WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

PAPERS OF THE 1989 ANNUAL MEETING

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

COEUR D'ALENE, IDAHO

JULY 9-12, 1989

The Impact of Lamb Imports on U.S. Sheep Products Markets

Glen D. Whipple, Dale J.Menkhaus and John P. Hewlett*

U.S. lamb interests have voiced concern over recent increases in lamb imports (ASPC,1988). Lamb imports were 18 million lbs. annually in the early 1980's, about 5% of domestic production. However, imports were 31 million lbs. in 1985, 28 million lbs. in 1986 and about 29 million lbs. in 1987 and 1988 (9 to 10% of production for each year) (ASPC,1988). Historically lamb has been excluded from legislation imposing import restriction on other meats. However, renewed concern about lamb imports resulted in the designation of lamb as a perishable product under the Omnibus Trade Bill of 1988. This allows for the imposition of restrictions on lamb imports if it can be shown that imports are damaging the domestic lamb market (ASPC,1988).

Carman and Maetzold estimated the effects of varying levels of lamb imports on producers and consumers for 1967 using a spatial equilibrium model. Their results show that consumers benefit from imports through increased meat supplies and lower prices while producers receive lower returns with lamb imports.

It is the purpose of this research to investigate the impacts of lamb imports on the markets for sheep products. To that end, consistent theoretical and empirical model are developed and the effects of lamb imports on impacted U.S. markets are estimated.

Economics of Wool and Lamb Markets

Wool and lamb are the joint products of sheep production and for the most part are complementary outputs. Any policy which affects prices or production levels of an output will impact its joint product. As a result, the economic effects of lamb imports are felt and thus, must be measured on farm and wholesale level wool markets as well as lamb markets.

Lamb and Wool Markets Illustrated

Domestic farm and retail level markets for wool and lamb are illustrated in Figure 1. The horizonal axis in Figure 1 represents the quantity of sheep and associated outputs of wool (sheep x wool/sheep) and lamb (sheep x lamb/sheep). Price or revenue per sheep from lamb and wool is located in the vertical axis. Thus, price in Figure 1 is defined as output per sheep times the price of the product considered. Interpretation is similar to the more traditional price/quantity graph since output per sheep is relatively unaffected by prices in the short run. Since price and quantity are adjusted for lamb and wool output per sheep, the same adjustment is implied for supply or demand schedules represented in Figure 1. This approach is necessary due to the jointness in lamb and wool production.

U.S. demands for wool at the farm or wholesale levels are labeled DWF and DWW, respectively, The wholesale level is considered the final demand in this case due to the lack of data at the retail level for wool. The farm, wholesale and retail level demands for lamb are labeled DLF, DLW and DLR, respectively, These demands are satisfied with both domestically produced and imported products. The supply of wool imports (SWm) is on a raw basis. Lamb imports supply, labeled SLm, is on a wholesale or carcass basis. The demand for domestically produced lamb, labeled EDLW in Figure 1, is defined as the excess of demand (DLW) over import supply (SLm) at various prices. Thus at a price P*, EDLW(P*) = DLW(P*) - SLm(P*). As illustrated in Figure 1, excess demand is zero at the intersection of DLW and SLm and positive at prices below that intersection, but is equal to DLW at prices below the minimum import price. The demand for domestic lamb at the farm level (EDLF) is derived from the wholesale demand (EDLW). Similarly, the farm level demand for domestically produced wool (EDW) is the excess of demand (DWF) over import supply (SWm) at

