IMPACT OF MEAT IMPORTS ON LEAST-COST UNITED STATES BEEF PRODUCTION

K. E. Nelson, N. R. Martin, G. M. Sullivan, and R. J. Crom

Meat imports have been a source of controversy in United States agriculture for more than 20 years. Beef producers early contended that imports unduly restricted their incomes and placed the domestic livestock industry at a disadvantage. In 1964, the Congress enacted the Meat Import Bill (P.L. 88-482), limiting imports of meat to approximately 7 percent of domestic red meat production. Consumers consequently complained that limitations on imports have contributed to higher retail beef prices. Periodic decisions to adjust quota levels occurred in 1968 and 1977. New legislation, the Meat Import Act of 1979 (P.L. 96-177), includes a countercyclical adjustment factor based on moving averages of domestic cow beef production.

Previous studies have examined the effects of imports on American aggregate livestock and meat prices and supplies (Crom; Houck; Freebairn and Rausser). However, previous research has not accounted for beef industry adjustments that could occur in response to the presence versus the absence of beef imports. This paper examines the configuration of beef production in the U.S. with and without imports under specified assumptions.

METHODS

The analysis is based on results from an interregional linear programming (LP) model of the U.S. beef industry. The model minimizes the total variable plus fixed costs for new facilities at each stage of the production and marketing channels for beef. Comparisons between total production costs and regional production organizations of the beef economy can be analyzed with and without imports.

Five production regions correspond to those used in U.S. Department of Agriculture cost of production publications, which are based on significant geographical, climatic, and agricultural patterns. Supply points were selected to represent spatial concentration within each supply region (Figure 1a).

Six consumption regions are groupings of primary markets defined by Raunikar et al, and, as such encompass slightly different geographic areas than the five supply regions. The central receiving point in each consumption region also differs from the supply points. The Northeast Region, omitted as a supply region, is included as a consumption region (Figure 1b.).

The LP model is a multistage, multiproduct, interregional competition model of beef production, processing, and distribution in the contiguous United States. The following description includes a summary of major components of the model. Detail description of the model is given in Kennedy.

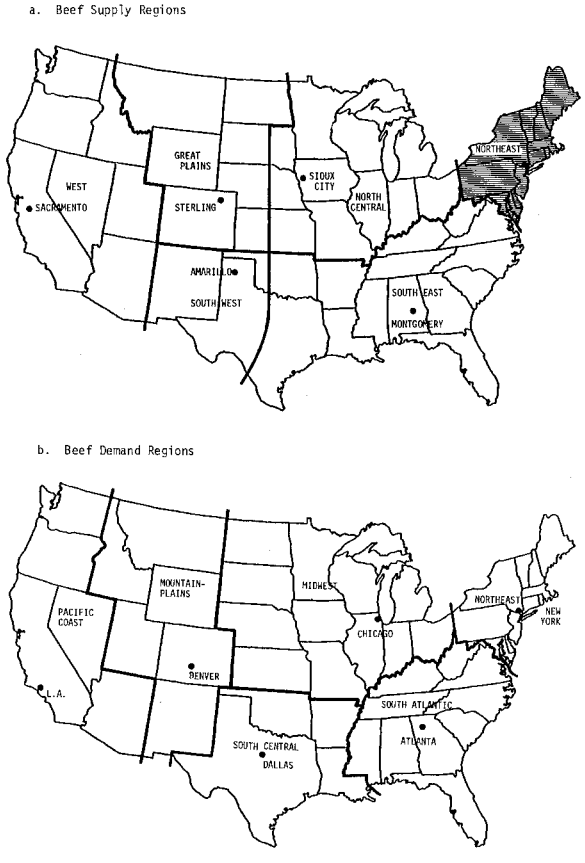

FIGURE 1. The Supply and Demand Regions for a Model of U.S. Beef Industry

K. E. Nelson is Agricultural Economist, NED/ESCS/USDA, University of Illinois. N. R. Martin is Associate Professor, and G. M. Sullivan is Assistant Professor, Department of Agricultural Economics and Rural Sociology, Auburn University. R. J. Crom is Branch Chief, Animal Products Branch, NED/ESCS/USDA, Washington, D.C.

