Western Economics Forum

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The Western Economics Forum

A peer-reviewed publication from the Western Agricultural Economics Association

Purpose

One of the consequences of regional associations nationalizing their journals is that professional agricultural economists in each region have lost one of their best forums for exchanging ideas unique to their area of the country. The purpose of this publication is to provide a forum for western issues.

Audience

The target audience is professional agricultural economists with a Masters degree, Ph.D. or equivalent understanding of the field that are working on agricultural and resource economic, business or policy issues in the West.

Subject

This publication is specifically targeted at informing professionals in the West about issues, methods, data, or other content addressing the following objectives:

- Summarize knowledge about issues of interest to Western professionals
- To convey ideas and analysis techniques to non-academic, professional economists working on agricultural or resource issues
- To demonstrate methods and applications that can be adapted across fields in economics (e.g. adapting conjoint analysis from marketing to environmental economics)
- To facilitate open debate on Western issues

Structure and Distribution

This will be a peer reviewed publication. It will contain approximately 3 or 4 articles per issue, with approximately 2,000 words each (maximum 2,500), and as much diversity as possible across the following areas:

- Farm/ranch management and production
- Marketing and agribusiness
- Natural resources and the environment
- Institutions and policy
- Regional and community development

There are two issues per year, which will be mailed out with the WAEA newsletter in the spring and fall.

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ANIMAL HEALTH: THE POTENTIAL ROLE FOR LIVESTOCK DISEASE INSURANCE

by
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Animal diseases can cause significant production losses and a reduction in livestock receipts. While compensation is provided by the U.S. government in the event of an emergency disease outbreak, that compensation, an indemnity payment, does not cover the other costs that producers incur when their production cycle is interrupted. Those other losses, consequential costs, include business interruption, loss of markets, reduced productivity, increased welfare costs and increased biosecurity compliance costs. The recent Canadian experience with bovine spongiform encephalopathy (BSE, commonly referred to as mad cow disease) demonstrates the significance and magnitude of these other, market related, losses-- most significantly losses in exports.

Federal and state governments have a role to play in minimizing disease risk because animal health has many of the characteristics of a public good. A healthy livestock herd not only provides adequate food but also ensures that zoonotic diseases[1] are not transmitted to humans. Animal health is a public good managed by federal and state governments and by individual producers. Market incentives alone are insufficient to induce adequate supplies of animal health, so federal and state governments intervene to improve the supply of animal health.

The actions taken by the U.S. to safeguard animal health are not readily understood or widely recognized outside of the animal health community. A basic understanding of issues facing livestock disease risk management needs to be communicated to a wider community. In this paper, we give a brief overview of U.S. animal health regulations, the role of the Animal Plant Health Inspection Service (APHIS), and discuss how livestock disease insurance, as supported by the USDA Risk Management Agency (RMA), may help bridge gaps in producer support. This perspective provides an introduction to both public and private economic concerns resulting from disease outbreaks.

Review of Animal Health Regulations

Nine federal regulations define the national government activities[2] in mitigating livestock diseases. Diseases addressed in the regulations include brucellosis, chronic wasting disease, pseudorabies, scrapie, tuberculosis and various foreign animal diseases. Brucellosis, pseudorabies, scrapie and tuberculosis have ongoing federally supported eradication programs that compensate producers for their part in removing those diseases from the national livestock herd. Johne's disease and avian influenza (AI) programs[3] were added recently and the government will concentrate on disease monitoring, surveillance, and eradication. When livestock are depopulated, compensation values are usually determined by appraisal but may be subject to budget constraints or reduced by the amount of

[1] Zoonotic diseases are those that are transmissible from animals to humans.
[2] The federal government is involved in many different disease management and exclusion activities. This article only concentrates on the parts of federal and state regulations that concern animal disease management and eradication.
[3] Johne's disease and the END regulations are in addition to the nine federal regulations identified when the review was completed in late 2002.

the animal's salvage value. Some programs may also cover cleaning, disinfection, transportation, or disposal, though the amount of this type of compensation is limited.

The total number of state programs relating to animal disease management in 2002 was 119. In the western states, there were 57 regulations addressing animal health and disease management. Many of these programs cover multiple species and/or multiple diseases. Most policies cover cattle, beef and dairy, and the most commonly mentioned disease is tuberculosis. Other diseases specifically mentioned include brucellosis, foot and mouth (FMD), glanders, classical swine fever (CSF; hog cholera) and the generic "contagious diseases" category. Table 1 lists the number of regulations identified in each western state, livestock species covered and diseases covered.

Some western states have regulations with specific disease titles, while other regulations are more general and describe safeguarding and surveillance for animal health. Most regulations are state department of agriculture regulations, though some are administered by marketing orders or industry groups. Western states involved in the federal eradication programs generally have a corresponding regulation that covers the state's role in satisfying federal requirements.

Many of the state animal health regulations specify an appraisal and indemnification system. Often appraisal values are capped at a specific proportion of the total appraised value of the animal (30%, 50%) and only owners of the livestock are eligible for compensation. When diseased animals find a secondary market, i.e. hides or for pet food, that salvage value is subtracted from the total state indemnity. Breeding animals are sometimes mentioned in the regulations and indemnities tend to be higher but vary by state. Funding for the indemnities also varies. Funding for these programs may be appropriated by the legislature; costs may be shared with the county where the disease occurs. Some states require per head assessments (CO) and other states tax producers (IA, KS, MS, MT). None of the western state regulations cover cleaning, disinfection or other costs associated with animal disease mitigation.

Opportunity for Insurance in Managing Livestock Disease Risks to Producers

The discussion above, of federal and state animal disease regulations, demonstrates two significant shortcomings of the current indemnification process. First, producers receive no compensation for consequential losses, the bulk of which are related to business interruption, resulting from a disease outbreak. Business interruption, the inability to produce and market livestock, may occur in livestock production in a number of different ways. Market access may be restricted because of quarantines, because commercial stock has been depopulated, because export markets are closed or because of reduced consumer demand. During BSE outbreaks in Germany and Japan, consumer demand for beef plummeted. Consumer demand was not significantly reduced during Canada's recent BSE outbreak, but export markets were closed to Canadian beef, creating significant oversupply in the domestic marketplace. Consequential losses associated with an animal disease always occur but risk management strategies to deal with their impact are underdeveloped.

The second area of weakness in the western framework for animal disease compensation is the indemnification values for higher valued commercial livestock. Owners of registered, purebred, and rare livestock have access to insurance markets, but many commercial breeding animals or genetically superior commercial livestock are not valuable enough to justify purchasing insurance. These animals receive compensation that may not be sufficient compensation for their higher value compared to other commercial livestock. Another issue related to insufficient indemnification values are pro-rated or capped indemnity payments. The indemnity payments may be capped because of budget constraint or may be capped when the federal indemnification proportion is not matched by a state indemnification. Both undervaluation and limited indemnification values result in producers receiving compensation for their animals that is less than the market value of the animal prior to the disease outbreak.

