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# How Highly Pathogenic Avian Influenza (H5N1) Has Affected World Poultry-Meat Trade

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## Abstract

In 2003, outbreaks of the highly pathogenic avian influenza (HPAI) H5N1 virus had a major negative impact on the global poultry industry. Initially, import demand for both uncooked and cooked poultry declined substantially, due to consumers' fear of contracting avian influenza by eating poultry meat. Consumer fears adversely affected poultry consumption in many countries, leading to lower domestic prices, decreased production, and lower poultry meat exports. These reductions proved to be short-lived, as prices, consumption, production, and exports returned to preoutbreak levels in a relatively short time. As consumers gained confidence that poultry was safe if properly handled and cooked, world demand for cooked poultry increased. The cooked poultry share of total cooked and uncooked global exports nearly doubled from 2004 to 2006. In 2006, the world poultry industry was again under pressure due to HPAI H5N1 outbreaks, this time in Europe. By the end of the year, however, world poultry meat output had reached a new high, although, for some European countries, it was slightly below the 2005 level.

**Keywords:** highly pathogenic avian influenza, HPAI H5N1, cooked poultry meat, uncooked poultry meat, poultry exports, domestic poultry prices, export poultry prices, poultry consumption, poultry production

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## Contents

Introduction .....	3
Definite Bird-Human and Possible Human-Human Transmission of HPAI H5N1 Virus Keeps World Concern High .....	5
Global Markets for Uncooked and Cooked Poultry Meats .....	6
Economic Impact of HPAI on World Poultry Production, Consumption, and Prices .....	14
Conclusions and Implications .....	22
References .....	25

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## Introduction

The outbreak of highly pathogenic H5N1 avian influenza (HPAI H5N1) in East and Southeast Asia in November 2003 had a worldwide impact on poultry production, consumption, domestic prices, export prices, and trade patterns in both HPAI-infected and uninfected countries around the world. The impact worsened as the virus spread westward to many countries in Asia, Central Europe, the Middle East, Africa, and Western Europe. In infected countries, millions of chickens died or were culled, prices plunged, and demand for poultry meat dropped substantially. In response, domestic production and exports declined. In uninfected countries, poultry exports were adversely affected due to temporarily falling demand for poultry meat.

Based upon risk concerns, many governments banned poultry imports from HPAI H5N1-infected countries to minimize the risks to uninfected flocks and to human populations. The import bans caused a 23-percent decline in global uncooked and cooked poultry meat exports from fourth-quarter 2003 to first-quarter 2004 (the first quarter following initial HPAI outbreaks).<sup>1</sup> However, as more information became available, consumers' fears subsided somewhat upon learning that poultry is safe if properly handled and cooked over 165 degrees Fahrenheit (OIE, October 2005; Swayne, 2006). Global cooked poultry exports rebounded and rose 3.2 percent in 2004 and another 42 percent in 2005. Global uncooked poultry exports declined 6.9 percent in 2004 but rose 10 percent in 2005. In 2006, cooked poultry exports rose 13 percent, while uncooked poultry exports declined 1 percent from 2005.

The major objective of this report is to analyze the impact of HPAI on global poultry meat trade following the 2003 outbreaks that started in East and Southeast Asia. The market analysis summarizes the growing demand for cooked poultry products, with attention to the growing challenge to uncooked poultry markets and competition among major suppliers in world markets. The report briefly discusses the spread of the HPAI virus and analyzes its impact on global export markets for poultry meats (uncooked and cooked), major exporters, world production, consumption, and domestic and export prices, as well as its implications for the United States.

<sup>1</sup>“Global” or “world” data are from Global Trade Atlas (GTA). These data are preferred to those of the United Nations' Food and Agriculture Organization or United Nations Trade Statistics data, because GTA data are reported monthly with only a few months' lag time, compared with at least 1 year's lag for FAO or other UN data. GTA poultry exports data are from the official sources of 69 reporting countries, while FAO data come from 209 countries. GTA poultry exports accounted for over 99 percent of total FAO poultry exports during 1996-2005. Statements referencing “global” or “world” conditions are based on this GTA information, unless otherwise noted.

## Avian Influenza Primer

Avian influenza is caused by a virus common in wild birds and contagious to other birds, including chickens, turkeys, ducks, geese, quail, ostrich, guinea fowl, and pheasants. Influenza viruses have two main surface antigens: haemagglutinin (H) and neuraminidase (N). There are many H and N subtypes, but the highly pathogenic avian influenza types are caused by viruses that carry H5 or H7, and, rarely, H9. The current major poultry epidemic in Asia, the Middle East, Africa, and Europe is caused mostly by the H5N1 virus (United Nations, FAO, *FAOAIDE News*, July 2007).

Avian influenza viruses are classified by pathotype as highly pathogenic (HPAI) or low pathogenic (LPAI). In the case of HPAI, mortalities occur within hours of initial infection and up to 2 days with up to a 100 percent mortality rate. Eggs laid after infection frequently have no shells, and if hens recover from the disease, they usually do not lay eggs afterward. In LPAI cases, mortality in chickens ranges from 3 percent in caged layers to 15 percent in broilers. Egg production per hen can drop by 45 percent, but returns to normal after 2-4 weeks.

Domestic poultry infection with the H5N1 virus is more likely to occur in areas where wild waterfowl congregate and domestic poultry are not in bird-proof sheds. Certain species of wild ducks can carry influenza viruses without exhibiting any clinical signs of disease. Viral transmission can occur from contaminated water and wild bird droppings, as well as from direct contact with wild birds by farmed poultry. Therefore, good farm-management practices focus on preventing close wildlife contact with humans and poultry by improving biosecurity practices in commercial farms (European Commission, EU, *Food Safety*, November 2006; United Nations, FAO, *Animal Health Special Report*, October 2006; OIE avian influenza update, October 2006).

## **Definite Bird-Human and Possible Human-Human Transmission of HPAI H5N1 Virus Keeps World Concern High**

Unlike other earlier avian influenza viruses that infected only poultry flocks and disappeared a few months later, the current HPAI H5N1 virus caused serious international concern due to the ability of the virus to spread from poultry to humans and possibly between humans. There is increasing world concern about the risk of the HPAI H5N1 virus mutating so that it becomes easily transmissible and sustained between humans, which could lead to a human pandemic. As of July 31, 2007, the number of confirmed human cases of HPAI totaled 319, including 192 fatalities: 81 in Indonesia, 42 in Vietnam, 17 in Thailand, 16 in China, 15 in Egypt, 7 in Cambodia, 5 in Azerbaijan, 4 in Turkey, 2 in Laos, 2 in Iraq, and 1 in Nigeria (United Nations, FAO, *FAOAIDE News*, July 31, 2007).

The first cases of HPAI H5N1 were discovered in Hong Kong in 1997. The HPAI H5N1 virus was dormant until it resurfaced in Vietnam in October 2003 and spread to neighboring countries, including Laos, Cambodia, Hong Kong, Japan, Thailand, Indonesia, and China in January 2004 (Otte et al., 2004; International Livestock Research Institute, 2006). In 2005, the disease rapidly moved westward to Russia (July 2005), Kazakhstan (August 2005), Turkey (October 2005), Romania (October 2005), Croatia (October 2005), Macedonia (November 2005), and Ukraine (December 2005).

In Africa, H5N1 spread rapidly: Nigeria (January 2006), Niger (February 2006), Egypt (February 2006), Cameroon (February 2006), Burkina Faso (March 2006), the Sudan (March 2006), Ivory Coast (March 2006), and Djibouti (April 2006).

In 2006, HPAI outbreaks occurred in Greece and Bulgaria (January), Italy, Hungary, Slovenia, and France (February), Poland and Czech Republic (March), and Spain (July).

In January 2007, the H5N1 virus resurfaced in a poultry farm in Miyazaki prefecture, Japan's largest poultry-producing region—the first outbreak there in more than 3 years. Outbreaks also resurfaced in a goose farm in Hungary in January 2007. In February, the HPAI virus hit a turkey farm in the United Kingdom owned by Bernard Matthews PLC, Europe's largest turkey producer, causing the deaths and culling of 159,000 turkeys in an effort to stamp out the disease (United Kingdom, Department for Environment, Food, and Rural Affairs, 2007). It was the first time H5N1 virus had occurred in the United Kingdom since an infected wild swan was found in Scotland in March 2006.

Governments are obliged to report outbreaks of highly pathogenic avian influenza to the Paris, France-based OIE (founded in 1924 as Office International des Epizooties; in 2003, OIE was renamed the World Organization for Animal Health but retained its well-known acronym). Such reports must include the official date of outbreaks in birds, other data, and updates on the status of the infection. More details on outbreak dates and country-by-country updates are available on the OIE website (<http://www.oie.int> (OIE, October 2006)).

