

Agriculture and Structural Transformation in an Open Economy: The Case of Ghana*

April 4, 2012

Francesco Caselli	Shawn Chen	Douglas Gollin
London School of Economics	London School of Economics	Williams College

Abstract

Previous literature has shown that in poor countries with no access to international markets, low agricultural productivity implies that large fractions of the workforce must be employed in food production. Until a country can escape what Schultz (1953) termed “the food problem,” it is difficult for the economy to begin the process of releasing workers and productive resources to other sectors of the economy. This paper argues that, even in an open economy, the same dynamics can apply – and that low agricultural productivity can constrain the process of structural transformation. The key insight is that domestic transport costs make it expensive to supply food to rural areas, implying that many rural people will remain engaged in subsistence food production even though their productivity is quite low. We use a multi-region multi-sector model, calibrated to data from Ghana, to argue that high domestic transportation costs can reduce the benefits of openness.

*Authors’ email addresses: fcaselli@lse.ac.uk, dgollin@williams.edu, x.chen21@lse.ac.uk. Research for this paper was funded by a grant from the UK Department for International Development through the International Growth Centre. We gratefully acknowledge this support. Caselli and Gollin also acknowledge the logistical support offered by the IGC Ghana office and by colleagues in Ghana, including Abena Oduro, Robert Darko Osei, and Ernest Aryeetey. We also appreciate the time and attention of farmers who participated in focus groups in the Ashanti, Brong-Ahafo, and Central Regions of Ghana.

– Policy Brief –

**Agriculture and Structural Transformation in an Open
Economy:
The Case of Ghana**

Francesco Caselli	Shawn Chen	Douglas Gollin
London School of Economics	London School of Economics	Williams College

1. Policy Motivation for Research:

This research asks how the patterns of agricultural development and economic growth in Ghana are related to domestic transport costs. Previous research (Gollin and Rogerson 2010, 2012) has suggested that in countries with costly domestic transport and limited access to international markets for food, urban populations are likely to remain small and many people will depend on subsistence agriculture for their livelihoods. In this paper, we ask whether the same logic extends to a country like Ghana, where food imports are readily available and where cash crop exports represent an important part of the economy. The answer to this question can inform discussions about public investments in transportation infrastructure and about other interventions targeted to the agricultural sector. Our research aims to address some hitherto unanswered questions about the economy-wide implications of different public investment interventions.

2. Policy Impact:

The research will feed into development strategy and priority setting decisions related to government expenditure. By showing the comparative impacts on the economy of different public investments, the research makes it possible to evaluate different plans of action. Although the paper does not include explicit cost calculations for the different government interventions, it does match different interventions to outcome of interest.

3. Audience:

Our research is intended to be of particular relevance to Ghana's economic decision makers, including those with sectoral responsibilities for transport policy, agriculture policy, and planning. If we are successful, the research should also have relevance more broadly – in other countries with similar characteristics to Ghana, and in the broader development community. Finally, we hope that our work will be of interest to other academics, especially in the fields of growth and development.

4. Policy Implications:

- In an open economy like Ghana, improvements in agricultural productivity will have relatively modest effects on the quantity of labor allocated to food production or other activities.

Ghana's situation contrasts with that of a relatively closed economy, where most of the food is produced domestically. In our model of the Ghanaian economy, imports initially account for a fraction of domestic food supply – contributing to the consumption in urban areas. An increase in productivity in the food sector does increase the domestic supply of food and displaces some imports. But the change in the supply of food to urban areas is not sufficient to induce any substantial increase in urbanization. In fact, because prices are largely determined by world markets, changes in agricultural productivity primarily show up as increases in the real wage and hence in food consumption.

- Changes in the productivity of the cash crop sector will have very modest impacts on living standards in either rural or urban areas.

Because the cash crop sector is initially quite small, increases in productivity within this sector do not have large aggregate effects on the economy. They do induce changes in the allocation of land and labor within the agricultural sector, relative to the benchmark economy. A ten percent increase in cash crop productivity results in a 32 percent increase in cash crop production, albeit from a modest base. (The increase is from 0.15 to 0.19.) As the agricultural economy shifts away from food production, the economy

imports more food from the world market, with imports rising from 12 percent of total supply to 16 percent. But the effects on rural and urban living standards are very small.

- Increases in the productivity of the food crop will increase food consumption in both urban and rural areas.

A 10 percent increase in total factor productivity (TFP) for food leads to a 9 percent increase in rural food consumption per capita and an 8 percent increase in urban food consumption per capita. Imports of food also fall, from about 12 percent of domestic supply to 9 percent of domestic supply. There is an increase in land devoted to food production and a corresponding decrease in land allocated to cash crop production, which falls. There is little change in the output of the urban service sector. This contrasts with the results that we would expect in a closed economy, where an increase in food production would have a direct impact on urban populations.

