

Technical Barriers in the Global Poultry Market:

A Search for “Missing Trade”

*Tim Josling, David Orden and Donna Roberts**

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* Timothy Josling is Professor and Senior Fellow, Institute for International Studies, Stanford University; David Orden is Professor, Department of Agricultural and Applied Economics, Virginia Tech; and Donna Roberts is Senior Economist, Economic Research Service, USDA. The views expressed in this paper are not to be attributed to any of the institutions with which the authors are affiliated.

Abstract

Global trade in poultry products has expanded greatly in recent years. But technical regulations ostensibly designed to protect human and avian health remain potentially important determinants of trade patterns. This paper attempts to evaluate the impact of such barriers on trade volumes and trade patterns, in effect a search for “missing” trade discouraged by those restrictions. Many if not most of the technical barriers have “sound” scientific bases and could not be removed without threatening production systems and food safety. But protection of domestic producers still exists in several markets, and even where regulations have a scientific basis there may be less trade distorting ways of approaching some of these potential health problems. The experience in world poultry trade points out some interesting aspects of the complex issue of regulating for safety in a global market.

I. Introduction

The poultry market is a success story. It has been one of the most rapidly growing sectors of the food industry in the past two decades. World poultry production has risen from 11 million tons in 1965 to over 63 million tons in 1999. Trade has more than kept pace with this increase in production, with world exports of poultry meat rising from 375 thousand tons in 1965 to 6.4 million tons in 1999. Consumption increases have far exceeded population growth: world per capita supplies of poultry meat have tripled from 3.3 kgs in 1965 to 9.9 kgs in 1997, a period of a dozen years. Poultry has overtaken beef in the market for meat, with a share of 29 percent of total meat consumption.

This paper considers one aspect of the global poultry market, the influence of sanitary regulations on trade flows. Poultry flocks, particularly when they are kept in intensive production facilities, are highly susceptible to disease. These diseases can spread rapidly across borders with trade, and most countries regulate such trade from countries known to harbor those diseases. Microbial contamination of poultry for human consumption is also a serious problem in the sector, as with other meats, and is universally addressed by health and safety regulations in importing countries. Thus poultry trade is regulated both for production and consumption externalities. To add to the list of regulatory issues, intensive poultry production can cause local environmental problems through pollution of groundwater, and the conditions under which chickens are kept have been the target of criticism by animal welfare advocates for many years. This heady mix of national regulations can obviously have an important impact on trade.

This paper reports on the results of a study underway by the authors on the implications of sanitary barriers in the world poultry market. A preliminary paper was presented to the IATRC Symposium in Montreal in June 2000 (Orden, Josling and Roberts, 2000). That paper contained details of international poultry trade flows, a discussion of poultry disease and human health issues and an examination of the many complaints that have been raised in the WTO's SPS Committee relating to poultry regulations. It also reported on the results of a trade model designed to quantify the impact of SPS barriers in poultry

trade.¹ The material in that paper will not be reproduced here except as necessary to give the background for the conclusions.

The object of this present paper is to try to place poultry trade SPS issues in the context of the broader set of variables that influence trade flows in poultry products and the wider set of issues in the SPS area. Most countries do not export poultry, though many have modern poultry facilities. Several countries do not import significant amounts of poultry, even though it is a cheap source of protein. In other cases the consumption levels are below that which might be expected on the basis of income. Given the strong growth in demand and the relative ease of setting up poultry facilities (and indeed the ubiquity of traditional poultry in agricultural systems) one might expect exports to be more widely dispersed. On the import side, one might expect SPS regulations to supplement traditional trade barriers to reflect domestic pressures for protection in cases where imports increase. This is the essence of the “search for missing trade”.² A major part of the explanation for export concentration lies in economies of scale and plant size and in the availability of feed, but disease conditions and sanitary standards in exporting countries play a role. In import markets, traditional trade barriers are undoubtedly important. But regulations and health considerations arguably also play a key role in determining trade patterns. This paper examines this proposition in the light of the observed trade flows, the experience of the SPS Committee and the results from the model presented in the earlier paper (Orden, Josling and Roberts, 2000). In doing so, it is hoped that light will be shed on similar situations in other livestock markets.

The paper starts with a brief overview of market conditions in the global poultry sector. This is followed by a discussion of the SPS issues that seem to be the most significant in determining trade flows. The search for “missing” trade entails a discussion of four aspects of the poultry market, the evidence of trade barrier challenges in the survey

¹ A shorter version of that paper will appear in the proceedings volume, emphasizing the model results (Orden, Josling and Roberts, 2001).

² The analogy is with the efforts by empirical trade economists to calculate gains from trade by simulating frictionless trade outcomes and comparing these with actual observed trade flows. (See for example the Theme Day papers from the IATRC New Orleans meeting, December 1999).

literature, the prevalence and nature of the disputes that have surfaced in the SPS Committee of the WTO; the linkage between SPS regulations and traditional trade barriers; and the importance of arbitrage and bilateral trade restrictions in the poultry market. This is followed by some tentative conclusions on the nature of trade conflicts in this market and the relevance for other sectors and for future trade policy discussions.

II. Market Overview

World production of poultry has increased rapidly in the last few years, as has trade in poultry meat (see Table 1). The dramatic growth in the poultry sector in the past twenty years is both demand- and supply-driven. Income and price elasticities of demand are relatively high for foodstuffs. Income growth, particularly in Asia until 1997, has spurred consumption. Real prices have been declining relative to red meats, stimulating a further expansion of market demand. Tastes have also shifted over time, as health fears have contributed to a switch away from red meats in the developed world. Developing country consumers have responded to the ready availability of chicken, both in local markets and in urban food stores. For many it is the most affordable form of animal protein to supplement a diet of vegetable starches such as cereals, beans or root crops. The combination of these factors has led to a significant increase in demand both in those countries that are growing rapidly and in more mature economies. The share of poultry in total meat consumption has risen from 20 percent in 1985 to 29 percent in 1998 and now exceeds that of beef.

Production

Supply factors have reinforced this expansion in demand, keeping the price of poultry products relatively stable and affordable. Productivity gains in the production and processing of poultry have been matched by dramatic changes in the distribution system. Traditional market channels have met a share of the additional demand, but the most significant shift has been in amount absorbed by modern distribution and retailing methods. The growth of both supermarkets and fast food retail outlets has had a major impact on poultry sales. This has increasingly led to the “globalization” of the sector, as both supermarkets and fast food chains are often foreign-owned enterprises. Thus foreign

direct investment (FDI) has also been a significant factor in the growth of the poultry business. This has in turn influenced the pattern of trade, the politics of trade barriers and the operation of SPS regulations.