University of Wyoming

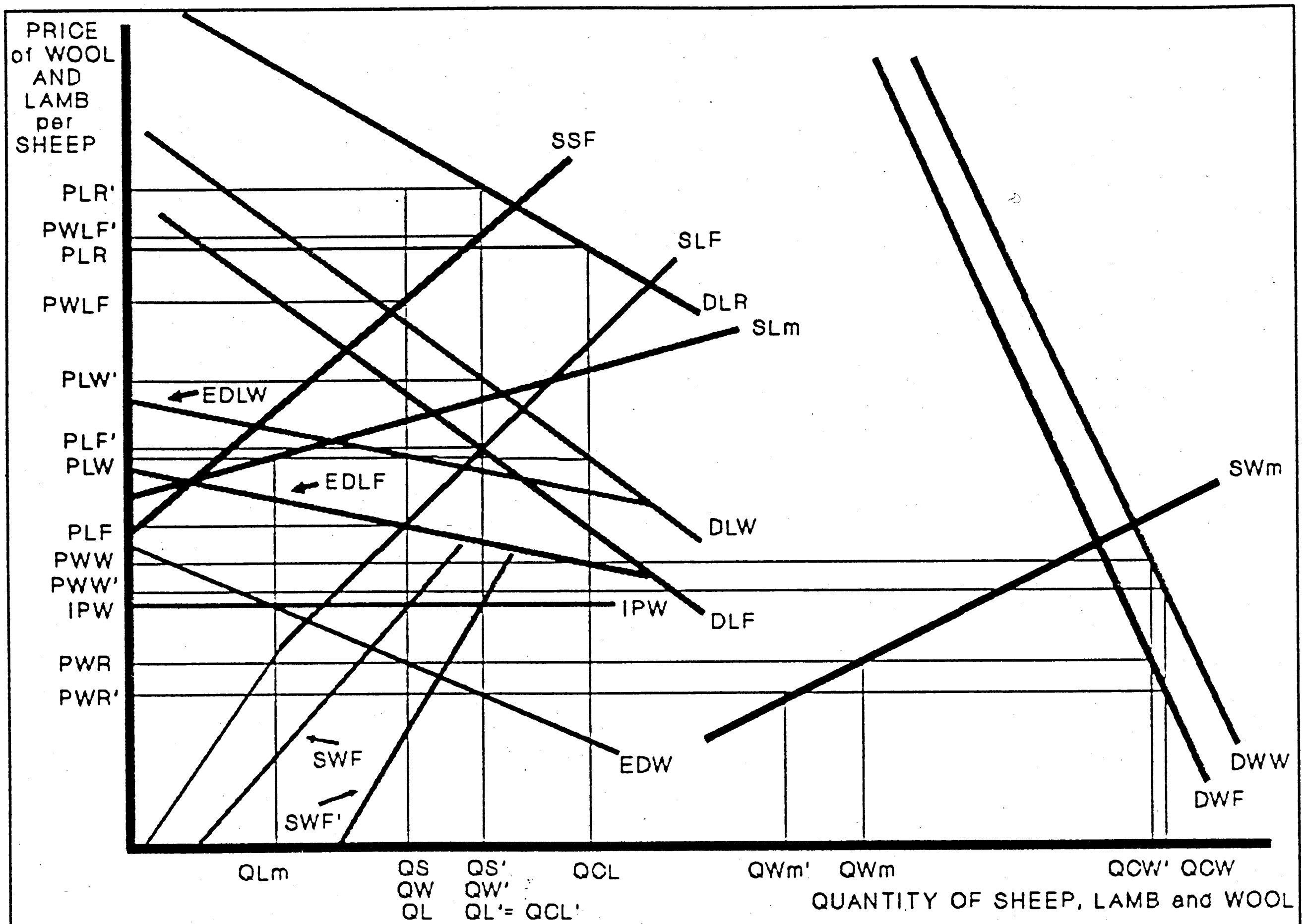

Figure 1. Effects of a Lamb Imports on U.S. Lamb and Wool Markets

various prices.

The domestic supply schedule for sheep products, labeled SSF, relates breeding sheep numbers to annual revenue from the lamb and wool output of the sheep. Due to the jointness in production, lamb and wool are produced in fixed proportions. Thus, lamb and wool prices work jointly to determine breeding sheep population and related lamb and wool output. As a result, supply schedules for domestically produced wool and lamb can be derived from the sheep supply schedule, SSF and the demands for domestically produced wool and lamb, EDW and EDLF, respectively. Due to jointness in production, the price of wool needed to induce a particular quantity of wool is the residual between the revenue per sheep needed to induce the sheep numbers necessary to produce that quantity of wool, and the revenue per sheep from the lamb output resulting from that number of sheep. Thus, the domestic supply of wool at the farm, SWF, is derived as SSF-EDLW. Under the wool act, wool production is encouraged by a subsidy paid directly to producers. On average, this subsidy is the difference between the wool incentive price (a parity based target price) and the wool's value in the market. In Figure 1, the incentive price is labeled IPW. With the incentive subsidy, the domestic lamb supply, SLF, is derived as SSF-EDW where EDW is above IPW and SSF-IPW where EDW is below IPW.

