

**The Potential Impact of a Proposed Ban on the Sale of US Horses for
Slaughter and Human Consumption**

By

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Abstract

Both the federal and state governments in the United States are being asked to enact laws that would make the slaughtering of horses for human consumption illegal. The US is one of the principal exporters of horsemeat to Europe. This paper examines the impacts of a proposed ban on the US horse industry and the US export market for horsemeat. The results suggest a loss of approximately \$300 per horse in the US as a result of such a ban. The supply and demand for US exported horsemeat have declined during the past decade. The most significant factors influencing this decline are competing imports and the negative economic climate regarding horse slaughter in the US.

Keyword: *Horse slaughter, horsemeat, meat exports*

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Introduction

During the past decade, the practice of slaughtering horses to produce meat for human consumption has been challenged in the United States even though virtually all of the meat is exported to foreign (mostly European) consumers. Horsemeat consumption in Europe is fairly common but European supplies are insufficient to meet demand (Grunder (2003)). Consequently, importing horsemeat, including horsemeat from North America, is an important business in Europe and slaughtering horses for human consumption has been a method used to dispose of many US horses. The value of US horses sold for slaughter in 2002 was about \$26 million (FATUS (2003)).

Horse enthusiasts and animal welfare activists have lobbied the national government and state governments in the US to ban the slaughter of horses for human consumption. For example, Texas state courts have held since 1949 that it is illegal to slaughter Texas horses for human consumption (THLN (2003)). In spite of this, the only two remaining equine slaughtering plants in the US are located in Texas. In 1998, the California legislature voted to ban the slaughter of horses in California. Many other states have considered enacting similar laws. At the federal level, the US House of Representatives has been lobbied to enact legislation banning the slaughter of horses for human consumption. In February 2003, Representative John Sweeny of New York, together with 60 co-sponsors, introduced legislation (H.R. 857) to ban the slaughter of horses in the United States. H.R. 857 is titled "The American Horse Slaughter Prevention Act (Sweeny and Spratt (2003)). The reasons supporters give for attempting to enact H.R. 857 fall into four general categories: 1) horses have not traditionally been raised or

intended as a foreign consumable product in the United States, 2) animal welfare issues, 3) food safety issues, and (4) lack of market transparency¹ (Sweeny and Spratt (2003)). The status of the bill has not changed since its introduction. The proposed law has been referred to the House Agriculture, the House International Relations, and the House Ways and Means Committees. No hearings have been scheduled as of this writing.

The proposed federal ban on horse slaughter has the potential to impact both the horse industry in the US as well as horsemeat industry in the European Union (EU) because the EU is the principal customer for US horsemeat. This research examined the potential economic impact the proposed ban might have on the \$112 billion US horse industry (American Horse Council (2003a)) and the potential impact of the ban on the supply of horsemeat in Europe.

Overview of the Horsemeat Market and State Legislation in the US

Unwanted horses include aged horses, horses deemed dangerous, injured horses, breeding failures and horses birthed for premarin² production (see <http://www.hsus.org/ace/11788>). The methods used to dispose of unwanted horses include slaughter, rendering, incineration (cremation), unprocessed animal feed, burial, or removal to a landfill.

Horses in the US sold for slaughter are transported to the slaughter facility in one of two ways. One, the horses could be sold at auction to a horse dealer who typically picks up enough horses to fill a trailer. The trailer is then transported directly to a

¹ When horses are sold, especially at auction, it is not required to inform the seller that the horse may be sold for slaughter. Consequently, sellers do not have full information about how the horse will be used or disposed.

² Premarin is a hormone replacement used by menopausal women. The hormone is extracted from the urine of pregnant mares. Male foals in these operations are viewed as a by-product and are often sold for slaughter (Humane Society).

slaughter facility that is typically located hundreds of miles from where the horses were sold. The other method is much the same as the first. However, rather than having the animals pass through an auction, the owner simply transports the animals directly to the slaughter facility (Potter (2003)).

There are currently two plants processing equine in the US that export horsemeat for human consumption. Both are located in Texas, one in Forth Worth and another in Kaufman.³ Four equine slaughter facilities are located in Canada, one in Owen Sound, Ontario, one in Yamachiche, Quebec, one in Massueville, Quebec; and one in Fort Mcleod, Alberta.