## Global Markets for Uncooked and Cooked Poultry

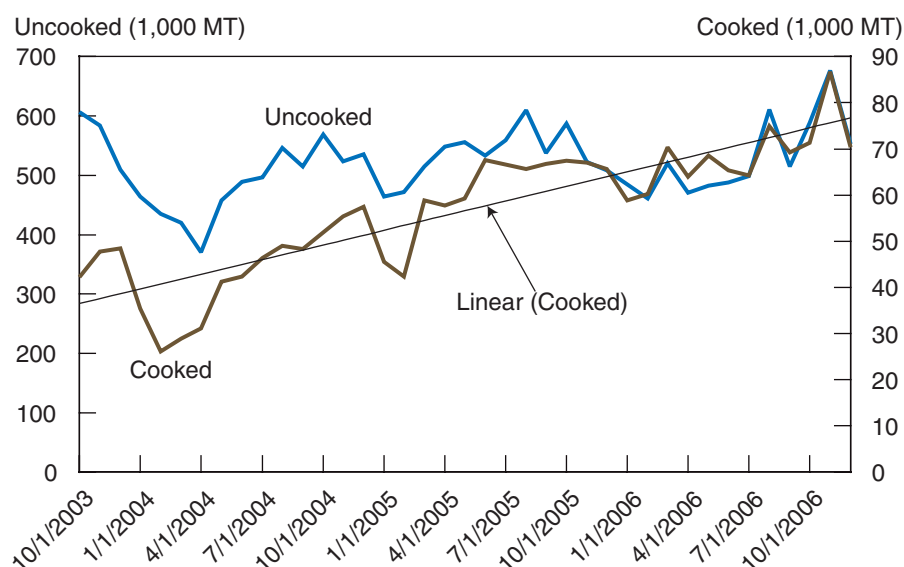
The major global markets for uncooked and cooked poultry were affected differently during HPAI outbreaks and their aftermaths. Uncooked poultry includes fresh, chilled, or frozen broilers, chickens, turkeys, ducks, geese, and guinea fowls sold in cuts, parts, or whole birds. Cooked poultry includes all processed poultry products sold in preserved, smoked, prepared, or cooked form. They are ready to consume after a relatively short preparation time.

Following the late-2003 HPAI outbreaks in China and Thailand, many importing countries banned both uncooked and cooked poultry imports, causing a sharp decline in global poultry trade. Consequently, global exports of cooked poultry decreased 35 percent in the first quarter of 2004 (the first full quarter after HPAI outbreaks in East and Southeast Asia), rebounded 27 percent in the second quarter, and ended the fourth quarter of 2004 about 19 percent higher than the pre-outbreak level (fourth quarter 2003) (fig. 1).

World exports of uncooked poultry decreased 22.4 percent in first quarter 2004, bounced up slowly, but ended 4.3 percent below the level of fourth quarter 2003. The initial drop (first quarter of 2004) in cooked poultry exports was larger than the early drop in uncooked poultry exports because Thailand and China, the two leading exporters of cooked poultry products, were infected with the HPAI H5N1 virus and their exports were banned worldwide. Supplies of cooked poultry products were constrained due to limited global capacities and production facilities. But supplies of uncooked poultry meat were available from several HPAI H5N1 virus-free countries, including the United States, Brazil, EU-25, and others. In the fourth quarter of 2003, China and Thailand accounted for 56 percent of world's total

Figure 1

### World exports of uncooked and cooked poultry meat, October 2003 to December 2006



Source: Global Trade Atlas.



cooked poultry exports, but that number dropped to 45 percent in the first quarter of 2004. The export share of U.S. and Brazilian cooked poultry products increased from 65 percent to 73 percent of world total exports during the same period.

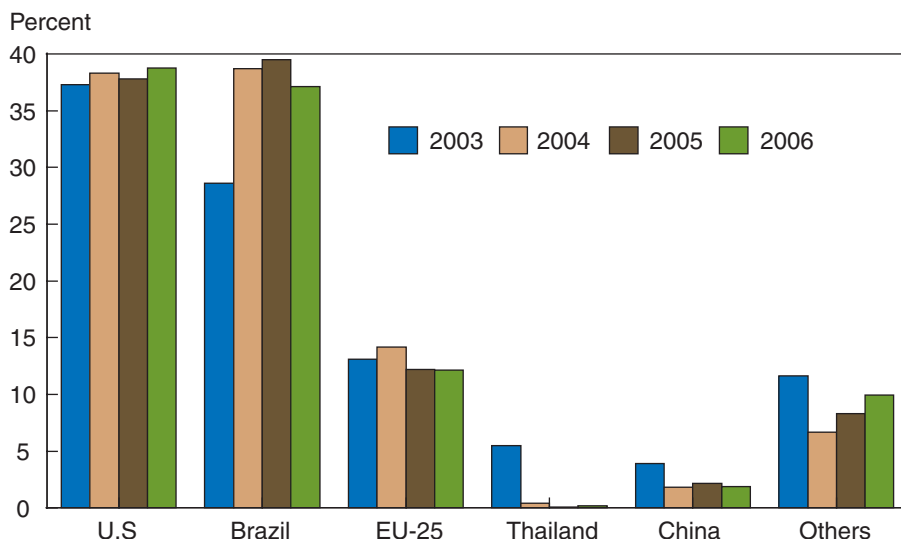
Demand for cooked poultry continued to grow rapidly in contrast to the corresponding drop in demand for uncooked poultry. Cooked poultry exports ended December 2006 (the latest available data) 73 percent higher than the pre-HPAI-outbreak level of exports in October 2003. During the same period, uncooked poultry exports declined 9.9 percent (Global Trade Atlas, May 2007).

## Uncooked-Poultry World Exports Stay Down

Global exports of uncooked poultry dropped substantially from December 2003 to April 2004 due to poultry disease outbreaks in East and Southeast Asia, recovered afterward, and declined again as HPAI H5N1 spread to Europe. Ninety percent of world exports of uncooked poultry are broilers and chickens, 8 percent are turkeys, and less than 2 percent are ducks, geese, and guinea fowl. World exports of uncooked poultry dropped 18 percent by volume in just one quarter, from the fourth quarter of 2003 (pre-outbreak level), to the first quarter of 2004. In 2003, the United States was the world's largest exporter of uncooked poultry meat, shipping 37 percent of total exports. Brazil ranked second at 29 percent, followed by the EU-25 (13 percent), Thailand (5.5 percent), and China (3.9 percent) (fig. 2).

The greatest impact of the disease fell on Thailand, whose exports dropped 75 percent in first quarter 2004, compared with the fourth quarter of 2003, followed by China (63 percent), and Hong Kong (55 percent) (fig. 3). During this one quarter, U.S. uncooked poultry exports decreased 27 percent; Brazil was the only major exporter that boosted its global shipments, by 6 percent. The substantial decrease in U.S. exports was due to the discovery of a less pathogenic variant of an HPAI H5N2 virus in Texas, and

Figure 2  
**Uncooked poultry export shares, by major countries, 2003-06**



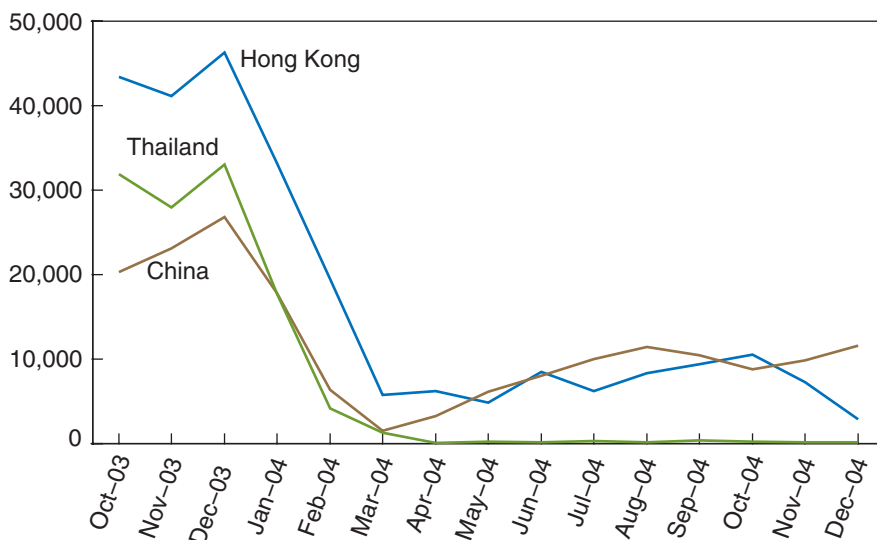
Source: Global Trade Atlas.



Figure 3

**Uncooked poultry meat exports by major HPAI-infected countries, October 2003 to December 2004**

Metric tons



Source: World Trade Atlas.

low pathogenic avian influenza (LPAI) virus outbreaks on poultry farms in Connecticut, Rhode Island, New Jersey, Maryland, and Delaware. As a result, import bans were extended to U.S. shipments, and Brazil was able to barely overtake the U.S. position as the world's largest poultry meat exporter in 2004. Hong Kong and Japan reopened their markets for U.S. poultry in May and June 2004, respectively. In 2006, the United States regained its position as the world's largest exporter of uncooked poultry.

