AN ANALYSIS OF **SHEEP[1] MEAT SUPPLY RESPONSE IN GREECE ***

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SUMMARY

This study focuses an annual production and inventory decisions of Greek sheep producers by modelling producer behaviour in the context of the capital stocks theory. Producers response was analysed via the use of econometric procedures. Aspects of lamb and sheep (mouton) supply, inventory level changes and ewe breading were tackeled one at a time. The results show that prices influence producer's decisions in opposite directions. Specifically, where - as lamb meat pricheese ces positively affect production, sheep meat prices as well as milk and feta prices are inversely related to the volume of production. It seems that the demand for stock building finally balances with that for slaughtering.

1. INTRODUCTION

Sheep husbandry in Greece is carried out principally for meat.

1. There is a strong similarity between sheep and goats, or iamb and kids in Greece and thus they will both be examined as one and the same and will be reffered to throughout as «sheep» or «lamb».

* This paper is based on the author's Dh. thesis completed at the University of Newcastle Upon Tyne 1985.

Thinks are due to Prof. C. Ritson who supervised my research and to all members of Agr. Marktz and Econ. Departments of the University of Newcastle Upon Tyne.

The views of the author do not necessarily coincide with those of the Ministry of Agriculture.

Milk is a second joint product with wool being a product of low value.

In most of the analysis we used meat production, number and yields of livestock as separate dependent variables. These are mainly affected in the equations used by farm prices, deflated by a general index of wholesale food prices (agricultural goods). Often strong interactions appeared between livestock numbers and yields over and above what could explicity be attributed to the economic, technical and climatic variables which were used.

In general the results are satisfactory in the sence that a high proportion of the variation of yields and numbers of livestock have been explained by the individual equations. Many selected equations include variables that are of an endogenous of lagged endogenous type.

Thus, the value of R^2 associated with the individual equation exaggerate the extent to which the course of events has been explained. More seriously, some of the relationships used cannot be regarded as unequivocably causual.

Some explanatory variables are included when they appear to reflect conditions in the livestock industry which they may or may not have caused. At an analytical level this probably indicates that more sophisticated assumptions should have been used about the covariance of the disturbances to different supply equations. The method of estimation of each equation is by ordinary least squares. Logarithmic forms of the variables were used in all the equations— the logarithmic specifications imposes a supply relationship of contranst elasticity. There are often several different interpretations that can be given to the relationships expressed in a single equation and several different equations often appear to be equally con. vincing as an account of the factors affecting a single variable.

The climatic factors are considered to be important exogenous variables influencing sheep meat and milk production. In particular, rainfall during certain periods [2] of the year, especially during September, October and May; will increase forage and influence the volume of meat and milk produced.

The quasi - convergence of the estimates of elasticities allows one to conclude that multicollinearity, even when it was identified has not seriously biased the results obtained from the estimation of the models.

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2. Those periods are linked with specific nutritional demands because of the biological cycle.

2. ECONOMIC THEORY OF CAPITAL AND INVESTMENT

There are two periods during a year within which Greek sheep farmers are able to decide whether to change the size of their flock.

From the first birth of lambs (October - November), farmers select their replacement lambs. They use the first born lambs in order to economise in time and to put then for mating earlier. The number of lambs are always higher than they are needed, in order to facilitate a final decision of flock size in July of the following year, the month which usually signifies the end of the marketing year.

«To build up casual models, we mast start not from equilibrium relations, but from the rules and motives governing human behaviour». (Robinson 1962) This statement sums up quite well the approach to the analysis of supply in the Greek sheep sector, embodied in the models presented here.

The basic microeconomic theory of capital and investment can be traced to Fisher (1907) and more recently to Hicks (1946) and Jorgenson (1963). More details of the investment decision model which underlies the specified supply re. lations are provided in earlier applications of the theory to livestock supply studies by Jarvis (1967, 1974), Court (1967), Freebairn (1973) and Reynolds and Gardiner (1980). In this exposition only the basic theoretical core is presented, and concentration is directed to the behavioural postulates embodied in the theory. Our general methodology is principally based on earlier work in this field by Jo. nes (1961, 1962, 1965) on the relationship between livestock populations and prices.

Sheep production is envisaged as comprising of two basic activities : the build up of a stock of capital or plant, the amount of which at any point in time determines the maximum out put capacity of the process, and the processing of a flow of raw materials generated by this capital stock into finished products. The ewe flocks are thus equated with the «capital stocks», the inflow of new replacements representing «gross investment» and the outflow of culled eye representing «capital depreciation».

