TRADE POLICY UNDER IMPERFECT COMPETITION: AN ASSESSMENT OF THE TRQ ON LAMB MEAT

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Abstract

The United States imposed a tariff-rate quota (TRQ) on lamb meat in July 1999. Early analysis suggested the possibility that lamb growers could lose welfare via the creation of packer market power. This paper considers how subsequent events modify that analysis. Observed prices suggest reduced pass-through. Lamb prices are unchanged and more stable. Using an annual quota instead of a quarterly quota reduces the opportunity for market conduct switching. Early termination of the TRQ to comply with the WTO rulings magnifies any welfare loss. Assistance payments prevent welfare losses to growers with little impact on the market.

Key words: Lamb, lamb meat, trade policy, TRQ

TRADE POLICY UNDER IMPERFECT COMPETITION: AN ASSESSMENT OF THE TRQ ON LAMB MEAT

In a recent article Paarlberg and Lee analyze the tariff-rate quota (TRQ) imposed by the United States on lamb meat imports in July 1999. They argue that the TRQ potentially allows lamb packers to exercise market power and, if that occurs, lamb growers can experience a welfare loss from the policy. Since the original research was conducted additional information about the administration of the policy has emerged. Furthermore, the initial impacts of the policy can now be observed as well as the reaction of exporting nations. This paper revisits the TRQ policy for lamb meat in light of what has occurred.

This paper divides into three sections. The first section summarizes the earlier analysis. The second section covers developments in the lamb meat market since the TRQ was imposed. The third section indicates how the earlier results are modified given those developments.

Previous Analysis

Some structural characteristics of the U.S. lamb meat market suggest imperfect competition. From 1993 through 1999 the four firm concentration ratio (CR4) for sheep and lamb slaughter varied from 65 to 73 (*Cattle Buyers Weekly*; September 18, 2000). Two plants slaughtered 40 percent of the animals in 1998 (USDA/NASS). At the time same other structural characteristics suggest that lamb packers were not in a position to exercise market power. Trade theory demonstrates that trade can erode market power (Caves and Jones). Between one-quarter and one-third of supplies were imported (USDA/ERS, *Agricultural Outlook*). Because the CR4 is calculated from domestic animal procurement it overstates the degree of concentration (Paarlberg). Thus, the effective concentration fell as imports rose during the 1990s.

Furthermore, the industry had excess capacity during the 1990s (USITC, No. 3176).

The pro-competitive effect of trade holds for tariffs, but not for quotas because tariffs and quotas are not equivalent under imperfect competition. Quantitative trade restrictions have the ability to create market power because quantitative barriers restrict rival foreign responses while a tariff does not (Bhagwati; Krishna and Thursby).

Paarlberg and Lee argue that the TRQ on lamb meat can create this situation. Under a tariff policy domestic lamb packers would set quantity and price in competition with imports from Australia and New Zealand. A tariff should raise U.S. domestic prices for lamb meat and live lambs causing welfare gains for both packers and lamb growers. Over four years the value-added by lamb packers is $113.1 million dollars higher while producer surplus for lamb growers is $239.4 million higher. When a quarterly TRQ is imposed the distribution of benefits changes radically because whenever the quota is reached packers would have the ability to engage in mark-up pricing. Value-added for packers is $236.4 million above the base under the TRQ policy while producer surplus for lamb growers is $16.0 million below the base. There is a temporal pattern for the change in lamb grower producer surplus that reflects the dynamics of the animal herd. Losses are incurred by growers during the first two years of the policy and cause herd reductions that generate gains in years three and four as packers compete for the smaller number of animals.

Developments since 1999

The TRQ policy has been in effect for two years so additional information is known about its operation and impacts. That information is used to modify the earlier simulation model and to update the results.

