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Wool Price Differences by Preparation in the United States

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Summary

Price differences for U.S. wools by preparation and type were examined using data collected from warehouses and pool sales across the United States over the period 1993 to 2002. The goal was to determine premium/discounts in wool prices by preparation and type, controlling for season, year, region, average-fiber diameter, and lot size. Unlike previous research efforts, a hedonic model was used in this investigation.

The hedonic price model explained about 83 percent of the variation in U.S. wool prices. Seasonality in U.S. clean wool prices was evident. Wool prices received by producers from January to March as well as from October to December were significantly lower from 5.9 percent to 17.4 percent than those prices in September. Wool prices in June were roughly 8 percent higher than those of September. In accord with prior expectations, U.S. clean wool prices were highest in 1995 and 1997. Prices in remaining years from 1993 to 2002 were significantly lower from 11.8 percent to 52.2 percent relative to the base year of 1997. Further, U.S. clean wool prices were discounted by 7.9 percent and 9.8 percent respectively, in the Eastern and Western regions of the United States relative to the Central region.

In line with prior research, prices of table-skirted and classed wool were significantly higher than original bag wool by slightly more than 8 percent. Significant differences among wool types also were evident. In particular, U.S. clean prices of TSC and BOU Main Line Wool were higher by 23.5 percent over the OB wool breed. Significant differences were noted as well among wool types from OB. Among wool types, the premiums/discounts relative to OB wool breed type were quite large in magnitude.

U.S. clean wool prices were sensitive to change in average diameter. The elasticity of clean price with respect to average fiber diameter was estimated to be roughly -1.42. Lot size, as measured by grease weight, also positively affected U.S. clean prices. The elasticity of clean price with respect to lot size was estimated as 0.16.

Key Words: U.S. Wool Prices, Hedonic Price Model.

Introduction

U.S. wool production has been on a steady decline since the 1940s, due in large part to the decline in sheep numbers. The number of sheep shorn from 1930 to the early 1940s was in the neighborhood of 40 to 50 million. Since the early 1940s, the number of sheep shorn dropped almost monotonically from a peak of nearly 50 million to roughly 6 million at present (Figure 1). Income support through the passage of the National Wool Act of 1954 stemmed the decline in sheep numbers until the early 1960s (Hager, 2003). This time frame coincided with the advent of man-made fibers, such as polyester and rayon, which have been well received by the apparel and home furnishings industry. The cotton industry was able to combat the onset of man-made fibers through the passage of the Cotton Research and Promotion Act of 1966 and the amended Act of 1990 (Capps and Williams 2006). Additionally, as a joint product with lamb, U.S. wool production also fell due to continued declines in the domestic demand for lamb (Hager, 2003; Williams et al, 2008).

With the signing of P.L. 103-130 into law by President Clinton in November 1993, which phased out over a two-year period wool and mohair incentive payments implemented by the National Wool Act of 1954, U.S. wool production experienced further declines. Wool production fell from 78 million pounds in 1993 to 47 million pounds in 2000, a 40 percent decline in this short time span. The loss of most domestic mills due to international competition and out-sourcing led to further difficulties (Hager, 2003; Williams, et al, 2008).

Support price schemes in Australia, New Zealand, and South Africa also contributed to wool market difficulties. Because support prices in these countries were set well above market levels, stockpiles of wool occurred, particularly induced by the Australian Wool Council (AWC) in the 1980s and early 1990s. After 1991, these stockpiles gradually were placed on the world market over the next decade, with the consequence of depressing wool prices. With the collapse of the former Soviet Union in the early 1990s, which contributed to a notable decline in demand, as well as the aforementioned repeal of the National Wool Act of 1954 in November 1993, world market prices of wool declined from 1995 to 2000. With the liquidation of the Australian stock piles in August 2001, however, wool prices began to rebound (Figure 1).

The United States is a small producer of wool in the world, with about 0.7 percent of world production. Australia, New Zealand, and China are the largest producing countries with 27.5 percent, 13.6 percent, and 12.7 percent of production, respectively. Australia and New Zealand also account for slightly more than 90 percent of world exports of wool. Australia is not only the largest exporter of wool in the world but also sets the international standard in the marketing of wools through preparation and class. In Australia, most wool is skirted and then subjectively classed by fineness, staple length, color, condition, style, and soundness. Classers produce as few lines as possible from the wool, while maintaining uniformity within a line and eliminating contamination of the clip with stained, pigmented fibers and all foreign material. (Lupton et al, 1996). Subsequently, most lots are objectively measured (prior to sale) for clean yield, vegetable matter content, average-fiber diameter (and variability), staple length, staple strength and color (Lupton et al, 1989).

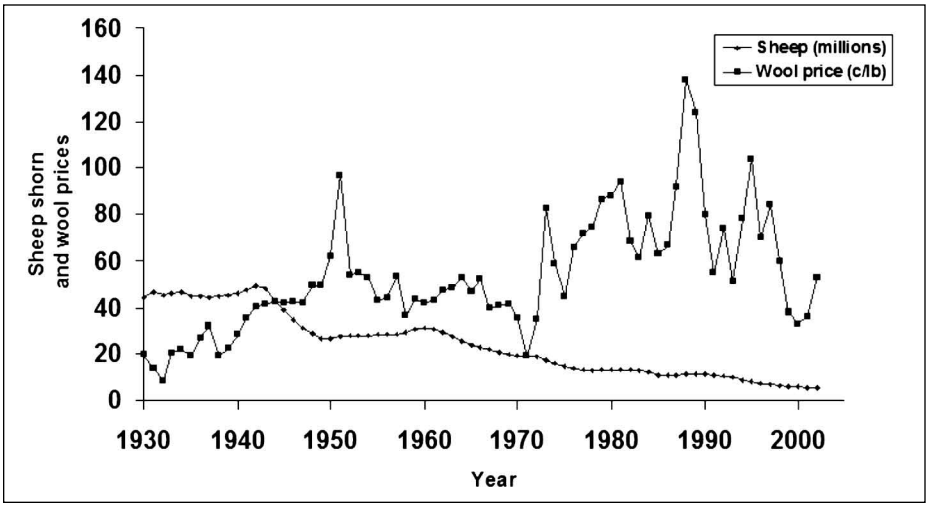
When a sheep is properly shorn, the fleece can be laid out on a table or floor and be seen as one piece. Skirting is the process of removing from fleeces the stained or inferior wool that grows on the belly and legs of the sheep (Lupton et al, 1992). Table skirting is simply placing the fleece on a table and finishing the skirting process. Classing is the preliminary sorting of fleece according to its quality.