New animals are the raw material generated by the «capital stocks» being turned into finished products for «consumption» (the sale of lamb) after a certain

tenght of time. Milk is a product generated by the capital stock which needs no processing.

The overal process in broken down into three stages which follow one another in time (see figure 1).

STAGE 1 : Producers decide how much of the total raw material generated in a period (lambing) shall be used for further processing (hoggets).

STAGE 2 : The decision of progressing of the raw material into «consumption» or «investment» goods is finalised.

STAGE 3 : The cycle is completed and the total «stock of capital» is defined.

The Greek sheep production chain also the more be clearly defined in figgure 2.

3. THE MODELS

The effect of price on actual numbers of animals slaughtered should at least take account of the following falctors :

a) The delay between the intention to increase the breeding stock and the subsequent production from (the offspring of) that stock.

b) The competition between the sale of fat animals at current or short - dated expected prices and the retention of animals for breeding or slaughter at heavier weights at prices which are subject to expectations associated with much longer-delays associated with a.

c) The effect of current changes in the breeding flock, or holding of young animals for breeding, on the current rate slaughter: this may be accentuated by the holding of young animals for slaughter at heavier weights.

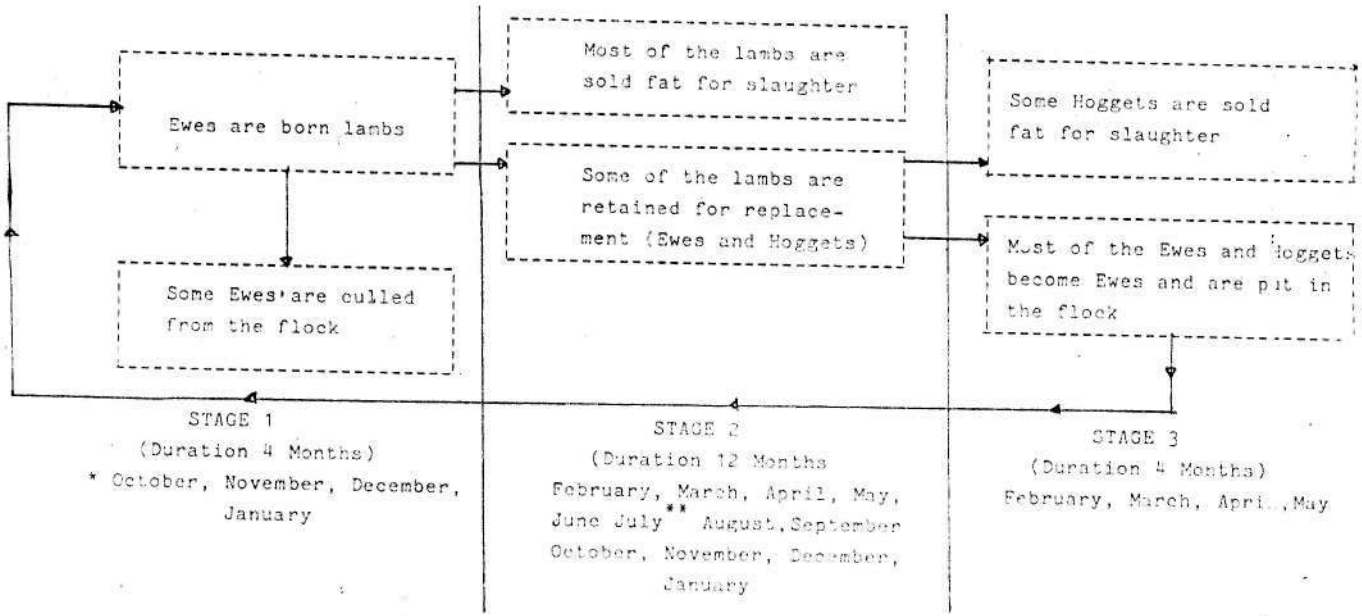

FIGURE 1: Descriptive Model of Sheep Production in Greece

* October is the principal month for decisions over how many lambs to retain

** July is the month where final decisions are taken over how many and which hoggets to retain

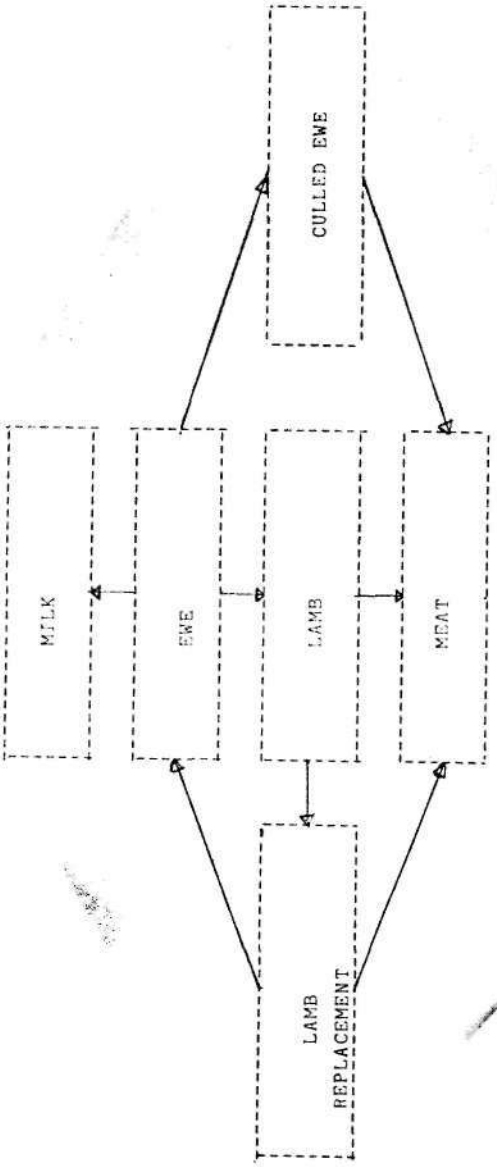

FIGURE 2.1 THE GREEK SHEEP PRODUCTIVE CHAIN

Where the weight of the animals slaughtered is taken into account, the following additional factors are relevant as well :

d) The immediate effect of higher prices on the use of feed, (which may include milk) and on rates of growth - especially of young animals.

e) Holding (young) animals to heavier weights.

f) Change to systems of production and breeds geared to heavier slaughter weights.

The theoretical background of the analysis of slaughter data involves several different kinds of response that farmers could show to price, so that even within a normal economic framework there is considerable difficulty in identifying the response to the price in a particular year as positive or negative on a - priori grounds. However one could expect that in the long - run the effect of meat prices on meat produced would be positive.

From the policy — making angle, these theories may seen less important than the prediction of what the effect of a set of prices changes might be over a sequence of years given the initial (normal) level of production and assuming that the policy maker has the ability to affect prices.