Table 1: Western States Animal Disease Management Regulations

State	Number of Regulations	Species	Diseases Covered
Alaska	1	Dairy cattle	Unspecified
Arizona	1	Unspecified	Tuberculosis (TB)
California	3	Beef cattle, dairy cattle and unspecified livestock	TB, brucellosis and unspecified diseases
Colorado	3	Captive cervids (deer, elk) and unspecified animals	Brucellosis and other unspecified diseases
Hawaii	4	Beef cattle, dairy cattle, swine	Anaplasmosis, TB, brucellosis, classical swine fever (CSF)
Idaho	4	Beef cattle, dairy cattle, swine, sheep, goats, captive cervids and unspecified animals	FMD, BSE, CWD, other TSEs, TB, brucellosis, pseudorabies
Illinois	3	Swine and unspecified animals	Brucellosis, trichinosis and unspecified diseases
Indiana	1	Unspecified animals	FMD, glanders
Iowa	3	Beef cattle, dairy cattle and unspecified animals	Farcy, anthrax, dourine, FMD, TB, brucellosis
Kansas	4	Swine and unspecified animals	Vesicular exanthema, pseudorabies, FMD and unspecified diseases
Michigan	1	Unspecified	Unspecified
Minnesota	2	Beef cattle, dairy cattle and unspecified animals	TB, brucellosis, paratuberculosis and unspecified diseases
Montana	2	Unspecified animals	Rinderpest, surra, contagious pleurapneumonia, FMD, unspecified diseases
Nebraska	1	Beef cattle, dairy cattle	TB
Nevada	2	Sheep, unspecified animals	FMD and unspecified diseases
New Mexico	1	Unspecified	Rinderpest, farcy, TB, rinderpest, FMD pleurapneumonia, glanders and others
North Dakota	1	Beef cattle, dairy cattle, swine, sheep, goats, captive cervids, equine	Unspecified
Oklahoma	3	Beef cattle, dairy cattle and unspecified animals	Brucellosis and unspecified diseases
Oregon	1	Unspecified	Unspecified
South Dakota	5	Beef cattle, dairy cattle, swine, and unspecified animals	Vesicular exanthema, CSF, brucellosis, TB and unspecified diseases
Texas	1	Unspecified	Unspecified
Utah	1	Unspecified	Unspecified
Washington	1	Unspecified	Unspecified
Wisconsin	5	Beef cattle, dairy cattle, bison, captive cervids, swine and unspecified	CWD, TB, brucellosis, pseudorabies and unspecified diseases
Wyoming	3	Beef cattle, dairy cattle, swine and unspecified animals	TB, Bang's disease, CSF and unspecified diseases

Considering these two state and federal compensation program shortcomings, there is an opportunity for insurance to be developed to assist in the management of livestock disease risks. Following the passage of the Agricultural Risk Protection Act (ARPA) in 2000, RMA has supported the development of livestock revenue insurance policies. The Livestock Risk Protection (LRP) policy was piloted in swine in Iowa in 2002 and extended to feeder and fed cattle in 2003[4]. Other policies, Livestock Gross Margin (LGM), Average Gross Revenue (AGR) and AGR-Lite provide revenue insurance for livestock producers in various states. These products, however, limit the total number of head or the total value of the herd that can be insured. AGR policies do allow for payments resulting from an unavoidable natural disaster and a resulting disease, but other disease mortality is not covered. Additional policies may be developed as RMA continues to support livestock insurance development as mandated in ARPA. Projects are already underway to support insurance development for aquaculture and provide protection for forage and grazing supplies for livestock producers. However, so far no RMA-supported products have been developed that include mortality from disease as a covered peril.

Livestock Risk Protection, Livestock Gross Margin and Adjusted Gross Revenue Insurance

Two revenue insurance polices for hog producers are currently available, Livestock Risk Protection (LRP) and Livestock Gross Revenue (LGM). In crop year 2004 feeder cattle and fed cattle policies for LRP were introduced across a variety of states. LRP protects livestock producers from a decline in the prices for livestock during the policy term. LGM protects against a decline in gross margin, defined as the value of the livestock minus the feed costs. Both policies use futures markets to establish prices over two six-month periods during one crop year. LGM has a specific closing sales date for each period, while LRP can be purchased anytime during each period. For LRP, 70 to 95 percent of the daily price can be insured while 85 to 100 percent of expected gross margin is insurable with LGM. Both policies limit coverage to relatively small numbers of animals per crop year: LRP Swine, 32,000 head; LRP Fed Cattle, 4,000 head; LRP Feeder Cattle, 2,000 head and LGM 30,000 head of swine.

After the outbreak of bovine spongiform encephalopathy (BSE) in December 2003, the Risk Management Agency (RMA) suspended the sales of LRP for feeder and fed cattle. LRP excludes mortality as a result of disease as a covered peril. Policy holders who did not have diseased animals but suffered the impacts of reduced cattle prices resulting from the market impacts of disease discovery, however, would be eligible for payment. Immediately after the BSE discovery, RMA reported a run on LRP cattle policy purchases and sales were suspended. As of January 29, 2004 sales had not resumed.

Adjusted Gross Revenue (AGR) provides a guaranteed minimum revenue for the insurance period. Multiple commodities are covered in the policy and protection is for natural disasters and market fluctuations. AGR uses the producer's IRS Schedule F tax returns over the most recent five years to establish a base income and then provides supplemental coverage by multiplying the approved AGR by the selected coverage level and payment rate. Purchase of an AGR policy is limited to producers who earn no more than 35 percent of expected income from animals and animal products. AGR-Lite allows coverage levels of 65, 75 or 80 percent and coverage is limited to $250,000 of liability, all of which can be from livestock production.

Source: RMA

[4] Beginning in the 2004 crop year (November 2003 policy sales begin), LRP will expand beyond IA to the following western states: IL, IN, KS, MN, NE, OK, TX, UT & WY. LRP for fed cattle will be available in IL, IA, NE and for feeder cattle in CO, IA, KS, NE, NV, OK, SD, TX, UT and WY in CY 2004.

As the development of additional livestock insurance programs continues, alternative value and consequential loss insurance could be developed. Alternative value insurance offers a way to address the two shortcomings previously discussed. Alternative value insurance could provide producers the option to insure the value of the animal above the indemnity value received. Development of alternative value insurance can be facilitated by pre-published compensation schedules. Currently, compensation schedules for livestock affected by emergency disease outbreaks are developed at the time of the outbreak. If compensation schedules were published in advance, insurance could then be purchased for the difference between the livestock's market value and the indemnification rate, essentially "topping up" the compensation. Additionally, when indemnity payments are made at a fraction of the appraised value, alternative value insurance can allow producers to insure the difference between the appraised value and the actual indemnity value. These two insurance policies would need to be based on sound actuarial data for RMA to support their development. However, actuarial data related to many diseases does not exist because those diseases have not occurred recently in the U.S.

The second area where insurance can improve the management of disease risk is by covering consequential losses. Consequential loss insurance would allow producers to purchase insurance to offset costs incurred from downtime, reduced productivity and loss of market not covered by government indemnity payments. Other industries already use variants of consequential loss policies, especially for business interruption, that might be adaptable to livestock production.

Evidence from Germany demonstrates that both alternative value and consequential loss policies for livestock producers can be developed and can work in parallel with government indemnity programs. In Germany, indemnity payments are made based on predetermined and published payment schedules (Bätza). These schedules are capped by maximum values that do not represent the value of superior commercial animals. Policies are available to insure the difference between the value indemnified according to the published government schedule and the value of the animal under regular, non-disease market conditions. The leading German agricultural insurer (R+V subsidiary VTG) offers policies to cover consequential losses, including government actions that interrupt trade (lost markets) and reduced reproduction rates.

Potential Benefits and Obstacles of Livestock Disease Insurance

Livestock disease insurance products have the potential to complement current disease management practices. Livestock disease insurance guidelines would require producers to be involved actively in the management of a disease event, minimizing total economic impacts. Livestock disease insurance may also assure lenders that loans are protected in the event of a catastrophic disease event, thereby providing continued access to capital markets for producers.

