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According to World Trade Organization (WTO) rules, countries can choose their own Sanitary and Phyto Sanitary Standards (SPS) to protect human, animal, and plant health as long as they are nondiscriminatory and justifiable by science. This discretion has resulted in regulations that can serve as a significant barrier to trade, as revealed by numerous disputes within the WTO (Josling, Roberts, and Orden 2004).

Aflatoxin regulations have attracted notice for their potential role in restricting trade. For example, total peanut meal imports by European Union (EU) countries fell from more than one million tons in the mid-1970s to just 200,000–400,000 tons annually after 1982, the year mycotoxin regulations were first tightened in the EU. In 2002, the EU further tightened standards, leading to concern about the impact on exports from Africa. Two groundbreaking papers on the trade impact of aflatoxin regulations (Otsuki et al. 2001a, 2001b) examined cereals and groundnuts, respectively. Their large estimates of the negative effects of aflatoxin regulations on African trade (greater than US\$750 million dollars annually in the two trades combined) received much attention. Even UN Secretary General Kofi Anan, at the time, cited these numbers when he called for a balance between the potential public health benefits of stringent aflatoxin standards and the economic pain that African countries experienced as a result.

For several reasons, however, assessing the effects of SPS standards is extremely difficult. First, standards can vary in intensity, which can be difficult to measure. In this context, aflatoxin regulations are somewhat easier to measure since they are specified as parts per billion (ppb) and hence do directly measure the intensity of product standards. A restriction of 4 ppb is clearly more restrictive than 20 ppb and is likely to create a bigger trade barrier. Second, standards do not change often and do not change across exporters to any particular market. Empirical estimations produce robust results only when there is sufficient variation in the data to identify the effects of one variable on the other. Hence, many studies have focused on the significant changes implemented in the EU in the early 2000s. Finally, as other factors influence trade over time, it can be difficult to isolate the impact of standards on trade in any given commodity market.

Given these difficulties in measuring the impact of standards on trade, it is not surprising that the findings of subsequent research on the impact of aflatoxin regulations have been more mixed than those reported in the two papers by Otsuki et al. Using a different empirical model and ex post data, Xiong and Beghin (2012) show that the tightened EU regulations did not significantly further reduce African groundnut exports, contradicting the ex-ante analysis of Otsuki et al (2001b). Furthermore, based on interceptions data (export rejections at the border), Diaz Rios and Jaffee (2008) argue that the contamination levels from many exporters are much higher than the limits imposed by European standards. The variations in standards, therefore, do not alter trade because

contamination levels are usually so high that many exporters would find it difficult to meet even less-restrictive standards. This means that while standards are a potential barrier to trade, relatively small changes in standards may not visibly impact trade.