With imports, equilibrium in the domestic farm level wool market is at the intersection of SWF and IPW with QW produced at the incentive price IPW. The domestic wool market clears at price PWR and QCW is consumed. This consumption is made up of QWm wool imports and QW domestic production. The wholesale wool price is PWW (from the intersection of QCW and DWW).

Equilibrium in the domestic lamb market is at the intersection of SLF and EDLF with QL produced at price PLF. A farm price of PLF corresponds to a carcass price of PLW (from the intersection of QL and EDLW). At PLW, consumption of QCL is made up of QLm imports and QL domestic production. The retail price is PLR (from the intersection of QL and DLR). Note that lamb and wool is produced in fixed proportions (QS, QW and QL are at the same output point in Figure 1), while lamb and wool can be imported and consumed in any proportion. Average producer revenue per sheep is PWLF (at the intersection of breeding flock numbers, QS and SSF).

Lamb Import Effects Illustrated

Without lamb imports, the import supply schedule is restricted to zero. Thus, the demand facing domestic producers is the market demand schedule, DLF, rather than excess demand, EDLF. As a result, the domestic wool supply schedule, SWF', is derived from SSF and DLF (SWF'= SSF-DLF).

Without lamb imports, the equilibrium in the domestic lamb market is at the intersection of SLF and DLF with QL' produced at price PLF'. Higher farm and corresponding wholesale (PLW') and retail (PLR') prices reduce lamb consumption to QCL' (equal to QL'). Equilibrium in the domestic farm level wool market is at the intersection of IPW and SWF' with QW' produced. The domestic wool market clears at price PWR' (intersection of QW' and EDW). Foreign producers supply QWm, at PWR'. Lower farm (PRW') and corresponding wholesale wool prices cause wool consumption to increase to QCW'. Without lamb imports, lamb and wool producer's average revenue is PWLF' (intersection of QS' and SSF). This higher producers' average revenue is due to higher lamb prices (PLF to PLF') and constant wool price (IPW). Since the incentive price is constant and wool production increases as lamb prices increase, the government cost of the incentive program is higher without lamb imports.

This graphic analysis indicates that lamb imports lower domestic lamb prices, benefiting lamb consumers but leaving producers worse off, while raising wool prices, benefiting the government with lower incentive payment costs, but leaving wool consumers worse off. Lamb exporters benefit from access to U.S. markets, but wool exporters suffer lower wool prices as a result of lamb imports.

The Econometric Model

The econometric model of the U.S. sheep products sector used in this research is reported in Table 1. It consists of a domestic sheep products supply segment, a lamb and wool import supply segment and a lamb and wool demand segment.[1] The domestic supply segment of this model (equations 1 - 8) is directly based on the dairy enterprise model developed by Chavas and Klemme. Focusing on the dynamic economic decision behavior of U.S. sheep producers, slaughter rates for lambs and stock sheep and per animal productivity are the important economic decision variables. A more complete presentation of the theoretical foundations of the sheep supply model is contained in Whipple and Menkhaus (1989). The imports supply segment (equations 9 and 10) is composed of wool and lamb import supply equations. The lamb demand segment (equations 11 - 14) is composed of price dependent retail, wholesale and farm level demand equations and a total consumption identity. This structure is equivalent to the excess demand for lamb (EDLF) depicted Figure 1. The constant elasticity form was chosen over the linear form for the lamb demand equations because low consumption levels in the 1980's results in an extremely inflexible demand response with the linear form. A more thorough discussion of the demand for lamb is included in Whipple and Menkhaus (1988).