Most of the meat from US horses that are slaughtered for human consumption is exported to the EU. France is the principle buyer of US horsemeat followed by Belgium (FATUS (2003)). Mexico, Argentina, Eastern Europe, and Australia are also major horsemeat exporters (FATUS (2003)). The only US demand for horsemeat comes from zoos who feed the meat to carnivores.

Texas state Representative, Betty Brown, and state Senator, Bob Deuell, proposed a Texas state bill to make the Texas processing plants and horse slaughter legal (H.B. 1324 and S.B. 1413) (Brown (2003)). On May 30, 2003, the Texas senate failed to pass H.B. 1324 and it is now considered a “dead” bill. Consequently, it is still illegal to slaughter horses in Texas. In response to the failure of H.B. 1324 to pass the Texas senate, a federal judge granted that the two plants could continue to operate until a lawsuit against one of the Texas facilities is settled (Brooks (2003); Drosjack (2003)).

Proposition Six was passed by California voters in 1998 and is titled, “The

³ An additional plant slaughters horses in North Platte, Nebraska. But, this meat is used for domestic zoo animals and none is currently exported for human consumption.

Prohibition of Horse Slaughter and Sale of Horsemeat for Human Consumption Act of 1998.” Proposition Six makes slaughtering California horses for human consumption illegal. It prohibits anyone to possess, buy, sell, or export from California any part of a horse for human consumption (Save the Horses (2003)). Interviews with people associated with California’s horse industry revealed that, even though the law had been in place for five years, little or no enforcement of Proposition Six is taking place (Bake (2003); Schonholtz (2003)). No research has been conducted, of which we are aware, to examine the economic impact of Proposition Six on the California horse industry.

Anecdotal evidence suggests that some horse owners in California have simply abandoned⁴ their horses as a result of Proposition Six rather than paying to dispose of the horses (Warren (2003)). In some of these cases, the horses become malnourished and die before help is rendered (Anonymous (2003a)). Other anecdotal evidence suggests that there has been an increase in the number of thin and crippled horses at auctions in California since the implementation of Proposition Six (Anonymous (2003b)). The horses most affected by California’s slaughter horse ban are low- value horses. At one time a sound 1,100 lb. horse was worth \$.40 lb., or \$440. Today, the same horse is only worth \$.10–\$.20 lb. (1,100 lbs. * \$.15 lb. = \$165), a difference of \$275 (Warren (2003)).⁵

Many landfills will not accept dead livestock, and it is illegal to bury horses in many California counties (Anonymous (2003a)). This creates additional costs for horse owners that must pay to have horses transported to be euthanized or disposed of in some other way. The costs of disposal become an important consideration when one considers

⁴ The belief is that some horse owners become desperate and abandon their horses in a manner similar to a cat or dog, leaving the animal in the field or in a neighbor’s yard.

⁵ This is offered as one opinion from a person close to the horse industry. One cannot tell definitively from this example what the effect of Proposition Six has been since other unknown factors could be causing this.

that without a ban horse sellers could sell an unwanted horse but with a ban they must either pay to have it disposed of or must find someone else willing to care for the horse.

Estimated Impact of the Proposed Ban on US Horse Prices

Estimated net present value (NPV) model was used to approximate the change in US horse prices that might be expected after a horse slaughter ban. Elimination of slaughter as a disposal method would eliminate the possibility of obtaining a positive salvage value for any unwanted horses in the US and a disposal cost that would be associated with each horse at the end of its life.

The formula used to calculate the NPV was the following (Robinson and Barry (1996), p.55):

$$(1) \quad \frac{Prevalue - Postvalue}{(1 + i)^n},$$

where *Prevalue* is the current value for cull horses in the US *Postvalue* is the cost to dispose of the horse following the implementation of the slaughter ban, *i* is the discount rate, and *n* is the lifespan of the horse. The disposal methods considered in this analysis include either euthanasia followed either by cremation, rendering, burial, or disposal at a landfill or the owner could pay to have the horse cared for until its natural death. Table 1 displays the expected costs of disposal using each of these methods. The costs of care or disposal vary from approximately \$170 to euthanize and bury an animal to an estimated \$24,570 to care for the animal until its natural death (Table 1). The estimate of the cost to care for the horse until death is documented in Table 2.