Table 1: World Production of and Trade in Poultry Meat, 1965-1998

Year	Production (000 mt)	Trade (Exports) (000 mt)
1965	10955	375
1970	15084	518
1975	18672	731
1980	25998	1519
1985	31183	1641
1990	40858	2631
1995	53779	5656
1999	63700	6400
Source: FAOSTAT and USDA		

The changes in the distribution and retail functions have been matched by rapid change in the method of production of poultry meat. The production structure in the US, Europe, Thailand and Brazil, as well as many other areas, has become highly concentrated, with a few large concerns producing a high proportion of the poultry for a particular market. These “integrated” operations are highly sophisticated and use advanced management techniques as well as scientifically up-to-date technology.³ They can often be located close to urban areas, simplifying the distribution network, though access to feed sources and to water supplies are important in the choice of location. These integrated poultry operations also operate across borders in many cases, representing another aspect of the “globalization” of the food sector. Traditional, small-scale poultry production still exists

³ Though commonly referred to as integrated, ownership of the various stages is often distinct. The integration is most apparent in the contractual links and the tight control of production and processing technology, quality and health standards and marketing functions.

side-by-side with the modern industry. It is prevalent in developing countries, but it has largely disappeared in industrial countries.

Consumption

Consumption of poultry meat is not uniformly high in all countries. The highest consumption is in Hong Kong (overstated by the shipments that go through Hong Kong to other parts of China) and the US, both above 40 kgs per year. Israel, Saudi Arabia and Singapore each have very significant consumption per head, averaging over 30 kgs per year. At the other end of the range Poland, Russia and China have less than a third of that level of consumption.⁴ In some cases this difference is a function of income, in others it reflects domestic prices of poultry compared to other meats, influenced both by traditional trade barriers and restrictive import regulations. The “search for missing trade” mentioned above is in part the identification of those situations where consumption is restricted by regulations on imports, of a tariff or non-tariff nature.

One country that has both a high income and a low per capita consumption is Germany. Poultry consumption of less than 14 kg per person is about the same as in Mexico which has an income only one sixth the level. Consumption in Japan is similar to that in Germany, though it has been rising rather faster in recent years. Hungary and Bulgaria have levels of poultry consumption greater than that of France and Italy. Do the low levels of consumption reflect non-tariff trade barriers? This seems somewhat unlikely in these two cases: Germany has broadly the same internal regulations as other EU members, though small national differences exist. Japan is one of the largest markets for poultry imports and has deliberately pursued a policy of investment in Thailand, Brazil and more recently China as a way of securing imports of poultry suited to the domestic market.

⁴ China’s consumption of just 3 kg per year per person may reflect inadequate statistical information, as may the low figure of 1kg per person for India.

Trade

Trade in poultry has expanded at about 6 percent a year over the past decade, a rate slightly faster than that of production (5 percent over the same period), implying continued international specialization. Poultry trade has reached 10 percent of production. International poultry trade has been in breeding stock, young chicks, fresh and frozen poultry meat and processed poultry products. Poultry meat is increasingly traded as poultry parts rather than as whole birds, and is generally frozen. Though most poultry meat trade is in broilers and broiler meat, turkeys and turkey parts are important traded products. Other poultry products with more limited markets include goose, duck and ostrich meat. Trade in other avian species, such as tropical birds, though statistically small can have an important impact on the spread of poultry diseases.⁵

Much of the increase in poultry exports has been from a few countries, notably the US. The EU and Brazil have also expanded exports in recent years. Exports from the US, the EU, China, Brazil and Hong Kong account for about 90 percent of all trade. This remarkable concentration has important implications for trade policy and for the regulation of the spread of disease. Imports have expanded in many countries in recent years, and the largest individual markets are China and Hong Kong, Russia, Egypt and Saudi Arabia.

US poultry exports go to Russia and to Hong Kong, with Mexico the third most important destination.⁶ Hong Kong, in turn, exports to China – both as re-exports of imported product and as a profitable outlet for exports of domestic production. Both Brazil and the EU export to Hong Kong, also predominantly for re-export to China. Brazil, however, also exports to Saudi Arabia, Japan and Argentina whilst the EU exports to Russia as well as to Saudi Arabia and other Mid-East markets. China itself exports to Asian markets such as Hong Kong, Japan and Korea.

⁵ Chickens can also be used for various forms of entertainment, often illegally, creating difficulties for regulatory authorities. Some part of poultry trade thus goes unrecorded or mislabeled.

⁶ See Annex Table for detail on trade flows.

Of the importing countries, Russia buys most of its poultry from the US, with considerably smaller quantities from Europe. China also buys most of its poultry from the US, but purchases major quantities from Brazil and lesser amounts from other countries, including the EU. The US is also the leading supplier of poultry to Hong Kong. By contrast, Japan buys more from China and Thailand and significant quantities from Brazil. Saudi Arabia, one of the main markets in the Mid-East, gets most of its poultry imports from Brazil and the EU (France), and relatively little from the US.

Exports of poultry and products are remarkably concentrated, in particular in the light of the fact that most countries have, or could easily acquire, a poultry industry. Meeting quality standards and delivery schedules requires considerable investments. A ready supply of feed grains as well as access to veterinary supplies and processing facilities is necessary for an effective export sector. The US, Brazil, Thailand and the EU (specifically France, the Netherlands and the UK) have such facilities, as increasingly does China. Many other countries are hampered by inadequate domestic infrastructure and quality control that would be needed to develop an export industry. Focussing on the four largest exporters seems a reasonable way to characterize the market. Nevertheless, if import demand continues to rise one would expect to see more countries emerging as exporters.

Although imports are somewhat less concentrated than exports, they are still dominated by a few countries. A large number of countries buy some poultry products in world markets, but the number of significant markets is small. Both the US and Brazil, in particular, sell into a large number of countries, but their exports to Russia, China and Japan are still the most significant determinants of the health of their industries.⁷ Of these markets, Russia tends to take low-priced poultry parts (chicken leg quarters) and Japan imports white meat, de-boned and prepared poultry products. China imports a range of products including wings and feet, boneless turkey thighs and drumsticks, and (increasingly) chicken leg quarters.

⁷ Exports to Russia often go through Latvia (and also Poland), suggesting that direct trade to Russia understates the true purchases of poultry from world markets.

III. Health and Safety Issues in the Poultry Sector

Health problems abound in the poultry industry that are generally contained by strict controls both domestically and at the border. These health issues are broadly categorized into avian and human health problems, though in a few instances there is some overlap where avian diseases have a close tie to human conditions (zoonoses). Environmental and animal welfare issues have not yet become significant in trade policy terms and are discussed in the final section.

Avian Health

The conditions of modern poultry production, which involves keeping large numbers of birds in close proximity, encourage the spread of disease through flocks. Highly infectious avian diseases such as Exotic Newcastle Disease (END) and Avian Influenza (AI) are a perpetual problem for intensive poultry production, and can cause acute financial distress. This has led to a variety of veterinary inspection, eradication and certification programs in the attempt to prevent spread of these diseases. The International Office of Epizootics (OIE) has categorized END and AI as “List A” diseases that must be reported (see Table 2). International coordination of the response to outbreaks of these diseases is an attempt to inhibit the spread of infectious diseases across borders and to encourage energetic eradication measures by exporters. However, these diseases are endemic within many countries, and control is imperfect.

