Controlling Avian Flu and Protecting People's Livelihoods in Africa and Indonesia

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Impact of a Potential Avian Flu Outbreak in Ethiopia: A Multimarket Model Analysis

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Key Findings

- HPAI outbreak risk is high in Ethiopia, and an outbreak would cause a supply and demand shock in the poultry sector.
- Economywide effects of an HPAI outbreak are expected to be minimal because of the poultry sector's small size and weak intersectoral linkages.
- Livelihood impacts of an HPAI outbreak could be substantial; despite the growth of a few modern firms, the poultry sector consists primarily of poor households—small-scale poultry producers who use traditional production methods.

The potential impact of a highly pathogenic avian influenza (HPAI) outbreak in Ethiopia is assessed, specifically on the country's poultry and associated sectors. Ethiopia has not yet experienced an HPAI outbreak but has experienced a scare. An HPAI outbreak would cause a supply and demand shock to the poultry sector. Whereas supply shocks would be related directly to the disease and be local, demand shocks would be more dispersed across regions.

Results of a dynamic spatially disaggregated multimarket model indicate that, given the poultry sector's small contribution to the Ethiopian economy, the likely overall effect of an HPAI outbreak on the economy would be small. Importantly, for the same reason that aggregate impacts are likely to be small, the livelihood impact could be large, because poor households participate significantly in poultry production.

Although an HPAI outbreak has not occurred in Ethiopia, risk assessment studies indicate that the threat of outbreak is high because of several factors, including bird flyways (Alemu et al. 2008, Stevens et al. 2009). The impact of such an eventuality has not been assessed in the literature and could provide valuable information to policymakers for advocacy and budgetary purposes. Moreover, it is important to analyze and understand the poultry sector features that would drive the magnitude and distributional effects of an HPAI outbreak on the Ethiopian economy. These features include the size and regional distribution of the poultry sector and the strength of backward and forward linkages with other sectors.

Country Background and Model

Ethiopia is one of the world's poorest countries. Agriculture is the main source of livelihood for more than 80 percent of its population, of which one-half lives below the poverty line (as defined by the World Bank's 1-dollar-a-day measure). The livestock sector supports the livelihoods of up to 70 percent of Ethiopians (Nzietcheung 2008), contributing an estimated 18.8 percent to the national gross domestic product (GDP) and 40 percent to the agricultural GDP (FAO AGAL 2004).

Within the livestock sector, poultry production plays an important role in rural livelihoods. The poor participate significantly, primarily in backyard poultry farming. Even though modern poultry farms exist (mainly in the town of Debre Zeit), their share of poultry production remains extremely small.

The poultry sector is dominated by traditional production methods, small-scale household operations, and limited intersectoral linkages. Consequently, the economywide effects of shocks to the sector (such as an HPAI outbreak) are hypothesized to be small. However, two caveats apply: As in most developing countries, regional disparities are expected to be strong, making some regions more vulnerable to shocks than others; and even though the economywide effects are not significant, some closely linked sectors might be affected significantly.

In the event of an HPAI outbreak, bird mortality will occur from the disease as well as from disease-control measures, such as culling. An HPAI outbreak also could lead to a demand shock as a result of a change in consumer preferences. Furthermore, although supply shocks are expected to have local effects, evidence from several countries indicates that demand shocks tend to extend nationwide.

The economywide Ethiopian multimarket model (EMM) provides a framework for tracing commodity, regional, and household effects of supply and demand shocks from an HPAI outbreak in Ethiopia (Diao et al. 2005). This model captures the detailed structure of all agricultural sectors and generates a baseline (no-shocks) level of the economy for 2003–15, against which changes generated by such shocks are measured.

Poultry Sector Structure and Performance

Bovine meat is the most important meat product across Ethiopia, but poultry is important in some regions: Amhara; Oromia; Tigray; and Southern Nations, Nationalities, and People's Region (SNN). Poultry demand and supply are very low in the Afar, Harari, and Somali regions and highest in Oromia, where the organized poultry sector resides (concentrated in the town of Debre Zeit).

Even though Ethiopia boasts a considerable poultry population, recent poultry sector performance has been poor. One report estimates that during 1985–94, annual poultry meat production increased by only 0.34 percent, on average, while annual hen egg production declined by 0.39 percent (ILRI 2000). Indeed, the growth rate of poultry production is much lower than that of the fast-growing population. Some rates have increased in recent years, but poultry-sector productivity and production remain low, mainly because of the dominance of traditional poultry farming.

Traditional poultry farming is characterized by low to nonexistent feed inputs, limited or absent veterinary care, minimal biosecurity, small flock size (2–15 chickens; Nzietcheung 2008), few forward and backward linkages, and high mortality rates. It requires few inputs—little investment beyond

that for the foundation stock, some local grains, and possibly simple night shelters (most poultry are housed in the family dwelling at night). Feed demand is limited to modern operations, whereas traditionally raised chickens scavenge.