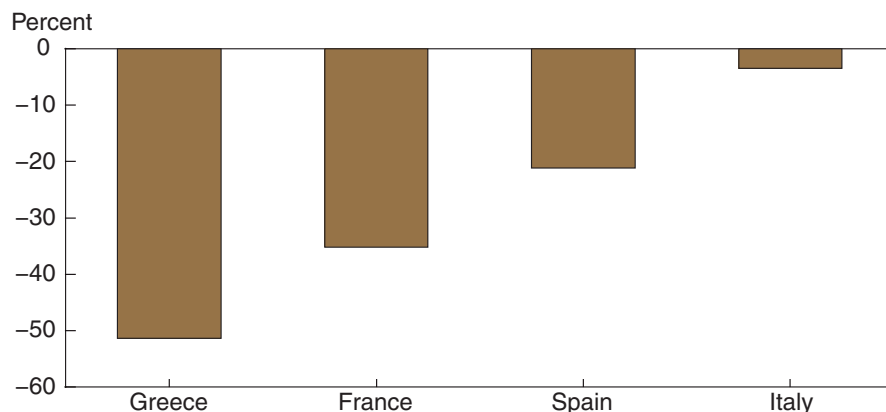
In 2006, world exports of uncooked poultry decreased 1 percent over 2005, due mainly to HPAI H5N1 outbreaks in Europe and the influence of consumer fears on poultry demand. In the first half of 2006, the EU-25 reported most of the decrease, down 24.4 percent, with drops of 51 percent in Greece, 35 percent in France, 21 percent in Spain, and 3.5 percent in Italy (Italy dropped 21 percent from the second half of 2005) (fig. 4). U.S. shipments of uncooked poultry rose 2 percent over the same period, boosting the U.S. share to 42 percent of the world total, followed by Brazil (37 percent), EU-25 (10 percent), and China (2 percent).

For all of 2006, however, poultry meat exports from China declined 13 percent, from Brazil 7 percent, from EU-25 2 percent; but U.S. poultry-meat exports increased 2.2 percent over 2005. Export shares of the world's markets ended 2006 at 39 percent for the United States, followed by Brazil (37 percent), EU-25 (12 percent), and China (1.9 percent).

The Asian and European HPAI H5N1 outbreaks caused global-export losses of 260,000 metric tons (MT) of uncooked poultry meat between the fourth quarter of 2003 and the second quarter of 2006. Most of these losses were recovered, as exports rose 26 percent between the second and the fourth quarters of 2006, due mainly to diminished consumer fears.

Figure 4

#### HPAI impact on uncooked poultry meat exports from selected European Union countries, first half of 2006



Source: Global Trade Atlas.

### World Exports of Cooked Poultry Rise

As a result of the late-2003 HPAI H5N1 outbreaks in Asia, global exports of cooked poultry decreased 35 percent in the first quarter of 2004 from exports in the fourth quarter of 2003. Later, as education efforts made consumers aware that cooking kills the HPAI virus, global demand for cooked poultry increased, and major exporters responded by increasing their shipments, raising 2004 exports about 3.2 percent over 2003 levels. Cooked poultry exports rose substantially, by 43 percent in 2005, and 13 percent in 2006 over 2005 (Global Trade Atlas, 2007). Major exporters were Thailand, China, Brazil, the United States, and the EU-25 (fig. 5).

In value terms, both Asian and European HPAI H5N1 outbreaks resulted in a 156 percent increase in global cooked poultry export value between the first quarter of 2004 and the fourth quarter of 2006. Except for the downward plunge in the first quarter of 2004, export values generally trended upward. By contrast, the export value of uncooked poultry rose only 41 percent during the same period. The value of uncooked poultry exports bounced off the low of \$1.48 billion in the first quarter of 2004 to a high of \$2.17 billion just before the start of the HPAI H5N1 outbreaks in Europe in late 2005. The value then fell to \$1.47 billion in the second quarter of 2006, due to an HPAI panic in Europe and lower demand for exports from Brazil, but rebounded to \$2.1 billion in the fourth quarter (fig. 6).

In volume terms, the cooked-poultry share of global cooked and uncooked poultry exports nearly doubled from 6.4 percent in the first quarter of 2004 to 12.1 percent in the second quarter of 2006 and 11.4 percent in the first quarter of 2007 (fig. 7).

Cooked poultry contains three harmonized standard (HS) categories of the (harmonized tariff code)<sup>2</sup>: chicken meat (HS 160232), turkey meat (HS 160231), and “all others”—ducks, geese, and guinea fowls (HS 160239).

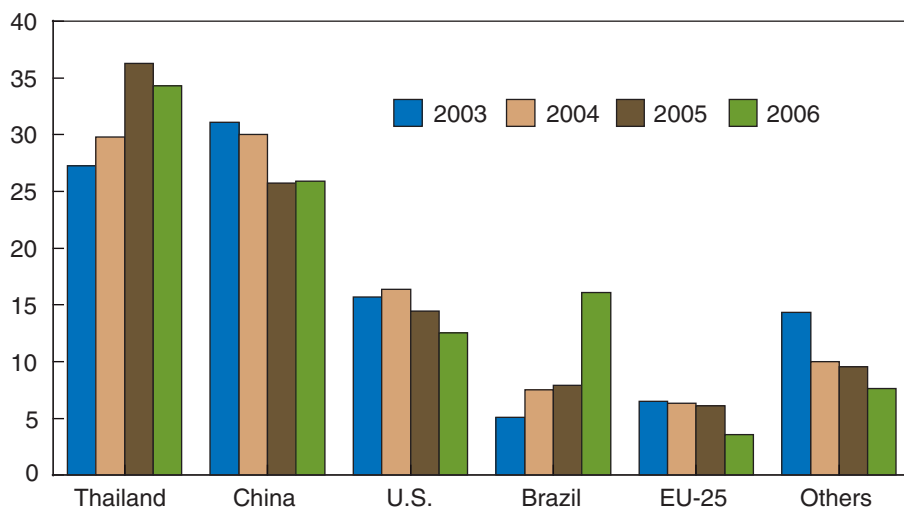
**Global Exports of Cooked Chicken Meat Rise (HS 160232).** In 2003, the

<sup>2</sup>U.S. Department of Commerce, U.S. Census Bureau, August 2007; United Nations Trade Statistics, August 2007.

Figure 5

**Cooked poultry export shares, by major countries, 2003-06**

Percent

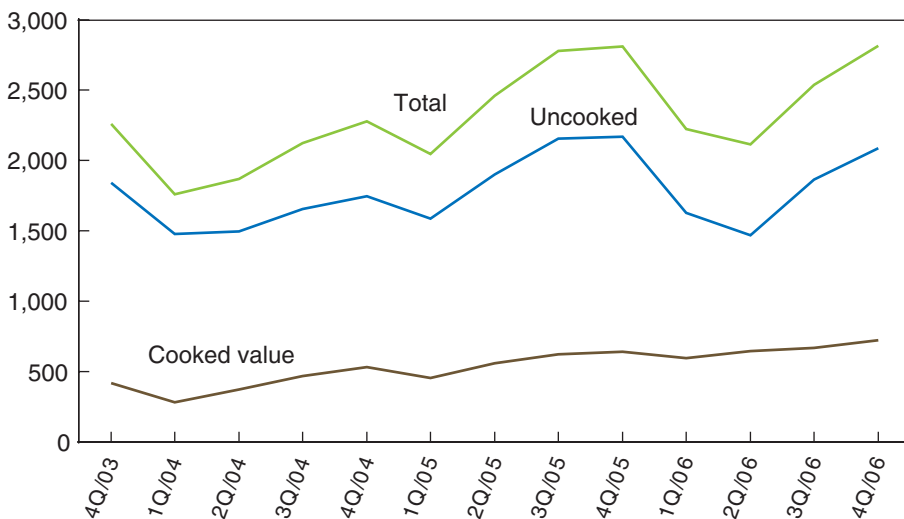


Source: Global Trade Atlas.

Figure 6

**Export value of cooked, uncooked, and total poultry meat exports, fourth-quarter 2003 to fourth quarter 2006**

US\$ million



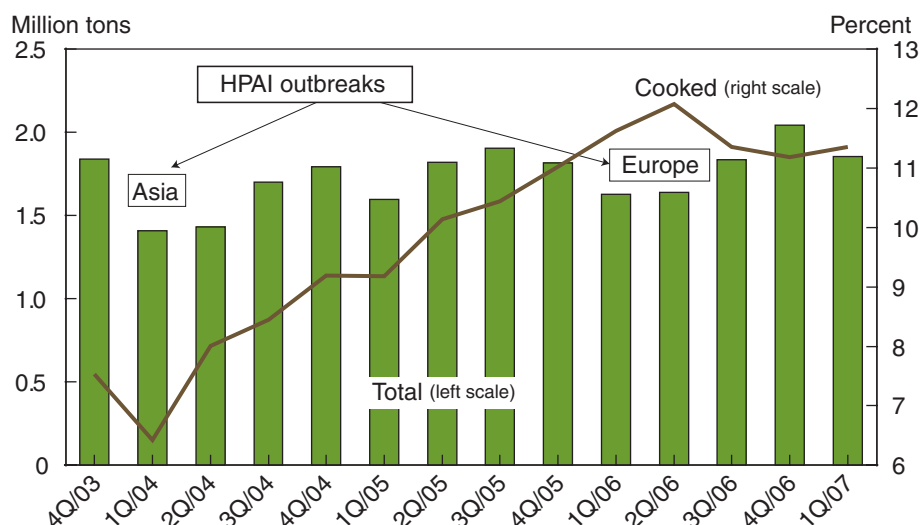
Source: Global Trade Atlas.

year prior to the import bans, exports of cooked chicken made up the largest proportion (74 percent) of total cooked poultry exports, followed by ducks, geese, guineas (19 percent), and cooked turkey (7 percent). In 2004-2006, exports of cooked chicken increased to 80 percent of total cooked-poultry exports, while turkey exports rose to 11 percent, and duck and geese exports declined to 9 percent.

