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Economic Impact of a Ban on Use of Antibiotics in U.S. Swine Rations

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Abstract
Antibiotic drugs are currently used in 90% of starter feed, 75% of grower feeds, more than 50% of finishing feeds, and at least 20% of sow feeds (USDA/APHIS). A ban on the use of feed grade antibiotics will lead to changes in production processes and practices in production of pork, and hence is likely to have an economic impact on the U.S. pork industry and pork market. On average, the cost of feed grade antibiotic use for all animal producers has been estimated to be about 3.75% of total ration costs, or about 50% of the value of the compounds to animal producers (1, cited in 2). To anticipate the potential effect on U.S. pork production, this study uses a set of technical impacts that are based in large part on a historical analysis of how the Swedish ban influenced the Swedish pork industry

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Economic Impact of a Ban on Use of Antibiotics in U.S. Swine Rations

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Introduction

Antibiotic drugs are currently used in 90% of starter feed, 75% of grower feeds, more than 50% of finishing feeds, and at least 20% of sow feeds (USDA/APHIS). A ban on the use of feed grade antibiotics will lead to changes in production processes and practices in production of pork, and hence is likely to have an economic impact on the U.S. pork industry and pork market. On average, the cost of feed grade antibiotic use for all animal producers has been estimated to be about 3.75% of total ration costs, or about 50% of the value of the compounds to animal producers (1, cited in 2). To anticipate the potential effect on U.S. pork production, this study uses a set of technical impacts that are based in large part on a historical analysis of how the Swedish ban influenced the Swedish pork industry.

Materials and Methods

Three cases are examined: a best case (I), a most likely case (II), and a worst case (III). The range of cases uses evidence from the experience in Sweden to describe what is most likely, given this evidence and (other) various expert opinions, to occur if the ban were to be implemented in the United States. Cases I and III are developed by revisiting each of the assumptions and considering the worst- and best-case impacts. The Case I scenario combines all of the best-case assumptions. Although case scenarios I and II focus on results and assumptions directly related to effects of a ban on over the counter feed antibiotics, case scenario III attempts to include a larger array of issues, including effects of animal welfare legislation. To do so, Danish pig production results have been included in the scenario, and the differences applied to U.S. conditions.

The economic model incorporates both biological and economic processes that govern production and consumption. The processes include the following:

- binding biological limits (e.g., weight gain rates, length of gestation),
- lags of variables to capture time periods required in production, and accounting identities to ensure consistency in the stock (e.g., animal inventory), and
- flow variables (e.g., number of animals slaughtered, pig crop, and mortality). The model also includes technical parameters such as feed efficiency, weight and weight gain, mortality, and sow efficiency. Economic data include information on fixed costs (buildings), veterinary costs, and any new investments required for buildings.

The analysis of the impacts of a ban on feed grade antibiotics is conducted by comparing the results obtained using baseline values and assumptions, to those obtained by using assumptions about the new requirements and changes in raising of hogs under conditions implied by the ban. Technological changes are introduced by respecifying some of the biological and technical parameters of the model to reflect changes in the new production technology. Simulations were conducted by using the revised technical parameters in the model. To account for increased weight variability due to the ban, baseline and scenario distributions of weights were characterized, and applied to a price grid with penalties for “sort loss.”

Based on information gathered during a visit to Sweden and Denmark, and from other sources, the technical assumptions for the different cases examined are summarized in Table 1.

Table 1. Technical assumptions for the three case scenarios.

	I (Best)	II (Most Likely)	III (Worst)
Age at weaning	no increase	+ 1 week	+ 1 week
Days to reach 25 kg	no increase	+ 5 days	+ 12 days
Feed efficiency from 50 to 250 lb	no change	- 1.5%	- 1.5%
Piglet mortality	+ 1.5% pt	+ 1.5% pt	+ 4.0% pt
Fattening-finish mortality	no change	+ 0.04%	no change
Piglets per sow	no change	- 4.82%	- 3.84%
Veterinary and therapeutic costs (per pig)	+ $0.25	+ $0.25	+ $0.25

In addition to the technical assumptions made for the most likely case scenario (II) in Table 1, additional space would be required for the nursery and finishing periods if restricted feeding and longer time in the nursery will be required. This new construction would cost $115 per head of nursery space and $165 per head of finishing space, or an estimated cost of additional space required of about $1.42 billion. Additional farrowing space for sows, required under two of the scenarios, would also add costs. The most likely scenario implements these changes.

