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Market and Welfare Effects of Livestock Feed Subsidies in Southeastern New Mexico

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Input subsidies have the potential to increase production, promote more input use, and impact the environment. Unlike many other federal agricultural subsidies, livestock feed programs have not been the subject of previous economic research. During 1992–96, the U.S. Department of Agriculture paid livestock producers an annual average of $73.2 million in feed subsidies. The objective of this research is to estimate the market and welfare effects of feed subsidies in one region of New Mexico. The price and output effects of the subsidy are found to be small, and the welfare impacts of the subsidy unevenly distributed between subsidized and nonsubsidized producers.

Key words: Emergency Feed Program, input subsidy, welfare

Introduction

In recent investigations, questions have been raised as to whether or not livestock feed subsidies cause range overstocking and deterioration, increased cattle supply, and reduced cattle prices (Holechek and Hess; Hess and Holechek 1994, 1995; Hess; DiSilvestro; Bixby). These questions have received considerable publicity by local and national media.

Unlike many other federal subsidies to the food and agricultural system, livestock feed subsidies have not been the subject of previous economic research, even though the potential for input subsidies to increase production, encourage excess input use, and impact the environment is well known (Knutson, Penn, and Boehm). For federal fiscal years (FFYs) 1992–96, the U.S. Department of Agriculture (USDA) paid an annual average of $73.2 million in feed subsidies. This amount is small compared to other more highly subsidized commodities; however, feed programs affect an industry that has been relatively free of direct income or price-enhancing subsidies. The subsidies are also commonly paid in regions dependent on marginal grazing lands subject to frequent drought conditions.

The objective of this research is to address the cattle market-related questions raised by Holechek and Hess. We do so by estimating the market and welfare effects of livestock feed subsidies. These effects are examined using marginal analysis applied to a region of the United States where the subsidies have been consistently available for

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many years. Based on the assumptions made in the model, the feed payments result in increased southeastern New Mexico calf output, slightly lower calf prices, and financial losses to the region's nonsubsidized producers.

The Emergency Feed Program

The Emergency Feed Program (EFP) was authorized by legislation enacted in 1949, 1988, and 1989 (USDA, Agricultural Stabilization and Conservation Service). The objectives of the EFP were to provide emergency feed assistance to livestock owners in areas affected by disease, insect infestation, flood, drought, fire, hurricane, earthquake, hail storm, hot weather, cold weather, freeze, snow, ice, winterkill, or other natural disasters (U.S. General Services Administration). Feed assistance was designed to prevent drastic reductions in breeding animal numbers as a result of short-term feed emergencies, and thus prevent fluctuations in livestock prices. Based on the *Code of Federal Regulations*, "livestock" were defined to mean cattle, sheep, goats, swine, poultry, equine animals used for food or in the production of food, and fish used for food (National Archives and Records Administration). The Federal Agricultural Improvement and Reform (FAIR) Act of 1996 suspended the USDA's authority to carry out EFP through 2002.

National data as to the distribution of EFP payments between kinds of livestock and enterprises are unavailable; however, Newcomer estimates that over the past several years, 75–80% of the funds were dedicated to beef cattle, 15–20% to dairy cattle, and less than 5% to swine and other species. For FFYs 1992–96, the feed subsidy totaled $356,495,623 (USDA, Office of the Chief Financial Officer). Table 1 provides a listing of the distribution of Emergency Feed Program payments by state for this time period. No estimates of payments per animal, per AUM, or per producer are available, although aggregated county-level data since 1992 are available from the USDA's Office of the Chief Financial Officer.

Requests to implement EFP were initiated by county Agricultural Stabilization and Conservation Service [(ASCS), now the Farm Service Agency (FSA)] committees or by the state's governor. Producers with at least a 40% loss of feed production were eligible for a 50% cost-share payment for eligible purchased feed. Total payments were computed as the lesser of additional livestock feed needs or loss of feed production. Feed losses were based on conditions early in the feeding season and benefits were paid on an advance basis.

EFP has been a popular program in the West, although the program has been used throughout the United States. The National Cattlemen's Beef Association has taken the position that the emergency programs are inequitable because they have not been applied consistently across states and producers (Keys). Cattle producers are divided in their opinions of the program, and some have declined to participate even when they were eligible for benefits. Combined farming/ranching operations were often ineligible because they typically failed to meet the 40% feed loss threshold required by the program.

Following the FAIR Act's suspension of EFP, a new emergency livestock assistance program was introduced in both the House and Senate in May 1996, and received strong bipartisan support. These congressional efforts to assist the livestock industry because of drought conditions were superseded by a presidential Executive Order in June 1996.