Although the potential benefits of livestock disease insurance could be significant, challenges exist. Insurance may increase the incentive for producers to commit bad acts (moral hazard), which increases the probability or size of a loss caused by the behavior of the producer (Kunreuther, 2002). Adverse selection, a specific type of moral hazard, would occur in animal production when producers with lax biosecurity choose to insure more frequently than those producers with better biosecurity. Inspections and co-payments are commonly used to protect against moral hazard in insurance and would be necessary when insuring for livestock diseases.

While two types of insurance policies, alternative value and consequential loss, have been discussed in this article as the most easily integrated into the animal disease indemnification schedule, the wording of the Animal Health Protection Act (AHPA) may be a limitation in the near term to the development of livestock disease insurance. The AHPA legislates that indemnity payments must be reduced by any compensation received from any state or other source, i.e., all insurance and indemnity payments

cannot exceed the market value of the animal. This may imply that any insurance payment resulting from animal disease may be deducted from federal indemnification values.

Conclusions

Animal health is a public good managed at the federal and state government and at the individual producer level. Livestock diseases can cause significant losses to agriculture and other industries. Livestock producers are compensated, though not always at market value, for depopulated animals. However, uncompensated consequential losses resulting from an eradication program can be considerable. Recent legislation has made it possible for the USDA-RMA to support the development of insurance for livestock, including disease coverage.

Livestock disease insurance could potentially provide relief to producers for consequential losses and the difference between market and indemnity values (alternative value). Consequential losses, including business interruption, welfare (feeding and care) costs for animals, and loss of markets, are not eligible for current U.S. government indemnification. Also, producers may not receive full market value for their animals because of budgetary limitations. Providing insurance to make up the difference between market value and indemnification value (what the government actually pays based on the market value) and for consequential losses seems to offer the best opportunity for developing livestock disease insurance.

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ECONOMIC FACTORS CONTRIBUTING TO THE U.S. BEEF PRICE SURGE IN 2003

by
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Before the December 23, 2003 reported case of *Bovine Spongiform Encephalopathy* (BSE or "mad cow disease") in the state of Washington, the U.S. beef industry experienced record beef prices the second half of 2003. United States Department of Agriculture (USDA) and Livestock Marketing Information Center (LMIC) data show that in October 2003 nominal prices of feeder cattle, fed cattle, and boxed beef exceeded those in October of 2002 by a range of 26% to 58%. Retail beef prices also increased over this period, but to a lesser extent (about 21%). Beef price increases from October 2002 to October 2003 are given in Table 1.

Table 1. Beef Price Changes from October 2002 to October 2003

	Time Period	
Beef Prices	**October 2002**	**October 2003**
	Dollars Per Hundred Weight	
Feeder Steer	$85	$107
Fed Steer	$65	$102
Boxed Beef	$112	$177
	Cents Per Pound	
Retail Beef	$3.26	$3.93

Note: Price of Feeder Steers is Oklahoma City, Medium No. 1, 600-650 lbs.; Price of Fed Steers is Nebraska direct, Choice, 1100-1300 lbs.; Price of Boxed Beef is Central U.S., Choice cut-out value, 600-900 lbs.; and Price of Retail Beef is weighted average of Choice retail cuts.

Producers, economists, and public officials have intensely debated the relative importance of factors contributing to changes in cattle prices. Specifically, there has been strong disagreement about the relative effects on beef prices of international trade (NAFTO and WTO), meat packer concentration and economies of scale, meat packer market power and captive supplies, and traditional market demand and supply factors. Depending upon stakeholder positions, public and private policies have been advocated to deal with the financial implications of beef price changes. Examples include government sanctions in international trade, enforcement of antitrust laws, USDA marketing regulations, animal health regulations, and producer management decisions involving cash sales, hedging, contractual arrangements, or marketing alliances.

Reasons

The single case of BSE in Canada (May 2003) may have been a catalyst for the 2003 beef price surges. As a result of the reported case, the United States and 34 other countries closed off imports of Canadian live cattle and beef products. Beef imports from slaughtered animals of 30 months of age or less into the United States were later restored, but have remained relatively low since reinstatement.

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Market analysts have indicated that the primary factors contributing to the recent beef price increases reflected economic trends in the beef market. They include decreased U.S. cattle inventories since 1996 (caused by relatively low real cattle prices and drought), increasing domestic beef demand since 1998, and to a lesser extent, decreases in total U.S. net beef imports (imports less exports including live cattle) since 1993. Other factors thought to affect the price advances were October 2002-to-October 2003 decreases in slaughter cattle weights (reducing meat supplies) and increases in beef by-product values. Corn prices also decreased over this period, increasing the demand for feeder cattle due to reduced cost of gain.

Price Changes

Many producers assume that the 2003 moratorium on Canadian live cattle and beef imports was primarily responsible for U.S. beef price increases. To determine the causes of beef price advances, an econometric model of demand and supply relationships in the U.S. beef sector (feedlot, meat packing and wholesale levels) was estimated. The model was based upon economic theory of output supplies and input demands in the marketing sectors. Several economic factors were hypothesized to influence beef price increases, including: (1) domestic retail beef demand; (2) domestic cattle slaughter and average slaughter weights; (3) live cattle imports from Canada, net beef imports from Canada (imports less exports excluding live cattle), and net beef imports from other countries (excluding Canada); and (4) beef by-product values and corn prices. The focus was on changes in fed cattle prices for a one-year period of October 2002 to October 2003 (prior the BSE outbreak in the U.S.). Prices in the feeder cattle market normally follow those in the fed cattle market; therefore, the effects of these economic factors extend to the feeder market.

Based upon data from the USDA and LMIC, the percentage changes in the economic factors from October 2002 to October 2003 were: (1) domestic beef demand (measured by a beef demand index) increased 6%; (2) commercial cattle slaughter from domestic sources decreased 5.5% and average slaughter cattle weights decreased 4%; (3) live cattle imports from Canada decreased to zero, which implied a reduction in U.S. slaughter cattle supplies of about 4.5% (the Canadian import share of U.S. slaughter cattle supplies in 2002), net beef imports from Canada decreased 70%, and net beef imports from all other countries decreased 7%; and (4) U.S. by-product values (hide and offal) increased 8% and corn price decreased 14%.

Results

Table 2 gives the relative impacts of these economic factors in percentage and dollar terms. The "Factors" in the table, all statistically significant, are arranged in descending order. The percentage figures in the table (in parentheses) are generated by the econometric model. Multiplying these percentages by average fed steer price of $83.35/cwt for October 2002 to October 2003 gives the dollar/cwt figures in the top row.

Table 2. Factors Causing Increases in 2003 Fed Cattle Prices.

Market	Economic Factors						
Fed Steer	***Domestic Cattle* Slaughter**	**Canadian Cattle Imports**	**Domestic Beef Demand**	**Slaughter Cattle Weight**	**Beef By-Products**	**Canadian Net Imports**	**Other Country Net Imports**
Price	$7.83/cwt	$6.42/cwt	$3.00/cwt	2.04/cwt	$1.67/cwt	$0.45/cwt	$0.08/cwt
Percent	(9.40%)	(7.70%)	(3.60%)	(2.45%)	(2.00%)	(0.54%)	(0.09%)

Note: Net Imports in the last two columns are beef imports less beef exports, excluding live cattle.

The leading factor in the cattle price increase was the decline in domestic cattle slaughter, which increased cattle price by $7.83/cwt, followed by the cessation of Canadian live cattle imports, which increased cattle price by $6.42/cwt. The Canadian effect was relatively large because of its relatively large contribution in reducing U.S. commercial cattle slaughter.