Most wool in the United States continues to be sold as original bag, termed OB. OB wool is just as it sounds, wherein the sheep is shorn and the fleece is bagged without any further processing. "Bellies out" means that the wool from the belly, which is generally dirty, stained, and has more contaminants, is removed. Most of the wool produced in the United States is in the rangelands of the Western and Great Plains States.

Lupton et al, (1996) compared clean prices of skirted and classed wool to OB wool over a four-year period ending in 1996 using Texas Agricultural Experiment Station sheep flocks in San Angelo, Texas. They found that skirted and classed wool prices were higher by 6.6 percent to 26.9 percent per year over OB wool (equivalent to 9 to 30 cents per pound.) The potential to add value to the wool by skirting and classing is attributed to the fact that less sorting of skirted and classed wool is required when the wools clip reaches the textile mills. The resulting labor cost savings then could be passed back to producers in the form of higher prices.

Pfeiffer and Lupton (1999) found that skirted and classed wool may not produce more net income to producers than selling wool in OB form. Lupton et

Figure 1: Annual U.S. Sheep Shorn and Annual Nominal Wool Prices (Greasy Price), 1930 to 2002.



al, (1989) concluded that skirting could be profitable when applied to fine-wool fleeces and is reduced as wool prices decrease, as skirting costs increase, and when the wool is most coarse.

Another factor to be considered is the way wool is presented to buyers. One experiment conducted by Lupton et al, (1993) elicited subjective measurements from buyers for all wool lots. Objective measurements were available on only half the lots. The wool lots that were accompanied by objective measurements consistently received higher prices.

The literature suggests that skirting and classing wool generally produce higher prices compared to OB wool. We build on the literature through the use of a hedonic price model to determine the premiums/discounts among different levels of preparation and wool types, controlling for seasonality, year, region, average-fiber diameter, and grease weight (lot size). Previous research failed to account for these other factors in affecting clean-wool prices. Consequently, this work is the most definitive to date in considering U.S. clean-wool prices.

According to Kott (1997), "Getting the most for your wool is a complete process that involves growing it, proper harvesting and packaging, and then proper marketing." By understanding this process, marketing strategies can be developed to enhance prices to U.S. wool producers, especially given the decline in U.S. wool production over the past 70 years. In this light, the objective of this research was to examine price differences for U.S. wools by preparation and by type. Specifically, the goal of this research was to determine the size of the premium in wool prices, if any, between skirted and classed wools (Australian practice) versus original-bag wools (U.S. practice). The results from this research also can provide evidence on the economic gains to producers from adopting various wool preparation practices. As such, this research may also shed light on the competitiveness of the U.S. wool industry versus other countries, particularly Australia

Materials and Methods

Data

A comprehensive survey was sent to wool warehouses and pool sales across the United States to collect historical data on skirted and classed, as well as original-bag wool sales. A researcher from Texas A&M University was sent to locations that did not have the resources to collect the information. The data span was a ten-year period starting in January 1993 and ending in January 2002. Clean-wool prices were gathered noting region, season (month of year), year, wool preparation, wool type, average-fiber diameter (AFD), and grease weight (GW). The number of observations indigenous to this analysis was 8,589.

To consider the possible impact of region on wool prices, the United States was divided into three regions: Eastern, Central, and Western. The Eastern region included all states east of the Mississippi River. The Central region was separated from the Western region by a line that ran west of the Dakotas, Nebraska, Kansas, and New Mexico. The regions were chosen on the basis of demographic and market attributes as well as the location of the marketing warehouse or wool pool.[5]

The Eastern market was made up of smaller volumes of wool that typically were combined to obtain shipping volume. Eastern producers have few market outlets except in niche areas. The wool produced in this region was variable in quality and style. In the Central region, more uniform wool in terms of quality, style, and quantity was generally produced. In this region, most producers raise sheep on privately owned land. Marketing outlets typically have been well established in the central region, and generally producers, warehousemen, and buyers have well-established relationships.[6] Wool from the Western region was more variable in terms of all quality attributes. In the Western region, wool production typically occurred on federally-owned land. Maintaining a uniform flock was not usually a high priority, either because of producer preference or because federal landlords could change the conditions for leasing the grazing rights from year to year.[7]

As exhibited in , nearly 80 percent of the observations were associated with the Central region, about 18 percent were linked to the Western region, and roughly 3 percent were tied to the Eastern region. About 50 percent of the observations occurred in May and June, when wool was shorn and sold. More than 50 percent of the observations occurred over the last three years, due to the availability of historic records from the warehouses and pools across the United States. Warehouses and pools only saved records from three to five years back, and they discarded more dated records.