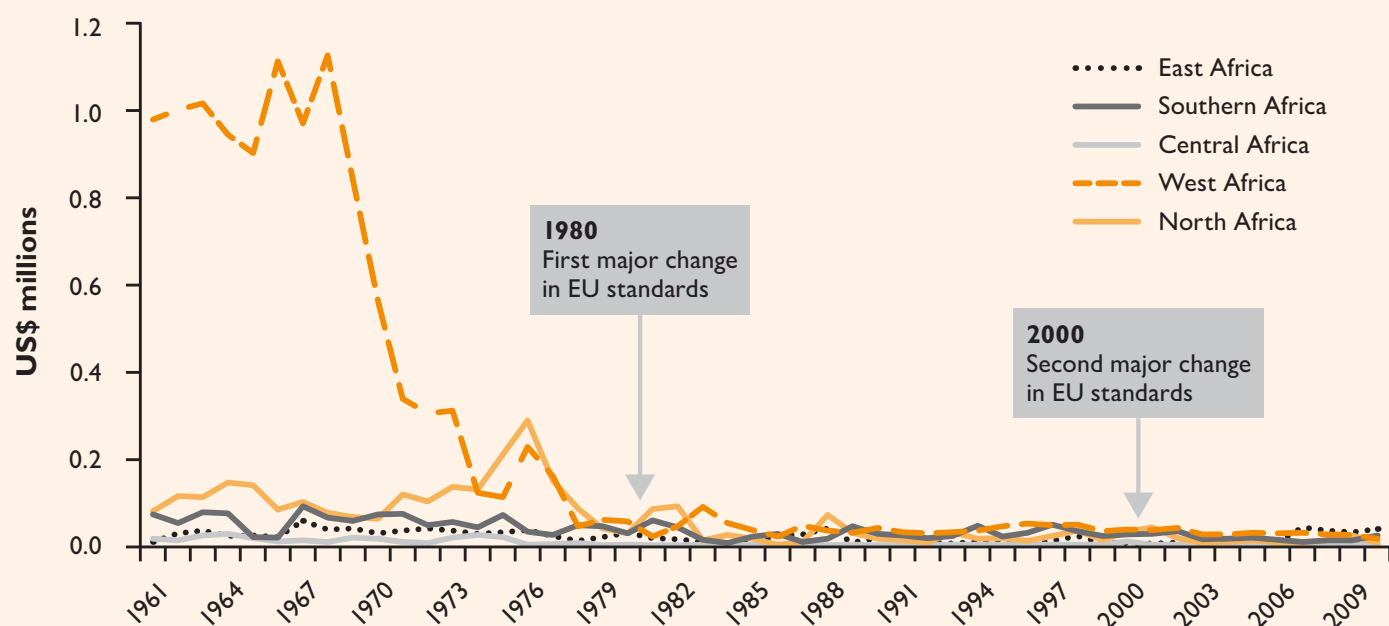
The maize market also provides evidence on the market losses from aflatoxin regulations. Maize, one of the most highly traded staples, is highly prone to aflatoxin contamination. Thailand was regularly ranked among the top five maize exporters during the 1970s and 1980s. But partly due to aflatoxin problems, Thai maize is regularly sold at a discount, having cost Thailand about \$50 million per year in lost export value (Tangthirasunan 1998). According to the Food and Agriculture Organization of the United Nations (FAO), the direct costs of mycotoxin contamination of maize and peanuts in Southeast Asia (Thailand, Indonesia, and the Philippines) has amounted to several hundred million dollars annually (Bhat and Vasanthi 1999). More recently, preliminary results of research by Munasib and Roy (2011) suggest that a 10 percent increase in the gap between standards of importers and exporters is associated with as much as a 4.4 percent decline in maize exports from low-income countries.

One issue is just how big the differences in standards may be. Considering a set of 48 countries with established limits for total aflatoxins in food, Dohlmán (2003) found that standards varied widely, ranging from 0 to 50 parts per billion. Preliminary research by Munasib and Roy (2011) suggests that maize regulations in different countries have become increasingly stringent over time. The EU harmonized its regulations in 2002, and members joining since then have been required to apply these new regulations. In the Czech Republic, for example, the permissible limits on aflatoxins went down to 2 ppb from 5 ppb when it joined the EU in 2004. Hence, both the harmonization of standards in 2002 as well as the entry of new members into the EU implies that globally the average level of regulation related to aflatoxins has increased. It can thus be expected that standards will play a growing role in restricting trade.

More than a decade has passed since the implementation of harmonization by the EU. African exports of groundnut products had already declined to modest levels before this harmonization, and fluctuations in trade over the last decade cannot be directly associated with these recent changes in European standards (Figure 1). African exports, particularly of groundnuts, experienced a secular decline since the 1970s because of several other factors, including changes in preferences in importing countries and increases in domestic demand in Africa. African exports were declining anyway, and African exporters who were unable to meet the new higher standards in 2002 would likely not have met the earlier less restrictive standards either.

Standards remain a potentially important barrier to trade, and meeting them is a necessary, but not sufficient, condition for market access for many exporters in low-income countries.

FIGURE 1 Value of shelled groundnut exports from African regions



Source: Author's calculation, 2012.

Note: The high correlation ($r = 0.99$) reveals the reliability of enzyme-linked immunosorbent assay (ELISA) to detect and quantify aflatoxins in breeding programs.

Reducing domestic levels of contamination and improving effective standards domestically in low-income countries could set the stage for greater market access for exports. Improving domestic

standards (in line with health and other benefits) could reduce the SPS barrier for exporting countries and increase exports of aflatoxin-affected products.

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