World exports of cooked chicken amounted to 368,774 metric tons in 2003, rose to 586,942 MT in 2005, and grew another 13 percent in 2006. China and Thailand were the leading exporters of cooked chicken,

Figure 7

**World export quantity of uncooked and cooked poultry meat, 4th quarter 2003 to 1st quarter 2007**



Source: Global Trade Atlas.

accounting for 37 percent and 31 percent of world trade, respectively, in 2003. The U.S. share was 11 percent, followed by Brazil (9 percent) and the EU-25 (6 percent).

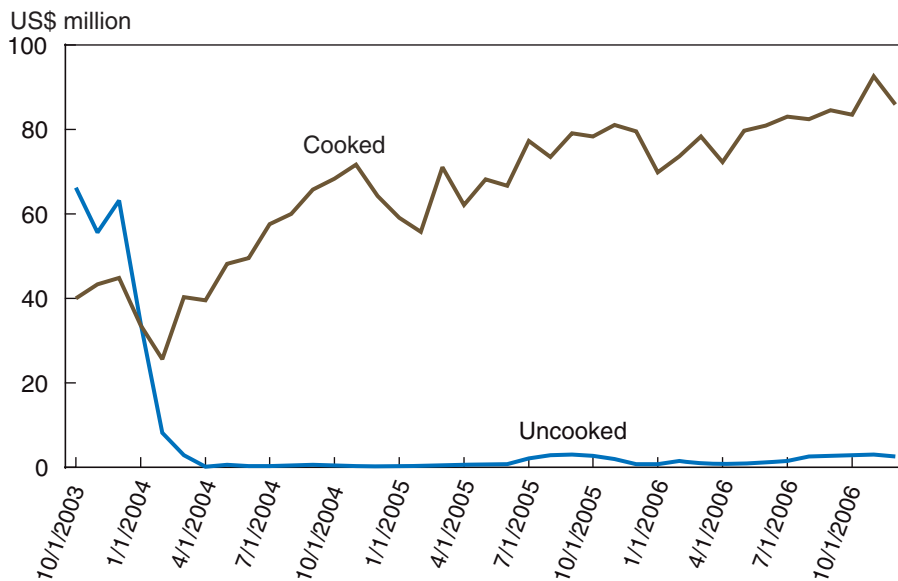
In 2004, the first year of imposed import bans due to HPAI H5N1 outbreaks, Thailand's poultry industry planned its response and switched from uncooked poultry exports exclusively to cooked poultry products (fig. 8). This strategy was successfully achieved, and Thailand became the world's largest exporter of cooked chicken (36 percent of world total), followed by China (29 percent) (fig. 9). During that time, export shares of all other exporters changed only slightly.

In 2005, Brazilian exporters rapidly increased their total foreign sales of cooked chicken by 86 percent over 2004 totals. Likewise, China's exports rose 43 percent, followed by the United States (37 percent) and Thailand (35 percent). On the other hand, EU-25 exports of cooked chicken declined 19 percent in 2005. In 2006, market shares were relatively unchanged, except for Brazil, whose share was 17 percent, up from 13 percent in 2005.

**Global Exports of Cooked Turkey Meat Rise From Low Base (HS 160231).** World exports of cooked turkey rose 117 percent from 32,495 MT in 2003 to 70,608 MT in 2005, after declining by 6 percent in 2004 due to import bans imposed after the HPAI outbreaks. In 2006, turkey exports increased by 24 percent over 2005. The United States was the world's largest exporter of cooked turkey meat, accounting for 62 percent and 54 percent of the world's total in 2003 and 2004, respectively (fig. 10). However, Brazil's exports of cooked turkey rose rapidly from 1,876 MT in 2004 to 42,974 MT in 2005, or 61 percent of the world total. Consequently, Brazil became the world's largest exporter in 2005, followed by the United States (24 percent), EU-25 (4 percent), and all other countries (11 percent).

Figure 8

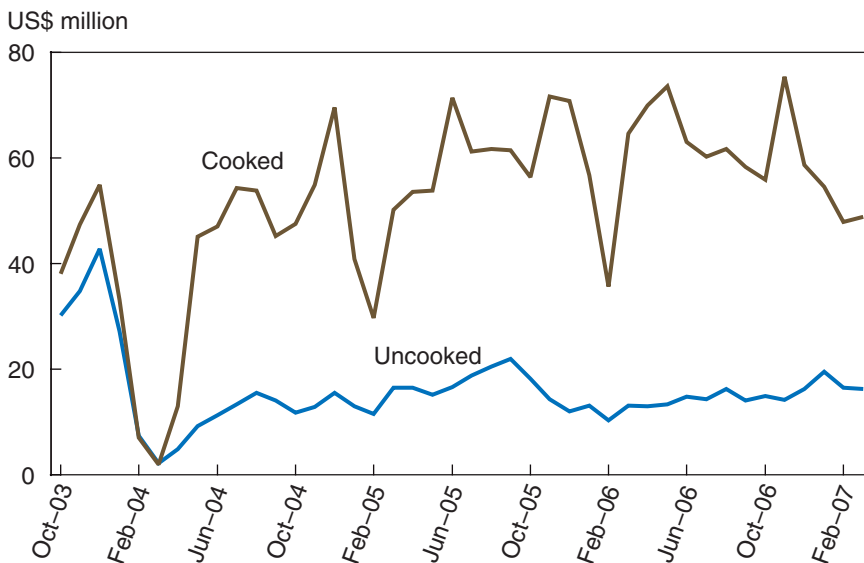
**Thailand's export value of uncooked and cooked poultry, October 2003 to December 2006**



Source: World Trade Atlas.

Figure 9

**China's export value of uncooked and cooked poultry meat, October 2003 to March 2007**

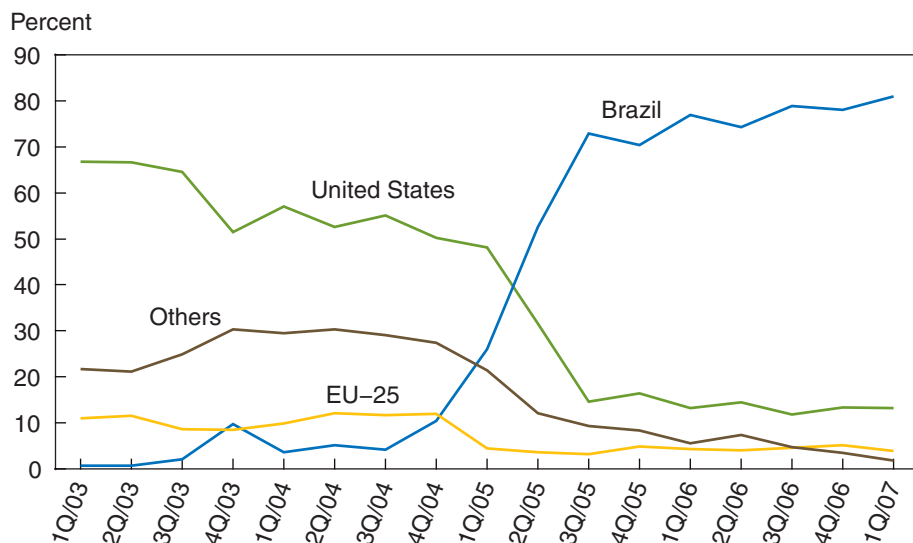


Source: World Trade Atlas.

In 2006, these market share rankings changed substantially: Brazil's market share was 77 percent, while the U.S. share dropped to 13 percent, the EU-25 share stayed unchanged at 4 percent, and the share of other countries dropped to 6 percent. Thailand did not export any cooked turkey during the period, and China exported a few tons per month.

Figure 10

**Cooked turkey meat export shares (HS 160231) by major exporters, 1st quarter 2003 to 1st quarter 2007**



Source: Global Trade Atlas.

**Global Exports of Cooked Ducks, Geese, and Guinea Meat Recover (HS 160239).** World exports of cooked ducks, geese, and guinea fowls (category HS 160239) were the hardest hit of the three categories by HPAI H5N1 outbreaks, declining to 57,949 MT in 2004, down from 96,162 MT in 2003. However, they rebounded to 73,070 MT in 2005 and 73,377 MT in 2006.

In 2004, Thailand was the world largest exporter of cooked ducks, geese, and guinea fowls, shipping 41 percent of world exports, followed by the United States (23 percent), EU-25 (8 percent), and China (5 percent). However, in 2005, Thailand's exports increased to 53 percent of the world total, followed by the United States (19 percent), China (15 percent), and EU-25 (4 percent). In 2006, Thailand's share of exports in the category rose to 59 percent, followed by the United States (16 percent), and China (14 percent). The decrease in world exports of "other" poultry (HS 160239 category) in 2004 was likely due to worldwide published scientific guidelines that the HPAI (H5N1) outbreaks probably start with direct or indirect contact between migratory and wild water birds (such as ducks and geese) and domestic poultry not raised inside poultry houses (United Nations, FAO, October 2006). Worldwide, commercially produced chickens and turkeys are usually raised in temperature-controlled enclosures, and therefore do not come in direct contact with migratory birds.