The choice of a starting point is in a sense arbitrary, but if prices over a sequence of 3 or 4 years are to be considered, it seems appropriate to treat normal production at least 2 or 3 years back as a starting point. Almost certainly over that period, some aspects of price changes will have a negative affect on slaughterings and production throught the build up of stock, and some will be favourable to production.

It would, however, be wrong to assume that all the adverse effects will come first and all the positive effects will come later when the stock has been built up> because yield responses can show themselves more immediately and because short - dated price expectations can play a role in causing early sales of sheep and lambs rather than delay production responses.

There are also problem of econometric estimation. One is that a build up of stock numbers can cause a shortage of animals slaughtered and a rise in prise which appears to justify that increase and a positive response of slaughter to the

agged effect of price. Another is that current sales may depress meat prices and hence affect the immediate response of meat supply to price - presumably with a negative bias.

The dependent variables (meat production, slaughterings, slaughter weights) were selected to cover different degrees of aggregation. Slaughter data are classified as lambs (under 1 year) or as sheep (over 1 year). Over the period analysed (1960 - 1983), about 20 % of the total by weight or 15% number were sheep. Many of these will probably be rolled down from the breeding flock, but there will be some natural wastage from the breeding flock and some slaughter of non - breeding animals over one year old.

The correspondence of 20 % with what is considered to be the normal turnover of the flock of ewes is somewhat approximate and accidental. It is extremely difficult to get estimates of the natural wastage from the available data.

The expectation was that the more immediate effects of price would be concentrated on the quicker maturing of lambs rather than on the sheep and many equations for lambs were run with Po^3, P_2 and P_3 which, in fact, proved to be quite significant. With sheep Slaughtering and sheep production, the price P_{1s} P_2 and P_3were specified and proved to be significant.

As a result, this leads to the specification of 6 different dependent variables, 3 for lambs and 3 for sheeps. So our dependent variables belcome :

a. YLK = Lamb weight slaughtered

b. SLK = Lamb head slaughtered

c. QLK = Lamb meat production

d. YEG = Sheep weight slaughtered

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3. P_o, P_1, P_2 and P_3 denoting the current meat price, the meat price lagged one, two and hree years respectively.
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e. SEG = Sheep head slaughtered

f. QEG = Sheep meat production.