- A reduction in transport costs will have substantial positive impacts on living standards in both urban areas and rural areas.

We model the effects of a 10 percent reduction in all domestic transport costs. In the model economy, this increases the consumption of food in urban areas and the consumption of the non-agricultural good in rural areas, as the change induces greater trade between these locations. The change also leads to a large increase in cash-crop production, since the cash crop output can now be delivered to world markets with a higher return for farmers. This leads agricultural resources (labor and especially land) to shift out of food production into cash crop production. In effect, the decrease in domestic transport costs allows the model economy to take greater advantage of its comparative advantage in the cash crop, relative to the world market.

- The economy is fairly resilient to changes in world agricultural prices.

Given the recent experience of world food markets, with large price spikes in the prices of staple grains, it is interesting to observe how the model economy reacts to a sudden and unanticipated increase in the world price of food. We consider the effect of a 20 percent increase in the price of food. In our model economy, this change does not have large impacts on the domestic economy. Farms in our model shift from cash crop production to food production to

the extent that cash crop production falls by one-third. Total food supply falls slightly, relative to the benchmark economy, but the net effects are modest. We acknowledge that this result depends on the assumption that the agricultural economy can switch costlessly and instantaneously from cash crop production to food crop production. This is not realistic, especially in an economy where the principal cash crop, cocoa, is a tree crop; switching between food production and cash crop production involves substantial costs and time lags. However, the model might have implications for land switching between other cash crops and the commodities with high international prices. This might include annual cash crops (sesame, ground nut, cotton) as well as allocation among food crops from non-traded to traded (e.g., grain vs. root crops).

5. Implementation:

Our results require substantially greater validation before we can be confident in recommending specific action points or implementation steps. Certain qualitative results of the model seem clear and well established, but we cannot endorse specific policy recommendations based on the model until we have subjected the model to further tests and until we have presented the results to Ghanaian experts and policy makers to assess the validity of the insights.

For now, we can make the following observations:

- Improvements in domestic transportation infrastructure have important implications for the types of goods produced in the agricultural sector and for the allocation of the country's land and labor between different agricultural commodities – and more generally between rural and urban areas.
- The extent of the country's reliance on food imports is related to domestic transportation as well as to the productivity of the agricultural sector.
- An increase in either the price or productivity of cash crops would lead to an increase in food imports; the net effect on food consumption, in both rural and urban areas, would be positive (but small).
- Policy planning should involve coordination among officials involved in the

food sector, cash crop sector, transport, and trade. Public investments made in any one of these will spill over and affect the others.

6. Dissemination:

We would hope eventually to disseminate the work to colleagues in Ghana at:

- University of Ghana:
 - ISSER
 - Department of Economics
 - Department of Agricultural Economics
- African Centre for Economic Transformation (ACET)
- Ministry of Agriculture
- Ministry of Trade and Industry
- Cocobod

7. Further Readings:

Calderon, Cesar. 2009. Infrastructure and growth in Africa. Policy Research Working Paper Series 4914. Washington, DC: The World Bank.

Carruthers, Robin, Ranga R. Krishnamani, and. Siobhan Murray. 2008. Improving connectivity: Investing in transport infrastructure in Sub-Saharan Africa. AICD, Background Paper, World Bank, Washington, D.C.

Fan, Shenggen and Connie Kang-Chan. 2004. Road development, economic growth, and poverty reduction in China. IFPRI mimeo.

Jedwab, Remi. 2012. Why Is African Urbanization Different? Evidence from Resource Exports in Ghana and Ivory Coast. Manuscript, Paris School of Economics.

- Jedwab, Remi and Alexander Moradi. 2011. Revolutionizing Transport: Modern Infrastructure, Agriculture and Development in Ghana. Manuscript, Paris School of Economics.
- Platteau, Jean-Philippe. 1996. Physical infrastructure as a constraint on agricultural growth: The case of sub-Saharan Africa. *Oxford Development Studies* 24(3): 189-219.
- Teravaninthorn, Supee and Gael Raballand. 2008. *Transport Prices and Costs in Africa: A Review of the Main International Corridors*. Washington, DC: The World Bank.
- Torero, Maximo and Shyamal Chowdhury. 2005. Increasing access to infrastructure for Africa's rural poor. IFPRI 2020 Vision Briefs, No. 32.
- United Nations Economic and Social Council and United Nations Economic Commission for Africa. 2009. *The transport situation in Africa*. Addis Ababa, Ethiopia: Sixth session of the Committee on Trade, Regional Cooperation and Integration 13-15 October.