## Economic Impact of HPAI on World Poultry Production, Consumption, and Prices

Like any other poultry disease, the direct economic impact of HPAI includes lost poultry and egg output and reduced production efficiency in cases of partial depopulation of poultry flocks. Losses include income losses resulting from production interruption, lower consumption, lower prices, and revenue loss for exporting countries.

Economic impacts are shaped by the time elapsed with reduced production and consumers' demand for poultry. Following a period of lower prices, markets tend to return to their pre-outbreak conditions. Economic losses are also influenced by producer and industry adaptation and possible market adjustment. Large poultry producers may choose to produce value-added poultry products to generate more revenue and minimize their losses. Likewise, poultry growers with backyard operations could seek other non-farm incomes to compensate for lost income. Although losses to individual producers may be significant, at the aggregate level, losses may be less than suggested by the decrease in poultry output because of possible increase in compensating non-farm income.

### HPAI H5N1 Trims World Poultry Meat Production

Following the 2003 HPAI H5N1 outbreaks in Asia, world poultry production in 2004 did not diminish as expected, but rose 1.6 percent compared with increases of 2.1 percent in 2003 and 4.6 percent in 2002 (USDA, FAS, *Livestock and Poultry*, 2007). This unexpected rise was mainly due to the quick adaptation of HPAI-infected countries to global market demand, rising exportation of cooked poultry, and the ability of the poultry industry to speedily resume production. However, Thailand's poultry production declined nearly 28 percent from 1.37 million MT in 2003 to 985,000 MT in 2004 and was at 40-50 percent of its normal levels at the height of the HPAI outbreaks in 2004 (Agra-Europe, AE2104, May 7, 2004).

Production growth in China slowed down in 2004, but total poultry production was 271,000 MT higher than in 2003. Other infected countries, such as Indonesia, Vietnam, Singapore, South Korea, and Cambodia reported declining production in 2004 compared with 2003. However, the loss of production in those five countries combined was less than the decrease in Thailand (fig. 11). A major reason that world production did not decline is that production rose in HPAI-free countries. For example, U.S. production rose about 3 percent, Brazil's rose 10 percent, and EU-25 output grew 1 percent. All three countries gained world market share in 2004.

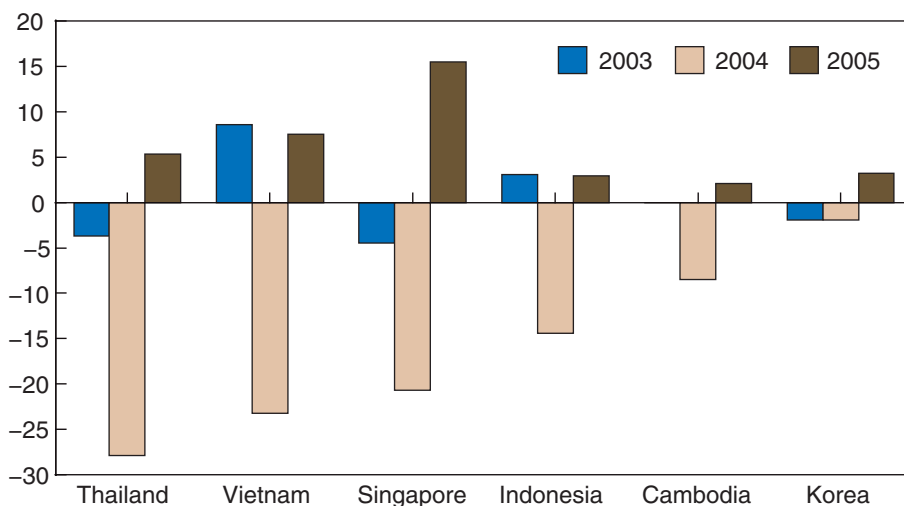
In 2005, world production rose to a record high of 81.4 million MT even though HPAI H5N1 outbreaks swept across a few more Central European countries near year's end. The HPAI H5N1 impact was small in 2005, with output increasing 4.7 percent, compared with a 1.6 percent rise in 2004 (Organization for Economic Cooperation and Development, August 2007). World production by region was led by Asia, with 31 percent of the global



Figure 11

**HPAI impact on poultry production in selected Asian countries, 2003-05**

Percent from previous year



Source: United Nations, Food and Agriculture Organization.

total, followed by North America (24 percent), Latin America & Caribbean (20 percent), Western Europe (14 percent), Africa and Middle East (7 percent), and Eastern Europe (5 percent). The United States is the world's largest poultry producer, accounting for 23 percent of the world total, followed by China (17 percent), EU-25 (13 percent), Brazil (12 percent), Thailand, and Japan (1.4 percent each). The rest of the world combined accounts for 32 percent of poultry production.

Production shares of these countries changed only a fraction of a percent since 2000, except for Brazil's share, which rose from 8.7 percent of world production in 2000 to 11.8 percent in 2005.

As the HPAI H5N1 virus spread to Western Europe, production losses due to bird culling and reduced production were more damaging to the poultry industry in 2006 than in 2005. For example, EU-25 output declined 22 percent in the first quarter of 2006, due to a fall in EU demand, the embargos on EU exports (especially French products), and the availability of poultry at lower prices from Brazil and the United States. EU-25 poultry production amounted to about 11 million MT annually, of which two-thirds was produced in France, the United Kingdom, Spain, Germany, and Italy. The Mediterranean countries have been by far the worst hit by HPAI, due to their proximity to HPAI outbreaks in the Middle East and Africa (Agra-Europe, AE2199, March 2006).

Falling production prompted the poultry industries in Italy and France to demand aid from their governments and the European Commission. In March 2006, France provided compensation to farmers for income losses due to avian influenza. EU production of broiler and turkey meat declined from 2005 to 2006 by 2.3 percent and 3.5 percent, respectively (USDA, FAS, January 2007). In 2006, Brazilian production was expected to decline, due to worldwide consumer fears, falling import demand for poultry meat

from major importers, and the imposition of bans on Brazilian poultry exports following the confirmation of different disease outbreaks (Newcastle disease) in July 2006 (USDA, FAS, August 30, 2006). However, a more recent report indicated a 0.2 percent increase in Brazil's 2006 broiler production (USDA, FAS, April 2007).

In June 2006, the Food and Agriculture Organization of the United Nations (FAO) forecast a decline in world poultry production for 2006 for the first time since the 2003 HPAI H5N1 outbreaks, due to a weakening demand, uncertain price prospects, and escalating trade restrictions (United Nations, FAO, *Food Outlook*, 2006). That forecast proved to be incorrect when world poultry production for 2006 ended the year 1.8 percent higher than the 2005 level. However, some poultry production setbacks did occur, mostly in the EU-25. Poultry production increased in several countries, including the United States, Thailand, Argentina, and Russia (USDA, FAS, *Livestock and Poultry*, 2007).

### **Outbreaks Adversely Affected Consumption Initially, But Levels Rose Within a Year**

HPAI H5N1 outbreaks were the major cause of a substantial decline in per capita poultry meat consumption in infected countries, but recovery generally occurred within a year. In a few European countries, consumption dropped following a new wave of consumer fear as a result of HPAI H5N1 outbreaks in Europe in late 2005. Those consumption declines recovered within a few months.

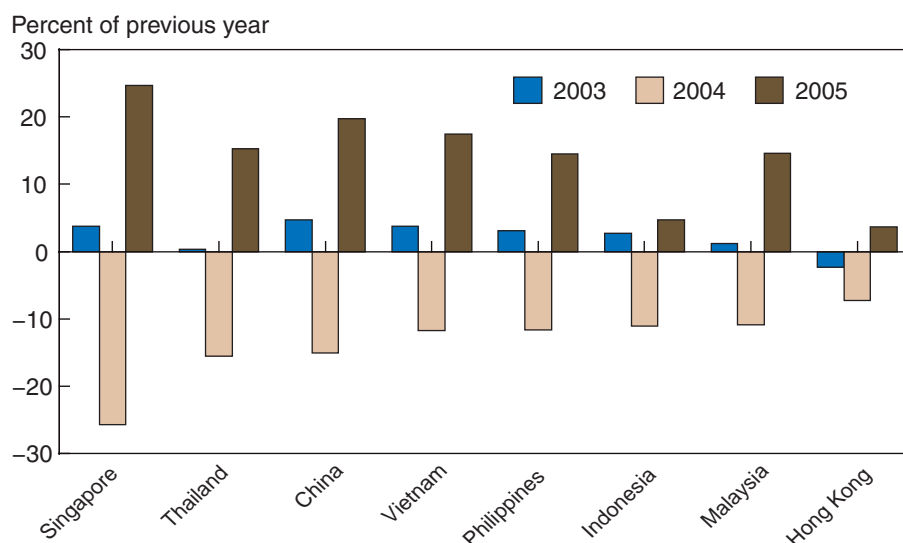
In 2003, per capita poultry consumption in HPAI H5N1-infected Asian countries averaged 88 pounds in Hong Kong, 72 pounds in Malaysia, 33 pounds in Thailand, 26 pounds in Singapore, 16 pounds in the Philippines, and nearly 7 pounds in Vietnam. In 2004, fears of HPAI H5N1 caused poultry consumption to drop by nearly 26 percent in Singapore, 16 and 15 percent in Thailand and China, respectively, and about 11 percent each in Vietnam, the Philippines, Indonesia, and Malaysia. The smallest consumption drop was recorded at 7 percent in Hong Kong (fig. 12).