Another set of diseases is economically important in the industry but do not have the same tendency to spread among flocks. These diseases are on the OIE “List B”, and include Marek’s Disease and Gumboro. Control of these diseases through vaccination or management practices is usually possible, and adds to the cost but does not interfere with international trade.

The prevalence of certain diseases has led to the segregation by importers of supplies by country of origin. The US, for instance, has strict rules on which countries can export poultry products to its market. Only twelve countries are deemed by the USDA’s Animal

and Plant Health Inspection Service (APHIS) to be free of END.⁸ Imports of poultry products from other countries are not allowed to enter the US. None of the END-free countries is a major exporter of poultry products.⁹ In addition, FSIS recognizes five countries as meeting HAACP requirements for poultry products.¹⁰

A recent outbreak of Avian Influenza in Italy illustrates the procedures taken by national authorities to prevent the spread of disease. Between December 17, 1999 and March 31, 2000, a total of 411 outbreaks of Highly Pathogenic AI had been reported and 13.7 million birds (mostly broilers and breeding turkeys) had been destroyed. No new outbreaks had been reported in the last week of March, implying an effective response to the crisis (IEPR, April 18, 2000).

Consumer Health

Consumer health issues are also a concern in the poultry industry. Raw poultry meat, in common with other meats, is a potent source of microbacterial contamination in the human food chain. The main contaminants are *E. coli* and *Salmonella enteritidis*. Less common bacteria are *Campylobacter* and *Listeria* (see Table 3). Health authorities regularly warn consumers of the need to cook poultry to a high temperature (160 degrees F) and to keep separate the utensils used for raw poultry. Despite the warnings, food poisoning cases are still fairly common, though poultry is by no means the only source of such problems.

⁸ The twelve countries include Australia, Canada, Chile, Costa Rica, Denmark, Fiji, Finland, Iceland, New Zealand, Sweden and Switzerland.

⁹ APHIS does not rely on OIE information when making regulatory decisions, because the disease status of each country is “self-declared” and U.S. authorities are skeptical of some of the claims.

¹⁰ These five countries are Canada, France, Great Britain, Hong Kong and Israel.

Table 2: OIE Classification of Poultry diseases that affect chickens

Disease	List	OIE Code Chapter
Highly pathogenic avian influenza (HPAI)	List A	2.1.14
Newcastle disease	List A	2.1.15
Infectious bursal disease (Gumboro disease)	List B	3.6.1
Marek's disease	List B	3.6.2
Mycoplasmosis (<i>M. gallisepticum</i>)	List B	3.6.3
Psittacosis/ornithosis	List B	3.6.4
Pullorum and Fowl typhoid	List B	3.6.5
Avian infectious bronchitis	List B	3.6.6
Avian infectious laryngotracheitis	List B	3.6.7
Avian tuberculosis	List B	3.6.8
Fowl cholera (avian pasteurellosis)	List B	3.6.11
Salmonella enteritidis and Salmonella typhimurium in poultry	List B	3.6.12

Source: USDA

In some limited cases, avian disease can lead to human health problems. An example of such zoonotic transmission is avian flu, in which some strains can affect humans, and Newcastle disease, which can cause mild conjunctivitis in people. Though Salmonella is also a common cause of infection in poultry, the strain that causes human health problems is not the same as that which attacks chicken.

More controversial than the prevalence of food-borne bacterial illnesses is the concern over the impact of the use of hormones and antibiotics in animal feed on human health. The source of these health issues has to do with the widespread use of antibiotics as growth promoters in poultry rations. There is concern in some countries that bacterial resistance to such antibiotics could eventually lead to resistance to medical treatments of human bacterial infection.

Table 3: Common Bacteria that can cause Food-borne Illnesses

Salmonella enteritidis is one of about 2,000 strains of this bacteria. It is often associated with poultry and eggs, but it is found widely in the intestinal tracts of warm-blooded animals.

Staphylococcus aureus is associated with unhygienic food handling and preparation of chicken (and other) products.

Campylobacter jejuni is a common bacteria associated with inadequate biosecurity in food preparation.

Listeria monocytogenes is a newcomer to the list of food borne organisms that cause human illness. It is also associated with poor biosecurity and inadequate cooking temperatures.

IV. Do SPS Regulations Impede Trade?

In this section we take four complementary approaches to the question as to whether SPS regulations impede poultry trade. The first approach is to look at the evidence in the literature on the prevalence of non-tariff barriers in poultry. One step beyond this is to what governments object to about the regulations of other countries in the structured context of the WTO SPS Committee. One assumes that these two sources of information are related, in that government protests reflect the commercial interest of exporting (or in some cases importing) firms, as well as objections lodged on matters of principle and general trade policy. The third second of enquiry is to consider the link between traditional trade barriers, tariffs and quotas, and the SPS regulations that complement them. Though a detailed study of the linkages is not attempted here, some initial conclusions can be drawn as to whether the two are related. The final part of the argument is to examine bilateral trade restrictions and consider the extent to which arbitrage can or might offset the trade impact of a bilateral trade ban. A final section brings together the four parts of the argument.

Questionable Barriers to US Exports

Few surveys exist on these “questionable” trade barriers. However some evidence for the prevalence of SPS-type trade barriers against exports of US poultry products is given in Roberts and Reemer (1997). The trade barriers in the study illustrate three different situations:

- Differences in interpretation of current scientific knowledge regarding hazards;
- National regulations which are more strict than international rules;
- Import regulations that are stricter than those which apply to domestic production.

One major case of interpretative differences among experts is the question of whether imports of poultry meat should be banned from countries with endemic AI. The US contends that AI can only be spread through the importation of live birds, and that those countries such as Australia, New Zealand, Ecuador and Venezuela that ban US poultry meat imports are imposing an unnecessary barrier to trade. However, there is opposition from within these countries to the lifting of the ban on poultry meat, some of which might reflect economic rather than animal health reasons.

The second category of disputes is those that arise when a country identifies hazards that are not generally recognized (i.e. are not built into the international standards of the OIE or CODEX). Examples include the French policy to ban certain feed additives over and above the restrictions in CODEX (and in the EU), the concern by Latvia about vesicular stomatitis, the policies of Azerbaijan on the presence of hormones. The third category of disputes is that in which the national regulations are apparently more restrictive than those applied locally. The disease may be widespread at home but provide a rationale for testing or banning imports. Examples of this type of conflict are the policies of El Salvador, Finland, Honduras and Sweden that restrict imports on the grounds of keeping out diseases which are endemic. Zero-tolerance import rules where inadequate domestic testing is applied is another example, though in this case one could argue that the domestic regulations are unlikely to be effective unless they are supported by strong import controls.