Demand for maize and sorghum broadly follows the regional production patterns of the modern poultry sector. Demand for maize as poultry feed is most important in Oromia, SNN, Amhara, and Tigray. Sorghum demand for poultry feed is important these four regions as well as in Benshangui, which is not a major poultry-producing region (only 2 percent of total poultry production) but is the fifth-largest region in poultry production using modern technology.

Model Scenarios and Results

Ideally, the magnitude of shocks from an HPAI outbreak could be estimated by combining an epidemiological model (which would trace disease behavior in the Ethiopian context) and a disease-spread model (to explain the spatial pattern). Because this information was unavailable, stylized supply and demand shocks that would induce the same poultry-sector reductions were simulated.

The simulation scenarios highlighted the importance of a demand shock, even in the absence of an actual outbreak of HPAI (or another zoonotic disease). The six scenarios—three each for demand shock and supply shock, all resulting in a 40-percent decrease in demand—are described as

- Simulation 1: Demand shock with decreased demand for 1 year (2009)
- Simulation 2: Demand shock with decreased demand for 2 consecutive years (2009–10)
- Simulation 3: Demand shock with decreased demand for 3 consecutive years (2009–11)
- Simulation 4: Supply shock with decreased demand for 1 year (2009)
- Simulation 5: Supply shock with decreased demand for 2 consecutive years (2009–10)
- Simulation 6: Supply shock with decreased demand for 3 consecutive years (2009–11)

The EMM uses a recursive dynamic framework that allows each type of shock to be cumulative over the specified simulation period. The simulation results reflect changes relative to the baseline scenario for a particular year.

Effects on the poultry sector

The trajectories of national poultry production resulting from demand and supply shocks were plotted (Figures 1 and 2, respectively). The model baseline takes into account GDP and population annual growth over the time line. Figure 2 highlights the greater magnitude of the supply shock needed to generate the same drop in demand resulting from a demand shock.

Price changes induced by a reduced poultry supply would have to be large to change people's consumption levels. These results suggest that factors unrelated to bird mortality from disease or disease-control measures could result in demand changes through a shift in preferences that could have effects as strong as those from an actual outbreak.

Poultry consumption could be a main indicator of the welfare effects from an HPAI outbreak because of its implications for nutrition (apart from the livelihood impact), but bird mortality may not be the only factor inducing a decrease in consumption from an HPAI outbreak. Instead, an exogenous shift in preferences could be the main reason for reduced poultry consumption.

Figure 1. Simulated effects of demand shock scenarios on national poultry production (×1,000 metric tons)
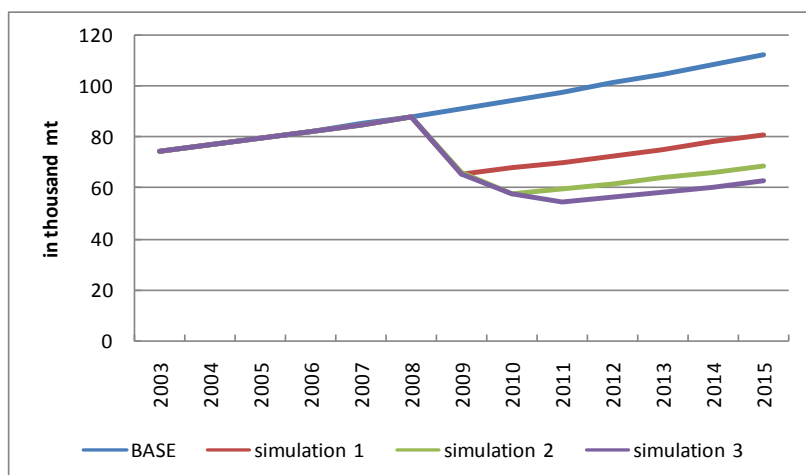
Figure 2. Simulated effects of supply shock scenarios on national poultry production (×1,000 metric tons)
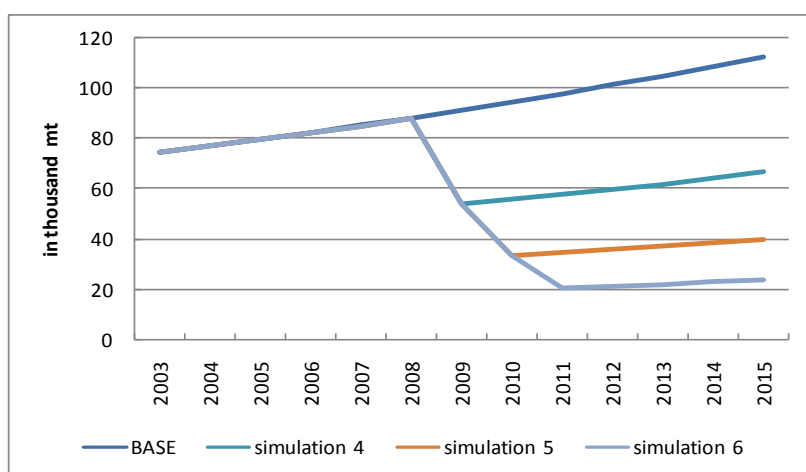
Effects on other sectors