The independent variables are all the dependent variables lagged one period lamb meat prices (PLK), Sheep meat prices (PEG), ewe milk prices (PML), feta cheese prices (PFE), ratio of lamb meat price (milk price (PLKR), ratio of sheep meat price/ milk price (PEGR), number of adult sheep (NEG), ratio of the number of slaughter lamb/ewe in milk (SLKR), ratio of the number of Sheep Slaughtered / ewes in milk (SEGR) weather index ((RAI = September - October's rainfall, RAM = May's rainfall) and trend (TRE). So our models become :

a. YLK = f (YLK1, PLK, PLK2, PLK3, PLKR1 SLK , SLKR1, RAI, TRE)

b. SLK = f (SLK1, PLK, PLK2, PLK3, PLKR, PLKR1, PLKR3, EGM , YLK, RAI, TRE)

c. QLK = f (PLK, PLK1, PLK2, PLK3, PML, PFE, PEG, PEG2, PEG3, NEG2, YLK, SLK, SLK1, RAI, TRE)

d. YEG = f (YEG1,P EG, PEG , PEGR2, PEGR3, PFE, PFE2, SEGR, SEG NEGL PAM, TRE)

e. SEG = f (SEG , PEG, PEG1, PEG2, PEG3, PML, PFE PEGR EGM2 RAM RAM1, TRE)

f. QEG = f (PEG, PEG1, PEG2, PEG3, RLK, RLK, RLK1, RLK2, PLK3, PEGR1, PEGR2, PML, PFE, SEG, SEG1, NEG2, RAM, TRE)

Tables 1, 2, 3, 4, 5 and 6 list the results from the best equations and are expressed in terms of constant elasticities. The figures in parenthesis are the t values of the relevant coefficients.

	YLK1	PLK	PLK2	PLK3	PLK R1	SLK	SLKR1	RAI	TRE	R^2	SE	D - W	
1. YLK				.57 (T=5.7)					.01 (T=6.0)	.91	.02	.65 P.AUT.	
2. YLK					.17 (T=2.42)			.0001 (T=1.38)	.008 (T=6.86)	.94	.02	.98 P.AUT.	
3. YLK		.35 (T=2.91)		.13 (T=1.18)	.09 (T=.87)	.30 (T=1.25)				.91	.02	1.10 INCON.	
4. YLK				.24 (T=2.0)		-.08 (T=.32)	.90 (T=2.57)			.88	.03	.94 P.AUT.	
5. YLK			.33 (T=4.12)			-.06 (T=.33)	.87 (T=2.92)			.92	.02	.94 P.AUT.	
6. YLK			.27 (T=2.7)	-.13 (T=1.30)			.32 (T=2.28)		.008 (T=3.25)	.95	.02	1.035 INCON.	
7. YLK	.11 (T=1.10)		.17 (T=1.30)	-.08 (T=.75)	.30 (T=2.14)				.007 (T=2.79)	.95	.02	.99 INCON.	
8. YLK			.10 (T=2.37)		.30 (T=2.10)				.007 (T=3.04)	.94	.02	.94 P.AUT.	
9. YLK	..66 (T=8.35)	.40 .13 (T=2.16)			.59 .19 (T=2.37)					.97	.01	1.03 N.SIT.	NC
10. YLK													

1. Average dressed carcass weight in kgrs
2. Long run elasticity
* The best equation
NC Not correlated

T A B L E 1: Estimated effects of factors affecting slaughter weights[1] of lambs - (1960-1983)

On the right side of the tables, and at the end of each equation, there are the corresponding values of R^2, the standard error, the Durbin - Watson statisfies and (NC), if there is no intercorrelation among explanatory variables.

4. DISCUSSION

a. Slaughter Weights of Lambs (Table 1)

The main economic variable affecting the slaughter weights of lamb is the Jamb meat price. The lambs are usually fattened during the winter and after their slaughter, all the milk from the ewes is available for human consumption or for processing.

For this reason decisions concerning the timing of slaughter may be influenced by the previous season's prices more than by the prices in the current season. The positive effect of current meat price on the slaughter weights was established against the expected bias in ordinary least square analysis by using endogenous a lagged variable equation (equation 9 in table 1).

For lambs, at any rate, the exogenous lagged variable equations work better omitting the current meat price. The slaughter weights of lamb have a positive effect of the two years lagged lamb meat prices (see table 1).