Table 1. Distribution of Emergency Feed Program Payments, FFYs 1992–96

State	Feed Subsidy ($)	% of Total	Rank	State	Feed Subsidy ($)	% of Total	Rank
Tex.	40,819,502	11.45	1	N.C.	3,481,713	0.98	26
N. Mex.	30,499,503	8.56	2	Va.	3,461,177	0.97	27
Mo.	19,792,875	5.55	3	Md.	3,183,351	0.89	28
Pa.	19,321,594	5.42	4	W. Va.	3,179,116	0.89	29
Wis.	17,860,935	5.01	5	Iowa	2,879,961	0.81	30
Ga.	17,679,732	4.96	6	Nebr.	2,427,373	0.68	31
Ark.	16,127,800	4.52	7	Maine	1,983,461	0.56	32
Oreg.	15,012,156	4.21	8	Vt.	1,882,590	0.53	33
Calif.	14,046,446	3.94	9	N. Dak.	1,802,959	0.51	34
S. Dak.	13,742,348	3.85	10	Ariz.	1,717,080	0.48	35
N.Y.	12,397,132	3.48	11	Mass.	1,580,860	0.44	36
Nev.	10,782,214	3.02	12	Mich.	1,510,481	0.42	37
Okla.	10,530,760	2.95	13	Ind.	1,433,649	0.40	38
Ala.	9,948,266	2.79	14	La.	1,206,385	0.34	39
Mont.	9,556,801	2.68	15	Ky.	934,217	0.26	40
Idaho	9,310,406	2.61	16	Ill.	726,959	0.20	41
Utah	8,956,295	2.51	17	Fla.	569,448	0.16	42
Minn.	8,835,450	2.48	18	N.H.	422,483	0.12	43
Tenn.	7,301,556	2.05	19	Miss.	355,667	0.10	44
Wyo.	5,719,665	1.60	20	Conn.	206,477	0.06	45
S.C.	5,677,861	1.59	21	Hawaii	191,637	0.05	46
Colo.	4,822,901	1.35	22	R.I.	154,396	0.04	47
Kans.	4,520,394	1.27	23	Alaska	66,011	0.02	48
Wash.	4,309,050	1.21	24	Del.	20,274	0.01	49
Ohio	3,546,256	0.99	25	N.J.	0	0.00	50
				Total:	356,495,623	100.00	

Source: USDA, Office of the Chief Financial Officer.

The order authorized the use of proceeds from sales of federal grain reserves in the Disaster Reserve Assistance Program (DRAP). DRAP has provided cost-share assistance under criteria similar to previous feed subsidy programs since June 1996; however, payments have been made at the reduced rate of 30% of the value of the eligible loss. In 1997 and early 1998, the USDA used the newly created Foundation Livestock Relief Program and the Livestock Indemnity Program to provide feed assistance to producers in selected states which experienced adverse weather conditions.

Feed Subsidies in New Mexico

Livestock feed subsidies in New Mexico have been available statewide since the 1950s, primarily for relief from drought conditions (Boykin, Gray, and Caton; Gray; New Mexico Agricultural Statistics Service). New Mexico ranks 22nd nationally in terms of

Table 2. Emergency Feed Program Payments to New Mexico, 1989–95

Year	Feed Program Payments by Federal FY ($)	Benefits Paid by Crop Year ($)	Applications for Which EFP Benefits Were Paid by Crop Year (No.)	Crop Year Benefits per Paid EFP Application ($)
1989	8,238,368	2,932,497[a]	1,542[a]	1,902[a]
1990	6,809,221	6,390,788	1,797	3,556
1991	2,175,799	2,175,453	693	3,139
1992	821,582	3,137,384	828	3,789
1993	3,245,172	8,041,178	1,691	4,755
1994	9,181,670	10,842,326	1,861	5,826
1995	10,126,985	9,804,113	1,941	5,051
Total:	40,598,797	43,323,739		

Sources: USDA, Office of the Chief Financial Officer; New Mexico Agricultural Statistics Service.
[a] Data are for FFY 1989.

beef cow numbers (USDA, National Agricultural Statistics Service), but ranked second in terms of total EFP payments allocated to states in FFYs 1992–96 (table 1). During FFYs 1992–96, 82% of New Mexico's 33 counties received feed subsidies in three or more of the five years (USDA, Office of the Chief Financial Officer).

Table 2 presents an overview of the Emergency Feed Program payments made to New Mexico from 1989 through 1995. During this period, New Mexico received a total of $40.6 million in feed subsidies. For livestock feed program crop years[1] 1990–95, an average of 95% of all New Mexico applications for feed subsidies were approved, while the average payment per application was $4,353 (USDA, Office of the Chief Financial Officer).

Methods

Southeastern New Mexico was chosen to illustrate the potential market and welfare effects of EFP. This program has had a high and consistent level of usage in New Mexico, most notably in the southeastern region of the state. The methodology used here draws from the works of Foster et al.; Lichtenberg, Parker, and Zilberman; and Ebel, Hornbaker, and Nelson. The feed cost subsidy is assumed to reduce the subsidy recipients' marginal cost of calf production. Similarly, eliminating the subsidy would increase the marginal cost of calf production for producers who previously received the subsidy. Economic theory suggests that profit-maximizing producers will adjust output to equate marginal cost and price (Lichtenberg, Parker, and Zilberman). Establishing an input subsidy thus leads to increases in output, while elimination would result in decreased output.