Increasing consumer beef demand (as measured by the LMIC beef demand index) was the third leading cause of the 2003 price increase, adding about $3.00/cwt to fed cattle price. Though not statistically verified, it is thought that several factors have contributed to the demand increase since 1998, including beef product promotion, beef product development (convenience foods), improved public perception of beef health attributes, and high protein diets (i.e., the Atkins diet). Declines in average slaughter weights, due to accelerated fed cattle marketings, was the fourth leading factor. This factor increased fed price by $2.04/cwt.

Changes in prices of beef by-products affect meat packer price bids for slaughter cattle since by-products are crucial for covering packer profit margins. The increase in the value of by-products added $1.67/cwt to fed cattle price, the fifth leading factor in affecting fed price. The last two factors were decreases in net beef imports from Canada and from other countries, which increased fed cattle price by $0.45/cwt and $0.08/cwt, respectively. The relatively small effect of these variables reflects two factors. First, *net* beef imports from *all* countries constitute only about 4% of U.S. beef supplies, and second, net beef imports more directly impact the wholesale-retail level of the market.

Summing up the estimated changes in fed cattle price gives a total price increase of $21.49/cwt. When added to the October-to-October average price of $83.35/cwt, this pushes fed steer price to nearly $105.00/cwt, which is within the range of weekly fed prices in October 2003 reported by the LMIC.

Prices in the feeder cattle market logically followed the price increases in the fed cattle market. Feeder cattle prices were also supported by about $2.00/cwt due to a 14% decline in corn price (from $2.41/bu in October 2002 to $2.08/bu in October 2003). Feeder cattle prices, however, did not increase as much on a percentage basis as fed cattle prices. This may have been due to low net cattle feeding margins in the fourth quarter of 2002 (about $3.00 per head) and uncertainty by cattle finishers about the permanency of high fed cattle prices.

U.S. BSE Outbreak

This study did not account for the December 23, 2003 report of BSE in the state of Washington. Within a few days after the announcement, cattle futures and cash prices for fed cattle declined by 15-20 percent, i.e., cash fed cattle prices fell from about $92/cwt to about $75/cwt. Most of the decline was due to the United States quickly losing 90 percent of its beef export market (the U.S. exports about 10 percent of its beef supplies) and market uncertainty. As of early March, however, cash fed cattle prices in the Southern Plains had increased to $84-$86/cwt, temporarily reflecting increasing wholesale beef sales and boxed beef prices.

Conclusions

The analysis indicates that, of the variables measured, 78% of the increase in October 2002-to-October 2003 fed cattle prices was supply related. This included decreases in domestic cattle slaughter, Canadian cattle imports, net beef imports, and average slaughter weights. Increased consumer demand for beef accounted for 14% of the fed price increase while increased by-product values accounted for 8% of the price increase.

In the period studied, percentage increases in retail beef prices did not match those in the live cattle and wholesale beef markets. Perhaps retailers expected consumer resistance to a complete pass through of wholesale beef prices due to relatively cheaper poultry and pork meats. Some consumer

resistance may have occurred, as wholesale beef prices substantially decreased from their high level of about $201.00/cwt in mid October to about $158.00/cwt in mid December.

Prior to the BSE outbreak in the U.S., market analysts predicted that the next two to three years would have maintained high nominal U.S. cattle prices. However, U.S. beef producers now potentially face a more volatile market due to the uncertainty of foreign markets, domestic consumer behavior, and the effectiveness of U.S. safeguards in preventing BSE contamination of beef supplies.

Beef price recovery from the current crisis hinges upon two major areas. One is the restoration of U.S. beef export markets, particularly the major markets of Japan, South Korea, and Mexico. This involves assuring foreign buyers about the safety of U.S. beef supplies, which is contingent upon non contaminated feed supplies, U.S. meat processing methods, U.S testing programs for BSE, and a national cattle ID system. Another is that the safeguards must maintain domestic consumer confidence in U.S. beef supplies. The foreign market recovery for U.S. beef could get entangled with other commodity issues in trade.

IMPLICATIONS OF THE CONSUMER RESPONSE TO EMERGING TECHNOLOGIES AND DISEASES FOR INTERNATIONAL TRADE: THE CASE OF JAPAN

By
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Introduction

There has been a recent transformation of the way consumers think about food. Food is now viewed as something one must be vigilant about and protect children from. Several visible issues illustrate this consumer-based trend. Genetically modified (GM) food has become controversial, and many consumers perceive GM food products as a health threat. Bovine Spongiform Encephalopathy (BSE), commonly known as "Mad Cow Disease," was discovered in Europe, Japan, Canada, and now recently, the United States. As a result, beef throughout the world is considered suspect. Although hoof and mouth disease does not affect humans, the recent outbreak, which caused herds of animals to be destroyed in Europe, cannot be viewed as a positive force on consumer perceptions of the food system.

The public's beliefs about health risks are often very different from those of the experts. Many European and Japanese consumers believe that genetically modified organisms (GMOs) pose a threat to human health. Even so, scientists at the U.S. Food and Drug Administration (FDA) argue that there is no health-related or scientific reason to reject genetically modified (GM) commodities and food products. Regardless of the regulations, the public's *perception* of risks, rather than scientifically proven risks, that directly affects markets. As the saying goes, "The customer is always right," even when he or she disagrees with the leading scientists.

Similarly, even though there were no confirmed cases of Mad Cow Disease in the United States at the time of the Japanese discovery, the Mad Cow Disease scare in Japan resulted in U.S. beef producers losing hundreds of millions of dollars in sales. U.S. beef shipments to Japan dropped by as much as 50% a month in volume since the first case of Mad Cow Disease was found in Japan in September 2001 (Ono, 2002). The important question for the beef industry was how to win back this previously growing market.

In order to satisfy consumers, many countries require mandatory labeling of GM food products. GM labeling policy is controversial, and specific policies have been challenged as non-tariff barriers to trade. For example, the United States challenged the European Union's mandatory labeling requirement for certain food products
produced from GMOs under the Agreement on Technical Barriers to Trade (GATT, 1994). A consideration in this debate should be scientific versus consumer sovereignty (Roberts, 1999). Although the scientific consensus may be that GMOs are completely safe for consumption aside from potential allergens, it may be the case that a majority of the population in a given country prefers to avoid GMOs. Should it be considered a barrier to trade if that country's government imposes mandatory labeling requirements on all imports? Although domestic firms may face the same requirement, it may not be a binding constraint for them if they are not leaders in biotechnology research. In many countries, such as Japan, consumers are truly concerned about GMOs.

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Findings

This paper discusses the findings of three related, but unique, consumer studies: (1) an empirical study of Japanese consumer preferences and willingness to accept genetically modified food products; (2) an empirical study of consumer response to the discovery of BSE in Japan and willingness to pay for BSE-tested beef; and (3) an analysis of GM labeling policy and the implications for U.S.-Japanese trade.[2]

The Consumer Response to GM Food in Japan

In Japan, a large U.S. export market, there has been growing public opposition to GM foods. This study utilizes survey data which was collected for the purpose of this study with in-person interviews conducted in Japanese at a Seikyou, in Matsumoto City, Japan, during June 2001. In total, 400 consumers were surveyed. The survey solicited data on respondents' demographic characteristics, their attitudes about the environment and food safety, and their self-reported knowledge and perceptions about biotechnology. Information about environmental and food safety attitudes was obtained by presenting trade-off situations between environmental quality and economic growth, and between food safety and low prices, respectively. Eliciting these attitudes from trade-off scenarios is an effective way of ensuring that the survey information is informative as well as useful in an empirical modeling context. Summary statistics for the variables used in this analysis are presented in Table 1.