One development is that in the fall of 1999 both Australia and New Zealand challenged the U.S. policy in the World Trade Organization (WTO). In December 2000, a WTO dispute panel ruled that the U.S. policy did not satisfy the safeguards rules. The United States appealed and lost that appeal May 1. The United States is requested to bring its policy into compliance (WTO). One way of complying would be to end the TRQ.

Details of quota administration were announced in the *Federal Register* in October 1999 (*Federal Register*, October 20, 1999). Paarlberg and Lee assumed that supplier specific quotas would be allocated quarterly by U.S. authorities to avoid end-of-quota-year price spikes. The actual quotas are applied on an annual basis starting July 22, 1999 and permit allocation is determined by exporting nations. The difference in temporal quota allocation is critical because the welfare losses by lamb growers are triggered when the quota is reached. Furthermore, although reported August-July lamb meat imports of 35,434 tons (USITC *Trade Database*) exceeded the quota of 31,851 tons, only import quantities of 26,946 tons were designated entering under the quota (USDA/AMS, *International Meat Review*).

Also surprising is the absence of noticeable price impacts from the TRQ policy in market outcomes until the spring of 2000. The below-quota tariff for the first year was 9 percent and the below-quota tariff for the second year is 6 percent. When the quota is not reached, observed meat and animal prices should have increased from the introduction of the tariff as characteristic of perfectly competitive market conduct. The meat price increase does not appear until the spring of 2000, six months after the policy was introduced, and the animal price increase never appears. Figure 1 displays the monthly live lamb price and the wholesale lamb meat price from July 1997 to April 2001 (USDA/ERS, *Livestock, Dairy, and Poultry Situation and Outlook).*

The vertical lines in figure1 indicate the first year of the policy. Live lamb prices are relatively stable through the TRQ months with small peaks in December 1999, May 2000, and February 2001. Initially wholesale lamb meat prices fell so margins shrank. During spring 2000 wholesale lamb meat prices rose relative to the stable live lamb prices so margins increased. After May 2000 the meat price fell and margins declined by September to levels below those initially following the policy. In November 2001 the meat price began to rise again and that has continued.

One explanation offered for the absence of observed U.S. price impacts from the tariff is that the dollars of Australia and New Zealand depreciated relative to the U.S. dollar. Those currency changes would put offsetting downward pressure on the U.S. price. Monthly exchange rate data show little trend for 1999, but beginning in early 2000 both currencies depreciated relative to the U.S. dollar enough to fully counter the below-quota tariff. The extent and speed to which that occurs depends on contract terms for trade in lamb meat (Carter and Pick). For contracts specifying payment in U.S. dollars, the price in Australian dollars rises. For contracts specifying payment in Australian dollars, the price in U.S. dollars falls. Thus, the change in the aggregate market price reflects the mix of contract terms. Another factor is that contract terms are often set in advance so that price adjustments lag exchange rate movements. For aggregate U.S. agricultural imports Carter and Pick estimate that 89 percent of the exchange rate pass-through occurs within two quarters. With that lag the impact of the depreciation of the currencies of Australia and New Zealand would appear in the summer of 2000 and beyond. The data in figure 1 show a noticeable U.S. price decline starting May 2000.

During the months of the TRQ policy, there is little evidence of the pass-through that

should occur if the market conduct where perfectly competitive. Prior to the policy, January 1989 - July 1999, a simple regression model estimates the pass-through elasticity from the meat price to the lamb price at 1.06. Following the policy, August 1999 - April 2001, the pass-through elasticity falls to 0.34. Pass-through from cif meat prices to the U.S. wholesale price also deteriorated during the TRQ period. The lamb meat price retains the volatility observed before the TRQ as there is no statistical difference in the variance (F = 1.22). Indeed, the price variance during August 1999 - April 2001 is slightly larger than the January 1989 - July 1999 variance (0.02305 per pound versus 0.018952) as should be the case under an *ad valorem* tariff (Bale and Lutz). By contrast, the animal price is more stable -- 0.00132 versus 0.004356 -- and the difference is statistically significant (F = 3.3). This is in contrast to the Paarlberg and Lee paper where the animal price is destabilized by the policy. Their result is due to the occasional introduction of mark-up pricing when the quarterly quota is reached. The actual situation was that the annual quota was not officially filled so the variability identified by Paarlberg and Lee would not be observed.