[1] The livestock feed program crop year is defined as the period beginning on the date the grazing of new pasture growth begins in the spring and ends 12 months later. This crop year varies among states and counties, and within counties.

Following Lichtenberg, Parker, and Zilberman, the conditions described above can be expressed as a system of supply and demand equations:

$$
\begin{aligned}
MC_S(Q_S) &= P \\
MC_N(Q_N) &= P \\
D_D(Q_{DT}) &= P \\
Q_S + Q_N &= Q_{DT},
\end{aligned} \tag{1}
$$

where MC_S represents the marginal cost function of producers who receive the feed subsidy, MC_N is the marginal cost function for producers not receiving the feed subsidy, Q_S is the output of calves by subsidized producers, Q_N is calf production by producers not using the feed subsidy, D_D is inverse domestic demand for calves, Q_{DT} is total domestic consumption of calves, and P is calf price.

The market impacts of a change in input subsidy policy are obtained by totally differentiating the system of equations above, where the marginal cost function is the inverse supply function (Lichtenberg, Parker, and Zilberman). Total differentiation of (1), and collecting terms into matrix notation gives:

$$
\begin{bmatrix}
0 & \frac{1}{\epsilon_S}\cdot\frac{P}{Q_S} & -1 & 0 \\
\frac{1}{\epsilon_N}\cdot\frac{P}{Q_N} & 0 & -1 & 0 \\
0 & 0 & -1 & \frac{1}{\eta}\cdot\frac{P}{Q_D} \\
1 & 1 & 0 & -1
\end{bmatrix}
\begin{bmatrix} dQ_N \\ dQ_S \\ dP \\ dQ_{DT} \end{bmatrix}
=
\begin{bmatrix} dMC_S \\ 0 \\ 0 \\ 0 \end{bmatrix}, \tag{2}
$$

where η is feeder calf demand own-price elasticity, and ϵ is the elasticity of placements of cattle on feed relative to feeder steer price for subsidized and nonsubsidized producers. In this application, estimates of the impact of changes in subsidy availability on the marginal cost of calf production (dMC_S) were first made. After substituting parameter values into (2), the system was solved for the impacts of subsidy policy changes on calf price (dP), calf output of subsidized producers (dQ_S), calf output of nonsubsidized producers (dQ_N), and domestic calf demand (dQ_{DT}).

Market and welfare effects can be estimated assuming supply and demand are approximately linear around the subsidized equilibrium (Lichtenberg, Parker, and Zilberman). Because no elasticity estimates exist for the region studied, Marsh's national feeder calf demand elasticity (η) with respect to feeder calf price (-0.887), and Brester and Marsh's estimate (0.411) of the national elasticity of placements of cattle on feed relative to feeder steer price (ϵ_S and ϵ_N) were used in the baseline solution. Sensitivity analysis using a series of supply and demand elasticities also was conducted to examine the market effects of subsidy elimination in the area studied. P was the mean 1993 calf price reported by Torell and Hawkes, while Q_S and Q_N were varied to examine effects of the feed subsidy at different levels of program participation.