As a result, trade conflicts tend to focus on SPS and other technical issues in the poultry industry. These problems have been addressed in the SPS Agreement, which acts as a guideline for national regulations and supports the use of international norms. In the poultry sector the norms are set in two agencies, the Codex Alimentarius Commission (CODEX) and the International Office of Epizootics (OIE). CODEX sets norms for such issues as additives and contaminants, and the OIE acts as a body to coordinate information on the outbreak of disease and the use of quarantine and eradication methods to control the spread of diseases.

Notifications to the SPS Committee

Often these differences can be resolved among the governments concerned. The Korean government recently modified its import regulations for Thai poultry imports after discussion in the SPS Committee. The SPS Committee, however, deals with more than just protects. One important aspect of the work of the Committee is the notification of SPS barriers. This is the starting point for any dispute that may arise.

Nearly 10 percent (131 of 1,405) of all notifications of SPS regulatory decisions affecting trade that were submitted by member countries to the WTO in the first five years under the mandate of the SPS Agreement referenced measures addressing poultry products. In some cases, regulations were being re-written in recognition that national standards had been developed without an explicit assessment of meat (rather than live animals) as an avian disease vector. To comply with new multilateral obligations, regulations were also modified to allow imports from regions *within* an exporting country, if animal health authorities could verify that the area was either free or nearly free of quarantine diseases.

In other cases, food safety regulations were being changed, largely attributed to shifts from an emphasis on *ante-* and *post-mortem* inspection to HACCP systems.¹¹

Divergent sanitary measures among countries are considered by many to be a serious impediment to trade for poultry and other animal products. Widespread adoption of international standards can therefore yield large potential benefits to exporters. Importers may benefit as well if the elimination of regulatory heterogeneity lowers prices and expands product choice while maintaining an appropriate level of protection for animal and human health. Yet international harmonization of poultry regulations appears to be infrequent, despite its potential advantages. Nearly two-thirds of the SPS notifications on poultry have indicated that an international standard did not exist for the measure or measures at issue. Given the absence of international standards for traded poultry products, it is not surprising that a number of disputes over different SPS policy regimes have emerged in this sector. During the first five years of the SPS Agreement, 10 of the 124 total “cross notifications” (complaints) raised within the WTO SPS Committee referenced poultry products.

The complaints lodged within the SPS Committee fall clearly into the two main categories of SPS measure, as identified in the previous section. Among those that relate to avian health, the challenge by Argentina that the US does not recognize its disease free status is perhaps the least significant in terms of potential trade. On the face of it this looks to be the type of dispute that can be resolved with improved information. No obvious ulterior motive is involved: it is unlikely that significant imports of poultry would have entered the US market even without the restriction. However it is interesting as one example of a more widespread problem that several countries in the Americas

¹¹ International harmonization of sanitary regulations related to food-safety measures is coordinated by the Codex Alimentarius Commission (Codex). Relevant Codex texts include guidelines, recommended practices, and maximum levels for residues that specifically reference poultry products, as well as “horizontal” texts that span commodity categories. An example of the latter includes the “General Principles of Food Hygiene” which (among other things) establishes a template for a system of process controls (Hazard Analysis and Critical Control Points, or HACCP) to minimize contamination by food-borne pathogens. Other relevant texts describe general regulatory procedures for import/export inspection, certification, laboratory accreditation, and other processes that can also impact poultry trade.

have with the US import regulations, as discussed below. The Venezuelan ban on US poultry from 1993 is less systemic, and appears to reflect an idiosyncratic policy decision, as that country seems to be alone in identifying US exports as potential carriers of Avian Influenza.

More problematic is the dispute over the heat treatment regulation, ostensibly to prevent the introduction of Infectious Bursal Disease (IBD), applied by Australia on imported poultry meat from Thailand and the EU, which the trade considers to render their product unsalable. This issue bears some of the characteristics of the regulations mentioned above which prevent importation of meat for the sake of guarding against AI. Many authorities consider the likelihood of AI being transmitted in meat to be remote or non-existent. It is precisely this type of disagreement that the SPS Agreement was meant to resolve within a framework of scientific evidence, and a panel may eventually have to decide on the merits of this case.¹²

A second group of complaints concerns the human health implications of microbial contamination of imported poultry. These cases are more widespread and potentially more difficult to resolve. A group of countries have established a so-called “zero-tolerance” policy for the presence of Salmonella on imported poultry. The trade conflict comes from the fact that this standard is more stringent than that which is imposed on domestic poultry (which in all countries carry some degree of contamination).

¹² There is an interesting parallel between the situation in the poultry and the salmon markets. Australia has lost a case in the WTO on its import policy for salmon (from Canada) on the grounds that it had not adequately shown that the import restrictions were necessary to protect the health of domestic salmon stock.

TABLE 4: Complaints Against Poultry Measures Raised in the WTO SPS Committee, 1995-99

Respondent	Complaint	Complainant	Additional complainants	Issue raised
US	The US does not yet recognize Argentina's claim that it is free of Newcastle's disease, and therefore prohibits imports	Argentina		Jul 99
Australia	Australia's time/temperature regime to prevent the introduction of Infectious Bursal Disease precludes imports of raw poultry meat	Thailand	EC	Sept 98
Czech Republic	An MRL of .1 parts per million for arsenic is not scientifically justified and effectively embargoes Thai exports to the Czech Republic	Thailand		Sept 98
Switzerland	Proposed Swiss regulations which restrict the importation of meat from animals and poultry fed with hormones, antibiotics and similar agents as growth promoters are unscientific, because they are not based on a risk assessment and apply only to meat imported under Swiss tariff rate quotas (i.e., the regulations do not apply to over-quota meat imports)	US	Australia, Canada, Israel, Hungary, Chile, Brazil, India, and New Zealand	Sept 98
Korea	Requirement that all imported poultry meat (including meat intended for further processing) be free of <i>Listeria monocytogenes</i> disregards the recommendations of the International Commission on Microbiological Specification for Foods	Thailand		Mar 98
US	Poultry imports from EC were suspended without specifying the grounds upon which EC poultry suddenly became ineligible for entry into the US	EC		Aug 97

TABLE 4: Complaints Against Poultry Measures Raised in the WTO SPS Committee, 1995-99, continued

Respondent	Complaint	Complainant	Additional complainants	Issue raised
Venezuela	US poultry was unjustifiably banned in 1993 because of the outbreak of non-pathogenic Avian Influenza in some backyard flocks and markets in the northeastern US	US		Jul 97
Honduras	“Zero-tolerance” standards for Salmonella in imported poultry meat exceed requirements for domestic meat	US		Oct 96
Slovak Republic	“Zero-tolerance” standards for Salmonella in imported poultry meat exceed requirements for domestic meat	US		Oct 96
El Salvador	“Zero-tolerance” standards for Salmonella in imported poultry meat exceed requirements for domestic meat	US		Oct 96
Czech Republic	“Zero-tolerance” standards for Salmonella in imported poultry meat exceed requirements for domestic meat	US		Oct 96
Chile	“Zero-tolerance” standards for Salmonella in imported poultry meat exceed requirements for domestic meat	US		Oct 96

Source: Summaries of WTO SPS Committee Meetings, G/SPS/R series and United States—Measures Affecting Imports of Poultry Production Request for Consultations by the European Communities, G/SPS/GEN/28 and WT/DS100/1. The EC’s complaint against the US measure is the only one that materialized as a request for formal consultations under the terms of the DSU, rather than in the SPS Committee.

