-farm labor participation of 14-17%. The one exception is the mean result in the Almon lagged adult equivalents model, which is not significant at the 10% level.

Second, we find that median productivity among farms that are cultivating less than 2 hectares has a positive and significant impact on non-farm labor – a doubling of productivity leading to a 24-31% increase. On the other hand, the productivity effect of larger farms (2-20 hectares) is either not significant or negative (negative 20-22% for a doubling of productivity). In other words, it is productivity growth on the smallest farms that has the most impact on whether rural farm households are increasing their non-farm sources of employment. Finally, we find tentative evidence, although less robust, that productivity growth on the relatively less productive farms in each district also contributes to non-farm labor employment.

Conclusions

This is one of the first micro-level empirical studies in sub-Saharan Africa to test the Johnston-Mellor structural transformation hypothesis as it pertains to labor factor

market linkages. In particular, we use nationally representative household cross-sectional and panel data to analyze the impact of lagged district crop-productivity on the movement of rural farm household members to off-farm work in the context of Zambia.

There is evidence that the lagged average district-level productivity is associated with an increase in the number of adult household members (or adult equivalents) that receive income from a non-farm (and non-farm wage) source. There is also evidence that this relationship is stronger for changes in productivity among smaller farms (<2 hectares) and farms at the lower end of the productivity distribution (the 10th percentile in each district). It is likely that smaller and relatively less productive farms have a higher income elasticity of demand for basic goods and services that can be acquired in the local economy, something that higher productivity leading to surplus can allow them to fulfill. This, in turn, can lead to more economic activity in the rural non-farm economy, providing opportunities for non-farm labor.

This study has a couple of data-related limitations. First, if we had sufficient data, it would have been useful to evaluate crop labor productivity, not just crop land productivity, which would have provided a more direct link between labor productivity to labor movement into the non-farm sector. Second, based on another limitation in the data, we were only able to include a measure of crop productivity, which did not include the production of fresh fruits and vegetables, and livestock.

Overall, this study appears to align with the structural transformation hypothesis, and in particular the dual economy model of Lewis (1954) and Fei and Ranis (1963) that as regions become more agriculturally productive, farm labor is freed up to pursue income-generating opportunities off the farm. This is important for policy because it suggests that investment in regional agricultural productivity, especially among the smallest farms, can provide opportunities for non-farm labor, allowing a more diversified and resilient livelihood strategy, a dynamic that is highlighted in the literature (Reardon 1997; Haggblade et al. 2010; Dedehouanou et al. 2018). While this appears valid for changes in average district productivity overall and for smaller farms, there is also some evidence, less robust, that policy that supports the growth in regional productivity for the least productive farms (relative to each district) can also be helpful in increasing non-farm labor opportunities and enhancing livelihood resilience.

References

Christiaensen, L., and Todo, Y. 2013. Poverty reduction during the rural-urban transformation-the role of the missing middle. The World Bank.

Dedehouanou, S.F.A., A. Araar, A. Ousseini, A.L. Harouna, and M. Jabir. 2018. Spillovers from off-farm self-employment opportunities in rural Niger. *World Development* 105: 428-442.

Fei, J.C., and Ranis, G. 1963. Innovation, capital accumulation, and economic development. *The American economic review*, pp.283-313.

Haggblade, S., P. Hazell, and T. Reardon. 2010. The Rural Off-farm Economy: Prospects for Growth and Poverty Reduction. *World Development*, 38 (10): 1429–41.

Jacobs, J. 2016. *The economy of cities*. Vintage.

Johnston, B.F., and J.W. Mellor. 1961. The Role of Agriculture in Economic Development. *The American Economic Review* 51 (4): 566–93.

Lewis, W.A. 1954. “Economic Development with Unlimited Supplies of Labour.” *The Manchester School* 22 (2): 139–91.

Reardon, T. 1997. Using Evidence of Household Income Diversification to Inform Study of the Rural Nonfarm Labor Market in Africa. *World Development* 25 (5): 735–47.

About the Authors

Jason Snyder is a Postdoctoral Research Associate in the Department of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU)

Thomas Jayne is a University Foundation Professor of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU)

Jordan Chamberlin is a Spatial Economist at the International Maize and Wheat Improvement Center (CIMMYT)

Paul Samboko is a PhD student in the Department of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU)

Nicole Mason is a Professor in the Department of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU)

*This policy brief summarizes the key findings of the full report: **Can agricultural productivity growth shape the development of the non-farm rural economy? Geographically localized evidence from Zambia**, by Jason Snyder, T. S. Jayne, Jordan Chamberlin, Paul Samboko, and Nicole Mason. *Food Security Policy Innovation Lab Research Report #158*, East Lansing, Michigan. (*need link to research paper*) (<https://www.canr.msu.edu/fsp/publications/research-papers/RP%20158.pdf>)*

This Policy Research Brief was prepared for the Feed the Future Innovation Lab for Food Security Policy (FSP) through the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-13-00001 (Zambia Buy-In). Additional funding support was also provided by the U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture, Michigan AgBioResearch [project number MICL02501], USAID/Zambia, and the Swedish International Development Agency (SIDA) funding to IAPRI. The content is the sole responsibility of the authors and do not necessarily reflect the views of the organizations listed above.

This research is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility of study authors and do not necessarily reflect the views of USAID or the United States Government

Copyright © 2019, Michigan State University and FSP. All rights reserved. This material may be reproduced for personal and not-for-profit use without permission from but with acknowledgement to MSU and FSP.

Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824