Table 1. Summary statistics: GM study in Japan

Variable	Description	Distribution
Female	1 if female	78%
	0 if male	22%
Education	1 if compulsory school	3.75%
	2 if HS diploma	42.5%
	3 if 2-3 year college	19.5%
	4 if 4-5 year degree	17.25%
	6 if Adv./Prof. degree	13.5%
	7 if refuse	3.5%
Income	Income in 1000 yen	Mean = 6,350 Std. dev. = 2,500
Environment	Scaled from 1 to 10; where1 if economic growth is all-important and 10 if environment is all-important	Mean = 6.5 Std. dev.= 1.91
Food Safety	Scaled from 1 to 10. where 1 food prices are all-important and 10 food safety is all important	Mean = 7.9 Std. dev. =1.94
Risk	1 if high or low GM risk	74%
	0 if no GM risk	26%
Opinion	1 if favorable or neutral opinion about biotech,	12%
	0 if negative opinion	88%
Knowledge	1 if high or little knowledge about biotechnology	82%
	0 if no knowledge	18%

[2] This research is largely drawn from Hiromi Ouchi's masters thesis at Washington State University, which was awarded the 2003 Western Agricultural Economics Association's Award for Best Thesis.

The survey included contingent valuation (CV) questions regarding willingness to accept (WTA) discounts to purchase noodles made from genetically modified wheat. Consumers were first asked if they were willing to pay the same price for noodles made with GM wheat as noodles made with the corresponding conventional wheat. If the respondent's answer to this question was "no," a follow-up question was asked in which the respondent was offered a random discount on the GM noodles relative to the non-GM noodles.

The model used to examine the outcomes of our survey can be considered a special case of the double-bounded logit model (Hanemann et al. 1991). In this model, the initial bid was set at zero and implied no price difference between GM noodles and non-GM noodles. The second bid was the discount for the GM noodles relative to the non-GM noodles. This bid was only given to individuals who answered that they would not buy GM noodles at the same price as non-GM noodles. The WTA function for GM noodles was estimated as a function of the discount bid and a column vector of characteristics (food safety and environmental attitudes, self-reported knowledge and risk perceptions about biotechnology, gender, income, and education) and a random variable accounting for random noise and possibly unobservable characteristics. (See McCluskey et al, 2003, for a detailed presentation of the model).

The estimation results are presented in Table 2. The estimation results indicate that Japanese Seikyou respondents, on average, wanted a 60% discount to choose GM noodles over non-GM noodles. A greater discount was required to choose GM noodles for consumers who self-reported a high level of knowledge about biotechnology and high levels of risk perceptions toward GM-food. Also, respondents who had a high level of concern about food safety required a greater discount to choose GM food. Interestingly, gender and income did not significantly affect the required discount for GM-food. These results support Baker and Burnham's (2001) findings that cognitive variables (opinions, beliefs, knowledge), moreso than demographics, are very important in consumer preferences for GM foods. For a more comprehensive analysis and discussion of this data, see McCluskey et al (2003).

Table 2. Parameter Estimates for WTA model: GM Study in Japan

Variable	Estimate	*p*-value
Intercept	-1.3214	0.0000
Bid	5.3704	0.0000
*Food Safety*Environment Knowledge*	-0.0846	0.0058
Risk	–0.6543	0.0152
Female	–1.7128	0.0000
Income	–0.0368	0.4528
Education	–0.4604	0.0776
	–0.4965	0.0406

Bse In Japan: Consumers' Perceptions And Willingness To Pay For Tested Beef

Food safety issues are receiving greater attention than ever in Japan. The discovery of Bovine Spongiform Encephalopathy (BSE), commonly known as "mad-cow disease," in Japan caused anxiety about consuming beef and beef products. Until the BSE outbreak, the prospects for the Japanese beef market had been promising. Annual Japanese beef consumption had tripled over recent decades to about 21 pounds per person (Brooke 2001), and the Japanese beef market had been liberalized, allowing for the importation of fresh/chilled and frozen beef. The BSE-scare caused a sudden, extreme disruption in consumer demand for beef. As a result, there was a sudden fall in sales of beef, which

hurt the Japanese beef industry as well as major beef exporters to Japan. A motivation for this research was to answer the question of how to restore the public confidence in safety of beef.

A consumer survey was conducted for the purpose of this study at a Seikyou, in Nagano, Japan during December 2001. This survey solicited data on respondents' demographic characteristics, their attitudes about the environment and food safety, their self-reported knowledge about BSE, their risk attitudes about beef from different origins, and their beef consumption habits. Concerning changes in consumption habits after the BSE-outbreak, 11% of respondents indicated that after the BSE discovery they started avoiding beef. Of those who still included beef in their diets, 23% ate beef daily or at least once a week, and 66% ate beef at least once a month. Eighty-six percent of respondents answered that they consumed less domestic beef since the BSE-outbreak. The fact that such a high percentage of respondents reduced their consumption of beef highlighted the impact of BSE, especially since habit was identified as important in Japanese beef demand (Price and Gislason, 2001). Summary statistics for the variables used in this analysis of Japanese consumer response to BSE are presented in Table 3.

Table 3. Summary Statistics for BSE Japan Study

Variable	Description	Mean
Female	1 if female/0 if male	0.82
Environment	Scaled from 1 to 10; where1 if economic growth is all-important and 10 if environment is all-important	7.10
Food Safety	Scaled from 1 to 10. where 1 food prices are all-important and 10 food safety is all important	7.96
Knowledge	1 if high self-reported knowledge about BSE 0 if little or no self-reported knowledge about BSE	0.90
Lessbeef	1 if consume less domestic beef 0 if no change	0.86

Survey respondents were asked if they were willing to pay a random premium for beef tested for BSE compared to the corresponding, non-tested product. Of the 381 respondents, 65.9% responded that they were willing to pay a premium for BSE-tested beef. This analysis utilized contingent valuation dichotomous choice methodology. A single-bounded logit model was used to analyze factors affecting willingness to pay (WTP) a premium for BSE-tested beef.

The premium (bid) information and other demographic, knowledge, and attitudinal information were used to estimate the magnitude of factors that affect Japanese consumers' WTP for BSE-tested beef and how much of a relative premium Japanese consumers were willing to pay for this product. Overall, results indicated that Japanese Seikyou respondents, on average, were willing to pay a 56 percent premium for BSE-tested beef (Table 4). The estimation results also showed that food safety and environmental attitudes, reduction in beef consumption following the BSE outbreak, and being female all have a statistically significant positive effect on the WTP for BSE-tested beef. For a more comprehensive analysis of this data, see Ouchi et al (2004).

GM Food Policy and U.S.-Japanese Trade

Finally, the effect of GM food policy and food safety, especially in terms of food labeling, has important implications for U.S.-Japanese trade. The Codex committees of the World Trade Organization (WTO) are working to harmonize international standards and resolve trade disputes associated with food labeling in order to promote fair trade of foods and protect consumer health. Since different countries have different attitudes toward GM food products, the Codex frameworks allow each country to develop their own standards. There has been a worldwide trend to implement food labeling for food products

that contain GMOs. The problem of asymmetric information may increase consumer anxiety about GM food products, which results in a greater need for GM foods to be accurately labeled. Governments have two policy options for GM food products: mandatory and voluntary labeling. Both mandatory and voluntary labeling give consumers choices based on their perceptions about GM foods and give producers an opportunity to differentiate their products. However, mandatory labeling is a hotly debated issue and is sometimes perceived as non-tariff trade barriers for major GM exporting countries.