The data were separated into three levels of preparation: Original Bag (OB), Bellies-Out Untied (BOU), and Table Skirted and Classed (TSC). OB, BOU, and TSC wool corresponded to 22.5 percent, 56 percent, and 21.5 percent of the observations, respectively. OB refers to wool that has been sheared off the sheep and put into a bag with nothing removed. A fleece that is BOU has had the belly wool removed, packaged, and sold separately from the remainder of the fleece. The belly wool often is lower quality, stained, and contains more foreign matter.

TSC refers to wool with the highest level of preparation, corresponding to the aforementioned skirting and classing practices corresponding to wool types from BOU and TSC (wool breed); meat breed; and wool types from OB. Seventeen different wool types were identified. The highest percentage of the observations, slightly more than 60

[5] *Despite this regional delineation, there is probably as much variation within a region as there is across regions. The regional breakdown is not without problems. For instance, eastern South Dakota is considered to be in the central region geographically; however, the wool typically is marketed through warehouses in the Eastern region, while a considerable amount of the wools marketed in western South Dakota are produced in the western region as defined in this study. Also, the quality of eastern South Dakota wool is quite different from that of Texas and New Mexico and even western South Dakota.*

[6] *The marketing structure in Texas is a consigned warehouse system, but not for Kansas, Oklahoma, Nebraska, eastern South Dakota, and North Dakota (Hager, 2003).*

[7] *This production system reflects western Colorado, Utah, Idaho, and California but not necessarily Wyoming and Montana.*

Table 1: A Breakdown of the Number of Observations by Region, Year, Level of Preparation and Wool Type from Surveyed Wool Warehouses, January 1992 to January 2002.

	Number of Observations	Percentage of Observations
Region		
Western	1,547	18.13
Central	6,705	78.58
Eastern	281	3.29
Year		
1993	432	5.06
1994	425	4.98
1995	436	5.11
1996	405	4.75
1997	537	6.29
1998	646	7.57
1999	827	9.69
2000	1,621	19
2001	1,442	16.9
2002	1,762	20.65
Level of Preparation		
Original Bag (OB)	1,919	22.49
Bellies Out Untied (BOU)	4,779	56.01
Table Skirted Classed (TSC)	1,835	21.5
Wool Type		
Wool Breed (Wool Type from BOU and TSC)		
Main Line	5,281	61.89
Tender or Short Line	733	8.59
Bellies	603	7.07
Pieces	146	1.71
Stains	76	0.89
Locks	446	5.23
Clothing	77	0.9
Main Line Lamb	220	2.58
Meat Breed		
Main Line	132	1.55
Bellies	1	0.01
Wool Types from OB		
Wool Breeds	564	6.61
Meat Breeds (White Face)	91	1.07
Meat Breeds (Black Face)	91	1.07
Cross Bred	41	0.48
Wool Breed Lamb	18	0.21
Meat Breed Lamb	3	0.04
Black	10	0.12

percent, was in the Wool Breed, Main Line category. Nearly 9 percent of the observations were associated with the Tender or Short Line category. Tender means the fiber content was not strong enough and could easily be broken. Short line means that the staple length was shorter than three inches. Wool Breed Bellies and OB Wool Breeds each constituted about 7 percent of the observations, respectively.

Some of the original 8,589 observations were eliminated from further consideration. Observations pertaining to the years 1990, 1991, and 1992 were eliminated due to the paucity of data. Missing observations pertaining to U.S. clean price, average-fiber diameter, and grease weight (lot weight) were discarded as well. Thus, the number of useable observations for the analysis was 8,533.

Descriptive statistics for U.S. clean price, U.S. grease price, average-fiber diameter, and grease weight, are exhibited in Table 2. On average, U.S. clean price for this sample was $1.35 per pound ($0.70 per pound, greasy). The average-greasy price corresponds with Figure 1. On average, the average-fiber diameter was slightly more than 22 microns. The average-lot weight (grease weight) was close to 8,500 pounds. For prices, average-fiber diameter, and grease weight, considerable variation among the 8,533 observations was evident.

Empirical Model

A hedonic-price model is used to determine the premium and discounts associated with wool characteristics, controlling for region, year, season, average-fiber diameter, and grease weight (lot size). Past research considered prices only to be a function of wool preparation. Shulte (2001)) similarly used a hedonic-price model to investigate premiums/discounts of breed, color, frame size, muscle score, and lot weight on commingled/background cattle sales.

This statistical model employed in this analysis is given by:

$$\log \text{U.S. Clean Price}_{it} = \alpha_0 + \alpha_1 \text{January} + \alpha_2 \text{February} + \alpha_3 \text{March} + \alpha_4 \text{April} + \alpha_5 \text{May} + \alpha_6 \text{June} + \alpha_7 \text{July} + \alpha_8 \text{August} + \alpha_9 \text{October} + \alpha_{10} \text{November} + \alpha_{11} \text{December} + \alpha_{12} \text{YR1993} + \alpha_{13} \text{YR1994} + \alpha_{14} \text{YR1995} + \alpha_{15} \text{YR1996} + \alpha_{16} \text{YR1998} + \alpha_{17} \text{YR1999} + \alpha_{18} \text{YR2000} + \alpha_{19} \text{YR2001} + \alpha_{20} \text{YR2002} + \alpha_{21} \text{WESTERN} + \alpha_{22} \text{EASTERN} + \alpha_{23} \log \text{AFD}_{it} + \alpha_{24} \log \text{GW}_{it} + \alpha_{25} \text{BOU} + \alpha_{26} \text{TSC} + \alpha_{27} \text{WT MAIN LINE} + \alpha_{28} \text{WT TENDER OR SHORT LINE} + \alpha_{29} \text{WT BELLIES} + \alpha_{30} \text{WT PIECES} + \alpha_{31} \text{WT STAINS} + \alpha_{32} \text{WT LOCKS} + \alpha_{33} \text{WT CLOTHING} + \alpha_{34} \text{WT MAIN LINE LAMB} + \alpha_{35} \text{WT MB MAIN LINE} + \alpha_{36} \text{WTMB BELLIES} + \alpha_{37} \text{WTOBMB WHITE FACE} + \alpha_{38} \text{WTOBMB BLACK FACE} + \alpha_{39} \text{WTOB CROSS BRED} + \alpha_{40} \text{WTOB WOOL BREED LAMB} + \alpha_{41} \text{WTOB MEAT BREED LAMB} + \alpha_{42} \text{ WTOB BLACK} + \varepsilon_{it}$$