The TRQ policy was introduced to control the flow of imports and encourage domestic production. Introduction of a 9 percent below-quota tariff should be reflected in import volumes and output. Following an initial sharp decline in August and September 1999, imports continued to rise as they had before the TRQ policy (figure 2). Over the July 1999 to August 2000 period total lamb meat imports breached the quota set at calendar year 1998 imports. The appreciation of the U.S. dollar relative to the dollars of Australia and New Zealand in 2000 would put upward pressure on imports which would tend to offset any tariff effect.

The decline in meat production in the United States, shown as animals killed in figure 3,

continued. There was a rise in kill during the fall of 1999 in accordance with the traditional seasonal pattern. April and May 2000 also showed increased kill, but below previous years. During the fall of 2000, the seasonal rise occurred again, but kill remained below the levels recorded in other years and the continued downtrend is clear.

Part of the policy was adjustment assistance for the industry. The details of that assistance are now known. Lamb producers are to receive $10 million in direct payments each year for three years (USDA/FSA, *Lamb Meat Adjustment Assistance Program*). Direct payments in year 1 are made for rams, sheep and facility improvement with a cap of $5,500 per operation. Subsequent years have per head payments for feeder and slaughter lambs with a $8 per head maximum for a slaughter animal. Guaranteed loans with allocations of $20, 10, and 5 million dollars are also authorized. Packers obtained assistance via U.S. Department of Agriculture meat purchases -- $ 5 million per year and $ 4 million in year 1 for market promotion and low interest loans to upgrade facilities (USDA/AMS, December 1999).

Reconsidering the TRQ

This section re-analyzes the lamb meat TRQ given the developments discussed above using the simulation model developed by Paarlberg and Lee. It begins by considering the consequences of early termination of the TRQ. Then the differences between a quarterly quota and an annual quota are considered. Finally, the role of adjustment assistance is incorporated.

Early Termination of the TRQ

A WTO panel ruled against the U.S. TRQ for lamb meat. One way to comply with the panel ruling is to terminate the policy. The original analysis assumed quarterly quotas imposed for three years. This assumption is changed to terminate the TRQ at the end of the second year.

Early termination of the TRQ magnifies the lamb grower revenue loss found under quarterly quotas because the revenue gains obtained in years 3 and 4 when the quota is breached are reduced while the revenue losses of years 1 and 2 due to mark-up pricing by packers are unaffected. This can be seen in figure 4 where lamb grower revenue under the TRQ policy is indexed to the base, pre-TRQ, policy. Quarters where the ratio falls below 1.0 indicate lamb grower revenue losses and quarters where the index exceeds 1.0 denote revenue gains. The TRQ is introduced in quarter 3. Under the TRQ policy as announced, the policy remains effective through quarter 14. Revenue losses occur in quarters 3, 4, 7, 8, 9, 10, and 13. Revenue gains occur in quarters 5, 6, 11, and 12. Early termination ends the TRQ in quarter 11 so all quarters with revenue losses, except quarter 13, remain. Only two quarters show revenue gains – quarters 5 and 6. The revenue gains of quarters 11 and 12 from the high over-quota tariff, which offset the losses, are sacrificed. When the TRQ is maintained for the full three years the loss in gross revenue for lamb growers is $15.8 million. Early termination causes a revenue drop of $35.2 million compared to the baseline.

Annual Quota

The quotas actually implemented apply to annual levels rather than quarterly. The first year quotas were set at the 1998 calendar year import level with a small growth allowed for years two and three. Annual quotas at the historical level of imports have implications for lamb grower welfare because reaching the quotas allows the switch in lamb packer market conduct while breaching the quota triggers the higher tariff. The implications for lamb grower returns relative to the base trade policy can be seen in figure 5.