Links with Traditional Trade Barriers

Trade flows reflect trade barriers, both tariff and non-tariff, as well as production systems, consumer tastes and sanitary regulations. But it is interesting to see whether there is any obvious connection between such relatively transparent trade barriers as tariffs and quotas and the use of SPS regulations to inhibit trade. One can postulate two linkages. One might expect to both traditional trade barriers to be used in conjunction with technical restrictions, a “belt-and-braces” approach. Alternatively, one could expect that the two types of trade barrier would be substitutes, the one being increased as the other is reduced. To see whether there is any apparent connection it is necessary to observe the trade barriers of the more traditional type as notified to the WTO.

Access to the markets of most of the major importing countries tends to be over substantial tariffs, typically 10-30 percent.¹³ This is high enough to keep internal prices significantly above world market levels but not to discourage trade altogether. Some countries, however, have significantly greater trade impediments, maintained with the intention to restrict trade. The Uruguay Round of trade negotiations converted all non-tariff border measures to tariffs, and established “minimum access” quotas at reduced tariffs. In the case of poultry these tariff-rate quotas (TRQs) are a significant part of market access conditions. The expansion of these TRQs in future will go some way to determining the future of poultry trade. Tariffs on poultry, as on other agricultural products, are now bound in the WTO, implying that their level cannot be increased without offering compensation to trading partners.

Table 5 summarizes the different trade regimes in the six most prominent countries in world poultry trade. Tariffs are quite high in many cases, though this should not influence the exporters (world) price if countries are competing for the markets. China and Russia both have state trading structures that have survived economic reforms, and thus may be

¹³ Most countries allow the import of breeding stock without duty.

able to steer trade towards particular exporters.¹⁴ However they have each agreed to substantial reductions in tariffs when they are admitted to the WTO. In both cases, trade can enter through contiguous countries with land borders (Hong Kong in the case of China and the Baltic States in the case of Russia). Poultry has in the past entered China through Hong Kong in part as a result of that country's zero tariff policy and good port facilities and in part as a reflection of regulations that discouraged direct sales to China for retail. Part of the US-China Agreement dealt with these problems. The sales to China from the US are likely to increase at the expense of those to Hong Kong. In the case of Russia, sales through the Baltic countries, that impose relatively low tariffs, are being discouraged by the Russian authorities. Other exports of poultry to Russia are included under the food aid program.

The EU has established TRQs, as mentioned above, which are allocated to countries such as Brazil (in compensation for loss of oilseed sales many years ago) and the countries of Central and Eastern Europe, who have quota-restricted preferential access under the Europe Agreements.¹⁵ Hungary, in particular, takes advantage of this access: it lost a large market for poultry in the Soviet Union under CMEA trade arrangements. EU export subsidies have been effectively curtailed under the terms of the Uruguay Round agreement, making it more difficult to sell in contested markets such as the Mid-East and China.¹⁶ The Japanese import market is relatively open, with modest tariffs.¹⁷ US poultry

¹⁴ Canada also has a form of state trading, through provincial marketing boards. However most of the trade across the US-Canada border is among private companies. A federal marketing board makes decisions on the level of provincial production.

¹⁵ The TRQs originally allocated to Brazil were the subject of a trade dispute in the WTO. Brazil charged that the EU had redistributed some of the quota to other exporters (Thailand and China). The EU claimed that this was allowed under the rules for TRQs agreed in the Uruguay Round. The EU position was upheld by the panel and had to make only minor adjustments to its regulations (WTO, 1998). Of those importing countries not in the model, Canada and Mexico both have TRQs that influence trade volume and probably unit values.

¹⁶ Prices of dark meat in Europe are somewhat lower than those for white meat, though the difference is not as great as in the US. Some dark meat has reportedly been sold to Russia without an export subsidy.

¹⁷ Japanese production is inadequate to meet demand. Foreign investment by Japanese firms in Brazil, Thailand and China has been encouraged as a way of reducing dependency on imports from the US.

markets are protected both by tariffs and by export subsidies under the Export Enhancement Program (EEP). This program was designed to allow US exporters to compete with subsidized exports from the EU, in particular in such markets as the Mid-East.

Table 5: Summary of the Trade Regimes of the Six Countries

<i>Country</i>	<i>Trade Regime</i>
Brazil	Tariffs bound at 35 percent on all poultry products. Poultry included in free trade agreement with Argentina and other MERCOSUR members.
China	Tariffs of 45 percent will be reduced to 20 percent under US-China Agreement if China joins WTO. Further reduction to 10 percent by 2004.
EU	Tariff of 299 ECU/t on whole chicken and 358 ECU/t on parts (18-60 percent ad valorem); TRQs established with quantities allocated to Brazil and to Central and Eastern Europe. Export subsidies constrained under WTO, used for lower value exports to Russia
Japan	Tariffs of 11.9 percent on whole chicken and 8.5 percent on parts; no TRQs.
Russia	Tariffs of 30 percent on chicken and 15 percent on turkey; tariffs could be reduced on eventual WTO membership to 10 percent over 10 years. Trade agreement with EU gives no special access to European imports. Restrictions on the transshipment through Baltic countries have been announced.
US	Tariffs of 8.8 c/kg for whole chicken and 17.6 c/kg for parts (18-36 percent ad valorem) have been bound in the WTO. Exports were eligible for EEP payments (currently about \$650 per ton).

Source: Josling (1999), based on USITC, USDA and WTO Schedules.

Evidence of a strong link between traditional and technical trade barriers is not obvious from the observations reported above. There is no convincing evidence that the binding of these tariffs in the WTO has unleashed a new set of sanitary regulations aimed at impeding poultry trade. Reductions in these tariffs as part of the UR Agreement on Agriculture, and in the case of China the accession agreement reached with the US and other trade partners, have not been accompanied by a strengthening of technical standards. Likewise the codification of poultry SDPS regulations under the rules of the

SPS Agreement have not led to tariff increases or quota reductions. In fact both are under tight constraints as a result of the Uruguay Round, and trade is being liberalized as a result of agreements made in the round.¹⁸

One observation sheds some light on this linkage between sanitary and traditional trade barriers. Many countries are frustrated by the imports of chicken leg quarters from the US at a price that causes concern to the domestic sector. Even with the tariffs applied by these countries, imports still threaten to drive domestic poultry firms out of business. Recent trade conflicts have arisen with India, which raised poultry tariffs from 35 percent to 100 percent (IEPR, June 13, 2000), South Africa, which accused the US of dumping leg quarters in its market (IEPR, August 15, 2000), Indonesia, which banned the imports of chicken parts to protect the industry (Poultry USA, November 13, 2000), and Romania which introduced a reference price system to curb imports of leg quarters (Poultry USA, November 8, 2000).¹⁹ What is striking is that these countries have not in general resorted to the use of stricter SPS regulations as a way of keeping the poultry parts out. As poultry tariffs are reduced, however this situation may change.

