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Evaluating the Economic Consequences of Avian Influenza[1]

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Avian influenza

The continued spread of the bird-to-bird version of avian influenza (or bird flu, also known by its scientific identifier H5N1) with limited bird-to-human transmission comprises part of the baseline forecast published in the World Bank's *Global Development Finance, 2006*.

Economic consequences of a further spread of bird-to-bird flu

The principal economic impact of the H5N1 virus so far has come in the rural sectors of several Asian economies in which the disease is enzootic. Its appearance in a number of European and African countries suggests that the disease may become as prevalent among the wild birds of these continents as it is currently in Asia.

Table 1 reports an effort to estimate the macroeconomic impact of such a spreading of the current bird-to-bird flu. The reported results are based on a scenario where bird-to bird flu becomes enzootic throughout the world to the degree observed in Vietnam in 2004 (approximately 12 percent of all domestic birds died from the disease or were culled to prevent spread). While direct costs are small (only 0.1 percent of world GDP),[1] differing degrees of international specialization and cost structures suggest that, allowing for interactions with other sectors, regional impacts could be as high as 0.7 percent of GDP.[2] Because the poultry sector is more important in developing countries and relatively labor intensive, job losses could represent about 0.2 percent of the global work force, or some 5 million jobs during the time it takes the global economy to adjust.

Table 1. Impact of a widening of bird-bird flu
(% change in GDP, relative to the baseline)

	Bird-bird [(a)]
World total	**-0.1**
High income countries	-0.1
Low & Middle-income countries	-0.4
East Asia and Pacific	-0.4
Europe & Central Asia	-0.4
Latin America &the Caribbean	-0.7
Middle East & North Africa	-0.4
South Asia	-0.4
Sub Saharan Africa	-0.3

Source : World Bank.
[(a)] Assumes that 12 percent of domestic birds in each region die from the disease or are killed in efforts to prevent its spread.

[1] Direct costs are small. Six percent of the world population of domestic poultry amounts to some 170 million birds. At a retail price of $2 per bird, and assuming (based on the Vietnamese experience) 0.75 cents in costs associated with monitoring and culling infected birds, this would amount to about $760 million worldwide, or about 0.02 percent of world GDP.

[2] While the poultry sector represents less than 0.2 percent of the GDP of high-income countries, its share in developing countries is about 1.2 percent of GDP, rising to 2.4 percent of GDP in the East Asia and Pacific region.

Possible economic consequences of a human pandemic

Even a flu with "normal" characteristics in terms of transmissibility and deadliness could have serious consequences for the world economy if the world's population has limited immunity. Estimates suggest that such a flu could infect as much as 35 percent of the world's population (WHO 2005), spreading throughout the world in as few as 180 days (RTI, 2006). As compared with a normal flu season, where some 0.2–1.5 million die (WHO 2003),[3] deaths from even a mild new flu might include an additional 1.4 million people worldwide. A more virulent form, such as the 1918-9 flu, which was more deadly for healthy adults than a normal flu, could have much more serious consequences, killing as many as 1 in 40 infected individuals (Barry 2005) or some 71 million, with some authors suggesting that as many as 180–260 million could die in a worst-case scenario (Osterholm 2005).

Table 2 reports the results of three separate simulations of the economic consequences of a pandemic (McKibbin and Sidorenko 2006). The first (mild) scenario is modeled on the Hong Kong flu of 1968-9; the moderate flu has the characteristics of the 1957 Asian flu; and the severe simulation is benchmarked on the 1918-9 Spanish flu.[4] Each of these scenarios assumes that efforts by individuals and official agencies to limit the spread of the disease are no more effectual than those observed during previous epidemics and reflects differences in population density, poverty, and the quality of healthcare available. For the world as a whole, a mild pandemic would reduce output by less than 1 percent of GDP, a moderate outbreak by more than 2 percent, and a severe pandemic by almost 5 percent, constituting a major global recession. Generally speaking, developing countries would be hardest hit, because higher population densities and poverty accentuate the economic impacts in some countries.

Table 2 Possible economic impacts of flu pandemic

	Mild	Moderate	Severe
(% change in GDP, first-year)			
World	-0.7	-2.0	-4.8
High-income	-0.7	-2.0	-4.7
Developing	-0.6	-2.1	-5.3
East Asia	-0.8	-3.5	-8.7
Europe and Central Asia	-2.1	-4.8	-9.9
Middle-East & North Africa	-0.7	-2.8	-7.0
South Asia	-0.6	-2.1	-4.9
Deaths (millions)	1.4	14.2	71.1

Source: World Bank calculations based on McKibbin & Sidorenko (2006).

[3] The World Health Organization (2003) estimates between 200,000 and 500,000 deaths each year. Osterholm (2005) reports a higher death toll of between 1 million and 1.5 million people worldwide from influenza infections or related complications, making it the third most deadly infectious disease after AIDS and tuberculosis, but ahead of malaria.

[4] McKibbin and Sidorenko also model an "Ultra" flu, which is not based on any known previous pandemic, but has the characteristics of the Spanish flu, plus higher mortality for older people. This simulation is not reported here.