The wool demand segment (equations 15 - 19) is composed of a final demand (15), a farm to wholesale price transmission equation (16), a total consumption identity (18) and an incentive price restriction (19). Following Figure 1, the demand for

Table 1. Simulation model equations[a]

---

(1) $$REPL_t = \sum_{j=1}^{8} SS_{jt-1} \cdot L\_\%_{t-1} \cdot (1-D_{ot-1}) \cdot (\underset{(4.54)}{7.620} + \underset{(0.0731)}{0.1339}\ PL_{t-2}/PH_{t-2}$$

$$- \underset{(0.0023)}{0.00391}\ YEAR_{t-1} + \underset{(1.479)}{4.245}\ PW_{t-1}/PH_{t-1} - \underset{(0.000508)}{0.0000686}\ PLB_{t-1}$$

$$+ \underset{(0.0016)}{0.00122}\ PB_{t-1}) \qquad R^2 = .985 \qquad F = 328.3 \qquad \rho = .34$$

(2) $$\sum_{j=1}^{8} SS_{jt} = REPL_t + \sum_{Y=2}^{8} REPL_{t-Y+2} \cdot \sum_{j=2}^{Y} (\underset{(0.1034)}{0.5691} + \underset{(0.04259)}{0.4181}\ PL_{t+j-Y-1}/PH_{t+j-Y-1}$$

$$+ \underset{(1.0444)}{5.8484}\ PW_{t+j-Y-1}/PH_{t+j=Y=1} - \underset{(0.06529)}{0.7358}\ PS_{t+j-Y-1}/PH_{t+j-Y-1} -$$

$$\underset{(0.000853)}{0.0003957}\ PB_{t+j-Y-1} - \underset{(0.00002)}{0.00000275}\ PLB_{t+j-Y-1} + \underset{(0.0224)}{0.00695}\ AGE_{t+j-Y-1})$$

$$R^2 = 0.993 \qquad F = 600.1 \qquad DW = 1.3$$

(3) $$LVWT_t = \underset{(0.878)}{79.386} + \underset{(0.058)}{0.18291}\ PL_t - \underset{(0.4103)}{0.9703}\ PCON_t + \underset{(0.0386)}{0.5052}\ YEAR_t$$

$$R^2 = .986 \qquad F = 504.3 \qquad DW = 1.91$$

(4) $$FLCWT_t = \underset{(0.531)}{1.2675} + \underset{(0.0698)}{0.8458}\ FLCWT_{t-1} \qquad R^2 = .738 \quad F = 61.21 \quad DW = 2.58$$

(5) $$SSRN_t = SS_t + REPL_{t+1}$$ (6) $$QW_t = SSRN_t \cdot FLCWT_t$$

(7) $$LMBS_t = (SS_t \cdot (1-D_{ot-1}) \cdot L\_\%_t) - REPL_{t+1}$$ (8) $$QL_t = LMBS_t \cdot LVWT_t$$

(9) $$QLm_t = - \underset{(5570045)}{32511753.4} + \underset{(78935)}{363904.4}\ WPLMB_t + \underset{(0.0053)}{0.03309}\ NZAULPt - \underset{(101209)}{497746.3}\ PEXPt$$

$$R^2 = .819 \qquad F = 36.2 \qquad \rho = 0.19$$

(10) $$QWm_t = \underset{(134873800)}{434234200} + \underset{(11069600)}{303151600}\ PRWL - \underset{(42155900)}{87692200}\ PWWD_t + \underset{(138200)}{144100}\ QAEXP_t$$

$$- \underset{(2835294200)}{1106820000}\ TRSUS_t - \underset{(1001700)}{2992400}\ YEAR_t + \underset{(4441600)}{14590100}\ WD_t$$

$$R^2 = .723 \qquad F = 12.61 \qquad \rho = 0.37$$

(11) $$RPLMB_t = EXP\ (\underset{(0.472)}{2.473} - \underset{(0.089)}{0.5824}\ LN\ (CONLMB_t) + \underset{(0.091)}{0.3860}\ LN\ (RPBEF_t) + \underset{(0.054)}{0.1118}$$

$$LN(INC_t)) \qquad R^2 = .995 \qquad F = 2122.7 \qquad \rho = 0.46$$

(12) $$WPLMB_t = EXP\ (\underset{(0.212)}{-0.9862} + \underset{(0.052)}{1.1378}\ LN\ (RPLMB_t) - \underset{(0.45)}{0.1956}\ LN\ (RETWAG_t))$$

$$R^2 = .995 \qquad F = 2189.0 \qquad \rho = 0.41$$

Table 1. (continued).