The right-hand side variables in the regression model correspond to seasonal

Table 2: Descriptive Statistics for U.S. Wool Prices, Average Fiber Diameter, and Grease Weight (Lot Weight) for the Useable Sample of 8,533 Observations.

Variable	Mean	Median	Standard Deviation	Minimum	Maximum
U.S. Clean Price[a]	$1.35	$1.25	$0.64	$0.17	$4.80
U.S. Grease Price[a]	$0.70	$0.65	$0.38	$0.07	$2.87
Average Fiber Diameter[b]	22.28	21.80	2.39	17.6	38.0
Grease Weight[c]	8,407	4,982	10,112	1	45,345

[a] units are dollars per pound
[b] units are microns
[c] units are pounds

dummy or indicator variables (January, February, March, April, May, June, July, August, October, November, and December); dummy variables corresponding to year (YR1993, YR1994, YR1995, YR1998, YR1999, YR2000, YR2001, and YR2002); regional indicator variables (WESTERN and EASTERN); level of preparation indicator variables (BOU and TSC); wool-type-indicator variables (wool breed [types from BOU and TSC] - Main Line; Tender or Short Line; Bellies; Pieces; Stains; Locks; Clothing; and Main Line Lamb; Meat Breeds [Black Face]; Cross Bred; Wool Bred Lamb; Meat Breed Lamb; and Black).

The base year and month for the analysis were chosen to be 1997 and September, respectively. The Central region was chosen to be the base region. The bases for level of preparation and wool type were Original Bag and Original-bag wool Breeds. Original Bag corresponds to the lowest level of preparation and the Original-bag wool Breeds correspond to the highest-quality wool for the OB level of preparation. We hypothesize that U.S. clean prices are the highest in the third quarter of the year, where wool supply is less abundant. The majority of the world wool production is clipped and sold during the first and fourth quarters of the year. A large proportion of U.S. wool is clipped in April and May. From the previous discussion about wool prices exhibited in Figure 1, we expect U.S. wool prices to be higher in 1995 and 1997 relative to other years. We hypothesize prices in the Eastern and Western regions of the United States to be lower compared to prices in the Central region. In general, marketing outlets for wool in the Central region have been well established relative to other regions. As well, in the Central region, more uniform wool in terms of quality, style, and quantity is generally produced relative to other regions.

Importantly, we expect, a priori, BOU and TSC prepared wools to command a premium to OB wool. As well, we expect BOU and TSC Main Line wool and BOU and TSC Tender on Short Line wool to command a premium over wool types from OB. Further, average-fiber diameter (AFD) is hypothesized to be inversely related to U.S. clean price. Finally, it is hypothesized that lot size, as measured by grease weight, to be positively related to U.S. clean price. The closer a lot is to a truckload, the less money buyers spend on transportation per pound.

Results and Discussion

Empirical Results

The hedonic-price model explains about 83 percent of the variation in U.S. wool prices. The estimated coefficients and their associated P-values are exhibited in Table 3. The level of significance chosen for this analysis to conduct statistical tests is 0.01, given the rather sizeable sample of 8,533 observations. Given that the dependent variable is the logarithm of U.S. clean price, the interpretation of the estimated coefficients for each of the qualitative variables (season, year region, level of preparation, and wool type) is in terms of percentage changes. To calculate the premium/discount or the percentage difference relative to the base category for each of the qualitative categories from the base or reference category, use the transformation $\exp(a_i\text{-}1) \times 100$ percent, where a_i is the estimated coefficient of the *i*th indicator variable.

Seasonal Effects

The months of April, May, July, and August were not different *(P > .01)* from the base month of September. The month corresponding to highest U.S. clean prices was June, roughly 8 percent higher *(P <.01)* than those of September. Wool prices received by producers tended to be higher in May and July, relative to September, but not significantly *(P > .01)*. In accord with prior expectations, wool prices received by producers from January to March, as well as from October to December, were lower *(P<.01)* than those in September. The range of differences was from 5.9 percent lower (in March) to 17.4 percent lower (in January). Unequivocally, seasonality in U.S. clean prices for wool was evident.

Yearly Effects

In accord with prior expectations, U.S. clean wool prices were highest in 1995 and 1997. Controlling for other factors, prices in 1995 were higher by 17.7 percent *(P<.01)* relative to the base year of 1997. Prices in all remaining years from 1993 to 2002 were lower *(P<.01)* relative to the base year of 1997. Annual price differences ranged from 11.8 percent lower (in 1996) to 52.2 percent lower (in 2000).

Regional Effects

As expected, U.S. clean wool prices received by producers were discounted by 7.9 percent and 9.8 percent respectively in the Eastern and Western regions relative to the Central region. Clearly, regional price differences were evident. In the Central region, recall that more uniform wool, in terms of quality, occurs relative to other regions. Also, marketing outlets have been well-established in the Central region vis-à-vis other regions.