In equations which use trend variables, the upward trend in the slaughter weights of lamb are modest and significant all the time. Changes in the structure of the breeding flock for sheep have occurred which may be related to the upward trend. When current slaughterings are used in the same equation with trend, the trend (has a lower) statistical significance and the effects of the price variable also become implausible. Then it appears that the price incentives, three years previous for the end product, still had some additional influence on yield. But the explanation can go still further. If the expansion of slaughterings takes place through a rise in the proportion of twins, the effect on slaughter weights appears to be reduced, though it is not numbers of lambs born per milking ewe, but it probably follows the movements in the slaughterings of lambs/ewes in milk last year more or less proportionately. The strong positive effect of this ratio on slaughter weights implies a negative effect of this ratio of least year's ewes in milk, on those weights, which may also tie up with a positive effect of expected milk prices.

	SLK1	PLK	PLK2	PLK3	PLKR	PLKR1	PLKR3	EGM1	YLK	RAI	TRE	R^2	SE	D - W
1.SLK	1.05 (T=3.62)				-.04 (T=.35)		-.03 (T=.16)	.00 (∞)			.002 (T=.33)	.95	.03	1.03 INCON
2.SLK		.18 (T=.85)						1.11 (T=2.92)			.009 (T=.204)	.85	.04	.35 NC PO.AUT
3.SLK	.99 (T=5.21)							.26 (T=.83)	.09 (T=.50)			.95	.02	1.04 INCON.
4.SLK						.12 (T=.75)		.85 (T=2.50)		.01 (T=.63)	.009 (T=1.76)	.87	.04	.33 PO.AUT.
5.SLK							.39 (T=2.60)	1.03 (T=3.67)			.005 (T=1.38)	.90	.04	.53 PO.AUT
6.SLK		-.25 (T=1.47)		.47 (T=2.93)				.61 (T=1.52)			.002 (T=.40)	.91	.03	.66 PO.AUT
7.SLK				.52 (T=5.77)			-.59 (T=5.36)	1.74 (T=8.28)			.02 (T=5.53)	.96	.02	1.46 INCON.
8.SLK			.39 (T=3.25)				-.54 (T=3.85)	1.80 (T=6.20)			.02 (T=4.27)	.94	.03	1.07 INCON
9.SLK														
10.SLK														

T A B L E 2 : Factors affecting numbers of lambs slaughtered -(1960 - 1983)

Finally, proxy variables for climates (September - October rainfall) should not carry long run effects.

b. Numbers of Lambs Slauhgtered (Table 2)

Slaughter of young animals can be regarded as affected by recent levels of the breeding flock, recent incentives to slaughter (rather than retain animals for breeding of future slaughter.

Also, the ability to finish off animals to required levels, which may be indicated by trends, rather than weather conditions or slaughter weights.

The possibility of using lagged slaughter to estimate current slaughterings is kept open ; most technical delays in production should be covered by the level of the breeding flock ; but there may be other developments which are not covered by the variables used to measure the breeding flock ; for instance, the lambs may come from ewes which are domestic or of nomadic[4] type with a different breeding performance.

The best equations quoted in Table 2 show the strong effect of the breeding flock on slaughtering. The meat/milk price ratio variable three years ago required strong significance of current slaughter, in spite of the expected negative bias. Also, the lamb slaughterings are given as being strong, stimulated by lamb meat prices. In both cases, the response may be at the expense of future production. In both cases, it would appear that there is some upward trend in fertility. The three years lagged responsiveness of lamb meat price and meat/milk price ratio is logical and in line with what has been said already, but it would have been at least as reasonable to expect this effect to be carried in the level of this or last year's breeding flock whose effect is now reduced and blurred by interaction with the Nerlovian rate of adjustment. It is, of course, possible that marginal changes in ewe numbers are unsupported by appropriate price incentives and trend improvements do not quite lead to a proportionate rise in lambs born or slaughtered. The

4. These flocks are accompanied by farmer families who have not got permanent residences. During the last decade this system has been utilized to a lesser extent and the flock ewe system (domestic) has been the predominant one at the expense of the Nomadic Flock System; less than 10% of total ewes are now included in Nomacic Flock System.