In the simulation model the annual quota is not reached in the first year – quarters 3 - 6.

The below-quota tariff applies and packers do not mark-up price. The tariff raises the meat price so imports fall, slaughter rises, and the live lamb price is higher. Lamb grower revenue is 20 percent above the baseline value. Most of this gain is a price effect – Stolper-Samuelson effects in a Ricardo-Viner model. That pricing conduct remains in quarters 7, 8, and 9. There is still a gain to lamb growers but the benefits are reduced as the below-quota tariff falls to 6 percent.

In the last quarter of year two, quarter 10, the quota is reached and mark-up pricing by packers occurs. This results in an animal price above the baseline because the above-quota tariff of 32 percent causes the quota to be filled exactly. Whether the lamb price rises or falls is linked to the difference between desired imports and the quota. As that difference increases an animal price increase is more likely (Paarlberg and Lee). Imports of lamb meat in quarter 10 are around 10 million pounds or around half of the level that would occur if the quota is ignored. In this case lamb growers gain from the increased tariff and mark-up pricing triggered by the quota.

The quota is not reached in quarters 11 and 12 and the below-quota tariff falls to 3 percent. Revenue gains for lamb growers relative to the baseline levels are smaller.

The market conduct switches radically over quarters 12 - 15. In quarter 12 there is no mark-up pricing, but in quarter 13 the quota is reached and mark-up pricing occurs. The live animal price falls slightly which causes a small drop in grower revenue relative to the base. In quarter 14 the quota is breached and the above-quota 24 percent tariff is imposed. There is no mark-up pricing and the live lamb price rises sharply to generate a gain in producer revenue. The pattern over these periods is similar to that shown by Abbott and Paarlberg for the TRQ on Philippine pork where demand growth causes the quota to be breached. In this model it is the contraction of U.S. domestic lamb production that causes over-quota imports.

The price drops sharply in period 15 with the end of the TRQ, the beginning of year four. Prices fall back to nearly the baseline levels. An implication is that the lamb meat industry has an incentive to lobby for continuation for the TRQ.

The quota was recorded as under-filled even when import levels exceeded the quota. Model solutions which treat the quotas as ignored in the sense that the price reflects only the below-quota tariff are also shown in figure 5. Lamb grower revenue is above the baseline through the life of the policy. Revenue gains are stable within the year because there is no market conduct switching. The revenue increases in quarters 10 and 14 when the quota triggers meat price increases are not obtained, yet, the revenue decrease in quarter 13 due to mark-up pricing also does not occur. When the tariff is increased once imports exceed the quota, revenue by lamb growers is $93.2 million dollars above the baseline level. If the quota trigger is ignored, grower revenue is only $73.8 million higher. Virtually all of the difference is a result of the triggering of the above-quota tariff in quarter 14.

Adjustment Assistance

A flanking part of the TRQ policy consists of a series of adjustment assistance programs totaling $100 million over three years. The majority of programs transfer money with limited implications for market outcomes. For example, during the first year the U.S. Department of Agriculture purchased 1.1 million pounds of lamb meat at a cost of $4.1 million (USDA/AMS, December 1999). With annual lamb meat consumption at around 300 million pounds the impact of the public lamb meat purchases is negligible. In year 1 $1 million is allocated to several marketing improvements including pelt certification, carcass information, and price reporting. Product promotion activities are allocated $4 million with over $10 million for scrapie

eradication.

Lamb producers are to receive $10 million per year in direct payments. Under the quarterly allocation rule for the quota there are revenue losses for lamb growers of $15.8 million with a three year policy and $35.2 million with a two year policy. The $30 million in direct payments offsets those losses. With the annual quota allocation rule lamb growers experience revenue increases so the adjustment assistance is added to the gain.