Effects of Level of Preparation

In line with most prior research studies, prices of table-skirted and classed wool (TSC) were higher *(P<.01)* than original bag (OB) wool by slightly more than 8 percent. Although prices of bellies out untied (BOU) wool were

Table 3: Estimated Coefficients and p-Values in the Hedonic Price Model

	Estimated Coefficients	Premium/Discount (%) Relative to Base	p-value
Month			
January	-0.1913	-17.4	<0.001
February	-0.0789	-7.6	<0.001
March	-0.0608	-5.9	<0.001
April	-0.0156	-1.5	0.212
May	0.0065	0.6	0.532
June	0.0779	8.1	<0.001
July	0.0039	0.45	0.756
August	-0.024	-2.4	0.081
September	Base	Base	Base
October	-0.0624	-6	<0.001
November	-0.1154	-10.9	<0.001
December	-0.1267	-11.9	<0.001
Year			
1993	-0.4947	-39	<0.001
1994	-0.1923	-17.5	<0.001
1995	0.1629	17.7	<0.001
1996	-0.126	-11.8	<0.001
1997	Base	Base	Base
1998	-0.2702	-23.7	<0.001
1999	-0.7014	-50.4	<0.001
2000	-0.7379	-52.2	<0.001
2001	-0.6249	-46.5	<0.001
2002	-0.2921	-25.3	<0.001
Level of Preparation			
Original Bag	Base	Base	Base
Bellies Out Untied	0.0209	2.1	0.27
Table Skirted Classed	0.0811	8.4	<0.001
Region			
Central	Base	Base	Base
Western	-0.1036	-9.8	<0.001
Eastern	-0.0823	-7.9	<0.001
Wool Breed (Wool Types from BOU and TSC)			
Main Line	0.2114	23.5	<0.001
Tender or Short Line	0.0551	5.7	<0.013
Bellies	-0.2903	-25.2	<0.001
Pieces	-0.4179	-34.2	<0.001
Stains	-0.6808	-49.4	<0.001
Locks	-0.9894	-62.8	<0.001
Clothing	0.1986	22	<0.001
Main Line Lamb	0.1432	15.4	<0.001
Meat Breed			
Main Line	0.0394	4	0.174
Bellies	-0.1288	-12.1	0.545
Wool Types from OB			
Wool Breed	Base	Base	Base
Meat Breeds (White Face)	-0.2325	-20.7	<0.001
Meat Breeds (Black Face)	-0.3826	-31.8	<0.001
Cross Bred	-0.3226	-27.6	<0.001
Wool Breed Lamb	-0.179	-16.4	<0.001
Meat Breed Lamb	-0.6988	-50.3	<0.001
Black	-1.1606	-68.7	<0.001
Log of Average Fiber Diameter	-1.416		<0.001
Log of Grease Weight	0.0162		<0.001
Constant	4.809		<0.001
R^2	0.8303		

higher by about 2-percent relative to OB wool, this difference was not statistically different from zero *(P>.01)*. Importantly, as the level of preparation of wool increases, U.S. clean-wool price increases. But, the only significant price premium was associated with TSC wool over the reference category OB wool. Even controlling for other factors, a price premium of 8 percent for TSC wool over OB wool was evident.

Wool Type Effects

As expected, U.S. clean prices of TSC and BOU Main Line wool were higher by 23.5 percent over the base category of OB wool breed. U.S. clean prices of TSC and BOU clothing and Main-line Lamb also were higher by 22.0 percent and 15.4 percent respectively over OB wool breed. Wool prices of TSC and BOU bellies, pieces, stains, and locks, all lower quality types, were discounted from slightly more than 25 percent (bellies) to just under 6.3 percent (locks) relative to prices of the reference category OB wool breeds.

Significant differences in wool types from OB were evident, as well. Relative to prices associated with the base wool type (wool breeds from OB), prices of other wool types from OB were lower, ranging from roughly 16 percent lower (Wool breed lamb) *(P<.01)* to nearly 70 percent lower (black) *(P<.01)*. Prices of OB wool breed and those from meat breeds, either main line or bellies, were not different *(P>.01)*. Differences in U.S. clean prices were evident among wool types. The premium and discounts among wool types relative to the OB wool breed type were quite large in magnitude.

Effects of Average-fiber diameter

As hypothesized, U.S. clean prices and average-fiber diameter (AFD) were negatively related. This relationship is depicted in Figure 2. Given that U.S. clean price and average-fiber diameter are expressed in terms of logarithms, the estimated coefficient of AFD in the hedonic-price model represents the elasticity. The elasticity of clean price to average-fiber diameter was estimated to be -1.416. Consequently, controlling for all other influences on clean prices, a 10-percent change in average-fiber diameter (e.g. a change from the sample mean of

22 microns to either 20 microns or 24 microns) leads to nearly a 14.2-percent change in price in the opposite direction (e.g. a change from the sample mean of $1.35 per pound to either $1.16 per pound or $1.54 per pound). Thus, U.S. clean-wool prices are sensitive to changes in average-fiber diameter.

Lot Size Effects

Again, as hypothesized, clean wool price and lot size, as measured by grease weight (GW), were positively related. This relationship is presented in Figure 3. Given that clean wool price and lot size are expressed in logarithms, the estimated coefficient in the hedonic-pricing model represents the elasticity. The elasticity of clean price to grease weight was estimated to be 0.0162. Hence a 10-percent change in lot size (e.g. a change from the sample mean of 8,490 pounds to either 7,640 pounds or 9,340 pounds) leads to a 0.16 percent change in clean-wool price. Although, this elasticity is statistically significant, practically speaking, U.S. clean-wool prices were not heavily influenced by lot size.

In summary, we pictorially represent the effects of season, year, region, level of preparation, and wool type on U.S. clean-wool prices in Figures 4 through 8. Each of these factors was statistically significant in influencing U.S. clean-wool prices. The hedonic-price model explained more than 80 percent of the variability in U.S. clean-wool prices.