Beef Production and Processing Stages

The general construction of the model is the same across regions. Production alternatives, technical coefficients, and related costs, which vary by region, were derived from secondary sources (see below). Each region has subsets of production activities for vertical linkages in the model. A flow chart of the LP model is illustrated in Figure 2.

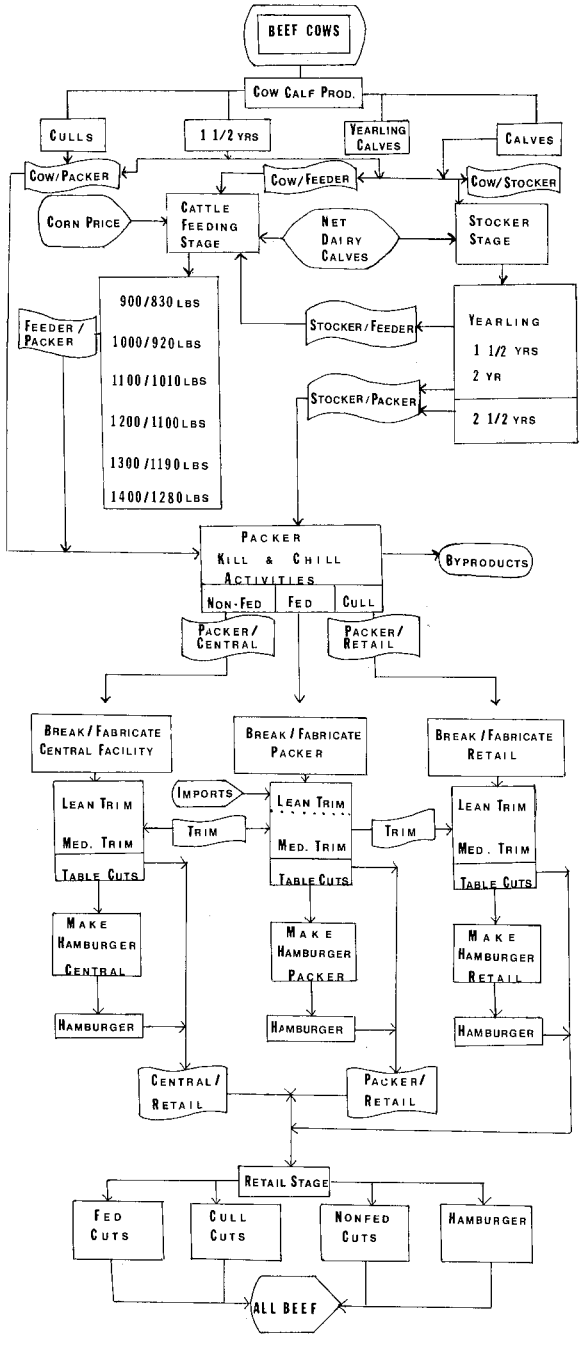

FIGURE 2. Flow Chart of U.S. Livestock-meat Linear Program Model

The Cow-Calf Stage. One hundred and seven cow-calf enterprises, typical of those in 36 subregions of the 5 supply regions, represent herd sizes of 50–1,500 cows. Production and cost coefficients are adapted from the Federal Enterprise Data System developed by ERS regional analysts (Gustafson et al).

Feeders, stockers, and cull cows are intermediate outputs of the cow-calf stage. Cull beef animals and an exogeneous quantity of cull dairy cows go directly to the packer stage of the model. Dairy calves not held for replacement are included in feeder cattle supplies. Feeder calves of two sexes and weight-range categories can be retained in cow-stocker activities or shipped to other stocker operations or feedlots along defined transportation routes. Feeder cattle, 1–1.5 years of age, can also go directly to the packer stage.