An estimated NPV for equation (1) can be calculated assuming that the foregone sale of the horse for slaughter, i.e., the *Prevalue* is \$350 for a horse weighing 1000 lbs. (455 kg.) (Palmer, (2003)). Assuming a discount rate of 5% ($i=5\%$), and that the average

lifespan for a horse of 11 years ($n=11$),⁶ the estimated decrease in the NPV for a horse in the US after the implementation of a ban on slaughtering horses would average \$304 (i.e., $\frac{\$350 - (-\$170)}{(1+.05)^{11}} = \$304$). The horse inventory in the US is approximately 6.9 million (Owens (2003)). Annual horse mortality in the US can be estimated by taking 6.9 million horses and dividing that number by the average lifespan of a horse which yields an estimate of 657,142 horse deaths in the US each year ($6,900,000/10.5\text{yrs} = 657,142$). Approximately 65,000 to 95,000 of the 657,142 US horses dying each year are disposed of by slaughter (AQHA (2003); and Cordes (2002)).

Multiplying the number of US horses slaughtered per year by the estimated loss in NPV for each of these horses following the implementation of a slaughter ban, yields an estimated impact on the US horse industry, in terms of lost value, of between about \$20 million and \$29 million annually ($65,000$ or $95,000$ horses * $\$304.00 = \$19,760,000$ or $\$28,880,000$).

Modeling Supply and Demand for Horsemeat Exports

A simultaneous econometric model was developed and estimated to identify the determinants of US horsemeat supply and European demand for US horsemeat because it was assumed that supply and demand are jointly determined. The structural model should include variables determined by economic theory and was specified as

$$(2) \text{ Supply } Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 C_t + \alpha_3 TREND_t + \alpha_4 TREND_t^2 + \varepsilon_t$$

$$(3) \text{ Demand } P_t = \beta_0 + \beta_1 Q_t + \beta_2 BSE_t + \beta_3 Q_{B,t} + \beta_4 INCOME_t + \beta_5 IMPORTS_{t-1} + \xi_t$$

⁶ The average lifespan of horses in the US is estimated to be 10.5 years (Thomson's Veterinary Healthcare

(4) Supply=Demand

where P_t is the exchange-rate adjusted value of US exports measured in real Euros at time t . Q_t is the annual quantity of horsemeat exported from the US. BSE_t is a binary variable used to test if the *BSE* crisis in Europe affected US horsemeat exports. The variable Q_{B_t} is per capita beef consumption in France at time t . $INCOME_t$ is the household income in France at time t . $IMPORTS_{t-1}$ are horsemeat imports in Europe from countries other than the US in the previous time period. Q_t and P_t applied to the supply equation are the same variables used in the demand equation. C_t in the supply equation is input costs, in this case, US cull horse price at time t . TREND and TREND² are used as proxies for the increasingly negative political environment that has existed in the US since 1990 relative to slaughtering horses for human consumption (see Figure 1). Total EU demand for horsemeat is presented in Figure 2. As can be seen from Figures 1 and 2, US horsemeat exports have become a small proportion of EU horsemeat imports over time. The observations for the variables described here and used in the model were taken from a variety of sources described below.

The value and quantity of US horsemeat exports is gathered and reported by FATUS (2003). FATUS reports the total value of US horsemeat exports in nominal US dollars per metric ton (MT) and also the MT exported. The price of horsemeat exports (P_t) used in the regression analysis was calculated by dividing the total value of US horsemeat exports by the total quantity measured in MT of horsemeat exported. This price was deflated using the US consumer price index (CPI) and then converted to Euros

Communications (2003)). Consequently, n was assumed to be equal to 11 for this study.

using the Pacific commerce exchange rate table (Pacific (2003)). The result was an exchange-rate adjusted, real price for US horsemeat exports. The data are a time-series beginning in 1990 and ending in 2002.