	PLK	PLK1	PLK2	PLK3	PML	PFE	PEG	PEG2	PEG3	NEG2	YLK	SLK	SLK1	RAI	TRE	R^2	SE	D-W
1.CLK	.34 (T=1.41)	.10 (T=.43)	.08 (T=.27)	.54 (T=2.57)	-.62 (T=5.16)					.17 (T=.62)				.03 (T=1.55)	.06 (T=1.17	.96	.03	1.52 INCON
2.CLK	.46 (T=2.0)				-.59 (T=4.53)		-.37 (T=2.31)			-.24 (T=1.33)					-.02 T=7.03	.95	.0	1.59 INCON
3.CLK			.47 (T=4.27)			-.06 (T=.50)			.09 (T=1.0)				1.01 T=5.45)	.04 (T=1.01)		.98	.02	1.60 INCON
*4.CLK	.59 (T=7.68)					-.54 (T=4.15	-.38 (T=2.37)							02 (T=6.45)		.95	.04	1.33 INCON
5.CLK				.36 (T=3.03)	-.51 (T=7.28)						1.28 (T=5.56)			.00 T=.02)		.98	.02	1.42 INCON
6.CLK				.31 (T=.71)	-.56 (T=4.91)				.12 (T=.42)					.02 (T=3.07)		.95	.04	1.08 INCON
*7.CLK				.37 (T=3.4)		-.53 (T=6.65)					1.50 (T=10.90					.97	.03	1.61 INCON
8.CLK			.42 (T=4.66			.13 (T=1.05)		-.12 (T=1.25)				1.50 (T=13.63)				.98	.02	1.44 INCON
9.CLK				.32 (T=3.20)		.22 (T=1.64			-.23 (T=2.36)							.98	.02	1.46 INCON
10.CLK																		

TABLE 3 Factors affecting lamb meat production -(1960-1983)

use of current slaughter weights as a proxy variable to measure improvement in the structure of the breeding flock, and improved conditions for finishing lambs was unsuccessful. The same results occurred when the reverse procedure was in Table 1. It also absorbs any long term trend, for when trend is included in the same equation with the slaughter weight. The trend makes no contribution to explaining the variation of slaughters, although it appears significant statistically. The rainfall seems not to influence slaughterings.

It is almost certain that either a series of a number of lambs slaughtered or slaughtered or slaughter weights, which did not correspond to a simple time-lag of one year, would have resulted in a higher coefficient and probably even less room for a technical rate of adjustment.

c. Lamb Meat Production (Table 3)

The main economic variables affecting lamb meat production appears to be more clear than previous models.

The current, recent, two and three year lamb meat prices have a positive effect, as was expected, on the lamb meat production. Likewise, most of these can be regarded as statistically significant. The overall positive response of the lamb meat prices is reasonably interpreted as a response to a «sure market».

The strong positive effect of the current lamb yields and its current and recent numbers slaughtered on lamb production, implies an immediate response which is strong for weight and modest for numbers slaughtered.

The overall negative effects of sheep meat prices and milk or feta cheese prices on lamb meat production, provides an immediate and long enough delay, which allowed for the build up of the breeding flock. It would seem that demand for a build up of stock finally balances those for slaughter.

d. Slaughter Weights of Adult Sheep (Table 4)

For the oldest animals, the effect of the economic variables on slaughter

	YEG1	PEG	PEG2	PEG3	PEGR2	PEGR3	PFE	PFE2	SEGR	SEG	NEG1	RAM	TRE :	R^2	SE	D-W
1. YEG	.12 (T=.44)					.04 (T=.50)				.09 (T=1.80)			.009 (T= 3.0)	.93	.01	1.98 N.AUT.
2. YEG									-.18 (T=1.80)		.18 (T=3.6)		.01 (T=2.23)	.94	.01	1.72
3. YEG							-.11 (T=2.2)		-.31 (T=2.81)		.11 (T=1.83)		.01 (T=9.23)	.95	.01	2.04 N.AUT.
4. YEG					.11 (T=2.2)		-.07 (T=1.51)	-.12 (T=2.40)					.005 (T=4.53)	.95	.01	2.05 N.AUT.
5. YEG		-.11 (T=2.2)		-.15 (T=3.0)					-.17 (T=1.21)				.01 (T=8.0)	.94	.01	1.60 INCON
6. YEG				-.10 (T=2.0)							.00 (∞)		.01 (T=16.66)	.94	.01	1.57 NC INCON
7. YEG	-.03 (T=.11)					.08 (T=1.12)				.16 (T=3.2)		-.24 (T=2.40)	.01 (T=3.82)	.95	.01	1.55 INCON NC
8. YEG					.16 (T=2.66)		-.13 (T=2.60)						.005 (T=3.53)	.93	.01	1.66 INCON
9. YEG					.17 (T=2.83)		-.13 (T=2.60)					-.008 (T=.90)	.005 (T=3.25)	.94	.01	1.48 INCON

T A B L E 4 : Estimated effects of factors affecting slaughter weights of adult sheep - (1969 - 1983)

weights is less clear. There is a price response for mutton/milk price ratio; it is delayed for two years and probably corresponds to an incentive to improve breeds.