Conclusion

We examined price differences for U.S. wools by preparation and type using data collected from warehouses and pool sales across the United States over the period 1993 to 2002. The goal was to determine premiums/discounts in wool prices by preparation and type controlling for season, year, region, average fiber diameter, and lot size. Unlike previous research efforts, a hedonic price model was used to ascertain these premiums/discounts due to wool characteristics.

Our model allows producers to ascertain premiums or discounts relative to the current practice of marketing OB wool. This information then can be used to determine marketing strategies to enhance prices to U.S. wool producers. Improvements in record keeping and a

Figure 2: Relationship between U.S. Clean Wool Price and Average Fiber Diameter-Based on the Sample of 8,533 Observations.

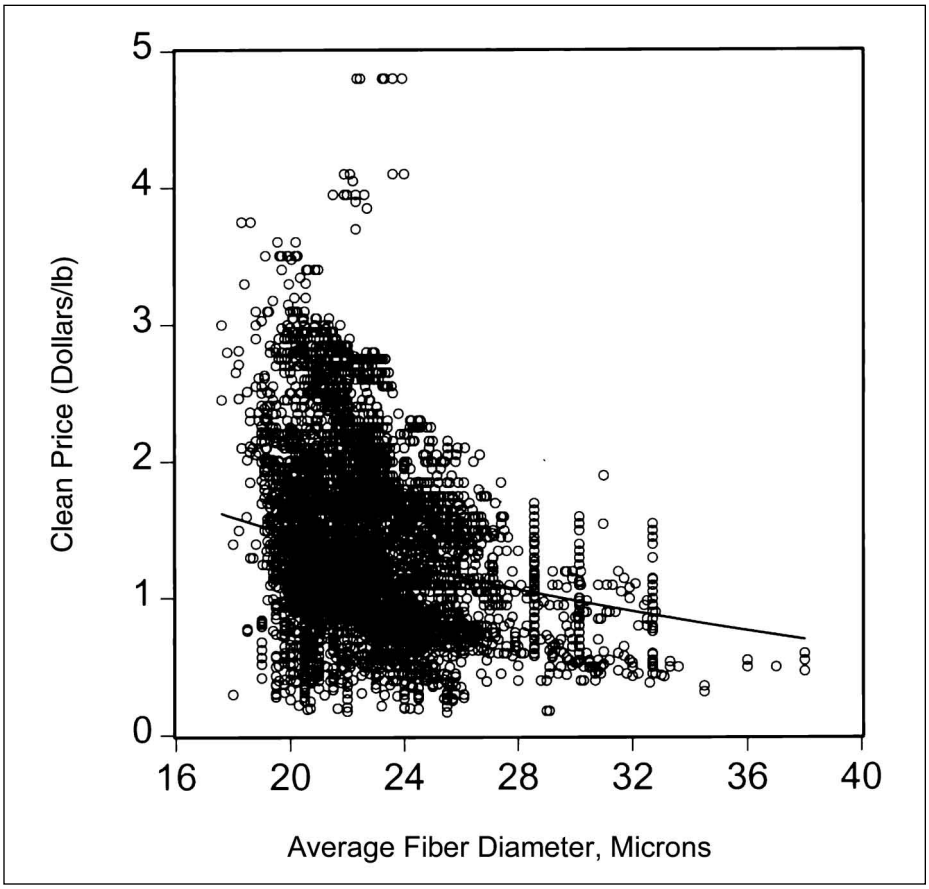


Figure 3: Relationship between Lot Size as Measured by Grease Weight and U.S. Clean Wool Price Based on the Sample of 8,533 observations.

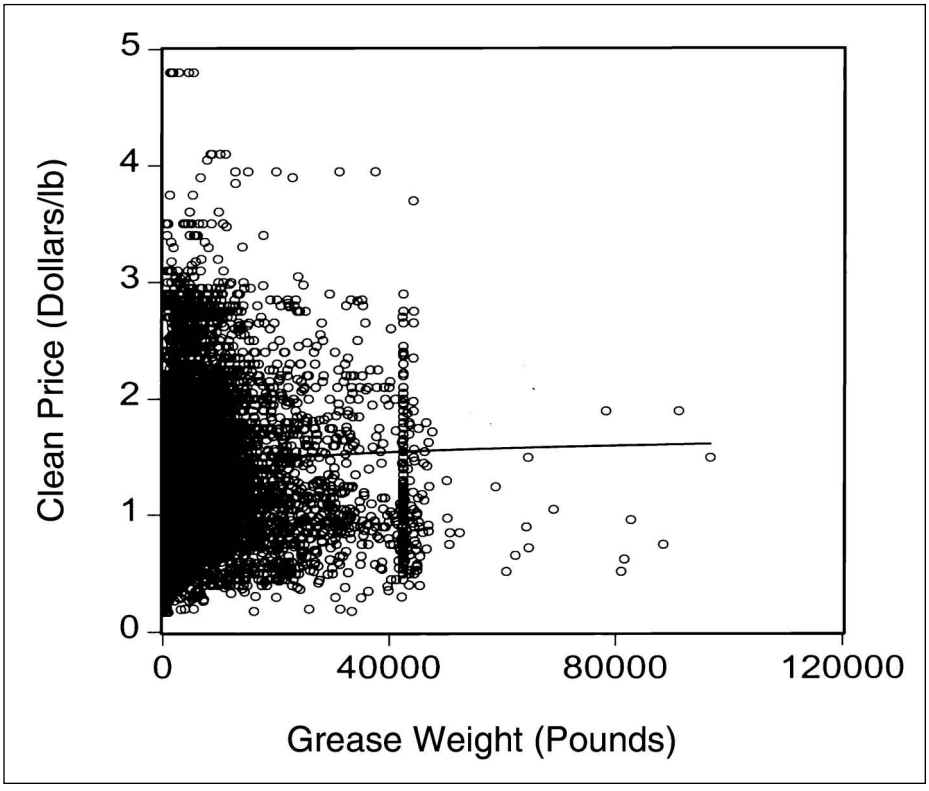


Figure 4: Percentage Differences in U.S. Clean Wool Price by Month Relative to the Base Month of September.