France was chosen as a proxy to represent European demand for US horsemeat in the analysis because France is the largest single purchaser of US horsemeat. The annual quantity of beef produced (Q_{B_t}) in France was used to test the effect of a potential compliment or a substitute (beef) for horsemeat in France (FATUS (2003)). Annual beef production in France was found through the Food and Agriculture Organization of the United Nations database (see <http://apps.fao.org/faostat/collections?version=ext&hasbulk=0&subset=agriculture>).⁷

The income measure ($INCOME_t$) is annual per capita income in France (Insee (2003)). The Pacific Commerce exchange rate tables were used to convert French income figures into US dollars and then the CPI was applied to maintain the income measure in real dollars. The import variable ($IMPORTS_{t-1}$) examines how increases in European imports of horsemeat during the previous year from non-US countries affected US horsemeat prices in the current year. Italy imports much of its horsemeat from non-US countries including eastern and central Europe. Because of this, Italy was used as a proxy for Europe's non-US sources for horsemeat. Data from ISMEA (2003) and ISTAT (2003) gave the volume of horsemeat imports for Italy and this is reported in kilograms per year between 1990 and 2001. Because the 2002 value for horsemeat imports was unavailable, it was interpolated using a semi-log growth model (Gujarati (1999)). A binary variable was used to test the affect of the *Bovine Spongiform Encephalopathy*

(*BSE* or Mad-Cow Disease) crisis on the demand for horsemeat in Europe. Some believe that Europe's *BSE* crisis changed some European consumers' preferences from beef to horsemeat (Helm (2003); and Heyde (2002)). This dummy variable (*BSE*) was used to test whether *BSE* changed European preferences to consuming horsemeat. The value for the variable, *BSE*, was 1 for 1996-1999 inclusive, the height of Europe's *BSE* crisis, and 0 otherwise.

The same prices and quantities of US horsemeat exports used in the demand equation were also used in the supply equation. The price of cull horses was used to represent input costs since it is the principle input cost in horse processing and because a time series for processing costs was not available. The data for culled horse prices gathered from an Idaho horse dealer who purchased and sole over 15,000 cull horses for slaughter between 1990 and 2002 (Palmer (2003)).

Results for Supply and Demand Model

Because the supply and demand for US horsemeat are jointly determined, a simultaneous model of supply and demand is used to estimate the parameters of the supply and demand system specified by equations (2-4). The demand equation is just identified but the supply equation is over identified indicating that a two-stage least square (2SLS) is the appropriate method for estimating the parameters of the system (Ferris (1998)).

The 2SLS procedure is accomplished in two steps. First, each of the endogenous variables in the system, in this case P_t and Q_t , are separately regressed on all of the exogenous variables in the system, in this case *BSE*, Q_B , *INCOME*, *IMPORTS*, *C*,

⁷ Per capita consumption was estimated by dividing total production by the estimated population of France. France is not a major beef exporter, so this was considered to be a reasonable estimate.

$TREND$, and $TREND^2$, to obtain ordinary least squares (OLS) estimates for P_t and Q_t that are not contemporaneously correlated, or \hat{P}_t and \hat{Q}_t . The equations used to accomplish the first step of the procedure are also called the reduced-form equations and are specified as follows:

$$(5) \quad \hat{Q}_t = \theta_0 + \theta_1 BSE_t + \theta_2 Q_{B_t} + \theta_3 INCOME_t + \theta_4 IMPORTS_{t-1} + \theta_5 C_t + \theta_6 TREND_t + \theta_7 TREND_t^2$$

$$(6) \quad \hat{P}_t = \phi_0 + \phi_1 BSE_t + \phi_2 Q_{B_t} + \phi_3 INCOME_t + \phi_4 IMPORTS_{t-1} + \phi_5 C_t + \phi_6 TREND_t + \phi_7 TREND_t^2$$

The second step in 2SLS is to estimate the parameters of the original model but substituting the predicted (uncorrelated) values for P and Q on the right-hand side of their respective equations (predicted values from equations (5) and (6)). Consequently, the 2SLS parameter estimates are obtained by using OLS to estimates for the parameters of the following equations:

$$(7) \quad Q_t = \delta_0 + \delta_1 \hat{P}_t + \delta_2 C_t + \delta_3 TREND_t + \delta_4 TREND_t^2 + \phi_t$$

$$(8) \quad P_t = \gamma_0 + \gamma_1 \hat{Q}_t + \gamma_2 BSE_t + \gamma_3 Q_{B_t} + \gamma_4 INCOME_t + \gamma_5 IMPORTS_{t-1} + \psi_t$$

The parameter estimates for equations (7) and (8) are presented in Tables 3 and represent unbiased estimates for the parameters indicated in equations (2) and (3), i.e., $\delta_i = \alpha_i$ and $\gamma_i = \beta_i$ for all i .