Per capita consumption in all these countries rebounded in 2005, with consumption exceeding 2003 levels (Euromonitor, 2006).

As HPAI H5N1 spread westward, poultry consumption during 2006 declined in some European countries. At the height of HPAI H5N1 outbreaks in Greece, poultry sales were down 95 percent in the first 7-10 days of February 2006 (Agra-Europe, February 10, 2006). In Italy, consumption fell by 70 percent within 1 month of its HPAI H5N1 outbreak (Agra-Europe, February, 24, 2006). The French Poultry Federation, which represents producers and processors, reported that poultry consumption in that country declined at least 25 percent during January and February 2006. In the wake of the HPAI H5N1 outbreaks that swept Europe, consumption fell 30 percent in Spain between October and November 2005, even before outbreaks were announced on July 7, 2006 (United Nations, FAO, *FAOAIDE News*, September 2006). However, country estimates cover only a 2-3-month period. For all of 2006, EU-25 broiler and turkey consumption fell

Figure 12

### HPAI impact on per capita consumption in infected Asian countries, 2003-05



Source: United Nations, FAOSTAT.

by 2.7 and 2.8 percent, respectively, compared with 2005 (USDA, FAS, January 30, 2007).

### Domestic Poultry Prices Dropped Sharply With Outbreaks, Then Recovered

Domestic poultry prices in infected countries declined substantially soon after the HPAI H5N1 outbreaks in late 2003, but the declines were temporary. Prices stayed low for a few months, rebounding with occasional increases above pre-outbreak levels before returning to the pre-outbreak level within nearly 12 months. Price declines were due to a decrease in demand, reflecting consumer fear of eating poultry meat and fears of HPAI H5N1 virus transmission from poultry to humans. For example, in China, broiler retail prices declined from 5.7 yuan per jin (500 grams) in December 2003 to 5.3 in March 2004, before they rebounded, overshot, and returned nearly to the pre-outbreak price 1 year later in December 2004 (fig. 13) (China National Development and Reform Commission, 2006).

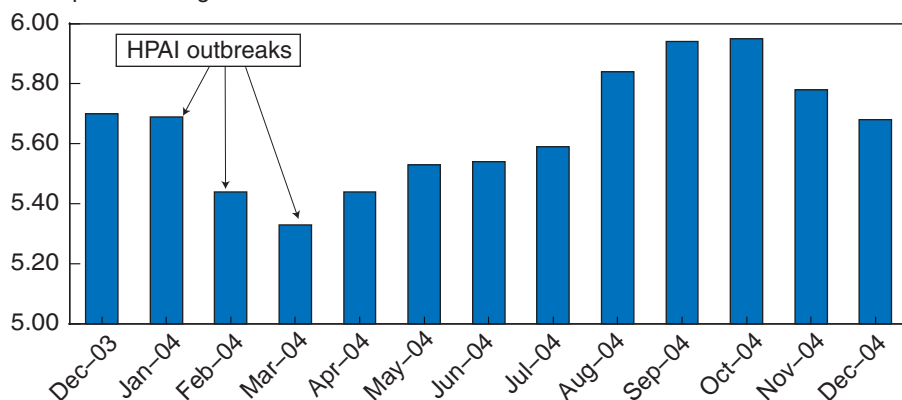
Likewise, in Japan, broiler wholesale leg prices decreased 28 percent from 657 yen in December 2003 to 473 yen per kilogram in March 2004, rose and dropped again, reflecting prices in global markets. Japan depends largely on foreign exports to cover domestic consumption (Government of Japan, 2006). In addition, Japan's traditional suppliers, China and Thailand, still could not export uncooked poultry, leaving Brazil, U.S., and EU-25 exports available, but at higher prices. In June 2004, Japan lifted the ban on U.S. imports, which resulted in Japan's domestic market prices' stabilizing to pre-outbreak levels in exactly 1 year (fig. 14) (European Commission, 2006).

In Thailand, broiler retail prices reached a bottom in February 2004, started

Figure 13

**Broiler retail prices in China, December 2003 to December 2004**

Yuan per half-kilogram

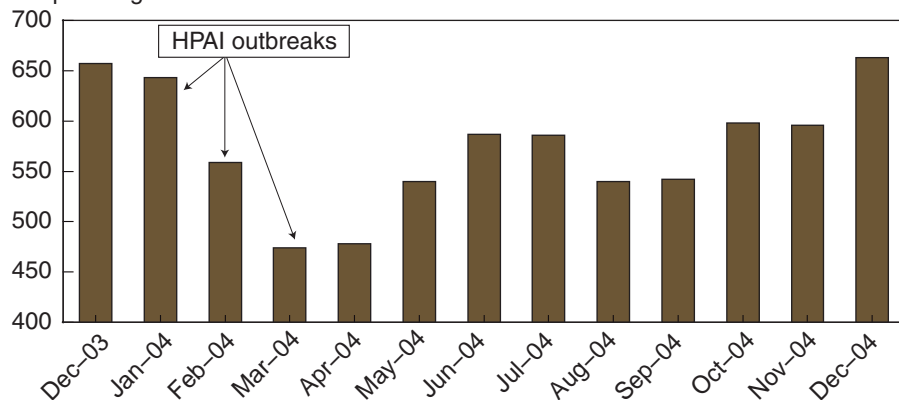


Source: China National Development and Reform Commission, July 2006.

Figure 14

**Broiler thigh wholesale prices, Tokyo, December 2003 to December 2004**

Yen per kilogram

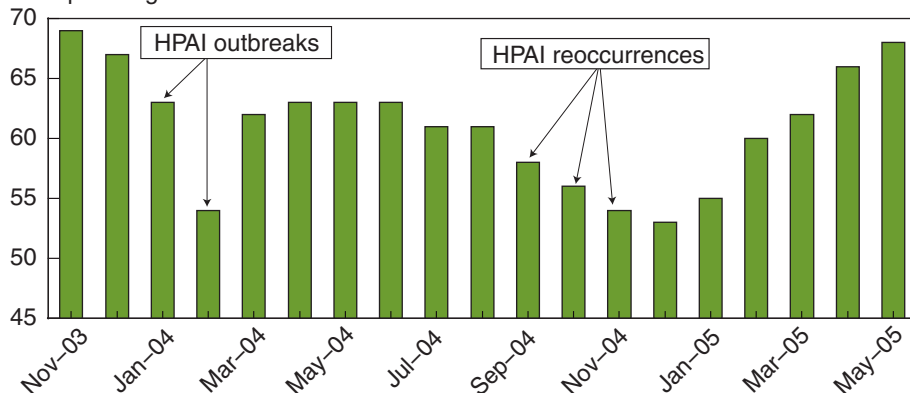


Source: Monthly Statistics of Agriculture Forestry & Fisheries, Government of Japan, Tokyo, March 2006.

Figure 15

**Retail prices for skinless boneless broiler meat in Bangkok, November 2003 to May 2005**

Baht per kilogram



Source: USDA GAIN Report No. TH5011, February 1, 2005; and Gain Report No. TH5092.

to rebound in March, but dropped again, due to new HPAI H5N1 outbreaks recorded in mid-year (fig. 15) (USDA, FAS, September, 2005). As a result, prices took more than a year to return to pre-outbreak levels.

A similar price pattern has surfaced in Europe since late 2005. Figure 16 shows price movements in France, Italy, and Greece immediately before and after the HPAI outbreaks. Prices stayed lower for a few months and then rose to the pre-outbreak levels (European Commission, 2006).

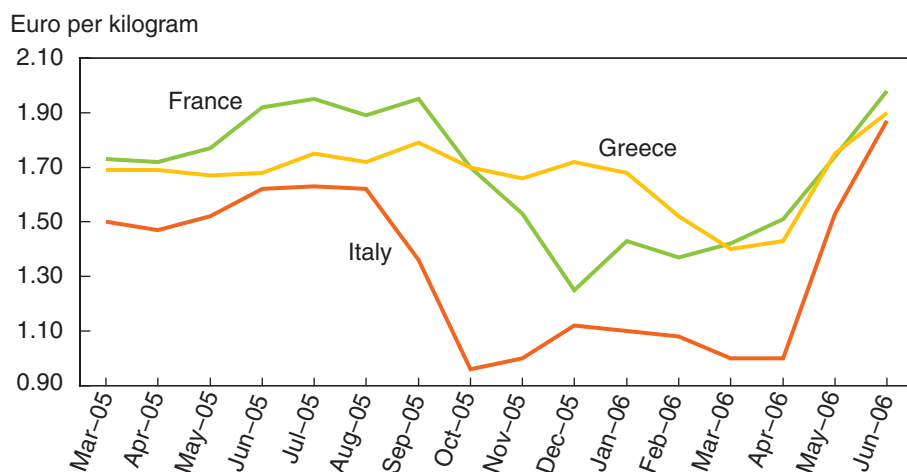
## Outbreaks' Impact on International Export Prices Was Temporary

Export prices of poultry meat followed a pattern similar to that observed in domestic markets—they initially dropped sharply due to consumer fears, overshot pre-outbreak levels as supplies declined, and returned to pre-outbreak levels as markets reacted to increases in production. That cycle usually takes several months. Demand for poultry starts to increase as consumers become more educated about the disease. Education about two facts was especially important in restoring consumer demand for poultry: cooking poultry at 165 degrees Fahrenheit will kill the virus, and only close and sustained exposure to infected live or dead birds or products such as shell eggs, feather, viscera, etc., can cause human infection (OIE, October 2005; Swayne, 2006).