Bilateral Trade Restrictions and Arbitrage

The avian and human health issues associated with poultry trade have led in some cases to sharp segregation by country of origin by importers and potential importers among suppliers and potential suppliers. Bilateral trade restrictions have a different impact on trade flows because of the possibility of arbitrage. An examination of the extent to which SPS barriers are source-specific is an important part of the estimation of trade impacts.

¹⁸ Russia is not currently a WTO member, and thus is under fewer constraints. Here there is some clearer evidence that increased market access ran up against the aspirations for and by the domestic sector and triggered some trade policy response. Given Russia's desire to enter the WTO the scope for such reactions may be less in the future.

¹⁹ Complaints from producers in the Caribbean and Central America about the low price of imported chicken leg quarters from the US have been common for several years.

Trade barriers on a bilateral basis

The US has strict rules on which countries can export poultry products to its market. Only thirteen countries are deemed by USDA to be free of END and only five countries are considered as meeting HAACP requirements for poultry products. Only two countries, Canada and Great Britain, in addition to one region in northwestern Mexico, satisfy all USDA criteria for gaining access to the US poultry market.⁵ Clearly, the bilateral relationships are important determinants of the flow of trade. But how important they are in determining the total trade flows is less clear. This is made less obvious by the lack of transitivity in allowable trade flows.

The pattern of sanitary barriers on poultry trade among the leading countries in the market is shown in Table 6. One might expect *a priori* that countries would divide sharply into those that are generally recognized as meeting adequate sanitary standards, and those that are not. Trade perhaps would only be sourced from the former group. This does not appear to be the case. Two importers, Japan and Russia, accept imports from all four exporters, the US, Brazil, the EU, and China. Imports from the three other exporters are allowed by China as well, but given recurrent domestic outbreaks of Newcastle Disease, China has not objected to restrictions on its exports by the US, Brazil, and the EU.

Bilateral trade restrictions appear to be explained in a different way. The profitable and relatively unprotected US market (in particular for white meat) is a target of commercial opportunity for other suppliers. The EU and Brazil, as well as Canada, Mexico, Thailand and China would relish more access into this market. Whether they would in fact sell significant quantities is debatable, but they see the access as important. Current SPS regulations in the US are problematic for these countries, even though their supplies are acceptable in other demanding markets. On the other hand, the potential injury to the domestic market is considerable.

The three principal poultry exporters (the US, Brazil, and the EU) impose restrictions *among themselves*. The US and Brazil have animal and human health restrictions in place that preclude any potential trade between the two countries. Intermittent outbreaks of poultry diseases in Brazil suggest that at best only certain regions could export to the US,

pending a thorough review by US authorities, but so far no trade is allowed. Regulators in the US and Brazil also have each determined that the other's inspection system for poultry processing plants is not equivalent to its own, thwarting the possibility for trade in poultry parts between the two countries.

The EU market is more closely controlled by quotas and therefore one might imagine that there would be less pressure for the use of SPS restrictions to protect domestic producers. New food safety measures adopted in 1997 prompted the EU to shut off poultry imports from the US (totaling about \$50 million annually). However, Brazilian poultry enters under a quota that is guaranteed in the WTO. Thus, unless one were to postulate that the poultry industry in the US lags that of Brazil in health standards, one has to conclude that there is more to these regulations than health systems. One part of the explanation has to do with the nature of the export industry in the different exporting countries. There is little doubt that US exporters could meet EU import requirements, by changing procedures to meet EU regulations. But that would imply the devotion of lines of production to the EU market. Without the assurance of market access that is not an attractive proposition. Brazil has a quota in the EU market and can therefore supply that market on a consistent basis.

The EC's complaint against the US measure is the only one that materialized as a request for formal consultations under the terms of the DSU, rather than in the SPS Committee. Technically the matter is still pending, as the parties have not notified the WTO that they have reached a mutually acceptable agreement, but as a practical matter, the US has withdrawn the restrictions and the EC is now allowed to export poultry meat to the US.

TABLE 6: Bilateral SPS Barriers on Poultry Trade

	Importers					
Exporters	<i>US</i>	<i>Brazil</i>	<i>EU</i>	<i>China</i>	<i>Japan</i>	<i>Russia</i>
<i>US</i>	--	No access	No access	Imports Allowed	Imports Allowed	Imports Allowed
<i>Brazil</i>	No access	--	Imports Allowed	Imports Allowed	Imports Allowed	Imports Allowed
<i>EU</i>	Imports Allowed from selected EU countries	Imports Allowed	--	Imports Allowed	Imports Allowed	Imports Allowed
<i>China</i>	No access	No access	No access	--	Imports Allowed	Imports Allowed

Source: Orden, Josling and Roberts, 2000

There have been poultry disputes between these countries in the past. Sanitary barriers on poultry meat exports from the US to Russia were subject to a high-profile dispute that erupted in 1996, when an embargo on US products threatened \$600 million in annual sales (see Ames 1998 and Kahrs 1996). This dispute raised awareness of the potential for SPS measures to disrupt agricultural markets, in particular by countries not yet in the WTO. A March 1996 agreement resolving the dispute included requirements on US products for more systematic disease certification, salmonella and residue standards, and a detailed regime for plant inspections. A side agreement required the US poultry industry to convert a failed Russian poultry operation into a state-of-the-art production facility. Subsequent to these agreements, US shipments to Russia quickly resumed.

It is interesting to note that Japan, which is widely viewed as highly protective of its domestic agriculture, and very sensitive to sanitary and phytosanitary considerations, imports poultry products at low tariffs from a diverse set of countries including the US, the EU, Brazil and China, and thus may play an important arbitrage role in world poultry trade. One possible explanation for the pattern of Japanese imports is the history of

foreign investment by Japanese companies in Thai, Brazilian and more recently Chinese production facilities presumably with the understanding that exports from these firms will have access into the Japanese market.

The pattern of sanitary trade barriers maintained on poultry by the six countries suggest that there are critical differences in regulatory assessments about whether trade should be prohibited based on avian diseases. The EU, for example, does not block imports from Brazil because of END, while the US does. Food-borne illness considerations further complicate the patterns of allowed trade, as in the case of the EU barrier against imports from the US but, again, not Brazil. Both the sanitary barriers that are imposed, and those that might be expected but are not enforced, have implications for the flow of poultry products in world markets, and for how well world markets are able to arbitrage price differentials among subsets of countries that do not trade between themselves.