There is evidence of a negative effect of current ratios of the number of adult sheep slaughtered/ewe in milk on current yields. In one way or another, thi, reflects increasing pressure on grazing. The current slaughterings can be high, either because there are plenty of animals to slaughter, or because keep is short and slaughter forced. In either case the slaughter will be associated with proper feeding, but in the second case, it will be a transited condition, not a parameter effect.

The total number of sheep last year (at the inventory date after lambs have been slaughtered) does not appear to have a depressing effect on the yield which is distinct from that of the current rate of slaughter (expressed in relation to the potential inflow, that is, ewes in milk). The second variable does not only reflect weather conditions ; the feed requirements for finishing animals already exceed those for keeping them alive ; the effect of a deliberate effor to raise slaughterings or by increasing numbers in the breeding flock.

An alternative explanation can be offered in terms of economic variables. This mainly hinges on the idea that the key variable for bringing habits of hand feeling, etc., into the industry is the price of milk or its processing feta cheese, operating in association with a rise in the proportion of domesticated sheep and a fall in the number of nomadic sheep.

The best equation of Table 4 suggests that there is evidence that current feta cheese prices may play some role in increasing slaughter weights, or inversely-reflect the number of sheep in existence. In the same equation, there is some evidence that the yields are raised in the long run by the meat/milk price ratio, presumably by selection of breeds.

e. Numbers of Sheep Slaughtered (Table 5)

The general pattern of the effects of meat prices on slaughtering of older animals is fairly consistent. Recent two and three years lagged prices appear to encourage current slaughter either through slaughter livestock to lighter weights, or through an increase slaughter of breeding animals. Current rainfall in May im-

	SEG1	PPG	PEG1	PEG2	PEG3	PLM	PPE	IPEG	LCMP	RIM	RAM1	TNE	R^2	SE	D - W	
1. SEG		.22 (T=1.63)		.61 (T=1.91)					3.39 (T=4.40)		-.003 (T=.34)	-.03 (T=6.80)	.84	.05	1.12 INCON	NC
2. SEG		.22 (T=1.79)		.38 (T=1.65)					3.07 (T=4.57)	.16 (T=0.65)		-.03 (T=6.83)	.89	.04	1.32 INCON	NC
3. SEG	.75 (T=6.8)			-.24 (T=1.50)				-.16 (T=1.33)	.34 (T=1.21)		.008 (T=.94)		.91	.04	1.74 INCON	NC
4. SEG			.37 (T=1.94)			.24 (T=1.60)			3.13 (T=7.27)	.07 (T=3.47)		-.03 (T=7.83)	.89	.04	1.64 INCON	NC
5. SEG				.54 (T=2.34)	-.63 (T=3.50)				2.62 (T=5.03)		.003 (T=.27)		.89	.04	1.53 INCON	NC
*6. SEG				.54 (T=3.03)	-.55 (T=3.90)				2.54 (T=6.51)	.05 (T=3.26)		-.03 (T=9.56)	.90	.03	1.51 INCON	NC
7. SEG		.13 (T=.81)	.60 (T=2.72)						2.99 (T=6.64)	.08 (T=3.42)		-.03 (T=9.76)	.91	.04	1.74 INCON	NC
*8. SEG			.49 (T=2.72)						2.91 (T=6.66)	.007 (T=2.33)		-.03 (T=9.69)	.91	.04	1.59 INCON	NC
9. SEG				.12 (T=.57)		.34 (T=2.26)			2.86 (T=5.60)	.07 (T=3.30)		-.02 (T=6.09)	.87	.04	1.26 INCON	NC
10. SEG			.40 (T=2.00)				.17 (T=1.13)		3.03 (T=6.78)	.07 (T=3.52)		-.03 (T=8.85)	.89	.04	1.63 INCON	NC

TABLE 5 : Factors affecting number of adult sheep slaughtered - (1960 - 1983)

prove the prospects of keeping animals or for heavier weights, or for milk production and depresses slaughterings.

The positive price effect (recent two years) comes (as one would expect) after a longer time lag and the whole price effect may be regarded loosely as changing the data of slaughter rather than the number of animals slaughtered. The three years lagged negative effect of sheep meat prices in open to some objection on grounds of statistical bias.