China's export prices of whole frozen chicken (HS 020712) declined 16.7 percent from \$1,366 per ton in December 2003 to \$1,138 in February 2004, rebounding by 63 percent in March 2004, when China was declared free of HPAI (Agra-Europe, May 7, 2004).<sup>3</sup> China's prices were as high as \$1,843 per ton in May, but dropped to \$1,403 per ton in June 2004, exactly when Japan restarted chicken imports from the United States (Agra-Europe, June 11, 2004). As a result, China's prices declined to their pre-outbreaks prices in July 2004. Thailand's prices for the same category were last reported at \$2,077 per ton in December 2003, but were not reported for all of 2004, as

<sup>3</sup>Export prices were derived from Global Trade Atlas (GTA) and defined as a monthly average unit value, reflecting unit price per metric ton on the border or at a national port (free-on-board, or FOB). FOB includes the price of the goods, transportation of the goods to the port of shipment, plus loading costs.

Figure 16  
Poultry prices in HPAI infected European countries, May 2005 to June 2006



Source: European Commission.

the country ceased exports of whole frozen chicken and changed to exports of more lucrative chicken parts (World Trade Atlas, 2007).

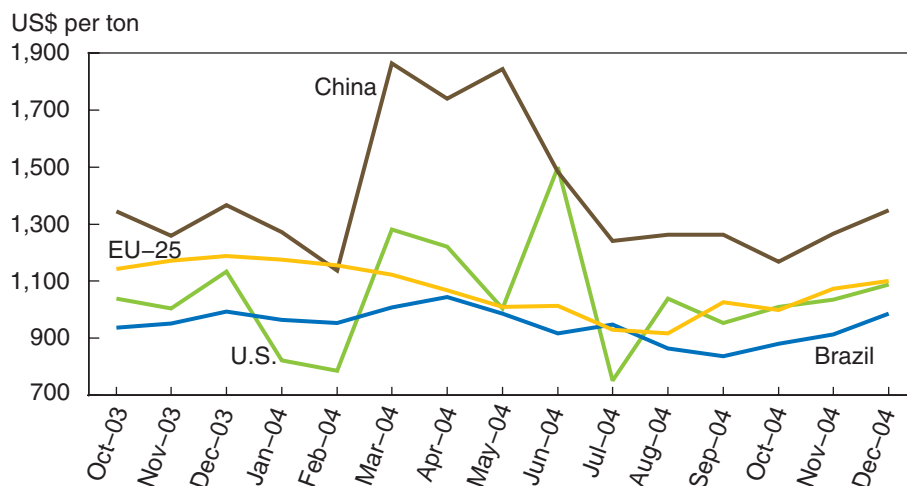
Declines in poultry export prices were reported in noninfected major exporting countries, such as the United States and Brazil, as import demand declined worldwide due to consumer fears of eating poultry (fig. 17). U.S. export prices decreased 31 percent from December 2003 to February 2004, when Japan imposed an import ban on U.S. poultry after the outbreak of a less dangerous HPAI variant in poultry flocks in Texas, and LPAI outbreaks in poultry flocks in Connecticut, Rhode Island, New Jersey, Maryland, and Delaware. However, U.S. prices rebounded strongly to \$1,499 per ton in June 2004, when Japan restarted imports from most U.S. States. Toward year's end, U.S. export prices dropped to the pre-outbreak level, due to rising competition from other exporters.

Brazilian export prices declined 4 percent between December 2003 and February 2004, rose slightly in March and April 2004, then declined to the pre-HPAI level toward year's end. EU-25 prices behaved similarly to Brazil's during December 2003-December 2004 (fig. 17).

Following HPAI outbreaks in Europe in late 2005, world poultry prices fluctuated in a way similar to Asian prices. French poultry export prices (France is the EU-25's largest exporter) dropped 36 percent over a 4-month period ending in March 2006. Brazil's export prices in May 2006 were 27 percent lower than in December 2005, due to consumer fears in importing countries and import bans imposed following outbreaks of Newcastle disease later in 2006.

Figure 17

**Export prices of frozen whole chicken (HS 020712),  
October 2003 to December 2004**



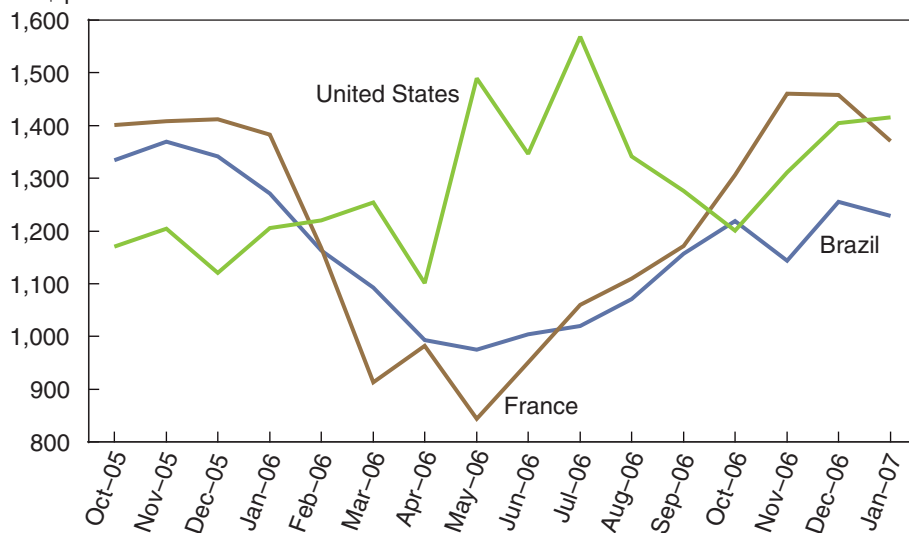
Source: Global Trade Atlas.

Consequently, in July 2006, U.S. whole frozen chicken sold at a 40 percent premium over December 2005 prices because the United States was the only major disease-free exporter of uncooked poultry meats (fig. 18).

Figure 18

**Export price of whole frozen chicken (HS 020712),  
October 2005 to January 2007**

US\$ per ton



Source: Global Trade Atlas.



## Conclusions and Implications

The virulent HPAI H5N1 virus spread across much of Asia starting in late 2003, then spread to Russia and Central Europe, the Middle East, Africa, and Western Europe. It had severe impacts on the global poultry industry, even in those countries not infected with the virus.

Consumer fears adversely affected poultry consumption, leading to lower domestic prices, decreased production, lower feed industry sales downstream, and to lower global poultry meat exports. Initially, major importers banned cooked and uncooked poultry meat shipped from HPAI H5N1-infected countries. Later, those countries allowed only poultry meat imports subjected to heat treatments that killed the virus, acknowledging that the main risks to humans arise when humans have prolonged direct contact with infected birds or their products.

The impact of the HPAI was perhaps more direct and severe in East and Southeast Asia, Central Europe, the Middle East, and Africa, where the virulent virus caused the death or culling of several million birds. These regions' high casualty rates were due to the large proportion of poultry raised in small, backyard, unprotected flocks in rural areas. In Western Europe, most commercial production is in temperature-controlled enclosures. Yet, a considerable number of outdoor and free-range operations also exist in Western Europe, motivated by consumers' willingness to pay higher prices for birds raised in these environments. Western Europe's free-range operations resemble the backyard operations of Asia, the Middle East, and Africa in their exposure to wild birds, and if it were not for growers' alertness and governments' extreme cautiousness, larger losses would have occurred in the European Union. For example, Germany imposed a ban on outdoor poultry production in October 2005, even before the first case was found on the German Baltic island of Ruegen in February 2006. France imposed a similar ban in February 2006, affecting many growers who previously were motivated by the extra bonus for poultry grown with the "raised outdoors" label "Poulet de Bresse."

Analysis of the HPAI impact on global markets of poultry meats indicates that trade went through two stages due to the virus outbreaks. The first stage was a decline in import demand for both uncooked and cooked poultry meats, due to consumers' fear of contracting avian influenza by eating poultry meat. This was, however, a short-lived phenomenon that temporarily reduced consumption, prices, and production.