The results for the equation explaining the supply of horsemeat exported from the US indicate a continual downward ($TREND$) but slowing ($TREND^2$) shift of the supply curve to the left that cannot be explained by the exchange rate-adjusted, real export price (P) and the cost of cull horses (C) (Table 3). If one considers $TREND$ and $TREND^2$ as proxies for public attitudes and policies in the US and elsewhere that have affected the desirability and/or costs of slaughtering horses for human consumption, then clearly public opinion and policy are affecting the number of US horses that are slaughtered for this purpose. Figure 1 provides some circumstantial evidence for this since US horsemeat exports declined dramatically during the study period even though input costs (cull horses or C) also declined in real terms during the same time.

The results for the demand equation (Table 3) provide some additional insights regarding factors affecting the market for US horsemeat. $TREND$ and $TREND^2$ were also first tested in the demand model and were both found to have parameters that were not statistically different than zero in the second stage of the 2SLS procedure. Consequently, the model was re-estimated after dropping these two variables from the demand equation.

The results suggest that the demand for US horsemeat exports has suffered because of a shift away from red meat in Europe. For example, the *BSE* crisis in the last half of the 1990s had a small negative effect on horsemeat suggesting that European consumers were exhibiting some reluctance to eat red meat in general and not just beef (parameter estimate for *BSE* in Table 3). This is illustrated perhaps more dramatically by the significant positive sign for Q_B , a result that suggests that horsemeat and beef are complements of one another. An examination of the data reveals that per capita beef

consumption⁸ in France fell by over 17% during the study period (from 33.6 Kg in 1990 to 27.8 Kg in 2002) at the same time US horsemeat exports fell by over 90% (from 46,066 MT in 1990 to 4,592 MT in 2002). These results suggest a general shift away from red meat during the study period which would explain the positive sign for beef consumption (Table 3).

INCOME has a positive and statistically significant coefficient indicating that US horsemeat exports are a normal good i.e., demand increases with positive changes in French income (Table 3). This is consistent with information from interviews conducted in France and Switzerland which suggested that income and consumption of horsemeat in Europe are positively related (Grunder (2003)). Finally, competing European *IMPORTS* were found to be significant substitutes for US horsemeat, as expected, because *IMPORTS* had a negative and statistically significant coefficient (Table 3).

Table 4 presents the supply elasticities and demand flexibilities calculated at their means for significant system coefficients. While the trend elasticities for the trend variables need to be interpreted with caution, they indicate just how dramatically the supply of US horsemeat exports has declined in the past 10-15 years. The relatively large flexibility for beef (Q_B) suggests that beef and horsemeat exports are relatively close compliments, i.e., that as the consumption of beef has declined in France it has had a close corresponding negative impact on US horsemeat exports. The flexibility for *INCOME* indicates a large impact as a result of income changes. The flexibility of 1.07 suggests an income elasticity that is close to one (Table 4). This is a very large income effect for a food product and suggests that horsemeat comes close to being a luxury.

⁸ Beef production per capita in France is actually used in the analysis. Assuming that most beef produced in France is consumed domestically, this should make domestic production a reasonable estimate for

Finally, the flexibility for *IMPORTS* suggests a relatively large impact on US horsemeat export prices as competing imports increase. For example, a 10% increase in competing imports would be estimated to have almost an 8% negative impact on US horsemeat export prices ($10\% * -0.795$) (Table 4).