The effects on other sectors of shocks to the poultry sector depend on linkages within the economy. Upstream linkages (feed demand) exist only from the modern poultry sector. The main poultry feed crops are maize, sorghum, barley, and pulses, which also are used mostly in beef and milk production. Poultry feed demand is more important for some inputs (maize and sorghum) and some regions (Amhara and Tigray). Even so, because traditional poultry farming dominates, the effect on upstream sectors would be negligible, even after a large demand shock where the value of modern and traditional poultry production decreased by 61.7 and 43.8 percent, respectively.

Both modern and traditional poultry producers have horizontal linkages with other food sectors, mainly producers of other animal meats. Poultry supply and demand shocks affect the feed sector directly (upstream effects) through changes in production, where feed is an input. Other meat sectors may be affected if they substitute for poultry: As poultry prices increase, consumers may choose other meats. Because other sectors also use feed, the shocks indirectly affect feed demand.

The effects on downstream sectors (such as hotels, restaurants, and institutions) of shocks to the poultry sector are not captured in this simulation because final consumption is aggregated. However,

effects on these linkages are postulated to be small. In Ethiopia, poultry is minimally processed, and organized retail sales are rare (except in Addis Ababa, where a few supermarkets exist).

Price changes in the poultry sector stemming from supply and demand shocks are expected to lead to demand changes in other food sectors as a result of combined price and income effects. In the demand shock scenarios, decreased poultry demand results in lower poultry prices that have a positive real income effect on all goods but a negative substitution effect. The reverse is true in the supply shock scenarios, which lead to poultry price increases.

Simulation results demonstrate the strength of horizontal linkages between the poultry and other animal meat (livestock) sectors. Shocks to the poultry sector have a minimal effect on demand for beef and slightly more on the demand for mutton and goat meat. The strongest demand shock (simulation 3) increases the demand for beef and for mutton and goat meat by 0.12 and 1.1 percent, respectively, in 2011. In contrast, the strongest supply shock (simulation 6) results in a decreased demand for all meat (strong income effect), but the changes are still very small: −0.4 and −1.3 percent for beef and for mutton and goat meat, respectively. Meats other than beef, mutton, and goat (labeled "other meat" in Figure 3) are most affected. All of the livestock sectors except poultry respond more strongly to supply shocks than to demand shocks.

Figure 3. Simulated effects of poultry supply and demand shock scenarios on other meat (all animal meat except beef, mutton, and goat) demand
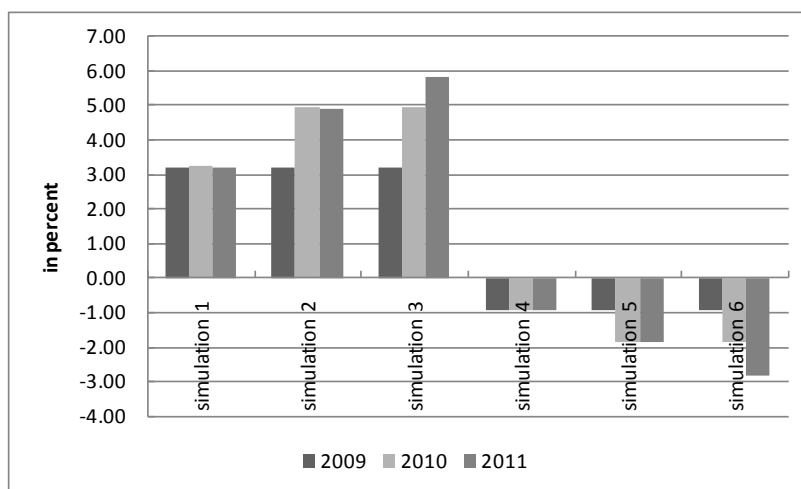
Conclusions

Results of model simulations indicate that the effects of supply and demand shocks resulting from an HPAI outbreak would be concentrated in the poultry sector and minimal on the rest of the economy because the Ethiopian poultry sector has weak intersectoral linkages. These weak linkages reflect a reliance on traditional poultry-farming methods that depend largely on the output of poor producers who have limited capital and limited access to other inputs. These producers cater to local markets and have few forward linkages. Thus, for the same reason that the economywide effects of an HPAI outbreak could be small, the livelihood impacts on poor producers could be substantial.

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