Conclusion

The United States adopted a tariff-rate quota for lamb meat and provided adjustment assistance for the industry in July 1999. Early analysis suggested the possibility of welfare losses for lamb growers if packers were able to exercise market power. Subsequently, more about the operation of the program has become known and the initial market impacts can be observed. One difference between the initial research and the actual policy is that the quotas are annual rather than quarterly. Annual quotas limit the scope for market conduct switching. Second, even though actual lamb meat imports exceeded the quota it was considered under-filled. Again this inhibits mark-up pricing. Third, a WTO panel ruled that the TRQ violated the WTO safeguard rules.

Observed prices and quantities suggest there was little impact on prices. Depreciating currencies for Australia and New Zealand relative to the U.S. dollar put offsetting downward pressure on the U.S. lamb meat price. There was also little pass-through of the meat trade policy to the live lamb price. When lamb meat prices rose margins expanded. When meat prices fell, margins shrank. Following an initial reduction of meat imports, import growth continued unabated. The fall in domestic lamb kill and meat production was unaffected.

Modification of an earlier analysis of the TRQ shows that early termination of the policy magnifies any welfare losses experienced by lamb growers. If the program is ended early most grower welfare losses remain and welfare gains in later quarters are sacrificed. Annual quotas create welfare gains for lamb growers because they do not allow packers to engage in mark-up pricing as frequently. If the quota trigger is ignored, welfare gains for lamb growers remain, but are reduced as the benefits from the above-quota tariff in the final quarter of the policy are not captured. There is an incentive for the lamb meat industry to lobby to retain the policy after year three as the model solutions return quickly to the baseline values.

Purchases of lamb meat under the adjustment assistance program accomplish little. Direct payments to lamb growers are sufficient to prevent any lamb grower welfare loss. In the scenarios where there is a welfare loss for lamb growers the payments offset the loss. In scenarios where lamb growers gain from the TRQ direct payments are added to the gain.

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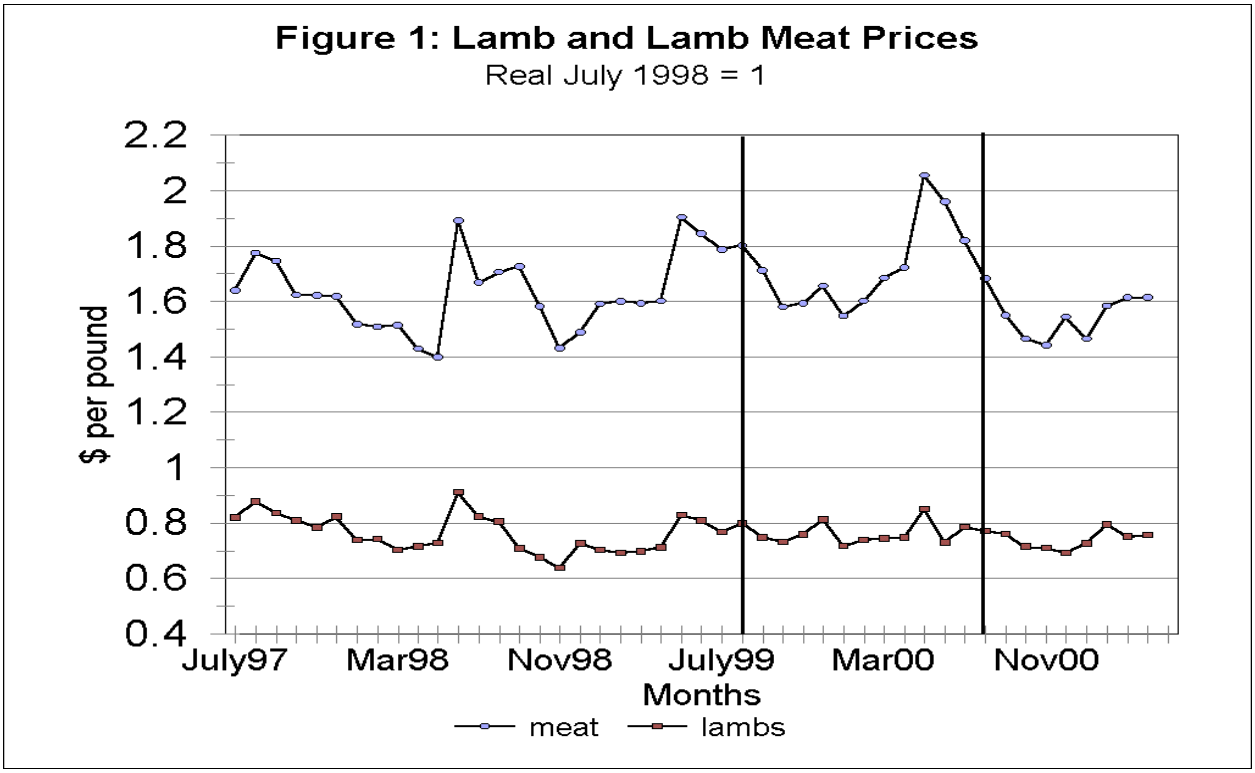
Figure 1: Lamb and Lamb Meat Prices
Real July 1998 = 1
$ per pound
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
July97
Mar98
Nov98
July99
Mar00
Nov00
Months
meat
lambs