The results for the demand equation suggest that a movement away from red meat, especially beef, and an increase in competing imports, probably low-priced imports from central and Eastern Europe, have combined to reduce the demand for US horsemeat since 1990. The results for the system of supply and demand indicate that the public concern and policy changes, such as the ban on slaughter in California, the difficulty in opening or expanding slaughter facilities in the US, together with rising competition and changes in consumer preferences for red meat have combined to reduce both the quantity and price of US horsemeat exports. Continuing pressure from US policy makers and the opening of freer trade within Europe and between Europe and South America all suggest a difficult future exists for the horse slaughter industry for human consumption.

Conclusions

US exports of horsemeat to Europe have declined throughout the past decade. This is a result of three major factors. First, the number of slaughtering facilities located in the United States has decreased to only two plants, both of which are located in Texas. As a result, the number of horses exported for slaughter to Canada and Mexico has increased. Second, horsemeat imports in Europe from countries other than the United States are increasing. This has the affect of reducing cull horse prices in the United States, as was observed in the regression model results.

Although many of the horses exported to Europe from Canada and Mexico actually originate in the United States, other countries have increased their horsemeat exports to Western Europe. In 1996, Argentina began exporting horsemeat, and now exports as much horsemeat, in terms of value, as the United States (Stolen Ponies (2003)). Even though the supply of US horsemeat has declined over the past decade, it is still an important source for the European market.

A ban on slaughtering horses will cause the US horse industry to experience both an immediate negative impact, as a result of the closure of the export market, and a permanent increase in expenses due to increased disposal costs. A ban on slaughtering horses will almost certainly cause the value of both US horses and horsemeat to decrease to some degree. For example, the value of live US horses that would have gone to slaughter is estimated to decline by an average of \$304 per horse following a slaughter ban. This figure was calculated using the net present value method. Horses currently have a salvage value. Following a ban on selling horses for slaughter, the salvage value of a horse would become zero or negative where the horse owner will incur the expense of having the animal disposed of using another method.

Aside from the immediate monetary impact, money will be needed to care for or dispose of unwanted horses that cannot be slaughtered and are not disposed. H.R. 857 does not contain language as to what to do with unwanted horses. The only thing the bill does is ban slaughtering, selling, and consuming horses. It does not answer the question, “What is to be done with unwanted horses?” “Where are these horses going to go?” Logically, the bill infers that unwanted horses will be euthanized and discarded through other disposal methods. But, there is no guarantee that this will be the case. There is

currently no data on how many horses are being disposed of by burial, rendering, or incineration. Consequently, no one knows if these other methods of disposal are capable of increasing production to fulfill the increased disposal needs if slaughtering is banned?

There are presently insufficient rescue or humane society facilities to house every unwanted horse (Cordes (2003); Warren (2003)). For the United States to absorb the effects from a ban on slaughtering horses, an increase in rescue facilities would need to be in place. Programs that find unwanted horses a new career will need to be developed in order to address the numbers expected on horse rescue farms.

If these horses are not euthanized, caring for each of them will cost rescue facilities approximately \$2,340 per year, depending on location (Table 2). This suggests that caring for unwanted horses until natural death could cost as much as \$152 million to \$222 million per year.⁹ A less expensive method than caring until death would be to euthanize and dispose of unwanted horses. The estimated annual cost to euthanize and dispose of unwanted horses is would be \$11 million to \$16 million.¹⁰

Prior to placing a ban on the slaughter of horses, policy makers and horse owners should begin to seriously consider alternatives for disposal that are cost effective and humane. The equine industry should understand the potential monetary impact of the proposed ban and consider methods to cover these additional costs. Plans need to be in place to provide funds to increase the number of equine rescue facilities along with people trained in handling large animals. A strategy to move horses quickly through rescue facilities and into new homes should also be established.

⁹65,000 horses * \$2,340 per year = 152,100,000;
95,000 horses * 2,340 per year = 222,300,000.

¹⁰65,000 horses * \$170 euthanasia, hauling, and rendering = \$11,050,000;
95,000 horses * \$170 euthanasia, hauling, and rendering = \$16,150,000.