After bans on fresh and frozen uncooked poultry exports in early 2004, Thailand and China rapidly increased production of cooked poultry, taking advantage of comparatively low labor costs. Brazil also realized gains from cooked poultry exports from 2004 until the EU imposition of quotas and high tariffs on cooked chicken and turkey in November 2006. The market was lucrative, adding substantial revenue through sales of value-added products, partially replacing uncooked poultry sales.

Thus, the second stage of the impact of HPAI H5N1 outbreaks affected poultry producers in uninfected countries by opening new trade opportunities in global poultry markets. Export opportunities for uncooked poultry arose in countries that had banned imports from their traditional suppliers. For example, Japan, the world's second largest importer, was able to switch its uncooked poultry imports from traditional suppliers, such as Thailand and China, to the United States and Brazil.

HPAI H5N1 effects increased cooked poultry exports as a share of total poultry global exports in response to consumer demand for safe poultry meat. Cooked poultry exports provided a cushion for the poultry industry in late 2005, when the uncooked poultry export market declined substantially. The cooked poultry market proved to be a stabilizing factor for the world poultry market. Without the rise in cooked poultry exports, the global market could have experienced greater losses, particularly during the first half of 2006.

Observations of the effects of HPAI H5N1 on the poultry industry around the world suggest some implications for U.S. poultry in particular:

- The U.S. Department of Agriculture (USDA) maintains trade restrictions on the importation of poultry and poultry products originating from countries and/or regions where the HPAI H5N1 strain has been detected in commercial or traditionally raised flocks. USDA regulations require that import permits accompany properly sanitized poultry products, such as raw feathers. Additionally, USDA has increased its monitoring for illegally smuggled poultry and poultry products through an anti-smuggling program in coordination with the U.S. Department of Homeland Security's Customs and Border Protection office.
- HPAI H5N1 infections in commercial poultry production in the United States may be less likely than in some other countries because most U.S. commercial production is in temperature-controlled enclosures that protect flocks from contact with wild birds. U.S. producers can take additional precautions to further reduce the likelihood of wild-bird contact, through association or droppings, with their poultry flocks.
- When HPAI H5N1 outbreaks have occurred, domestic production generally declines sharply and then returns to pre-outbreak levels in less than a year, depending on the extent and scope of the outbreak, the time required to contain it, and the time required to recover uncooked poultry meat exports. Recovering or expanding export markets (for example, expanding markets for cooked meats) would help support prices, encouraging domestic producers to rebuild flocks.
- Demand for U.S. poultry has increased following infections in competing exporters, offering opportunities for rising U.S. exports. There is a lucrative global market for cooked poultry in particular, which is priced much higher than uncooked poultry.

The experiences of other countries affected by outbreaks often follow a pattern of initial declines in poultry consumption as consumers fear contagion, followed by recovering consumption after a few months as consumers gain confidence (USDA GAIN Reports, 2004-2006). The time lag occurs because consumers are often unaware of many relevant facts about HPAI H5N1 virus and food safety in the initial stages of an outbreak. However, media coverage and consumer education have allayed consumers' fears and enticed them to revive poultry meat consumption (USDA, GAIN Report, 2006).

## References

- Agra-Europe AE2199, March 31, 2006. <http://www.agra-net.com/portal/>
- Agra-Europe AE2196, February 24, 2006. <http://www.agra-net.com/portal/>
- Agra-Europe AE2194, February 10, 2006. <http://www.agra-net.com/portal/>
- Agra-Europe, AE2109, June 11, 2004. <http://www.agra-net.com/portal/>
- Agra-Europe AE2104, May 7, 2004. <http://www.agra-net.com/portal/>
- China National Development and Reform Commission, China Price Information Network, July 2006. <http://www.chinaprice.gov.cn>
- Euromonitor 2006. <http://www.euromonitor.com/>
- European Commission, European Union, Agriculture and Rural Development web page. Accessed October 2006. [http://ec.europa.eu/agriculture/publi/prices/index\\_en.htm](http://ec.europa.eu/agriculture/publi/prices/index_en.htm)
- European Commission, European Union, *Food Safety—From the Farm to the Fork* web page, Animal Diseases: Avian Influenza. Accessed November 2006. [http://ec.europa.eu/food/animal/diseases/controlmeasures/avian/index\\_en.htm](http://ec.europa.eu/food/animal/diseases/controlmeasures/avian/index_en.htm)
- Global Trade Atlas, May 2007. <http://www.gtis.com/gta/usda/>
- Government of Japan, Ministry of Agriculture, Forestry, and Fisheries, *Monthly Statistics of Agriculture, Forestry, and Fisheries*, Tokyo, March 2006, and previous issues.
- International Livestock Research Institute, *Livestock in the News* web page. Accessed August 9, 2006. <http://www.ilri.org/ilripubaware/ShowDetail.asp?CategoryID=NEWS&ProductReference>
- Martin, V., A. Forman, and J. Lubroth, *Preparing for Highly Pathogenic Avian Influenza*, United Nations, Food and Agriculture Organization, 2006. [http://www.fao.org/docs/eims/upload/200354/HPAI\\_manual\\_en.pdf](http://www.fao.org/docs/eims/upload/200354/HPAI_manual_en.pdf)
- OIE (World Organization for Animal Health), update on avian influenza in animals (type H5). Accessed October 26, 2006. [http://www.oie.int/downld/AVIAN%20INFLUENZA/A\\_AI-Asia.htm](http://www.oie.int/downld/AVIAN%20INFLUENZA/A_AI-Asia.htm)
- OIE (World Organization for Animal Health), *Disease Information*, Vol. 19, No. 33, August 17, 2006. [http://www.oie.int/eng/info/hebdo/AIS\\_05.HTM](http://www.oie.int/eng/info/hebdo/AIS_05.HTM)
- OIE (World Organization for Animal Health), avian influenza web page. Accessed October 2005. [http://www.oie.int/eng/info/en\\_influenza.htm](http://www.oie.int/eng/info/en_influenza.htm)

- Organization for Economic Cooperation and Development (OECD) website. Accessed August 22, 2007.
- Otte, M.J., Nugent, R. and McLeod, A. *Transboundary Animal Diseases: Assessment of Socio-Economic Impacts and Institutional Responses*. UN/FAO, Livestock Information and Policy Branch, AGAL, February 2004.
- Swayne, David, "Microassay for Measuring Thermal Inactivation of H5N1 High Pathogenicity Avian Influenza Virus in Naturally Infected Chicken Meat," *International Journal of Food Technology* 108, 2006, pp. 268-71. <http://www.elsevier.com/locate/ijfoodmicro>
- United Kingdom Department for Environment, Food, and Rural Affairs (Defra), Avian influenza outbreak update, February 2007. <http://www.defra.gov.uk/news/2007/070212a.htm>
- United Nations, Food and Agriculture Organization, *Animal Health Special Report: Avian Influenza–Disease Card*, October 31, 2006. <http://www.fao.org/ag/againfo/subjects/en/health/diseases-cards/avian.html>
- United Nations, Food and Agriculture Organization, *FAOAIDE News*, Avian Influenza Disease Emergency Situation Update 47, July 31, 2007. [http://www.fao.org/docs/eims/upload//231580/AIDENews\\_aug07\\_no47.pdf](http://www.fao.org/docs/eims/upload//231580/AIDENews_aug07_no47.pdf)
- United Nations, Food and Agriculture Organization, *Food Outlook: Global Market Analysis*, No. 1, June 2006. <http://www.fao.org/docrep/009/j8126e/j8126e10.htm>
- United Nations Trade Statistics August 2007. <http://fastnet.usda.gov/untrdscripts/unmain.exe>
- U.S. Department of Agriculture, Foreign Agricultural Service, Global Agriculture Information Network (GAIN) Report No. E47009, Washington, DC, January 30, 2007.
- U.S. Department of Agriculture, Foreign Agricultural Service, Global Agriculture Information Network (GAIN): BR6623, August 30, 2006.
- U.S. Department of Agriculture, Foreign Agricultural Service, Global Agriculture Information Network (GAIN) Report No. TH5092, Washington, DC, September 14, 2005.
- U.S. Department of Agriculture, Foreign Agricultural Service, Global Agriculture Information Network (GAIN) Report No. TH5011, Washington, DC, February 2, 2005.
- U.S. Department of Agriculture, Foreign Agricultural Service, *Livestock and Poultry: World Markets and Trade*, Circular Series DL&P 1-07, Washington, DC, April 2007. Available at: [http://www.fas.usda.gov/dlp/circular/2007/livestock\\_poultry\\_04-2007.pdf](http://www.fas.usda.gov/dlp/circular/2007/livestock_poultry_04-2007.pdf)

U.S. Department of Agriculture, Foreign Agricultural Service, *U.S. Trade Exports, 10-Digit Codes in Detail*. Accessed on August 22, 2007. <http://www.fas.usda.gov/USTrade/ustlists/ExCmdty.asp?QI=&Type=3&code=160232>

U.S. Department of Commerce, U.S. Census Bureau, exports and imports web page. Accessed August 22, 2007. <http://www.census.gov/foreign-trade/faq/sb/sb0008.html/>

U.S. International Trade Commission, Harmonized Tariff Schedule web page. Accessed August 22, 2007). <http://www.usitc.gov/tata/index.htm>

World Trade Atlas, Internet Edition, Global Trade Information Service, May 2007.