The trade impact of SPS barriers depends crucially on how those regulations are framed. Consider the main regulation that impedes trade, a ban on imports. The most important determinant of the trade effect is the scope of the ban.²⁰ If an importer places a ban on purchases from one exporter, the likelihood is that the ban will have relatively little effect on the importing country and even the exporting country may not be severely impacted. Arbitrage will redirect the flows of trade and though the resulting pattern may differ from a “free market” pattern there could be relatively little welfare implication.

Arbitrage and bilateral trade barriers

This appears to be important in the world poultry market. The results of the model reported elsewhere (Orden, Josling and Roberts, 2001) suggest that arbitrage could offset the effects of a hypothetical ban on US exports to Russia. The ban would shift trade patterns in low-value products (chicken leg quarters). Assume that Russia imposes an embargo on imports from the US, as threatened in 1996. This sanitary regulation applies in the market for low-value products, but the surprising result in the model is that it has no effects on the equilibrium total quantities of exports and imports of each country or on

²⁰ This general issue of the geographical scope of SPS regulations was discussed in Roberts, Orden and Josling, 1998.

the world equilibrium price. Even with Russian imports comprising 13.4 percent of the total value of world poultry trade, and 22.2 percent of the value of trade in low-value products, there are sufficient arbitrage possibilities among the various trading partners for trade deflection to offset the effects of the simulated Russian sanitary barrier. Such a disruption of established marketing channels might result in many real-world costs being incurred (especially in the short run) that our model does not take into account. But the model results also illustrate the important concept that multi-market arbitrage can mitigate the effects of seemingly onerous technical trade barriers, as long as those barriers do not become too widespread.¹²

On the other hand if all importers ban imports from a single exporter then that country will be adversely impacted. World prices may rise if a significant share of world trade is involved. The exporting country will have an incentive to change practices and sanitary conditions to prevent such isolation.

If a country were to try to protect its domestic producers it would be more likely to ban imports from all exporters. In this way the market arbitrage would not work, and trade would diminish. Moreover, individual exporters would be less able to adjust their practices to recapture the market. This behavior is evident in relatively few instances in the poultry market.

Imports from Brazil are prohibited only by the United States. Brazil may seek access to the US market and perhaps such access might eventually be granted, but one expects that such an outcome will be slow to be achieved and costly to pursue. The trade data suggests that if bilateral Brazil-US access were mutually provided, there would be a small amount trade induced but not a surge, because of the other market opportunities Brazil has and because of price arbitrage across markets. This may be the reason why neither Brazil nor the US has pressed its case against the poultry barriers of the other country—multi-country arbitrage opportunities may be making two specific sanitary barriers less trade-distorting than suspected based simply on the plausibility of the regulations *per se*.

Summary

In the global poultry market, SPS regulations can be a more significant impediment to trade than tariffs. Some import markets are closed altogether, ostensibly for animal and human health reasons. More common is selective restrictions based on the country of origin. This tends to put the burden on exporting countries to bear extra costs of qualifying for access or to be excluded from particular markets. The use of SPS import measures to protect domestic producers is a constant temptation for importing country governments.

How significant is the influence of sanitary regulations on the poultry trade? Clearly regulation is necessary for the prevention of disease and for the protection of consumers. But whether that protection extends to supporting the income of domestic producers is not so clear. It is useful to consider separately the two different types of SPS regulation identified above as significant in the poultry trade. Avian health measures deal with the spread of poultry diseases across countries, while human health measures relate to food-borne microbial hazards to consumers. There seems relatively little evidence that trade is greatly distorted by the use of measures to prevent the spread of poultry disease.

Countries with serious problems of endemic diseases such as END and AI are not likely to be competitive exporters of poultry. Accordingly, banning imports from those countries probably has little impact on trade flows. Some developing countries, such as Brazil and Thailand, have succeeded in controlling these diseases and have been able to establish a reputation for disease-free poultry. Moreover, there is little evidence that countries restrict imports on poultry imports just to protect farmers from the cost of endemic poultry diseases.

Where there appears to be evidence of producer protection is in the application of consumer health measures. But this appears to be as prevalent in exporting as importing countries. Importing countries have found other ways of coping with import competition and have not resorted to artificial trade barriers hidden in the guise of health regulations. When traditional barriers are reduced the use of health regulations to influence trade may increase.

Implications for Trade Policy

How representative are the results suggested here for poultry of the broader set of technical barriers to trade? However, conditions in the poultry sector may differ from those in other meat sectors. Moreover, animal health and meat safety issues can be different from those in the crop, fruit and vegetable markets.

Poultry production is based on a short cycle that makes control of disease somewhat easier than, say, for beef. Eradication of the poultry flock, at least in advanced systems, is feasible and relatively inexpensive (except to the operators concerned). There appears to be relatively controversy over such issues as the incidence of disease and the importance of notifying the OIE. Rapid reaction, particularly in those countries with an export interest seems to satisfy legitimate concerns by importing countries. Residual issues such as the possibility of transmitting poultry diseases through meat should eventually be resolved through scientific evaluation and consensus.

By contrast with such health problems as the spread of BSE to human populations through new-variant CJD, poultry health issues are also of a more short-term nature and the biology better understood. Though Salmonella, Listeria and Campylobacter can cause serious illness, the prevention of such diseases through appropriate food preparation is considered a more constructive solution than the banning of imports at the first sign of an outbreak. Moreover the HACCP system has improved the confidence of regulatory bodies in production systems. And if all else fails, irradiation of poultry is available as a reliable way of destroying common microbial organisms.

Broader Issues

SPS issues in poultry reflect many of the range of issues that are important in the assessment of trade barriers in foodstuffs, even though the each market has its own peculiarities. Some of the broader issues that impinge less directly on the poultry trade are discussed below.

GMOs

So far, no-one has developed or put on the market a chicken that has been genetically modified by modern biotechnology.²¹ But the poultry industry is unlikely to escape some of the fall-out from the GMO controversy. Chickens eat modified corn and chicken feed commonly contains soybean products that come from modified beans. But scientific opinion has been that the foreign genetic material introduced into the plants does not in any way change the genetic make-up of the animal or bird. But in spite of such assurances, in October 2000, Tysons, the largest US poultry producer, announced that it would not use Starlink corn in poultry feed.²²

More recently, the possibility of a GMO related trade conflict has increased. The appointment of a new Minister of Consumer Safety, Food and Agriculture in Germany, following the outbreak of BSE among German cattle, could indicate the adoption by at least one major EU country of harsher restrictions on poultry fed with GM feed.²³

Environmental Problems

The intensive production process common in the poultry sector can give rise to a number of pollution problems, contaminating groundwater both from avian waste products and from chemicals used for medication and feed additives. Disposal of manure can also cause problems in areas of concentration of production. These problems cause authorities in some countries to impose costly restrictions on production activities, with potentially significant implications for trade patterns. The cause of much of the problem is the accumulation of phosphorus in the soil as a result of manure run-off. Phosphorus is an

²¹ The modern broiler chicken is of course the product of intensive genetic modification, but by traditional breeding methods. The familiar turkey bears little resemblance to its skinny forbears. Researchers are planning to modify chickens to express certain proteins in their eggs which may have medicinal use (Poultry USA, November 22, 2000). This use of modified poultry as medicine producers raises different issues from the modification of meat or egg producers.