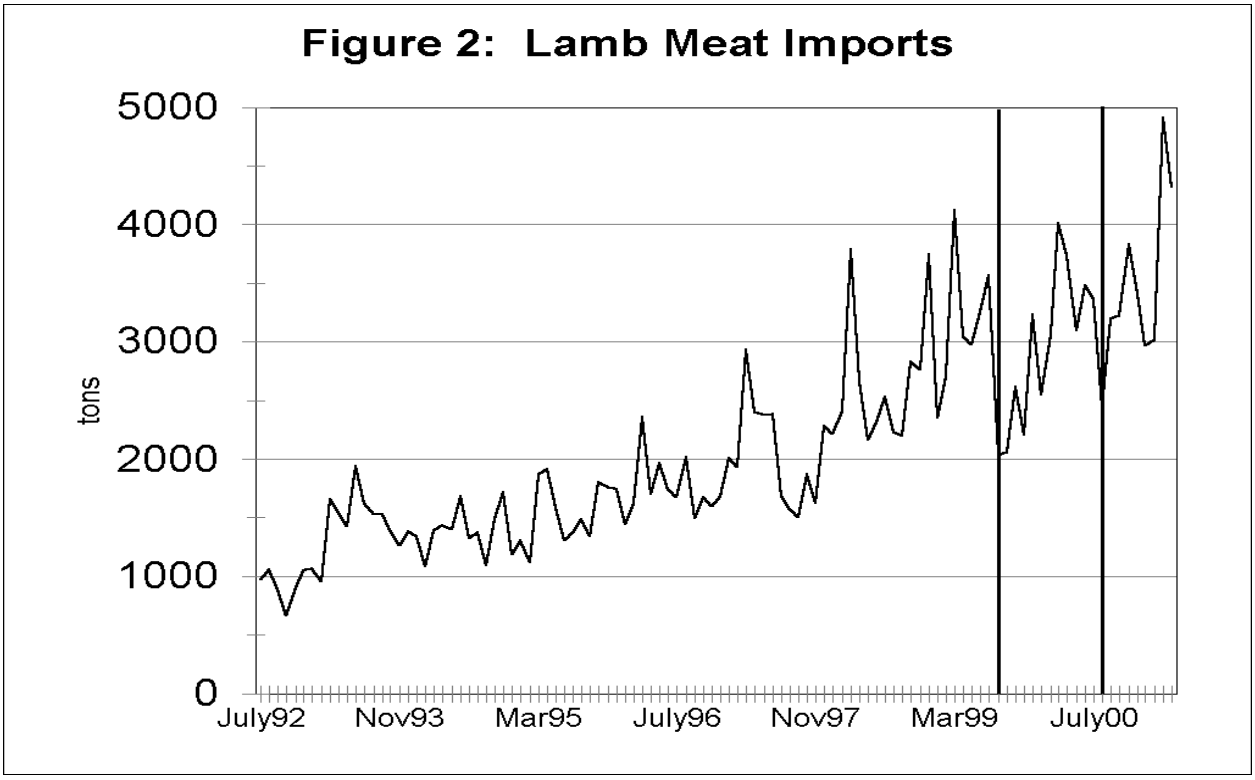
Figure 2: Lamb Meat Imports
5000
4000
3000
2000
1000
0
tons
July92
Nov93
Mar95
July96
Nov97
Mar99
July00