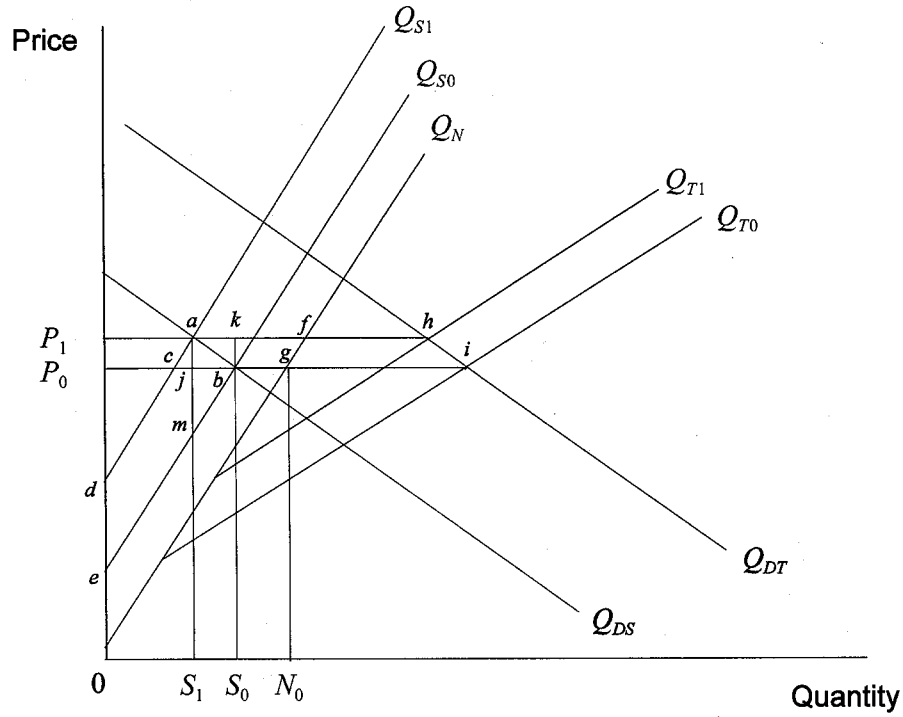

Figure 1. Effects of eliminating an input subsidy to a subset of producers

Figure 1 illustrates market and welfare effects when an existing input subsidy is eliminated. Q_{S0} is the initial supply schedule of subsidized producers, Q_N is the supply of unsubsidized producers, Q_{T0} is total initial supply ($Q_{S0} + Q_N$), Q_{DS} is demand for the production of the subsidized producers, and Q_{DT} is total domestic demand for calves. With the input subsidy, equilibrium output price is P_0, where subsidized production is S_0 and unsubsidized production is N_0. With elimination of the input subsidy received by some producers, their supply curve shifts to Q_{S1}, equilibrium price increases to P_1, production by formerly subsidized producers decreases to S_1, output by formerly unsubsidized producers increases (along Q_N), and total supply decreases (Q_{T1}).

Changes in nonsubsidized producers' surplus resulting from elimination of the input subsidy were thus estimated as $dP(2Q_N + dQ_N)/2$ (area P_0P_1fg in figure 1). Changes in domestic consumers' surplus were calculated as $-dP(2Q_{DT} - dQ_{DT})/2$ (area P_0P_1hi). Changes in subsidized producers' surplus were estimated as the sum of the following effects: change in revenue, $(P + dP)(Q_S + dQ_S) - PQ_S$ (area $P_0P_1kb - jbS_0S_1 - akbj$); change in feed costs, $(dMC_S/Y)(Q_S + dQ_S)$, where dMC_S/Y is the increase in feed cost per unit of output resulting from elimination of the feed subsidy; and the change in total cost due to changes in calf output, $PdQ_S + P(dQ_S)^2/2\epsilon_S Q_S$ (area $jbS_0S_1 - jbm$). Regional welfare effects were calculated as the sum of subsidized producer, nonsubsidized producer, and consumer surplus changes. The national net welfare effect of subsidy elimination is the difference between regional welfare changes and the cost of the region's feed subsidy payments.

The method described above is a comparative statics approach to analyzing the marginal effects of changes in one policy variable in one subsidized region. The market and welfare impacts of changes in input subsidy policy are thus evaluated ceteris paribus.

Empirical Model

The model described in (2) was used to evaluate the market and welfare effects of livestock feed subsidies in southeastern New Mexico in 1993. The results show changes in the regional market and welfare impacts due to the feed program. The results also provide a foundation for discussing the broader impacts of the program.

Southeastern New Mexico accounted for about 25% of the state's beef calf production in 1993 (Torell and Hawkes). This region has received a high level of emergency feed payments in the past several years, although it is unknown what percentage of the region's calves are produced by subsidized producers. A representative ranch in this region has 350 cows (Torell and Hawkes). Based on the information provided in table 2, an average ranch in New Mexico was computed to receive $4,755 in EFP subsidies in 1993. This payment would have been $13.59/cow for a representative ranch in the southeastern region.

A representative ranch in the southeastern region sold 249 calves in 1993, for an average gross return of $496.79/calf. The total 1993 feed program payment per calf sold was thus $19.10. With an average calf sale weight of 521 pounds, the subsidy would have been about $0.04/pound. If the feed program payment had not been made to the cow-calf operator, the marginal cost of production would have been $19.10/calf, or $0.04/pound higher.

The system of four equations with four unknown variables (dP, dQ_S, dQ_N, and dQ_{DT}) presented in (2) was solved to find a unique solution, given the assumptions described above. Equation system (2) was repeatedly resolved with changes in the percentage of calves produced in subsidized herds and over a range of supply and demand elasticities. The results discussed below assume 50% of the region's calves were produced with the feed subsidy.

Results

Table 3 presents the market and welfare effects of eliminating the livestock feed program in southeastern New Mexico, based on 1993 data. The baseline solution of the model using previously estimated elasticities for the national cattle market showed that if the $19.10/calf subsidy had not been available to 50% of southeastern New Mexico beef calves produced in 1993, producers not receiving the feed program payment would have produced 167 more calves in response to slightly higher calf prices, while subsidized producers would have produced 889 fewer calves. Without the subsidy, 0.5% fewer calves overall would have been produced in the region, and the gross return per calf would have been $3.02 higher.