(13) $PL_t = EXP\ (-1.736 - 0.1992\ LN\ (MPWAG_t) + 1.2792\ LN(WPLMB_t))$
(0.1232) (0.029) (0.0371)
$R^2 = .996$ $F = 2739.0$ $\rho = 0.29$

(14) $CONLMB_t = (LCY((QL_t \cdot LDP) + QLm_t))/POP_t$

(15) $CQWWL = 3.6556 + 0.0001769\ INC_t - 0.11241\ PWWL_t - 0.05413\ YEAR_t + 0.3586\ WD_t$
(0.2915) (0.0000608) (0.1037) (0.0086) (0.2143)
$R^2 = .932$ $F = 106.2$ $\rho = 0.55$

(16) $PWWL_t = 44.3377 + 2.4334\ PRWL_t + 0.26708\ PTLUSS_t - 0.0224\ YEAR_t$
(32.2995) (0.2466) (0.1049) (0.0165)
$R^2 = .923$ $F = 92.9$ $\rho = 0.55$

(17) $PW_t = [((POP(3.6556 + 0.0001769\ INC_t - 0.11241\ (44.3377 + 0.26709\ PTLUSS_t - 0.0224\ YEAR_t) - 0.05413\ YEAR_t + 0.3586\ WD_t)) - (434234200 - 87692200\ PWWD_t + 144100 - QAEXP_t - 1106820000\ TRSUS_t - 2992400\ YEAR_t + 14590100\ WD_t\ ) - CQW_t)/((0.11241 \cdot 2.4334 \cdot POP) + 303151600)]$

(18) $QCWL_t = CQW_t + QWm_t = CQWWL_t \cdot POP_t$

(19) IF $PRWL_t > INPR_t$ THEN $PW_t = PRWL_t$; Otherwise, $PW_t = INPR_t$

a. **REPL**$_t$ is the number of replacement lambs in t, $\sum_{j=1}^{8} SS_{jt}$ is the number of stock sheep aged j through 8 in the breeding flock in t, $L\_\%_t$ is the lambs saved per stock sheep in the breeding flock in t, D_{ot} is the lamb death loss as a percentage of lambs saved in t, **PL** is the farm price for lamb ($/lb.), **PH** is the alfalfa hay price ($/ton), **YEAR** is a linear time trend variable (1950-1985), **PW** is the farm price of wool including incentive payments ($/lb), **PLB** is the price of farm labor index, **PB** is the calf price ($/lb), **PS** is the price of cull sheep ($/lb), **AGE** is the age in years of a particular stock sheep cohort, **LVWT** is the average live lamb weight (lbs), **PCON** is the price of 20% protein concentrate ($/ton), **SSRN** is the number of sheep shorn, **QW** is wool sales (lbs), **LBS** is the number of lambs sold, **QL** is the lamb sold (carcas lbs), **QLm&** is annual lamb imports for the U.S. (lbs), **WPLMB** is the U.S. wholesale carcass lamb price ($/lb), **PEXP** is the average price of new Zealand and Australian lamb exports weighted by share of U.S. lamb imports by origin ($/lb), **NZAULP** is lamb production in New Zealand and Australia (lbs), **QWm** is total wool imports (clean lbs), **PRWL** is the U.S. raw wool price ($/lb), **PWWD** is the world market price of raw wool (U.S. $/clean lb.), **QAEXP** is Australian wool exports (mil. greasy Kg.), **TRSUS** is the tariff on raw imported wool ($/clean lb), **WD** is a binary variable for war (WD = 1 if YEAR = 1951-52; WD = 0 otherwise), **RPLMB** is the retail price of lamb ($/lb), **CONLMB** is annual per capita consumption of lamb (lbs), **RPBEF** is the retail price of beef ($/lb), **INC**$_t$ is annual per capita personal income in the U.S., **RETWAG** is the per hour wage rate in food retailing ($/hr), **MPWAG**$_t$ is the per hour wage rate in meat packing ($/hr), **CONLMB** is per capita lamb consumption (lbs), **POP** is the U.S. population, the **LDP** is the live lamb dressing proportion (0.5), **LCY** is the carcass to retail yield (0.845) (Livestock and Meat Statistics), **CQWWL** is annual U.S. per capita wool consumption (lbs), **PWWL** is the wholesale wool price ($/lb), **PTLUSS** is the price of textile labor ($/hour), **QCW** is total wool consumption (lbs) and **INPR** is the wool incentive price ($/lb).