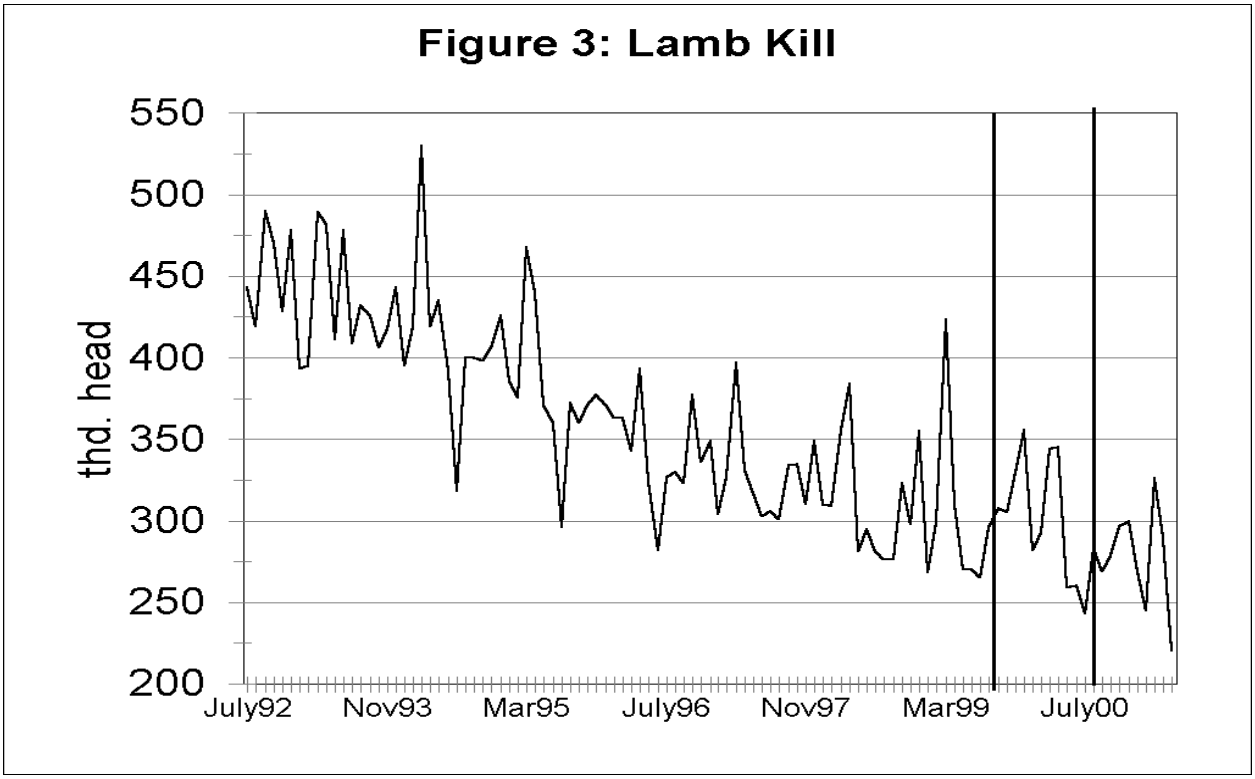
Figure 3: Lamb Kill
550
500
450
400
350
300
250
200
thd. head
July92
Nov93
Mar95
July96
Nov97
Mar99
July00