The effects of the milk price on slaughterings or sheep are not entirely in line with what could be expected. The high level of slaughter during the 1960's and the low one since 1970 and afterwards, in the same period, real prices of milk and meat rose and the weather appeared generally favourable, is difficult to explain without deflating by the milk price. Yield of milk did rise very sharply around that time and it is possible that the rise in productive effort in relation to current prices takes the form of increased retention of domestic sheep at the expense of nomadic ones - even leading to a rise in current slaughter.

The slaughterings of sheep are all subject to some negative trend. That is expected, because during the examined period, producers have gradually increased lamb meat and respectively have reduced sheep meat responding to the consumer's's movements ; the lamb meat is considered by Greek consumers to be of superior «quality» compared with sheep or equivalently as a different commodity.

Recent levels of ewes in milk strongly affect slaughtrerings as expected. With the sheep, it is quite clear that the long run changes in the level of slaughterings of mature animals depend mainly upon what causes changes in the size of the breeding flock.

f. Sheep Meat Production (Table 6)

The effect of price of sheep meat on sheep meat production is a reasonable sign, in that it is positive when the current and recent prices are specified and negative when the lagged (two, three years) are specified.

Current and recent sheep meat prices respond positively on sheep meat production by encouraging slaughtering, while two and three years prices demand for

build up of stock. Furthermore, the long run negative effects of sheep meat prices can be accepted perhaps with the explanation that the effort to raise more lambs leaves less room for slow maturing sheep not in the breeding flock and this contributes to a reduction of sheep slaughtered. One other possible explanation is that it might reflect a shift of preferences for stocks with fewer domestic animals, rather than nomadic flock. Finally, although the effects of price should have their effects in the expected way, at the same time, legislation imposing stricter controls on sheep grazing on open land could have been affected quite strongly, because heavy penalties were imposed on sheep flocks exercising insufficient care.

The effect of lamb meat prices on sheep meat production are almost always significant and of a reasonable sign (negative for current - recent prices and positive to long lagged prices).

Current milk or feta cheese prices, as are expected, appear to depress slaughterings by keeping animals for milk production.

Finally, two dated responses are clear on Table 6 one immediate positive response for current slaughter of sheep and long strong demand for build up of stock.

	PEG	PEG1	PEG2	PEG3	PLK	PLK1	PLK2	PLK3	PEGR1	PEGR2	PML	PPE	SEG	SEG1	NRR2	PAM	TRC	R^2	SE	D -W
1.QEG		.57 (T=2.11)					-.53 (T=1.76)					-.30 (T=1.36)			1.23 (T=4.41)	.05 (T= 1.86)	.003 (T=.80)	.74	.05	2.05 NO.AUT.
2.QEG										.32 (T= 4.57)		- .44 (T=4.40)		.89 (T=11.12)		.02 (T =.71)		.87	03	2.48 NO NO.AUT.
3.QEG	.26 (T=1.08)				-.99 (T=3.41)							-. 10 (T=.50)			1.41 (T=4.86)			.64	.05	1.66 NO AUTCN
4. QEG								.22 (T=2.00)	.03 (T=3.81)		-.12 (T=2.03)		1.09 (T=13.6)					.94	.02	1.49 AUTCN
5. QEG				-.43 (T=3.30)				.57 (T=4.25)			-.09 (T=1.26)		1.05 (T=11.66)					.94	.02	1.37 AUTCN
6. QEG			-.25 (T=2.08)					.60 (T=5.02)					1.11 (T=9.25)					.88	.03	1.61 P.AUT.
7. QEG				-.55 (T=5.02)				.78 (T=7.8)					1.17 (T=11.03)					.94	.02	1.40 AUTCN
8. QEG		.79 (T=2.72)				-.61 (T=2.65)					-.37 (T=2.12)			1.47 (T=5.46)				.74	.05	1.39 AUTCN
9. QEG		.55 (T=2.32)				-.73 (T=2.80)									1.50 (T=6.00)		.009 (T=2.98)	.75	.05	1.39 NO AUTCN
10. QEG		.51 (T=2.03)					-.39 (T=1.69)					-.39 (T=1.92)			1.40 (T=4.93)			.69	.06	1.64 AUTCN
11.QEG		.60 (T=2.03)						-.65 (T=2.03)				-.34 (T=1.91)				1.29 T=4.03		.70	.06	1.63 AUTCN

TABLE 6 - Factors affecting sheep meat production - (1960 - 1983)

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