U.S. produced wool is defined as total U.S. demand (18) minus import supply (10). Setting the demand for U.S. wool equal to production (QW), adjusting for clean yield ($CQW_t = QW_t \cdot WCYLD_t$ where WCYLD is clean yield of wool), substituting equation (16) for PWWL in equation (15) and solving for PWFM yields an equilibrium equation (equation 17) which insures that total wool consumption equals wool production plus imports (QWm). A more detailed discussion of wool demand is contained in Hewlett, Whipple and Menkhaus.

All behavioral equations were estimated based on 1950-1985 annual data. Data were collected from selected issues of Livestock and Meat Statistics (USDA), Agricultural Statistics (USDA), Wool Statistics (USDA) and Cotton and Wool Situation Reports (USDA). Supply and demand components of the model were estimated separately, using single equation techniques, due to data limitations and the size of the model. Where autocorrelation is a problem equations are corrected for autocorrelation using the Yule-Walker method (Gallant and Goebel) and ρ is reported. Where autocorrelation is not serious, least squares techniques are used and the Durbin Watson statistic is reported. The standard errors for the coefficients are in parentheses beneath the respective coefficients.

This empirical model is consistent with the theoretical model depicted in Figure 1. Because the dynamic components of the empirical model need several periods for adjustment to shocks imposed on the system and because lamb imports were negligible in the 1950's, the 1950 - 1987 period was selected for analysis. The model was dynamically simulated using the Newton method with observed values for independent variables assuming lamb import supply as implied by (9) and again assuming lamb imports are zero.[2] All tariffs were assumed in place in both simulations. The results of the two equilibrium simulations were compared to gauge the effects lamb imports on the sheep industry.

Results

The impact of lamb imports on stock sheep numbers and various output, price and revenue measures affecting sheep producers are listed in Table 2. These results of the model simulations indicate that lamb imports into the U.S. have had a substantial impact on the sheep production sector, particularly during certain periods of time. Lamb imports were negligible during the 1950's and thus had modest impacts. Lamb prices and stock sheep numbers were reduced by less than 1% and wool price was increased by less than 1% in 1960 as a result of lamb imports. However, by 1980 lamb imports accounted for a substantial part of the U.S. market and had a substantial impact on U.S. markets. In the 1980's lamb imports have reduced domestic sheep producer's output and revenues by about 10%, increased wool prices by about 2% and reduced lamb price by about 4%. It is interesting to note that model solutions suggest that for the 1983 to 1987 period lamb price was increased by lamb imports. Even so, producers' revenue was still lower with imports because of reduced output levels. This result is possible due to the dynamic adjustment process inherent to the domestic sheep supply model. The model results display a cyclical production pattern reflecting over adjustment to price with corresponding periods of growth and decline reflective of a Cobweb formulation. The period of the cycle appears to be about 10 years. The simulation results suggest similar periods of over and under adjustment in the middle 1950's, 1960's and 1970's. Note that the results in Table 2 suggest a cyclical adjustment since the lamb imports price effect is declining from a high of 4.2% in 1985 to 2.4% in 1987. Over the period of analysis lamb price was reduced an average of 0.6% by lamb imports.

Retail lamb and wholesale wool prices follow patterns similar to farm level prices (Table 3). Wool consumption is consistently lower (average of 0.2% lower) as a result of higher wool prices induced by lower production, while lamb consumption is consistently higher (average of 0.7%) due to lower lamb prices. Of particular

Table 2. The Effects of Lamb Imports on Sheep Producers.