²² Starlink corn is a GMO that was approved for animal feed but not human use. The FDA considered that there may be some allergens that had been introduced that could cause health problems for susceptible individuals. No health problems have been traced to Starlink, but it was removed from the market to reassure the consumer.

²³ It is of course possible that tougher regulations by Germany will be rejected by the EU Commission as being inconsistent with common regulations.

essential nutrient for plant and animal growth, but run-off into fresh water can lead to eutrophication. Management methods can help to prevent a build up of phosphorus, including the use of feed additives to increase the chicken's absorption of the element (Sharpley, 1998).

Environmental problems of this type are particularly significant in countries such as Hong Kong, the Netherlands and Japan, where population density exacerbates the problem of groundwater pollution. This restricts the possibility of production growth and leads to growing imports (or reduced exports in the case of the Netherlands). Modeling the extra cost of measures to control pollution is possible. More difficult is to determine whether trade policies will be used to attempt to offset such additional costs.²⁴

Animal Welfare Concerns

Among the emerging concerns that could influence trade regulations and hence trade patterns is that of "animal welfare". Intensive egg and broiler production has been an issue for advocates of animal welfare for some time. The complaints center around the amount of space given to laying hens, the practice of de-beaking and the alleged cruelty of the process of culling day-old chicks. Some of these concerns are finding their way into legislation, with the implementation of standards relating to the conditions for housing of birds. These standards also influence relative costs and hence the pattern of trade. As with environmental protection costs, the impact of these regulations can be incorporated into the trade model in a straightforward way.

The EU has recently published a new Directive on poultry housing which may have a significant impact on the location of poultry production and the comparative advantage of producers in various EU members. The impact of the proposed legislation targets egg production not broiler enterprises. A recent report by the EU Scientific Advisory Committee on Animal Health and Welfare identifies the increasing problem in broiler production as genetic selection for increased weight gain has led to added health

²⁴ The issue of using protection at the border and the use of compensation payments to farmers to offset the extra cost of environmental regulations is one aspect of the debate on

problems (IEPR, April 25, 2000). The ultimate intention of animal welfare advocates may be to ban all cages, and to ban eggs from those countries that allow their use. It is doubtful whether the EU will go as far as this, in the light of their considerable poultry industry and their export interests. Animal welfare issues are more muted in the US, but there have been complaints about such practices as beak trimming and the forced molting of hens.²⁵

Antibiotics

The EU has developed perhaps the most extensive regulations to govern antibiotic use, with four such products banned altogether in animal feed. The aversion of European consumers to the use of hormones in other branches of livestock rearing is well known, and therefore the practice of giving hormones to poultry has never developed in the EU. In the US, only one hormone is approved for poultry use (on roasting chickens), but no hormones are presently being used. Antibiotics are however widely used both to prevent disease and also to increase feed efficiency (FSIS, "Focus on Chicken, June 1995). A recent GAO report examined the implications for human health of the use of antibiotics in agriculture (GAO, 1999). It found that resistant strains of three diseases, Salmonella, Campylobacter and E. coli, are linked to the use of antibiotics in animals. The resistance develops while the micro-organism is in the animal and is then transmitted to humans through food or by contact. In addition, the effectiveness of the antibiotics when used in humans may be reduced by continual ingestion of low levels over a period. It is likely that the four US Agencies that regulate antibiotics will come under pressure to limit the use of those drugs that are also used for human treatments.²⁶ Indeed, the Center for Science in the Public Interest has already called for the FDA's Center for Veterinary

"multifunctionality" which is likely to consume time and energy in the current WTO agricultural negotiations (Josling, 2000).

²⁵ Australia has also introduced regulations to increase cage size for laying birds (IEPR, September 19, 2000)

²⁶ The FDA approves antibiotics for use on animals and allowable residues in food. Testing for antibiotic levels in food is the responsibility of the FSIS for meat, including poultry, and the FDA for eggs. Monitoring resistance to antibiotics in humans is the joint task of the USDA, the FDA, the DHSS.

Medicine to institute such a ban, and this body has responded by setting up a program to monitor the diminished susceptibility of enteric bacteria to anti-microbial drugs.

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ANNEX TABLE 1: Value of 1998 World Poultry Trade, SITC Code 01235, Million US Dollars

Exporters	Importers									
	US	Brazil	EU	China	Japan	Russia	Sub-Total	All Others		Total
								High Value	Low Value	
US	---	0	0	317.6	84.6	490.6	892.8	5.6	637.8	1536.2
Brazil	0	---	108.3	97.2	129.3	1.4	336.2	85.7	3.0	424.9
EU	0.1	0.1	---	130.9	7.2	102.9	241.2	0.3	252.2	493.7
China	0	0	0.2	---	365.9	0.5	366.6	83.6	0	450.2
Japan	0	0	0	8.5	---	0	8.5	0	0	8.5
Subtotal	0.1	0.1	108.5	554.2	587.0	595.4	1845.3	175.2	893.0	2913.5
All Others										
High Value	2.8	2.1	209.9	0	257.1	0	471.9	81.7 ¹		722.0
Low Value	0	0	59.3	100.6	0	8.5	168.4			
Total	2.9	2.2	377.7	654.8	844.1	603.9	2485.6	1149.9		3635.5

¹ Data not tabulated to differentiate between high-value and low-value trade among unspecified countries in the categories of “all others” exporters and importers.

ANNEX TABLE 2: Quantities of 1998 World Poultry Trade, SITC Code 01235, 1000 Metric Tons

Exporters	Importers									
	US	Brazil	EU	China	Japan	Russia	Sub-Total	All Others		Total
								High Value	Low Value	
U.S.	---	0	0.2	490.6	76.1	682.6	1249.5	3.6	788.6	2041.7
Brazil	0	---	43.2	135.5	66.6	2.6	247.9	48.3	6.3	302.5
EU	0.0	0.2	---	138.9	2.1	144.5	285.7	0.2	355.2	641.1
China	0	0	0.1	---	193.7	0.5	194.3	53.5	0	247.8
Japan	0	0	0	9.2	---	0	9.2	0	0	9.2
Subtotal	0.0	0.2	43.5	774.2	338.5	830.2	1986.6	105.6	1150.1	3242.3
All Others										
High Value	1.3	1.1	64.3	0	124.8	0	191.5	38.3 ¹		428.4
Low Value	0	0	63.0	126.0	0	9.6	198.6			
Total	1.3	1.3	170.8	900.2	463.3	839.8	2376.7	1294.0		3670.7

¹ Data not tabulated to differentiate between high-value and low-value trade among unspecified countries in the categories of “all others” exporters and importers.