Table 1. Costs Associated with Horse Disposal

		Average	Total cost of Euthanasia, hauling and disposal
Euthanasia +	\$71-90 ^a		\$80
Transportation *50 miles @ \$.35 per mile			\$18
Cremation/ Incineration	\$1,000 ^b	\$1,000	\$1,098
Rendering	\$75-100 ^c	\$88	\$186
Burial	\$200-350 ^d	\$275	\$373
Landfill	\$100 ^e	\$100	\$198
Care until natural death**	\$195/Mo ^f	195*12*10.5 yrs	\$24,570

*Slaughter is considered a gain, not a cost and therefore not listed.

**Disposal at death is not calculated into the horse's maintenance costs.

^aThomson Veterinary Healthcare Communications (2003) p. 107.

^bEndersby (2003) .

^cEndersby (2003).

^dEndersby (2003).

^eEndersby (2003).

^f See Table 2.

Table 2. Estimated Horse Maintenance Costs for Care Until Death.

	Average Cost/ Horse/Month	Average Cost/ Horse/Year
Board (own facility) ^a	\$20 ^b	\$240
Hay consumption (16.5–20 lbs/horse/day)	80	960
Grain @ 4 lb./day	24	288
Shoeing (7 X per year)	48	576
Deworming 6 X per year	6	72
Vaccinations 2 X per year	9	104
Float teeth 1 X annual	8	100
Ave. Cost	\$195	\$2,340
	per month	per year

^aConsidered as overhead, therefore, decreases through economies of scale. Varied considerably from state to state.

^b Horse maintenance costs are the average calculated between three sources.

<http://www.petplace.com/Articles/artShow.asp?artID=786>

[http://www.easyhorseseach.com/horse-costs.html#\(5\)](http://www.easyhorseseach.com/horse-costs.html#(5))

http://www.horsekeeping.com/horse_management/cost_of_keeping_a_horse.htm

Note: Averages were calculated on an annual basis from the sources cited above. Monthly figures are calculated from the annual amount divided by twelve.

Table 3. 2SLS Parameter Estimates for the Supply and Demand for US Horsemeat to Europe (Equations (7) and (8)).

Variable	Parameter Estimate (Standard Error)
Supply Equation:	
Intercept	44569.488 (22204.995)*
\hat{P}	-1.341 (1.360)
C	12829.715 (20709.193)
$TREND$	-8426.138 (1220.410)***
$TREND^2$	413.3889 (81.978)***
Demand Equation:	
Intercept	-1966.230 (902.864)**
\hat{Q}	-0.010 (0.008)
BSE	-173.851 (89.403)*
Q_B	134.178 (30.260)***
$INCOME$	0.110 (0.026)***
$IMPORTS$	-10.327 (1.465)****

* Denotes statistically different than zero at the 10% level of confidence.

** Denotes statistically different than zero at the 5% level of confidence.

*** Denotes statistically different than zero at the 1% level of confidence.

Table 4. Estimated Supply Elasticities and Demand Flexibilities for Significant Estimated Coefficients Reported in Table 3 Calculated at Their Means.

Variable	Elasticity	Flexibility
<i>TREND</i>	-4.07	
<i>TREND</i> ²	1.815	
<i>Q_B</i>		1.644
<i>INCOME</i>		1.070
<i>IMPORTS</i>		-0.795

Figure 1. US Horsemeat Exports and Export Prices, 1990-2000.