	The effect of lamb imports on					
				Farm level price		
	Stock Sheep (Million head)	Wool production (Million pounds)	Lamb production (Million pounds)	Wool ($/lb)	Lamb ($/lb)	Sheep Producer's Revenue ($/M.)
1960	-0.146 (-0.5)	-1.471 (-0.5)	-5.779 (-0.4)	0.002 (0.04)	-0.002 (-0.9)	-4.466 (-1.0)
1965	-0.437 (-1.7)	-4.224 (-1.7)	-22.011 (-1.6)	0.010 (1.4)	-0.001 (-0.04)	-8.227 (-1.9)
1970	-0.734 (-3.5)	-7.480 (-3.5)	-39.535 (-3.3)	0.010 (1.5)	-0.004 (-1.5)	-19.660 (-4.4)
1975	-0.596 (-3.7)	-5.665 (-3.6)	-41.263 (-3.7)	0.008 (1.5)	-0.002 (-0.7)	-19.853 (-4.2)
1980	-0.949 (-9.7)	-9.810 (-9.5)	-45.049 (-8.6)	0.014 (1.7)	-0.030 (-9.5)	-60.283 (-12.5)
1981	-1.048 (-10.6)	-11.529 (-11.1)	-57.813 (-10.2)	0.017 (2.1)	-0.003 (-0.4)	-54.834 (-10.8)
1982	-0.879 (-10.7)	-11.483 (-11.1)	-57.389 (-10.7)	0.017 (2.7)	-0.008 (-1.2)	-60.178 (-11.8)
1983	-1.178 (-11.9)	-12.008 (-11.0)	-66.608 (-11.0)	0.017 (3.2)	0.030 (0.6)	-57.991 (-10.5)
1984	-1.229 (-10.9)	-13.017 (-11.1)	-71.611 (-11.0)	0.019 (1.0)	0.006 (1.0)	-61.168 (-10.3)
1985	-1.325 (-11.1)	-13.639 (-11.0)	-80.515 (-11.2)	0.020 (4.2)	0.024 (4.2)	-49.803 (-8.0)
1986	-1.100 (-9.9)	-12.207 (-9.7)	-68.392 (-9.1)	0.018 (3.4)	0.020 (3.4)	-47.728 (-7.3)
1987	-1.097 (-8.7)	-11.572 (-8.5)	-62.918 (-9.2)	0.017 (2.4)	0.016 (2.4)	-49.323 (-7.2)

[a] Percentage changes are in parentheses.

interest is the reduction in wool incentive program costs associated with lamb imports. Lower production levels and higher price for wool result in substantially lower wool incentive payments.

Implications

The theoretical model suggests lamb imports reduce lamb prices resulting in reduced production of lamb and wool. Lower domestic wool production in turn results in higher wool prices, thus higher wool imports and lower consumption. Lower lamb prices result in higher lamb consumption. The simulation results bear out these theoretical results but suggest that the impact of lamb imports on domestic lamb and

Table 3. The Effects of Lamb Imports on Lamb and Wool Consumers and Incentive Program Costs.

	The effect of lamb imports on					
	Retail lamb price ($/lb)	Lamb consumption per capita (lbs)	Wholesale Wool price ($/lb)	Wool consumption per capita (lbs)	Wool imports (M. lbs)	Incentive program costs ($ M.)
1960	-0.004	0.040	0.005	-0.001	0.646	-0.819
	(-0.6)	(1.0)	(-0.3)	(-0.0)	(0.3)	(-2.0)
1965	-0.006	0.010	0.015	-0.002	1.800	-2.268
	(-0.3)	(0.4)	(-0.8)	(-0.1)	(1.1)	(-4.9)
1970	-0.010	0.048	0.026	-0.003	3.164	-5.227
	(-1.0)	(1.8)	(-0.4)	(-0.2)	(2.5)	(-6.3)
1975	-0.006	0.018	0.021	-0.002	2.564	-21.684
	(-0.5)	(0.8)	(-0.9)	(-0.4)	(2.7)	(-9.8)
1980	-0.078	0.039	0.035	-0.004	5.923	-5.369
	(-3.1)	(5.1)	(-1.0)	(-0.5)	(3.9)	(-13.5)
1981	-0.071	0.006	0.041	-0.005	5.068	-8.425
	(-0.3)	(0.5)	(-1.2)	(-0.6)	(4.1)	(-14.4)
1982	-0.022	0.016	0.040	-0.005	5.039	-10.607
	(-0.8)	(1.4)	(-1.4)	(-0.6)	(3.9)	(-13.5)
1983	0.010	-0.008	0.042	-0.005	5.261	-13.852
	(0.4)	(-0.7)	(-1.5)	(-0.6)	(4.0)	(-13.2)
1984	0.017	-0.016	0.045	-0.005	5.694	-16.563
	(0.7)	(-1.2)	(-1.5)	(-0.6)	(4.1)	(-13.0)
1985	0.023	-0.070	0.047	-0.005	5.957	-17.795
	(2.9)	(-5.1)	(-1.6)	(-0.6)	(3.9)	(-13.0)
1986	0.056	-0.050	0.042	-0.005	5.308	-18.219
	(2.3)	(-4.1)	(-1.5)	(-0.5)	(3.5)	(-11.2)
1987	0.042	-0.037	0.040	-0.005	5.029	-15.269
	(1.7)	(-3.0)	(-1.2)	(-0.5)	(3.8)	(-10.1)

a/ Percentage changes are in Parentheses.