Case scenario III uses factual production differences between the best quartiles of pork producers in Denmark and Sweden in 1996 to suggest that inferior results in Sweden are caused by its "model" of ban on feed grade antibiotics from 1986 and its animal welfare law of 1988. However, the scenario is very uncertain because it includes so many other factors, such as genetics, feed and feeding techniques, the fact that more than 50% of the herds in the Danish statistics are SPF while none are in the Swedish, and national differences regarding business structure, economic supports and investments (2). With all of these reservations, the parameters in Table 1define a worst case.

Under the *scenario (III)*, piglets required 11.7 more days to reach 25 kg. Average feed cost from weaning to feeder pigs was adjusted to account for the additional feeding days. Piglet mortality increased by 4 percentage points. There was no change in mortality for fattening-finishing pigs. Pigs per sow per year declined by 3.84%. Cost components included in the profit estimation are the same as those in the most likely scenario.

The best-case scenario (I) assumes that the only effect of the ban of antibiotics in feeds is in the increase of piglet mortality by 1.5%. New investment in additional nursery and finishing spaces are still required, but not for farrowing space.

Results and Discussion

The estimates show for case II that costs per head would increase by $5.24 to $6.05. However, with the higher prices due to the smaller pork supply, net profit would decline only by $0.79 per head by the end of the period, or less than $0.01 per pound of pork in retail weight. The net present value of forgone profit to the industry over 10 years is $1.039 billion (with a range over the scenarios from $1.135 to $0.429 billion). Under the three scenarios, the results include the costs of adding troughs and space to allow restricted feeding. These costs totaled $960 million in total, or $1.20 per hog, about 20% of the increased costs. If the assumption on the need for restricted feeding capacity is incorrect, then the estimated values overstate the impact estimate by this amount. This is obviously an area where additional research is needed.

The estimated impact of such a ban on an "average" or "representative" farm hides very wide differences across farms. Although certain general patterns stand out, the Swedish experience must be regarded very cautiously as an exact indicator of what might happen in the United States (see full report). First, the use of restricted feeding will force almost all U.S producers to make some adjustments. The impact of the ban also will differ across commercial producers. The Swedish experience suggests that those who follow good hygienic and health practices will see the smallest impact. The greatest impact may be on densely populated farms in areas with large numbers of hog farms who have older buildings and who do not follow sound management practices. The social impacts of the changes may be very different than the economic impacts.

In the assumptions for the different cases, consumers respond only to changes in the price of pork. We have not altered the prices of poultry or beef, which are likely to be affected similarly by a ban involving pork. Nor have we factored in any positive effect of such a ban on consumer willingness to pay for pork produced without the use of feed-grade antibiotics. Consumer pressure and responses have been shown to be important in the Swedish and other European experiences, but they are difficult to estimate with the lack of reliable data in the United States. However, one very important consumer response should be mentioned, and that is the one that may occur on export markets. So far there is very little evidence to suggest that these export customers are concerned about the use of antibiotics among suppliers. However once the European Union or Danish industry can guarantee reliable supplies of "antibiotic free" pork, this situation may change. Losses to the U.S. pork industry associated with a loss of an important export customer, such as Japan, would dwarf the losses associated with the ban described above.

Finally, to understand the effects of a ban on U.S. consumers, we estimate the effect of the change in retail price on cost per U.S. family (of four). This change would be approximately $4.68 per year in additional costs, or $333 million per year in total. Again, this estimate considers only the change in pork, with no change in other meats. The range of producer and consumer impacts provides a bound to estimates of the economic effects of a ban.