The Stocker Stage. Stocker programs involve placement of calves on pasture for 6, 12, 18, or 24 months. Regional differences in pasture and range qualities are reflected in production coefficients. All stockers up to 2 years of age can be transferred either to the feedlot stage or directly to the packer stage as nonfed slaughter. Cattle that are 2.5 years old must be shipped direct to the packer stage.

The Cattle Feeding Stage. The feedlot stage includes cattle taken from cow-calf and stocker programs. A range of 200 to 600 pounds of gain will be added, based on sex, age, weight class, and feeding regime. Long (120–260 days) and short (40–95 days) feeding operations are available. Sixteen different finished weights are possible, ranging from 600 to 1,400 lbs. for steers and 580 to 1,280 lbs. for heifers. Average daily gains in feedlots are assumed to be identical for each region. Nonfeed costs vary by region, reflecting differences in average size of lots by region (Gee). Feed costs also reflect regional differences in corn prices. Costs escalate as cattle are fed to higher weights, reflecting the decrease in feed conversion efficiency by older and heavier cattle.

The Packer Stage. At this stage, the dressing percentages and cutability coefficients for each carcass type produced vary according to livestock class, weight, and sex. Cost coefficients reflect typical plant size and hourly earnings in each region (Cothern et al. 1977b; Baker; U.S.D.L.). By-products at the packing stage are sold at an average value of $39 (1976 dollars) per 1,000 lbs. liveweight.

The Fabrication Stage. Fabrication activities are formulated to reduce carcasses to subprimals. Technical coefficients are consistent with the carcass type, whether it is a cull cow, nonfed, or short- or long-fed steer, and heifer. Six classes of fabricated beef, including table cuts and medium trim (50% lean), are output. Lean trim (85% lean) and medium trim can go into ham-

burger production. Fat (100%) is sold as a separate product. Beef imports enter a region as 85-percent lean trim. Carcass fabrication occurs in conjunction with the packer stage either at central processing facilities or at retail levels. Cost by regions reflect typical plant sizes and hourly earnings (Baker; Cothern et al., 1977a; U.S. Dept. Labor).

The Hamburger Stage. Hamburger activities represent all processing uses of trimmings of beef. The model uses 85- and 50-percent lean trimmings and table cuts to produce hamburger which contains no less than 20 percent, but no more than 30 percent fat. Hamburger production can occur at the packer, fabricator, and retail demand stages. Production capacity is unlimited at any stage.

The Retail Stage. This stage reflects average final distribution costs aggregates for hotel-restaurant-institutional (HRI) and food store components (Trieb; U.S. Dept. of Agriculture 1980b). Products sold are fed, nonfed, cull table cuts, and hamburger.

THE TRANSPORTATION ACTIVITIES AND DEMAND FOR BEEF

Transportation activities make up a significant proportion of the model (1,845 activities). These include transportation of feeder cattle, slaughter cattle, carcass, and boxed beef among 5 supply regions and 6 demand regions. Of the 25 possible transfer routes among supply regions, 20 routes are selected for the model (15 interregional and 5 intraregional). Some transfer routes (a total of 5), such as shipping live animals from a deficit region (West) to a surplus region (Great Plains), were excluded. Freight costs, death loss, and shrinkage are included in the shipment coefficients. All interregional shipments are between supply points (Figure 1a) and consumption destinations (Figure 1b). All transportation activities terminate at each of the 6 designated regional cities.

National beef consumption is set at an exogeneous level and regionalized among the demand regions from previous research by Raunikar et al. National beef consumption (all forms) was set at 27,200 million lbs. carcass weight, which is 124 lbs. per capita, respectively. Although above current levels, the per capita consumption level reflects estimates based on past beef industry statistics (Quance).