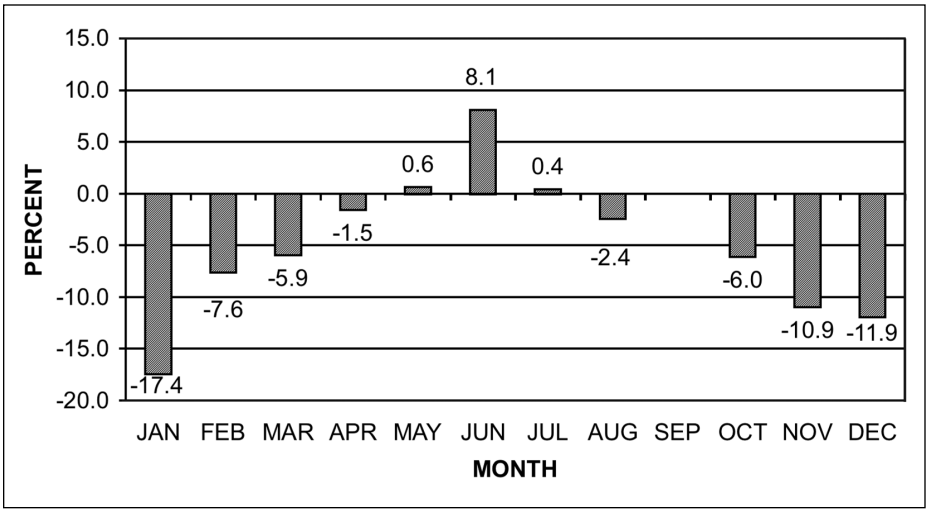


Figure 5: Percentage Difference in U.S. Clean Wool Price by Year Relative to the Base Year of 1997.

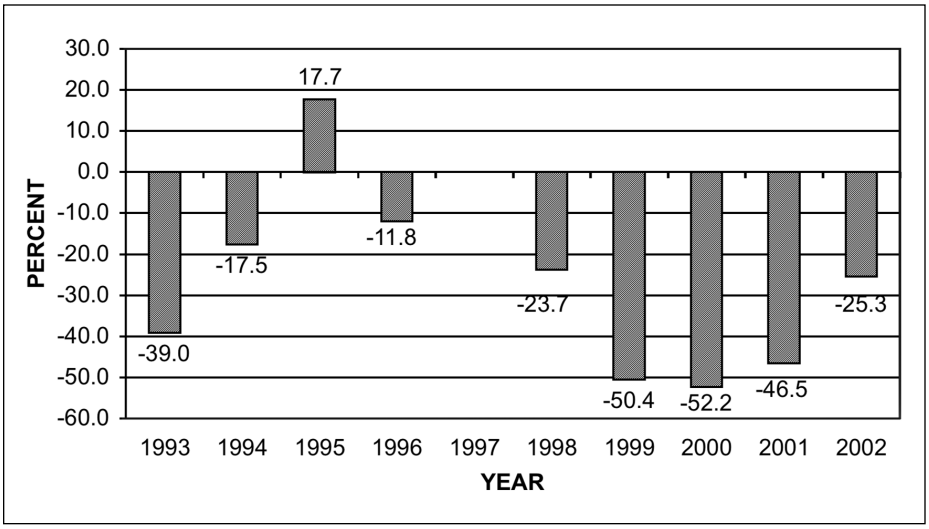
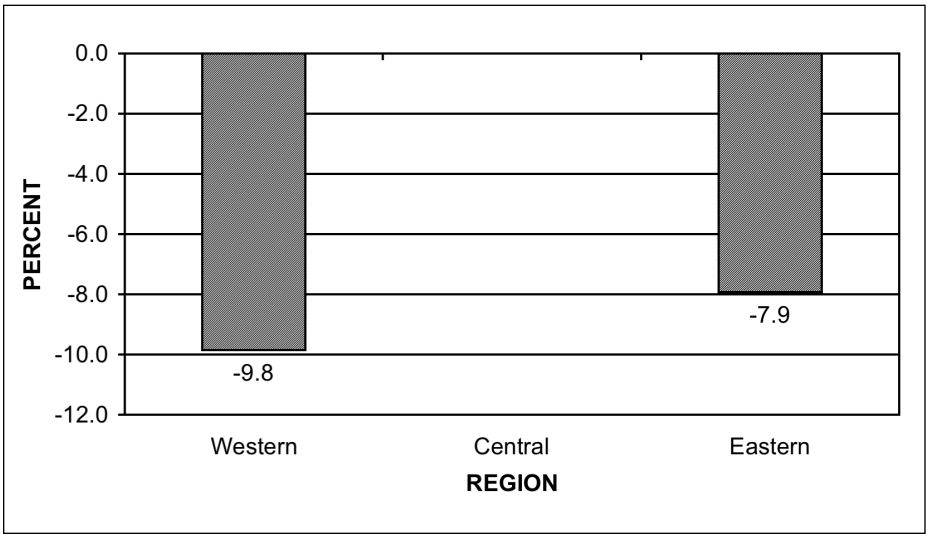


Figure 6: Percentage Difference in U.S. Clean Wool Price by Month Relative to the Base Region of the Central United States.



more uniform description system are needed in order to continue to monitor premiums/discounts of U.S. clean prices due to wool characteristics.