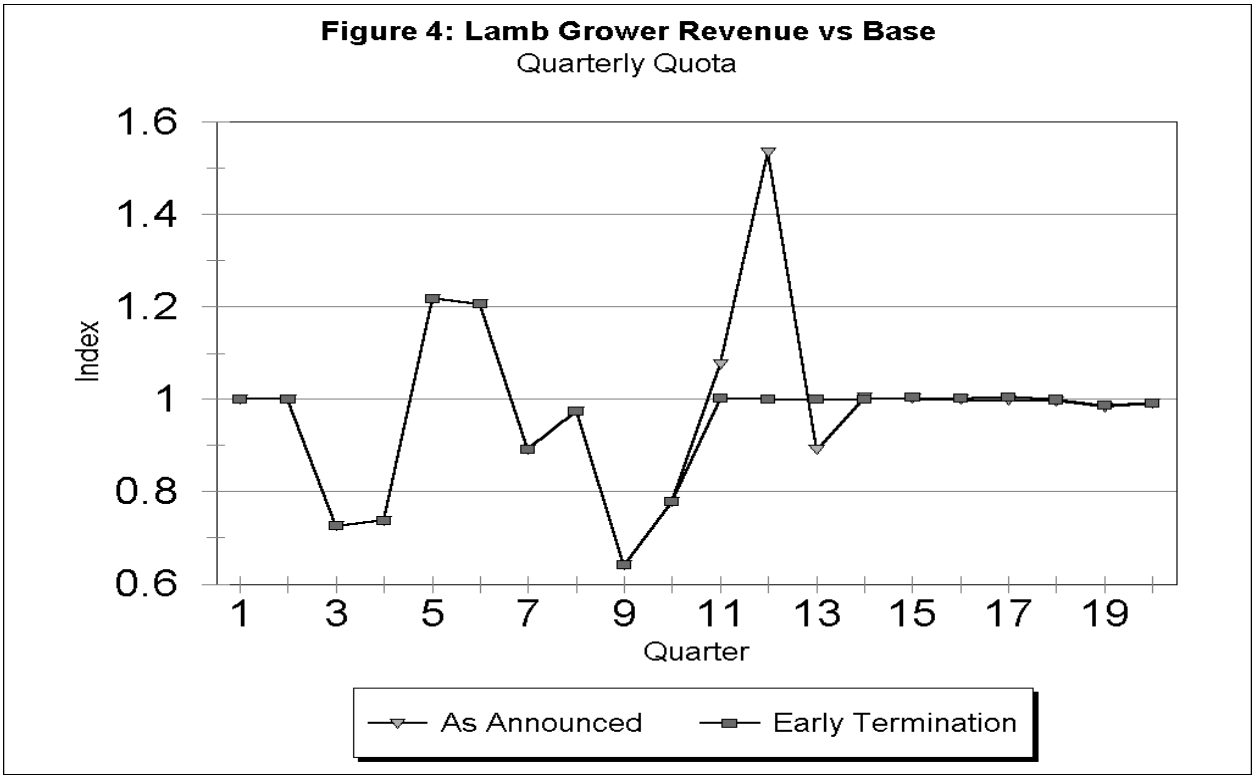
Figure 4: Lamb Grower Revenue vs Base
Quarterly Quota
1.6
1.4
1.2
1
0.8
0.6
Index
1
3
5
7
9
11
13
15
17
19
Quarter
As Announced
Early Termination

Figure 5: Lamb Grower Revenue vs. Base
Annual Quota