Acknowledgments

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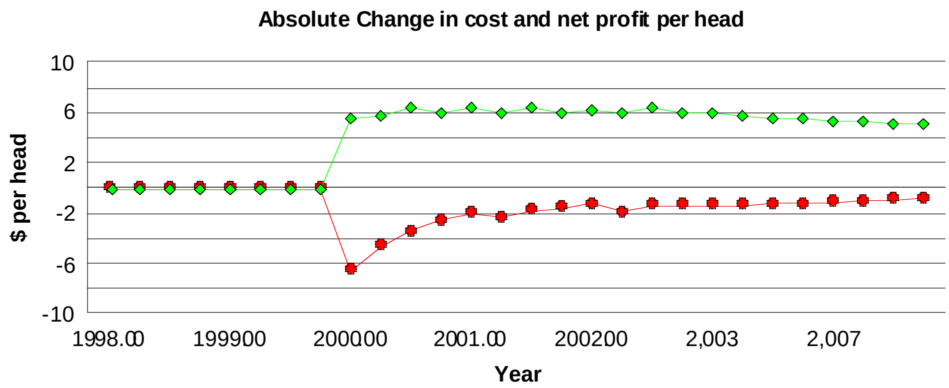
Figure 1. Most likely scenario.



Annualized after 2003

Figure 2. Worst case scenario.

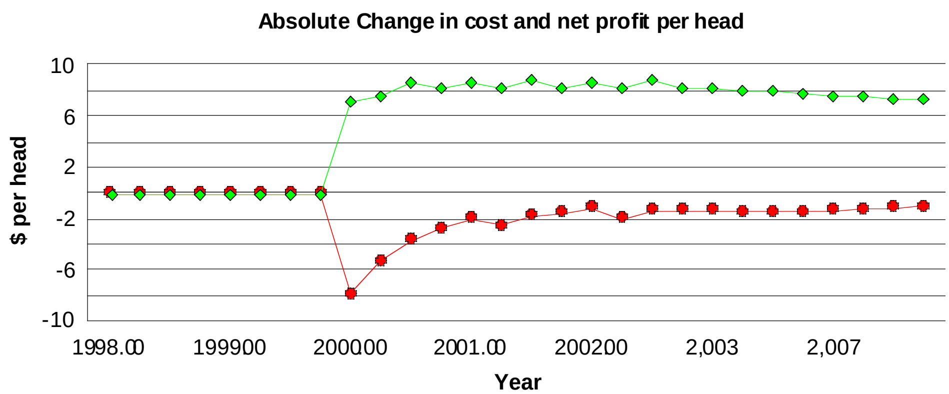


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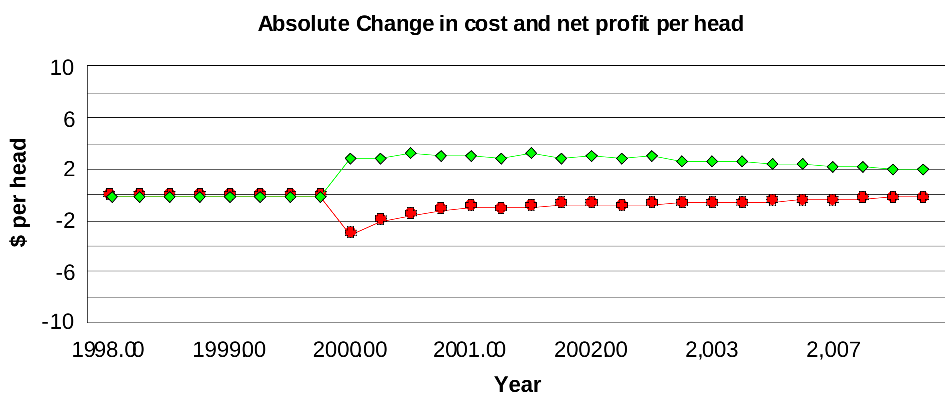
Figure 3. Best case scenario.



Annualized after 2003