Table 3 shows an alternative modeling of a pandemic. It is based on a pandemic similar in terms of mortality to the Spanish flu epidemic of 1918/9. This scenario is presented with a view to better understanding the factors driving the aggregate numbers in such simulations. The first column shows the impact in terms of GDP lost in the first year of the pandemic purely from additional deaths (here roughly equal to McKibbin's severe scenario). The second column builds in the impact on aggregate productivity resulting from the infection of some 35 percent of the population. Even though individuals are only temporarily unavailable from work, the impact on output here is more than twice as large as from the loss of life, because the affected population is so much larger.

The third column shows the largest impact. Here individuals are assumed to change their behavior in the face of the pandemic by (a) reducing air travel in order to avoid infection in the enclosed space of a plane, (b) avoiding travel to infected destinations, and (c) reducing consumption of services such as restaurant dining, tourism, mass transport, and nonessential retail shopping. The degree to which such reactions would occur is necessarily uncertain. In this scenario it was assumed that for the year as a whole air travel would decline by 20 percent and that tourism, restaurant meals, and consumption of mass transportation services would also decline by 20 percent.

Table 3. A breakdown of economic impacts of a potential human-to-human pandemic
% of GDP

	Impact of:				
	Mortality[a]	Illness and Absenteeism[b]	Efforts to avoid infection[c]	Total	Total[d]
		(% of GDP)			($ billion)
World total	-0.4	-0.9	-1.9	-3.1	-1,526
High income countries	-0.3	-0.9	-1.8	-3.0	-1,131
Low and middle income countries	-0.6	-0.9	-2.1	-3.6	-405
East Asia and Pacific	-0.7	-0.7	-1.2	-2.6	-99
Europe and Central Asia	-0.4	-0.7	-2.3	-3.4	-83
Latin America and the Caribbean	-0.5	-0.9	-2.9	-4.4	-118
Middle East and North Africa	-0.7	-1.2	-1.8	-3.7	-25
South Asia	-0.6	-0.8	-2.2	-3.6	-37
Sub Saharan Africa	-0.6	-0.9	-2.2	-3.7	-26

Source: World Bank.

a Assumes a human flu pandemic similar to the 1918 Spanish flu. Globally 1.08 percent of the world population dies, with mortality rates varying from 0.3 percent in the U.S. to more than 2 percent in some developing countries.

b Assumes that for every person that dies, 3 are seriously ill, requiring hospitalization for a week and absence from work for two weeks, 4 require medical treatment and are absent from work for a week, and approximately 27 percent of the population has a mild bout of flu requiring two days absence from work. It assumes that in addition for every sick day another absentee day is registered either because people stay at home to care for a sick person or to avoid illness.

c Efforts to avoid infection are modelled as a demand shock, reflecting reduced travel, restaurant dining, hotels, tourism and theater visits as individuals seek to avoid contact with others.

d Total impact in 2006, in 2006 dollars; e.g., $1.5 trillion shown is 3.1% of world GDP of $49.6 trillion.

The assumed 20 percent declines are well below the peak decline of 75 percent in air travel to Hong Kong during the SARS epidemic and an average decline of 50-60 percent during the four-month period the outbreak was active. Retail sales declined by 15 percent at the peak, and by about 9 percent over the four month period, implying about 15 percent decline from trend (Siu and Wong, 2004) over the four month period or about 5 percent on an annualized basis. Sharper declines on an annualized basis are assumed in these simulations because a flu pandemic

would last more than a year (pandemics are typically experienced in at least two waves with peak period of infection during the winter).

The total impact of a shock combining all these elements is 3.1 percent for the global economy and ranges from 4.4 percent in Latin America and the Caribbean to 2.6 percent in the East Asia and Pacific region, mainly reflecting the relative importance and labor intensity of tourism and other services in each region.

The modeling attempted to take into account the possibility that the economic effects of an outbreak would be greatest in the country where the human-to-human strain originates, the main factor here being private and public efforts to isolate and contain the disease by avoiding travel and imposing quarantines. However, simulations of an outbreak beginning in Thailand suggest that whatever additional costs the originating country might endure, these would be dominated by secondary effects as the disease spreads to other countries and global economic activity declines.

Given the tremendous uncertainties surrounding the possibility and eventual nature of a pandemic inflation, these simulations must be viewed as purely illustrative. They provide a sense of the overall magnitude of potential costs. Actual costs, both in terms of human lives and economic losses, are likely to be very different.

That said, these simulations serve to underline the importance of mobilizing global efforts to meet this potential crisis. Monitoring outbreaks of bird-to-bird and bird-to-human infections and culling infected flocks appear to be effective strategies to reduce bird-to-human transmission and reduce the likelihood that the disease will mutate into a form that is easily transmissible between humans. The fact that there have been no reported cases of bird flu in Vietnam in the 2005-6 flu season suggests that such preventative efforts can be effective.

However, even with such efforts, an eventual human pandemic at some unknown point in the future is virtually inevitable (WHO, 2004). Because such a pandemic would spread very quickly, substantial efforts need to be put into place to develop effective strategies and contingency plans that could be enacted at short notice. Much more research and coordination at the global level are required.

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