In the absence of feed program payments, nonsubsidized producers' surplus would have been $202,439 higher, while subsidized producers' surplus would have been $1,067,738 lower. The breakdown of subsidized producers' surplus is as follows: revenue

Table 3. Market and Welfare Effects of Eliminating Livestock Feed Program in Southeastern New Mexico, 1993

Description	Percentage of Regional Calf Crop Subsidized by Livestock Feed Program										
	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	99%
Market Impacts:											
▸ Change in price ($/calf)	0.60	1.21	1.81	2.42	3.02	3.63	4.23	4.84	5.44	5.74	5.99
▸ Change in price ($/cwt)	0.12	0.23	0.35	0.46	0.58	0.70	0.81	0.93	1.04	1.10	1.15
▸ Change in output, subsidized producers (no. calves)	-205	-396	-574	-738	-889	-1,027	-1,151	-1,262	-1,360	-1,404	-1,436
▸ Change in output, nonsubsidized producers (no. calves)	60	107	141	161	167	161	141	107	60	32	7
▸ Change in total output (no. calves)	-144	-289	-433	-578	-722	-866	-1,011	-1,155	-1,300	-1,372	-1,430
Impact on Subsidized Producers:											
▸ Change in gross revenue ($)	(93,688)	(164,784)	(213,264)	(239,104)	(242,280)	(222,767)	(180,541)	(115,578)	(27,853)	24,552	70,580
▸ Change in feed costs ($)	(251,507)	(503,269)	(755,287)	(1,007,560)	(1,260,089)	(1,512,873)	(1,765,913)	(2,019,209)	(2,272,760)	(2,399,631)	(2,501,174)
▸ Change in other costs ($)	99,759	193,114	280,053	360,562	434,631	502,246	563,397	618,070	666,254	687,908	704,061
▸ Change in producers' surplus ($)	(245,435)	(474,939)	(688,498)	(886,102)	(1,067,738)	(1,233,394)	(1,383,057)	(1,516,717)	(1,634,359)	(1,687,171)	(1,726,534)
Impact on Nonsubsidized Producers:											
▸ Change in producers' surplus ($)	72,805	129,464	169,964	194,293	202,439	194,390	170,134	129,658	72,951	38,507	8,026
Change in Consumers' Surplus ($)	(80,918)	(161,924)	(243,017)	(324,197)	(405,464)	(486,819)	(568,261)	(649,791)	(731,408)	(772,249)	(804,937)
Total Regional Welfare Effects ($)	(253,548)	(507,398)	(761,550)	(1,016,006)	(1,270,763)	(1,525,823)	(1,781,185)	(2,036,849)	(2,292,816)	(2,420,913)	(2,523,444)
Total Feed Program Payment (@ $19.10/calf)	255,463	510,925	766,388	1,021,850	1,277,313	1,532,775	1,788,238	2,043,700	2,299,163	2,426,894	2,529,079
Net National Welfare Impacts of Eliminating Feed Subsidy ($)	1,914	3,527	4,837	5,844	6,550	6,952	7,053	6,851	6,347	5,981	5,634

would have been reduced by $242,280; feed costs actually paid by producers instead of through subsidies would have been $1,260,089 higher; but other costs of production would have been $434,631 lower. Consumer surplus without the feed program payment attributed to 50% of the region's calf production would have been $405,464 lower. Net regional welfare impacts due to eliminating the feed subsidy to 50% of the region's calf production in 1993 thus would have been -$1,270,763 (table 3).

Assuming a per calf subsidy of $19.10 (as calculated above), the total amount of 1993 federally provided feed subsidy to the region was $1,277,313 (not including administrative costs at the federal, state, or county levels). Eliminating feed program payments in southeastern New Mexico in 1993 would have resulted in a small national net social welfare gain of $6,550 when the market effects outlined above are considered (table 3). These welfare effects do not account for any positive external benefits of feed subsidies which may be extended to the rural economy of the subsidized area (e.g., economic stabilization or multiplier effects), any negative environmental externalities which may result from the subsidies, or the impact of reduced calf prices outside southeastern New Mexico due to subsidies in that region.

The market effects of the feed subsidy are shown to be quite small; however, the welfare impacts of the feed program payments in southeastern New Mexico in 1993 are very unevenly distributed. With subsidy elimination, nonusers' gains would have been 19% of users' losses. Changes in output are similarly distributed.

Sensitivity analysis shows that as the percentage of the regional calf crop subsidized by the feed program increases, the increase in price which results from elimination of the program is higher, while the total output of calves in the region is lower. The effect of higher production costs for the previously subsidized producers outweighs the increase in production by the previously nonsubsidized producers (who respond to the increase in calf price). Each 10% increase (decrease) in the percentage of calf crop subsidized is shown to reduce (increase) price by $0.60/calf (table 3).

Eliminating the subsidy (regardless of how many calves are subsidized) results in increased production by previously nonsubsidized producers due to increased prices. However, the potential increases in production are smaller at higher levels of program participation because there are fewer nonsubsidized producers. Nonsubsidized producers' gains from EFP elimination also decrease as a percentage of subsidized producer losses as the percentage of calves subsidized increases. Net welfare impacts of feed subsidy elimination increase up through the 70% subsidy level, and then are shown to decrease at the highest levels of subsidy. At the 80% subsidy level and above, the revenue impact of eliminating the subsidy is reduced due to the increase in calf price (table 3). The price effect outweighs the revenue impact of output reductions due to subsidy elimination at the highest levels of program participation.

