Economic Implications of Aflatoxin Regulations on Peanut Producers and Consumers in Ghana

Michael Ayegkum and Curtis M. Jolly

Department of Agricultural Economics & Rural Sociology, Auburn University, Auburn, ALA, USA.

Abstract

The welfare implications of stringent food standards are evaluated. This study determines price and quantity effects of aflatoxin regulation enforcement on the Ghanaian peanut sector. The Equilibrium Displacement Model framework, an analysis framework, is employed. Findings suggest that supply prices are lowered while consumer prices are raised following increases in compliance costs due to the aflatoxin policy. Also, producers and consumers share the costs from the aflatoxin policy although the nature of elasticities is critical in the distribution of welfare impacts.

Introduction

Peanuts are an important food crop in many Sub-Saharan African countries. In Ghana, the crop is a key ingredient in a protein-dominant diet grown in the northern regions. Figure 1 is a time plot of production and demand for peanuts in Ghana.

Figure 1: Peanut Production and Distribution in Ghana

Peanuts are susceptible to mycotoxin contamination—especially aflatoxins. It has been estimated that a number of regulatory health outcomes are associated with aflatoxins exposure (Williams et al. 2004). Although international standards exist, WTO’s agreement on SPS also allows countries to enforce own standards. E.g., international aflatoxin standard set by Codex is 15 ppb while EU requires zero ppb and USA 20 ppb. The presence of own regulations in advanced countries is a manifestation of heightened international food safety. Therefore, it is inevitable that, in the near future, less-developed countries will pursue SPS policies that parallel those of rich countries. According to FAO (2004), Ghana has no national peanut standards. As Ghana prepares to introduce and enforce standards, it is important to assess possible policy implications since standards are typically associated with additional costs in supply chains.

The majority of studies on food standards focus entirely on the effects on trade volume. The focus on trade flows has led to a fridled attention on how economic welfare of domestic producers and consumers are affected. Consequently, the impacts of aflatoxin regulations on prices of foods are largely unknown. The current study, therefore, determines price effects owing to introduction and tightening of aflatoxin regulations in the Ghanaian peanut sector. Thus, the goal is to gain insights into economic effects and the distribution of policy impacts on peanut market participants.

Method/Model

The Equilibrium Displacement Model framework is applied. Results demonstrate how peanut prices and consumer prices are impacted by a 1% increase in compliance costs associated with aflatoxin regulation tightening in Ghana. This study assumes that regulation tightening leads to increases in compliance costs which shifts the supply price curve. The paper ignores any productivity improvement effects of the standards and focuses on aflatoxin compliance costs. Ghana’s peanut market is represented by two different models.

Model One: Auctory for Peanut Market in Ghana

This naive model assumes that Ghana is self-sufficient in the supply of peanut. Figure 1 shows that domestic peanut production and consumption are nearly identical. Hence a closed-economy peanut model is analyzed. Initial equilibrium in auctory is represented by the following structural model in percentage changes:

\[
\begin{align*}
\Delta q &= \alpha_0 + \alpha_1 \Delta P_r + \alpha_2 \Delta P_c + \alpha_3 \Delta P_a + \epsilon_1 \\
\Delta P_r &= \beta_0 + \beta_1 \Delta q + \beta_2 \Delta P_c + \beta_3 \Delta P_a + \epsilon_2 \\
\Delta P_c &= \gamma_0 + \gamma_1 \Delta q + \gamma_2 \Delta P_r + \gamma_3 \Delta P_a + \epsilon_3 \\
\end{align*}
\]

where \(q\) denotes quantity demanded, \(P_r\) represents quantity supplied, \(P_c\) is producer price, and \(P_a\) is the per-unit compliance costs or tax. Subscripts \(D\) and \(S\) denote demand and supply respectively. Auctory indicates percentage changes. See Tables 1 and 2 for information on variables and parameters. Endogenous variables are \(Q_p\), \(Q_r\), \(P_r\) and \(P_c\), while \(R\) is exogenous. (1) is the demand equation; (2) represents the supply equation; (3) accounts for relationship between supply and demand prices with the price wedge attributed to compliance costs; also, (3) provides the link to modeling the regulation as a tax and ultimately distinguishing consumer price effects from those of producers. Finally, (4) imposes a market clearing condition where quantity demanded is exactly identical to quantity supplied.

Results and Discussion

Table 3 shows reduced-form elasticities from the two models together with results from sensitivity analysis. Also, economic welfare changes due to increases in aflatoxin compliance cost are displayed in Table 4 (welfare formulas adapted from Eun and Kimmons 2011). In Table 3, Model 1 indicates that a 1% rise in compliance costs associated with regulation enforcement leads to a 0.0251% decrease in supply price and a 1.0000% drop in production. Consumer price, on the other hand, rises by 0.0439%. Jagdisingh’s magnitude of price effects suggests that the policy’s incidence is greater on consumers as opposed to producers. The preceding observation is in line with basic principles of supply and demand given that domestic demand elasticity is absolutely values, is less than that of supply (see Table 2).

Conclusion

Price and quantity effects of strict aflatoxin policies translate into changes in economic welfare of peanut market participants. Overall, consumers and producers share consequences of strict aflatoxin standards enforcement (i.e., increased compliance costs) with distribution critically determined by relative magnitude of supply and demand elasticities. The authors hope to extend conditioned policy by employing contingent valuation (CV) methods to determine Ghanaian consumers’ willingness to pay for peanuts with different aflatoxin levels. The proposed CV survey will account for quality improvements associated with peanuts containing low aflatoxin levels (which is beyond the present form of the paper).