Table 4. Parameter Estimates for WTA Model: BSE Study in Japan

Variable	Estimate	p-value
Intercept	–0.3933	0.369
Bid (Premium)	–2.3874	0.000
*FoodSafety*Enviro*	0.1004	0.020
Lessbeef	0.7709	0.015
Female	0.5498	0.053

Conclusions

The United States and Japan have been important partners in the international trade of agri-food products for many years. Consequently, it is important for both U.S. policy makers and food exporters to understand Japanese consumers' preferences and attitudes toward biotechnology and food safety. A policy concern is that food labeling will be used strategically to create non-tariff barriers to trade. The cost of meeting the standards associated with each labeling policy will differ depending on a country's comparative advantage. Consequently, one country may push for specific GM labeling requirements because of the effects on their rivals. Even if GM labeling policy is not made strategically, it may not have a detrimental effect on the ability to trade for countries in other regions of the world. Most importantly, consumer preferences should be included in the policy equation. Clearly, in practice, any trade policy solution will be complicated, including the fact that there is often no consensus across regions on risk assessment for GM food products.

Based on the empirical findings of this line of research, there is an opportunity to market food segregated from GM products and BSE-tested beef in Japan. For those firms who want to market either GM foods or beef in Japan, they need to convince Japanese consumers of the safety of their products with consumer education campaigns and credible risk communication. It suggests that there is at least a niche market for BSE-risk-free beef. However, in order to command a price premium, consumers must be convinced of the safety of labeled beef products through documentation of standards and inspections.

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THE POLITICAL ECONOMY OF RIVER RATS AND IDAHO'S FOUR RIVERS WHITEWATER RAFTING LOTTERY

By
Hayley Chouinard and Jonathan Yoder[1]

Introduction

Idaho is known as the *Whitewater State*. It includes thousands of miles of navigable whitewater, ranging from steep creeks to big rivers with huge rapids. Some of the big rivers have become especially well-known and rafting on four of the most popular stretches of these rivers is regulated during peak season by the U.S. Forest Service via the Four Rivers Lottery. To raft these river sections during the peak season, rafters must submit an application for a permit, and the permits are then allocated by computer lottery for the upcoming rafting season.

There are at least 12 stretches of rivers in the west, for which rafting permits are distributed in this way, and most western states hold lotteries to allocate permits for hunting one or more big game species (Buschena, Anderson, and Leonard, Loomis 1982, Nickerson). Lotteries come in many forms, but they are not the only way of allocating rights for natural resource use. Noncommercial permits to raft the Grand Canyon of the Colorado River are allocated by a waiting list, although as of December 2003 the National Park Service placed a hold on adding names to the 8,000+ waiting list, and are considering alternative allocation schemes (Grand Canyon National Park).[2] Rationing permits strictly by price is an alternative that tends to be good at getting permits to the right people, but it is rarely used as the primary distribution mechanism for these types of resources, often because of protest about the inequity associated with a pricing system (Sandrey, Buccola, and Brown, Loomis 1980). Those with higher incomes are more likely to obtain the permits, and this is in conflict with the idea that everyone should have equal access to natural resources.

As is usually the case with lotteries for the use of natural resources, once the permits are allocated by the Four Rivers Lottery they are not transferable; the permit holder must be on the raft trip for the permit to be valid. This restriction is enforced, too; a Forest Service official verifies the permit holder's identity at the river put-in site, and Forest Service officials may review permits at any point along the river. Financial penalties are issued for rafters without a valid permit.[3] Standard economic logic suggests that allowing permit trading, even after the permits have been allocated by lottery, would increase welfare among rafters by allowing those who value rafting trips most highly to buy a permit from lottery winners who care less about rafting. In this article, we examine why this market restriction might have been imposed, and whether it should be.

In the next section, we begin by examining some of the important characteristics of the rafting environment and the current Four Rivers permit allocation system. We then hypothesize why the Forest Service imposes this market restriction. Next, we informally compare the expected value to

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[2] In contrast, Loomis 1980 reports that in 1976 there were 425 applications for 36 permits to float the Grand Canyon, which were at that time apparently allocated by lottery. Demand for white water rafting has exploded since then.
[3] On the other hand, enforcement is undoubtedly not perfect, and there are other ways of buying your way onto the river. It may take nothing but some spare time at the put-in and a few cases of beer for a non-permit holder to sneak on with a permitted rafting party.

rafters of the permits with and without a post-lottery permit market. We conclude with a discussion about the efficacy of prohibiting a secondary permit market.

Rafting Permits and the Allocation Process

The Middle Fork of the Salmon, the Main Fork of the Salmon, the Upper Selway, and Hells Canyon of the Snake River are all situated in the mid-section of Idaho (Figure 1). A permit is required to float these stretches during the most popular times of year, roughly between early June and late July, which coincides with high water periods for each river. These river stretches provide some of the most desirable multi-day river trips in the world, with big sandy beaches for camping, excellent fishing, and beautiful scenery. The early season provides big, fast, and challenging whitewater for adrenaline junkies, and the late season provides a more relaxing, sunny, warm float, with milder rapids and crystal-clear water for the more laid-back crowd. Rafters highly value these rivers for recreation. Consumer surplus estimates calculated in 1969 by Michalson for recreation on the Middle Fork of the Salmon average approximately $385 per day or to just over $2300 for a six-day trip when inflated to 2003 dollars. This compares to a six-day commercially run raft trip on the Middle fork of the Salmon, which costs approximately $1,500 or more per person, depending on the outfitter.[4] This amount does not include the costs of getting to the rivers (which, by the way, can be quite an excursion in itself) or the opportunity cost of time.

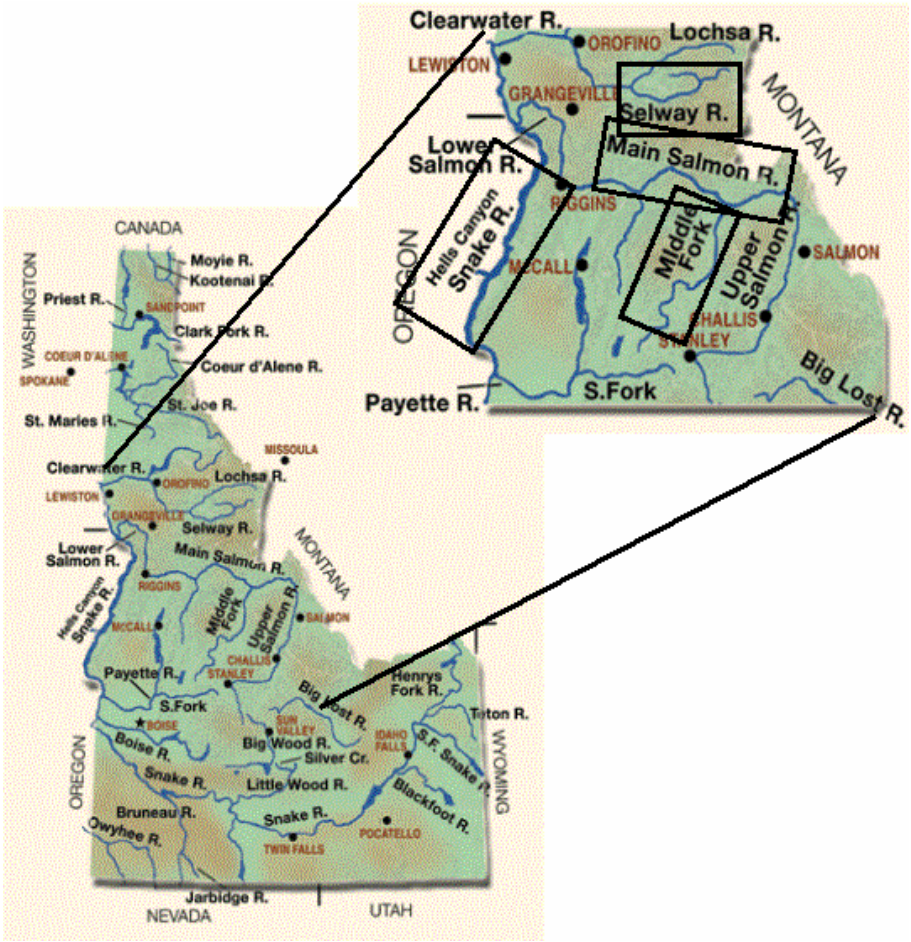

Figure 1: Idaho and the 4 stretches of river under the 4 Rivers Lottery.
Source: http://www.ioga.org/riverssearch.htm

[4] These raft trips include various services provided by the outfitters, so this market price is not strictly related to the willingness to pay for a private permit.