Producers and marketers alike need to find more consistent ways to present U.S. wool to buyers. Many U.S. producers sell their wool on a sealed-bid basis after subjective evaluation by warehouse managers or buyers. It may be worthwhile to determine if alternative marketing practices such as open auction, sealed bid, private treaty, subjective description, and objective description are influential on U.S. wool practices.

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Figure 7: Percentage Difference in U.S. Clean Wool Price by Level of Preparation Relative to the Base Preparation of Original Bag (OB).

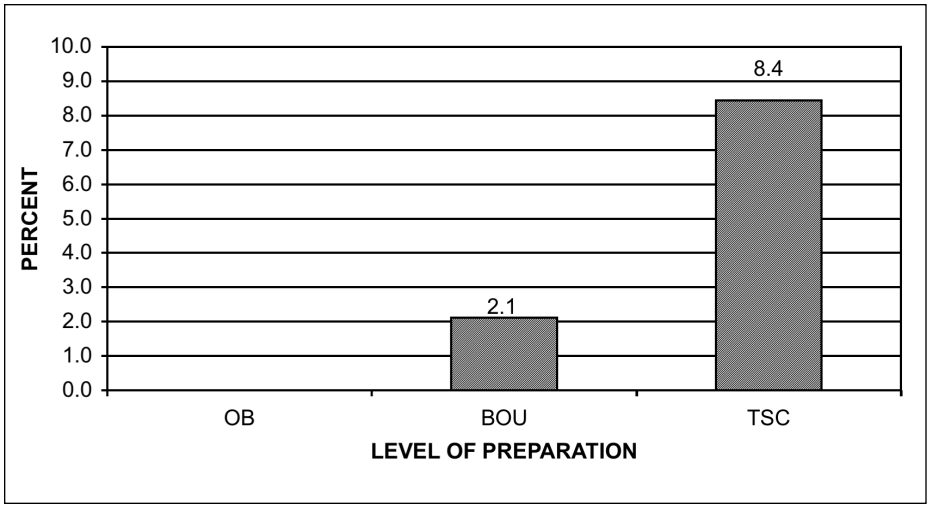


Figure 8: Percentage Difference in U.S. Clean Wool Price by Types Relative to the Base OB-Wool Breed.

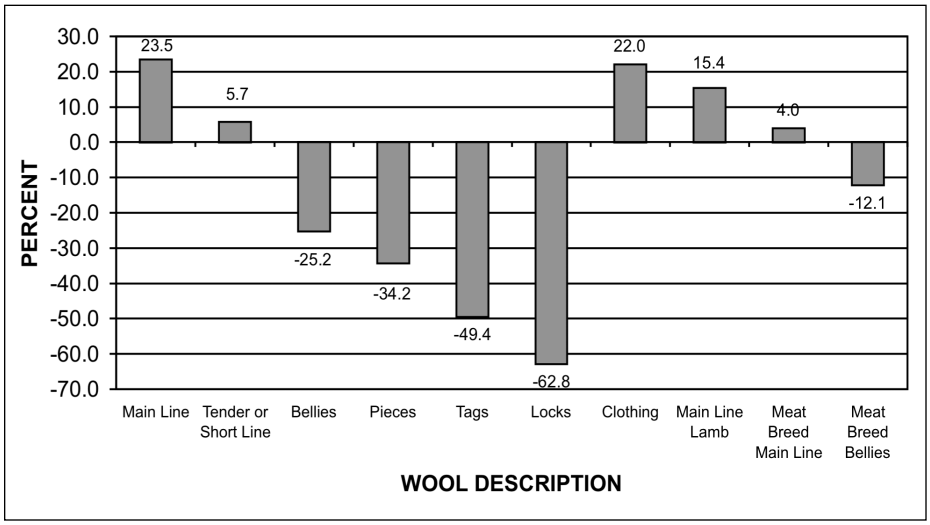
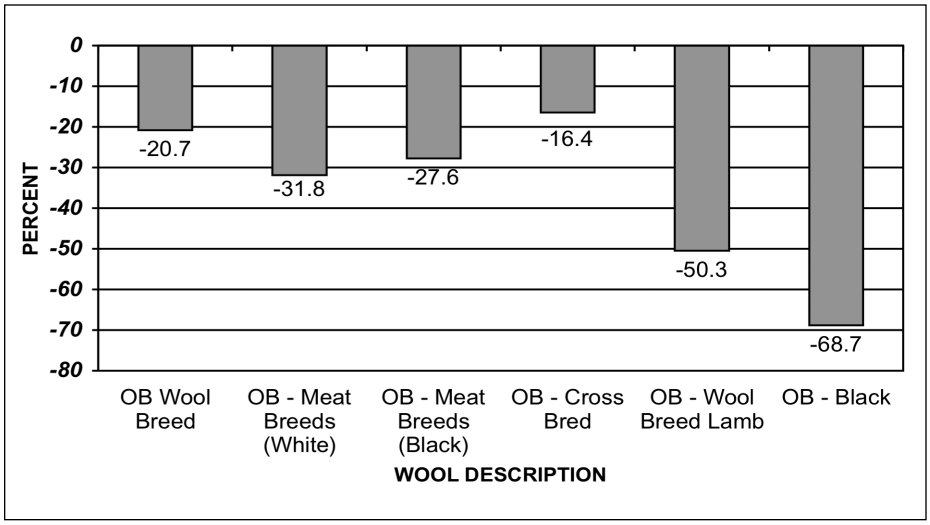


Figure 8: Continued.



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