RESULTS

Least Cost Production

Baseline results are obtained by constraining the model to the domestic production of 25,400 million lb. carcass weight of domestic beef output, with net imports of 1,800 million lbs. Total beef supply amounts to 124 lbs. per capita (U.S. population of 220 million).

With imports, the least-cost U.S. beef cow herd is estimated at 53.308 million head (Table 1), a long-term least-cost herd size. Without imported beef, the least-cost herd increases 8 percent, to 57.580 million head. The restriction in imports is offset by a slightly greater-than-equal increase in cow numbers to replace the imported meat.

With available imports, corn (equivalents) used in cattle feeding in the U.S. is 1,389.0 million bu. (Table 1). Model alternatives included both the possibility to replace restricted imports with more domestic cattle feeding, or with more domestic beef production from increased forage input. Results indicated that the cattle feeding alternative was lower in cost for the total amounts of beef required. This is consistent with results reported by Brokken. The impact of restricting imports requires an increase in corn utilization to 1,547.2 million bu., an increase of 11 percent.[1] The additional corn is used to carry cattle on feed to heavier weights to meet the shortfall in meat imports. With likely future deficits in world demand for food grains (Quance), restricting U.S. meat imports would affect America's position in international trade in corn.

Meat imports with the least-cost cow herd affects the types of cattle processed into retail meats. More nonfed and cull cows are used as table cuts in total consumption, replacing table cuts from fed cattle. Imported meat, as 85-percent lean trim, is used as hamburger and processed meat. The impact of no imports causes

TABLE 1. The Effect of Import Policies on Least-Cost U.S. Beef Cow Herd and Corn Utilization

Supply Regions	Beef Cow Production				Corn Utilization		
	Lower Limit[a]	With imports	Without imports	Change	With imports	Without imports	Change
	(million hd)			(%)	(million bu)		(%)
Western	3.033	5.349	6.038	+13	149.60	151.10	+1
Great Plains	6.687	12.730	14.646	+15	346.04	347.50	+.4
Southwest	2.724	6.043	6.043	---[b]	212.98	252.20	+18
North Central	7.239	15.979	17.472	+9	530.56	644.60	+21
Southeast	13.207	13.207	13.379	+1	149.00	151.80	+2
Nation	32.890	53.308	57.580	+8	1389.00	1547.20	+11

[a]Lower limits were placed on number of beef cows in each region to reflect the long-term nature of the beef cow-calf enterprise.

[b]For the Southwest Region, cattle raising reached an upper constraint with and without imports because of physical limits on expansion of herd based on historical trends from the previous cattle cycles.

[1] The model did not include an endogenous supply or price response for corn; however, sensitivity analysis did not indicate significant changes over a 10-percent range in corn prices.

nonfed and cull cows to go for processing into hamburger to replace imported lean trim. In addition, cattle are fed a longer period in feedlots to produce more beef. The increased number of fed cattle go for table cuts and for trim to make hamburger.

IMPLICATIONS AND CONCLUSIONS

Imports affect sectors differently. The results indicate that significant trade-offs between imports of lean beef and U.S. grain production occurs. With the importation of 1,800 million pounds of beef annually, the American cattle feeding sector would utilize 158 million fewer bushels (8,848 million pounds) of feed grains. United States grain export capacity is increased with the imports of lean beef.

Restricting meat imports requires a larger U.S. cow herd (8 percent) and greater utilization of corn (11%) in cattle feeding than under import levels experienced in 1979. More resources have to be put into livestock production, resulting in higher average cost of production. Meat imports thus play a role in moving the cattle industry toward the least-cost optimum herd size under conditions modeled.

Results should be interpreted to indicate direction, order of magnitude, and general areas of economic impacts—not predictions of precise future outcomes. Future research is needed on beef demand at the retail level. Inclusion of own and cross price elasticities for processed beef and table cuts would allow for the effects of consumer response on the model. The resulting impacts on production, processing, and distribution stages could be examined.

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