In their bid to win a permit in the private (noncommercial) lottery, rafters submit an application that may list up to four choices ranked for specific rivers and dates, along with a $6 application fee. After the January 31 deadline, a random drawing for applicant's names occurs. When a name is drawn, the applicant is issued a permit for their first choice river and date if it is available. If the first choice is not available, review of the remaining choices occurs until a permit is issued or all four choices are determined to be unavailable. Random drawings occur until the full quota of permits are issued (Martin, U.S. Department of Agriculture). This permit allocation system was instituted in 1987, in response to high demand replacing various allocation systems for these stretches of river (Martin). Today, much more so than a couple of decades ago, demand for permits far outweighs permit availability: 15,357 applications were submitted for the 1076 permits allotted for the 2003 season. This equates to an average 7% chance of obtaining a permit. Table 1 contains summary statistics for the Four Rivers Lottery for the 2000-2002 seasons. Clearly, given the cost of a raft trip, more rafters positively value rafting permits than are available.

Table 1. Numbers of applications submitted and permits allocated for the Four Rivers Lottery, average for 2000-2002.

	Submitted	*Allotted*	*%*
Main Salmon	2,646	285	10.8
Middle Fork Salmon	9,508	351	3.7
Hell's Canyon, Snake	807	327	40.5
Selway	1,755	62	3.5
Total	**14,715**	**1,025**	**7.0**

Source: http://www.fs.fed.us/r4/sc/recreation/4rivers/stats.htm

Why Might the Forest Service have a lottery and Prohibit a Secondary Market?

Loomis (1980) compares the level of efficiency under a pricing versus a lottery allocation method for permits in Westwater Canyon of the Colorado River, and concludes that a pricing mechanism would provide the greatest efficiency but is less equitable than a lottery. Nonetheless, the idea that everyone should have equal access to government-regulated resources has been a part of the recreation culture for at least the last century, and the objectives of the Forest Service (as molded in part by the interests of stakeholders) clearly play a role in the allocation process used for the four rivers permits. The use of lotteries for allocating resources is one way to minimize the perception that some receive preferential treatment or easier access than others.

We hypothesize further that the Forest Service intends to direct the rents associated with rafting permits to the users of the resource services themselves. By prohibiting a post-lottery market for permits, nonrafters have no incentive to apply for a permit, and rafters are protected from losing a portion of the rents from the resource to profit-seeking nonrafters. Rafters are an interest group concentrated on this specific type of resource (of which these rivers are an important and unique component), and are likely to have a great deal of influence on the managers of the permit system (Becker).

Expected benefits with and without a post-lottery permit market

To shed light on the economic effects of a post-lottery market restriction, we compare the expected value of rafting permits to rafters under three scenarios: 1) the status quo, in which no secondary market is allowed, 2) a scenario in which only "rafters" are allowed to apply to win a permit by lottery but are then allowed to buy and sell permits afterward, and 3) a scenario in which anyone, including nonrafters, may apply to win a permit by lottery, and a post-lottery market for permits is allowed.

In any of these cases, the demand for permits by rafters underlies the equilibrium characteristics of both the lottery and market. We define *rafters* as individuals that place a positive value on a rafting permit --- that is, the set of individuals for whom demand is positive. Think of rafters as being arranged in descending order of their valuation and, once our duckies are in a row, their valuations can be represented by a continuous, linear, downward sloping demand curve.[5] As Rumy and Hanke observe, in a simple market for permits (with no lottery involved), rafters would pay up to the net expected value of the rafting trip to obtain a permit to allow them to go rafting. Therefore, the expected value of the permit itself is a direct reflection of the net value of rafting.

The permit allocation process can be divided into two steps, the application step, and the redistribution step. For the no-market alternative, the second step is disallowed. With a market, the second step involves trading between some lottery winners and would-be rafters. People will only apply for a permit if their expected benefit of doing so outweighs the cost of applying. This expectation is the probability of winning times the value of the permit to the winner, and the scenario that applicants face affects both of these elements. Assuming a simultaneous random draw for each available permit, the probability of winning is the number of allocated permits divided by the number of applications. The value of the permit to the applicant is either the net value of a rafting trip or the expected market price for permits, whichever is greatest.

For the analysis below we assume that the total cost of applying is the application fee. Further, if a market is allowed, the market price of a permit will be equal to the marginal permit valuation for the marginal permit issued; that is, we assume a competitive market, and all transferred permits will be bought and sold at the market price. In Figure 2, $\overline{p}$ is the market price given total allocated permits $\overline{q}$.

The Permit Lottery with no Secondary Market

Permit winners are chosen randomly from all applicants, and so with a secondary market prohibited, the expected aggregate value of the permits to rafters is the sum of the expected value for all applicants, represented by area B+C+D+E in Figure 2 minus the sum of the application fees. There are two important consequences of the market restriction: 1) some of the nonwinners may value a permit more than some of the permit winners, and both permit winners and losers could be better off if trade between these rafters was allowed; 2) because nonrafters (by definition) would not want to use the permit themselves and are prohibited from selling them, no nonrafters will enter the lottery given the market prohibition.

Rafter-Only Lottery with a Secondary Market

Suppose, however, that only rafters (people who like rafting) are allowed to apply for the lottery. The expected benefit of an application for a rafter in this setting is the maximum of the market price and the rafters individual permit value, times the probability of winning. The cost of an application is still the application fee, and the individual will apply if the expected benefit is larger than the application cost. The market price will induce some half-hearted rafters to apply for a permit just to sell it, so there will be

[5] A "duckie" is common name for a one-person raft.

more applicants. However, with more applicants, the probability of winning will decrease. The marginal applicant will be that person for whom the expected value of obtaining a permit (market price times the probability of winning) equals the application cost.