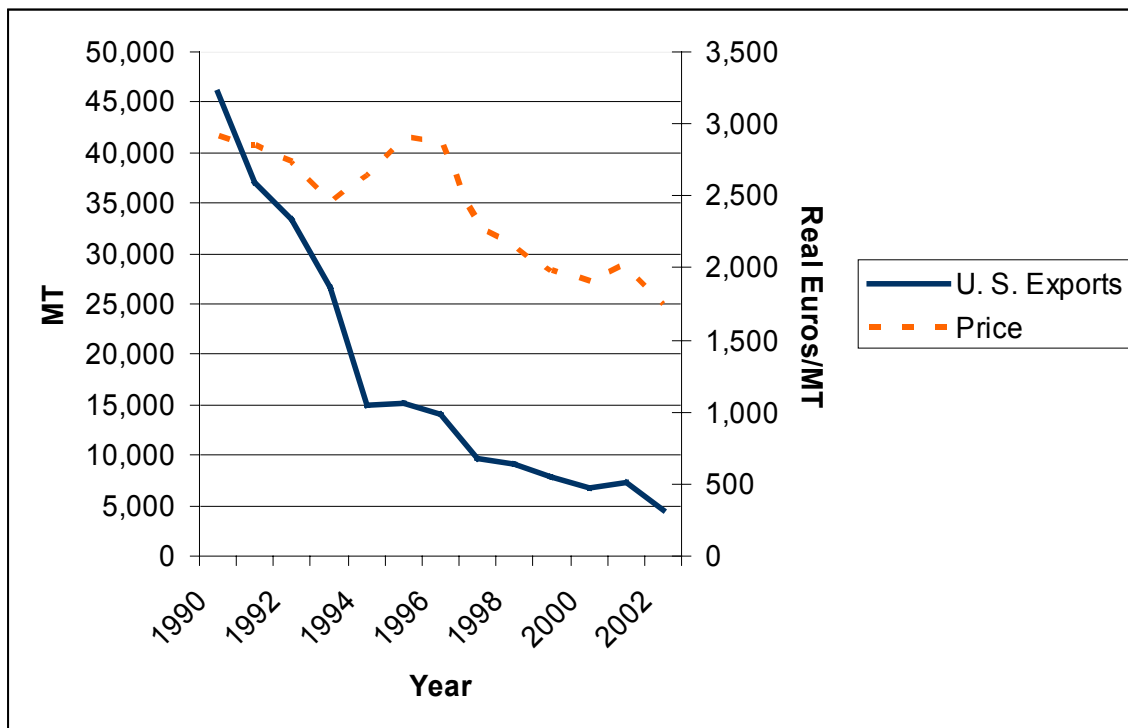
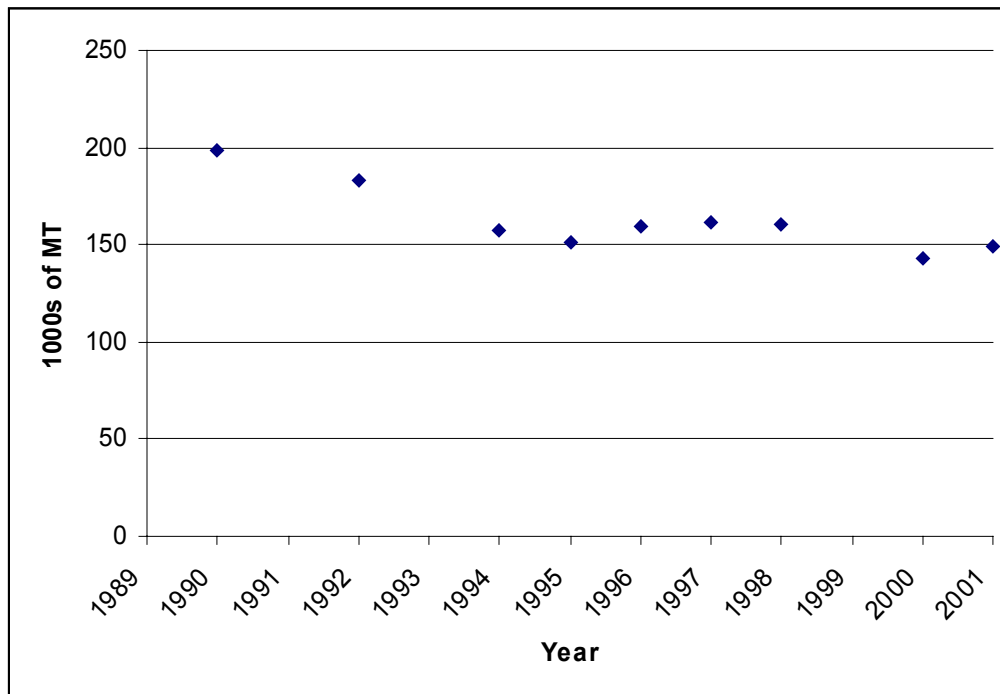


Figure 2. European Horsemeat Consumption from 1990-2001 (Broken).



Source: MHR Viandes (2003).

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