wool markets has been modest for most of the period of analysis. However, as lamb imports increased (as a percent of production) in the 1970's and 1980's the impacts of imports on producers and consumers have been substantial (about 10% breeding flock and outputs reduction). It is of interest that lamb imports have substantially reduced the cost of the wool incentive program. These measures of the impacts of lamb imports on lamb and wool market participants and the government would seem to be important considerations with the respect to import policy issues.

Footnotes

1. Live sheep imports and exports as well as lamb and wool exports have historically been negligible. Thus, they are ignored in this analysis.

2. To validate the simulation model, the dynamically simulated equilibrium with lamb imports was compared to observed equilibrium conditions. The results of this comparison show the model to do an adequate job of simulating actual equilibrium. Mean percent simulation error was 7.1% for stock sheep,7.9% for wool output,6.3% for lamb output, -2.7% for farm price of lamb, 10.2% for lamb consumption, 2.2% for retail lamb price, -11.1% for wool consumption, 1.9% for lamb imports and 6.2% for wool imports. The most serious error was an missestimation of lamb and wool consumption during certain periods.

References

American Sheep Producers' Council. Situation Outlook Report: 86-87. ASPC, Denver, Colorado, 1987.

____________. Insights. ASPC, Denver, Colorado, December 30, 1986.

Carman, H.F. and J.A. Maetzold. "The Regional Impact of Lamb Imports on Equilibrium Returns to Domestic Producers, 1967." American Journal of Agricultural Economics. 53(1971):92-100.

Chavas, J.P. and R.M. Klemme. "Aggregate Milk Supply and Investment Behavior on U.S. Dairy Farms," American Journal of Agricultural Economics, 67(1985):55-66.

Gallant, A.R. and J.J. Goebel. "Nonlinear Regression with Autoregressive Errors," Journal of the American Statistical Association, 71:961-67.

Hewlett, J.P., G.D. Whipple and D.J. Menkhaus. "The Demand for U.S. Apparel Wool," Sheep Industry Development Research Journal, In Press.

United States Department of Agriculture. Agricultural Statistics, 1939-1984.

____________. Cotton and Wool Situation and Outlook Report, CWS47, November 1986.

____________. Livestock and Meat Statistics, Statistical Bulletins, various years, 1940-1985.

____________. Wool and Mohair Background for 1985 Farm Legislation, Agricultural Information Bulletin, 466, September 1984.

____________. Wool Statistics and Related Data and Supplements, Statistical Bulletin No. 250, 363, 455, ERS.

Whipple, G.W. and D.J. Menkhaus. "Supply Response in the U.S. Sheep Industry," American Journal of Agricultural Economics. (1989). In Press.

Whipple G.W. and D.J. Menkhaus. "An Econometric Investigation of the Demand For Lamb," Sheep Industry Development Research Journal, 5(1988):7-11.

Dairy Policy of Pacific Traders: Potential for Conflict with the United States

by

Don Blayney*

Abstract. A large proportion of U.S. agricultural trade flows to Pacific areas. Agricultural policy adjustments create conflict among Pacific traders of dairy products. Dairy policies of four major actors in Pacific dairy trade are reviewed and their implications for U.S. entry into the international dairy market are presented.

Introduction

Agricultural trade has gained considerable attention in recent years. The keystone of the current round of GATT (General Agreement on Tariffs and Trade) multi-lateral trade negotiations is the removal of trade distorting agricultural programs and trade barriers by nations around the world. To date the agricultural issues have led to rather acrimonious debate but there has been no movement to shift attention from agreement on agricultural trade as a measure of the negotiations' success.

Because many of the agricultural trade issues involve stances taken by the United States and the European Community (EC-12), there is a tendency to view the problems in a trans-Atlantic

*The author is an agricultural economist in the Commodity Economics Division of the Economic Research Service, USDA. The views expressed are those of the author and do not necessarily reflect the policies of USDA.