Because there is little alternative use for rangeland in southeastern New Mexico compared to other parts of the nation, the regional supply elasticity may be lower than that estimated for the national market by Brester and Marsh. The elasticity of demand for calves from the region may also be close to perfectly elastic, given the small effect New Mexico production likely has on national prices. As shown in figure 2, supply elasticity has a significant effect on changes in total calf output regardless of demand elasticity if the feed subsidy is eliminated to 50% of the region's calf crop. With regional supply more inelastic than at the national level, calf output in southeastern New Mexico would decline in the absence of feed subsidies, although the reduction in output is

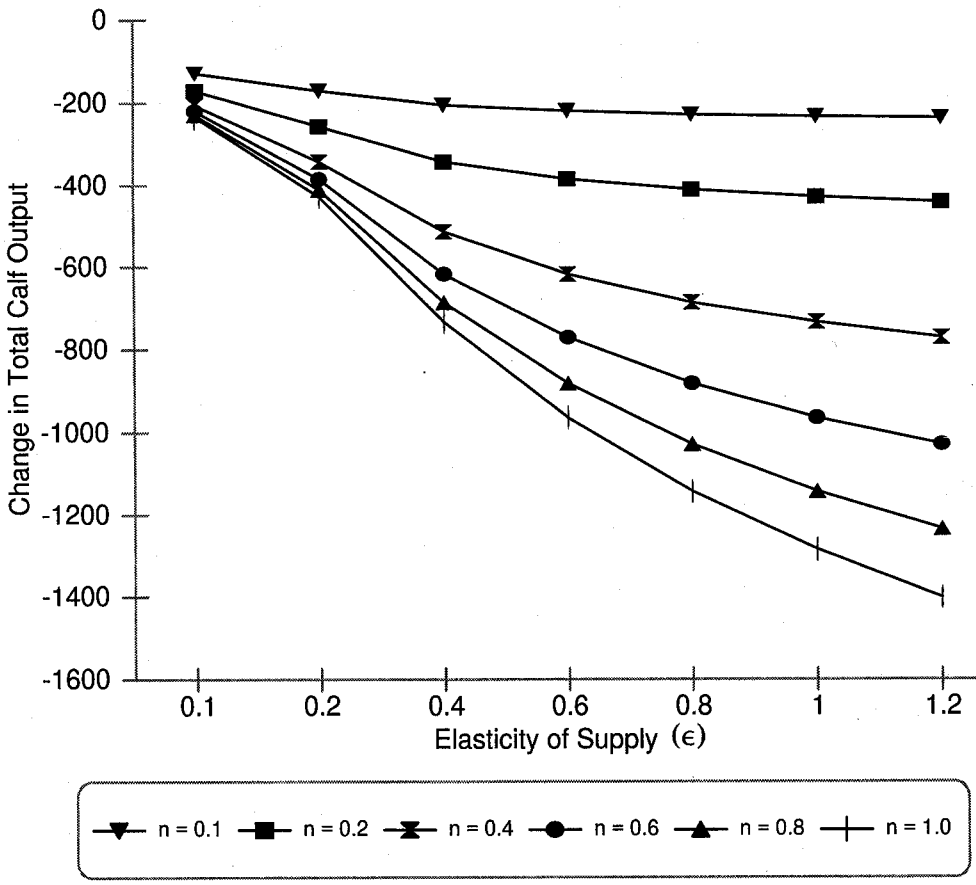

Figure 2. Impact of supply and demand elasticities (ϵ, η) on total regional calf output

smaller than that which results when regional supply response is assumed to be consistent with national supply response.

With subsidy elimination, the change in calf price is lowest with inelastic supply and elastic demand conditions (figure 3). Figure 3 also shows diminishing marginal impact of supply elasticity on price changes resulting from subsidy elimination regardless of the elasticity of demand.

Conclusions

The net welfare effect of livestock feed subsidies in southeastern New Mexico, including the national taxpayer expense for the payments, indicates that the program is largely a redistribution process which brings federal tax dollars to the state. As a result of the redistribution, the region's nonsubsidized producers lose, local subsidized producers gain, the supply of beef calves is increased, calf prices are reduced, and the federal tax cost is almost equal to narrowly defined within-region welfare gains. By eliminating the