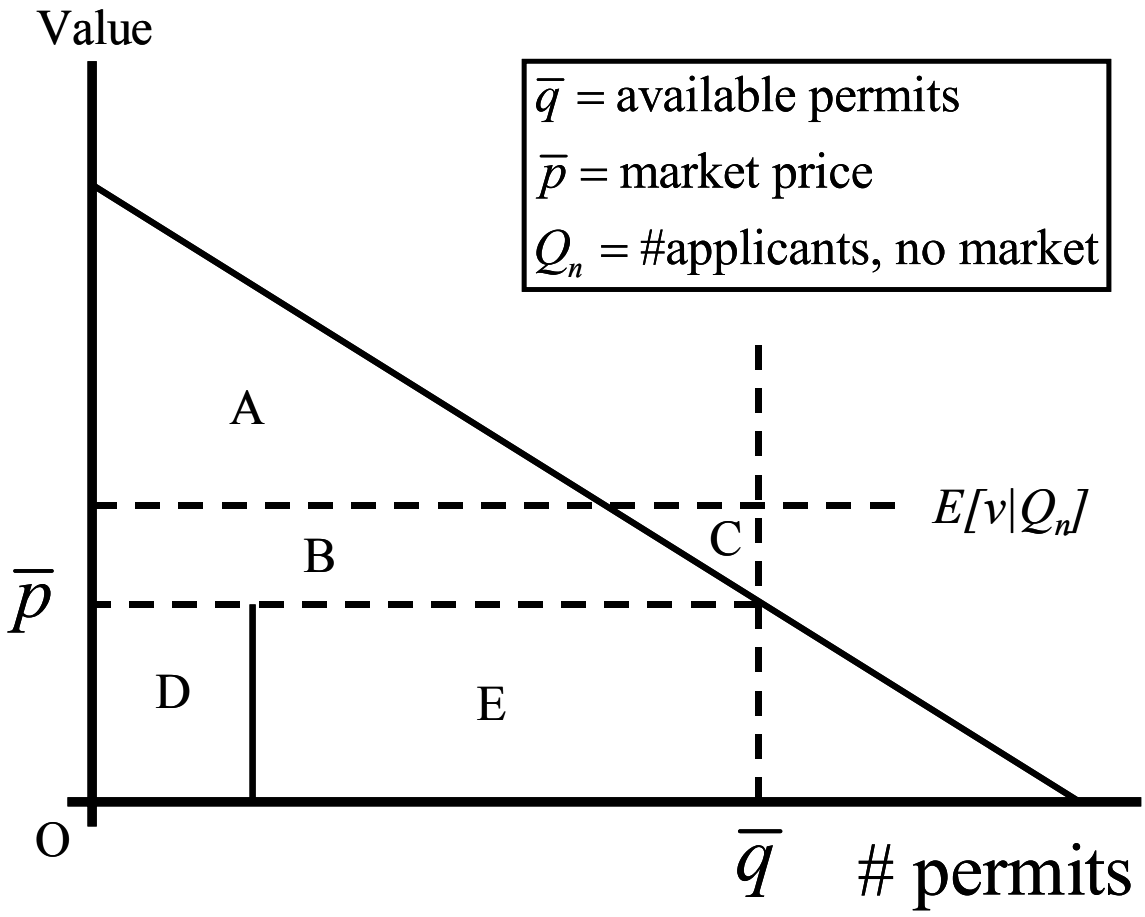

Figure 2: Benefits from a random lottery are (B+C+D+E), a rafter-only lottery with market (A+B+D+E), and an open lottery with market (A+B+D). Area *E* is equivalent the value lost to non-rafters in an open lottery and market, given that E/(D+E) is the fraction of applicants who are nonrafters. The lottery with no market outperforms an open market from rafters' perspective if C+E-application fees > A- non-rafter application fees. This graph does not account for application fees.

Because rafters now have the ability to sell to other rafters in a secondary market, the value of a permit to a rafter will be the greater of the market price or the individual's willingness to pay for the right to take a raft trip. With the rafter-only secondary market, zealous lottery losers will buy permits from half-hearted winners. The value of the traded permits is maximized because the highest valued users ultimately use them, and all the value of the right to take a trip is accrued by rafters. Winners who choose to use the permit rather than sell them receive the same surplus as under the lottery-only scenario. The aggregate benefit of permits in the rafter-only market in Figure 2 is A+B+D+E. This total aggregate value will be higher with the secondary market than without, and all of it is accrued by rafters because the lottery is restricted to rafters only.

An Open Permit Lottery with a Secondary Market

If application for a permit is not restricted to rafters and permit trading is allowed after the lottery, the market price might induce nonrafters to apply for a permit for the sole purpose of selling it (just as a rafter-only market might induce half-hearted rafters to apply and sell). In this open lottery case, an individual's permit value is still the maximum of the value they place on a raft trip or the price they can receive in the market. The market price of a permit will be the same with either type of secondary market ($\overline{p}$ in Figure 1). Nonrafters will apply if the expected value of an application (the market price times the probability of winning a permit) is greater than the application fee.

With an open secondary market, the aggregate value of permits to rafters will be less than in the rafter-only lottery with a secondary market. Rafters will be less likely to win a permit because nonrafters also submit applications, and some of the rafter surplus will be transferred from rafters to nonrafters. This loss is equal to the market price times the number of winning nonrafters, and is equivalent to area E in Figure 2 given that the fraction of winners who are nonrafters is equal to E/(D+E). With this transfer of welfare to nonrafters, the total aggregate value of permits to rafters is less with the open secondary market than under a rafter-only lottery with market.

The comparison between an open lottery and market and the current lottery for nontransferable permits is very interesting. The aggregate value of permits to rafters in the open secondary market may be higher or lower than in the lottery market with no secondary market (which, remember, is the current policy). The upside of allowing a secondary market was discussed above: rafters who win can sell to other rafters if the price is right, and rafters are therefore better off. The downside is that nonrafters enter and extract some of the rents embodied in the market price of permits. Considering Figure 2 again, the lottery with no secondary market outperforms the open market only if C+E – (total application fees) is greater than A – (application fees paid by rafters). Which of these amounts outweighs the other is an empirical question that depends in large part on how many nonrafters are induced to apply in the initial lottery. This fraction in turn depends on the size of application fee charged, the number of permits allotted, and the shape of the demand curve.

Conclusions

From the perspective of the resource users --- rafters in this case --- allowing a post-lottery market for permit trading is a double-edged sword. Although such a market would allow rafters to trade permits among themselves and improve the aggregate value of river use to this stakeholder group as a whole, it also puts them in a position where they are less likely to win a permit in the initial lottery, and more likely to have to pay an individual to be able to raft these rivers --- someone who never had any intention of rafting in the first place, no less. Although it is true that with a secondary market rafters will transfer some amount of surplus to nonrafters, it remains unclear whether rafters are better off with a market prohibition.

Nonetheless, the lottery managers have at least two instruments that would affect the incentives to apply for permits: the application fee and the number of allotted permits. Changing the levels of these two policy instruments may change the share of applications, and therefore permits, that go to nonrafters, but using these instruments in such a way will have other ramifications for the distribution of user-group welfare as well. For example, higher lottery application fees or post-win permit charges could also be applied to through the Recreational Fee Demonstration Program for maintaining these beautiful river environments, which face substantial pressure almost entirely from rafters. It remains to be seen if a market mechanism can be developed, even in theory, which might make use of the market in a politically expedient way.

There are a couple of reasons to think that a post-lottery market for rafters is more than just a useful hypothetical for understanding the losses to rafters associated with a rafter-only lottery. First, if the goal were to allow a secondary market while restricting that market primarily to rafters, there may be ways to do so, at least to some extent. For example, to be eligible to receive a permit for rafting the Grand Canyon, individuals are required to show some evidence of experience on comparable rivers. Although this requirement is ostensibly implemented for safety reasons, evidence of experience is also evidence of prior interest, and so could be interpreted as a signal that the individual is really a part of the "rafting community". Second, a lottery in Kansas has been designed explicitly for transfer of deer permits. Fifty percent of all nonresident deer permits are set aside for a lottery for landowners, who then may sell these permits to hunters (Taylor and Marsh). This case is particularly interesting not because of the similarities with rafting permits, but because of a big difference. Kansas landowners are easily distinguishable from non-Kansas landowners (or Kansas nonlandowners).[6] If river rats were as easily flushed out, perhaps a post-lottery market would have been implemented by now.

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