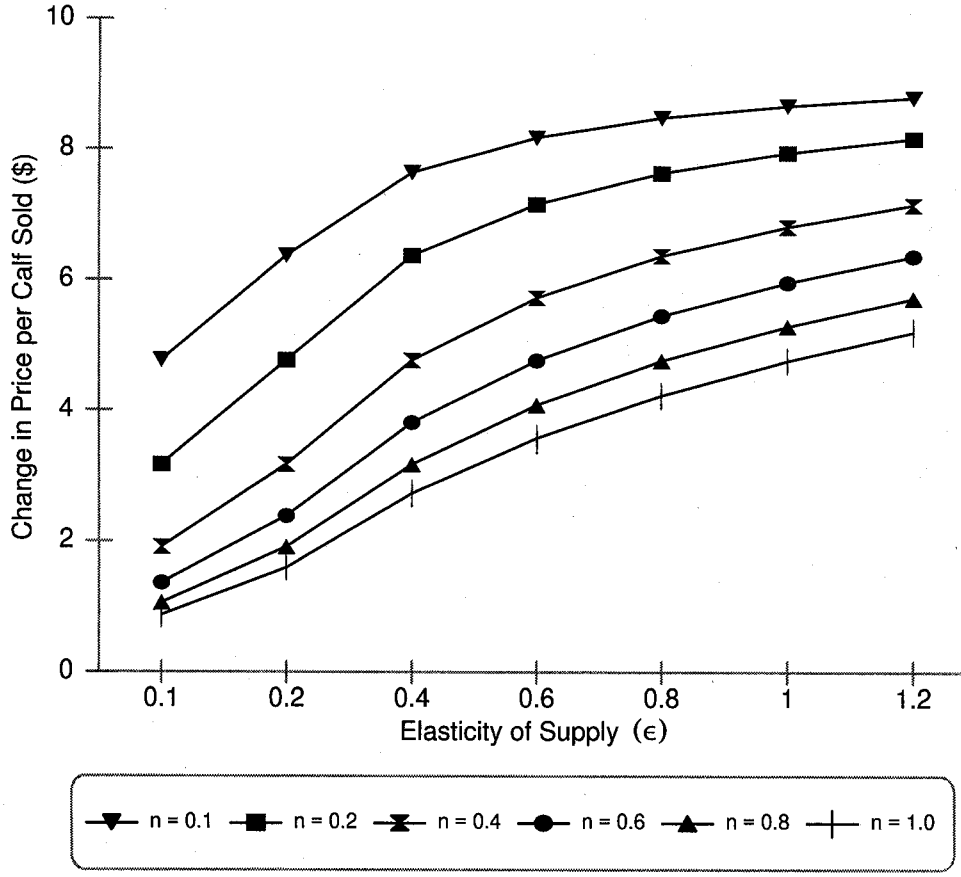

Figure 3. Impact of supply and demand elasticities (ϵ, η) on price per calf sold ($)

subsidy, the reduced federal tax burden is essentially equal to the within-region welfare losses (excluding positive and negative externalities). Our findings regarding the directions of the price and output effects support the Holechek and Hess hypotheses, and are consistent with the results of other analyses of input subsidies or supply shifters (Foster et al.; Sampath; Ebel, Hornbaker, and Nelson).

An underlying assumption within the analysis is that the input subsidy is a dependable factor in cow-calf production decisions. While data indicate that feed subsidies have been paid to cow-calf producers in southeastern New Mexico since the 1950s, the extent to which producers have viewed the subsidies as an annual entitlement is unknown.

The broader welfare effects of EFP include the benefits and/or costs of preventing partial or total liquidation of breeding stock in the face of drought conditions. Reported beef cattle numbers in New Mexico (including the southeastern region of the state) have not fluctuated significantly over the last several years despite a severe drought (New Mexico Agricultural Statistics Service). A comprehensive welfare analysis of EFP would account for the economic value of stable cattle numbers, markets, and prices if this stability can be attributed to EFP. However, if EFP has prevented herd liquidations and

resulted in overgrazing, that information also should be included in a comprehensive welfare assessment.

Assuming there is social value in stable cattle numbers, markets, and prices, these benefits would tend to accrue to producers and not to society at large when the region in question is a small contributor to the national beef supply. Assessing social costs and benefits is even more complex if private financial incentives to maintain cattle numbers result in overgrazed public lands. Furthermore, feed subsidies' role in discouraging diversified crop/livestock operations also should be assessed.

The market and welfare effects analyzed here are based on the fundamental assumption that cattle producers are profit maximizers in a competitive market. Some researchers have questioned the objectives of small-scale cattle producers, and have concluded that their behavior may be better understood within the framework of utility maximization or other goals (Smith and Martin; Young and Shumway). No data exist to indicate whether EFP recipients in New Mexico or elsewhere tend to be commercially oriented or otherwise motivated. However, with 249 calves sold in 1993 by a representative southeastern New Mexico ranch, more than likely these operations are commercially motivated rather than hobby oriented.

Southeastern New Mexico is part of a much larger national market for calves, and although the region has received a consistent high level of feed subsidy, it is a relatively small contributor to total output. Feed subsidies have been paid to beef producers throughout the United States, in both minor and large production regions. This research has concentrated on the effects of the feed subsidy in southeastern New Mexico. The national cost of the subsidy used in this analysis was restricted to the amount of the producer payments only. The national social burden of feed subsidies is obviously much larger than the payments, and includes the costs of program administration, distortions caused by taxes, and losses to both subsidized and nonsubsidized producers outside of southeastern New Mexico. Moreover, consumer benefits of feed subsidies (larger beef supplies and reduced prices) are also national in incidence.

Effects on the national market of subsidized feed in New Mexico, in other marginal and heavily subsidized regions, and in larger but less consistently subsidized areas of the country likely exist, but this research points to smaller impacts than those hypothesized by Holechek and Hess. However, many questions regarding the effect of EFP on the national beef industry, rural economies, and grazing resources remain unresolved.

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References

Bixby, K. "Congress Races to Revive Pernicious Program" [editorial]. *The* [Las Cruces, New Mexico] *Bulletin* (6 June 1996):9.

Boykin, C. C., J. R. Gray, and D. D. Caton. "Ranch Production Adjustments to Drought in Eastern New Mexico." Res. Bull. No. 470, Agr. Exp. Sta., New Mexico State University, Las Cruces, 1962.

Brester, G. W., and J. M. Marsh. "A Statistical Model of the Primary and Derived Market Levels in the U.S. Beef Industry." *West. J. Agr. Econ* 8(1983):34–49.

DiSilvestro, R. "Your Tax Dollars Are Feeding Cattle and Destroying Habitat." *National Wildlife* 34,1(December 1995):58.

Ebel, E. D., R. H. Hornbaker, and C. H. Nelson. "Welfare Effects of the National Pseudorabies Eradication Program." *Amer. J. Agr. Econ.* 74(1992):638–45.

Foster, W. E., L. S. Calvin, G. M. Johns, and P. Rottschaefer. "Distributional Welfare Implications of an Irrigation Water Subsidy." *Amer. J. Agr. Econ.* 68(1986):778–86.

Gray, J. R. *Ranch Economics*. Ames IA: Iowa State University Press, 1968.

Hess, K. "Storm Over the Rockies." *Reason Magazine* 27,2(June 1995):18–25.

Hess, K., and J. L. Holechek. "If Rain Doesn't Fall, the Money Will." *High Country News* 27,8(1 May 1995):20.

———. "Subsidized Drought" [editorial]. *The New York Times* (12 December 1994):A19.

Holechek, J. L., and K. Hess. "The Emergency Feed Program." *Rangelands* 17,4(1995):133–36.

Keys, C. Vice President for Public Policy, National Cattlemen's Beef Association, Washington DC. Personal communication, 5 August 1996.

Knutson, R. D., J. B. Penn, and W. T. Boehm. *Agricultural and Food Policy*, 3rd ed. Englewood Cliffs NJ: Prentice-Hall, Inc., 1995.

Lichtenberg, E., D. D. Parker, and D. Zilberman. "Marginal Analysis of Welfare Costs of Environmental Policies: The Case of Pesticide Regulation." *Amer. J. Agr. Econ.* 70(1988):867–74.

Marsh, J. M. "Estimating Intertemporal Supply Response in the Fed Beef Market." *Amer. J. Agr. Econ.* 76(1994):444–53.

National Archives and Records Administration. *Code of Federal Regulations.* Part 1475, "Emergency Livestock Assistance." 7CFR, Chap. XIV. Washington DC: U.S. Government Printing Office, 1 January 1996.

Newcomer, J. Agricultural Assistance Specialist, Noninsured Assistance Branch, Farm Service Agency, U.S. Department of Agriculture, Washington DC. Personal communication, 27 September 1996.

New Mexico Agricultural Statistics Service. *New Mexico Agricultural Statistics.* Las Cruces NM. Various annual issues, 1989–96.

Sampath, R. K. "Returns to Public Irrigation Development." *Amer. J. Agr. Econ.* 65(1983):337–39.

Smith, A. H., and W. E. Martin. "Socioeconomic Behavior of Cattle Ranchers, with Implications for Rural Community Development in the West." *Amer. J. Agr. Econ.* 54(1972):217–25.

Torell, L. A., and J. M. Hawkes. "Range Livestock Cost and Return Estimates for New Mexico, 1993." Res. Rep. No. 700, Agr. Exp. Sta., New Mexico State University, Las Cruces, 1995.

U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service. "Farm Program Fact Sheet: ASCS Emergency Livestock Feed Programs." USDA/ASCS, Washington DC, August 1994.

U.S. Department of Agriculture, National Agricultural Statistics Services. *Agricultural Statistics, 1995–1996.* Washington DC: U.S. Government Printing Office, 1996.

U.S. Department of Agriculture, Office of the Chief Financial Officer. Unpublished data for Emergency Feed Program (10.066). USDA/CFO, Washington DC, October 1996.

U.S. General Services Administration. *Federal Domestic Assistance Catalog.* Online. Available HTTP: http://www.gsa.gov/fdac. 13 December 1996.

Young, K. D., and C. R. Shumway. "Cow-Calf Producers' Perceived Profit Maximization Objective: A Logit Analysis." *S. J. Agr. Econ.* 23(1991):129–36.