UNITED STATES DEPARTMENT OF AGRICULTURE
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MIDEAST MARKETING AREA
Federal Order 33

TRANSPORTATION ANALYSIS FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST ORDER

APRIL 2007

Staff Paper
08-02

Prepared by:
John Newton

April 2008

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MIDEAST MARKETING AREA
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Transportation Analysis for Producer Milk Associated With the Mideast Order April 2007

John Newton

This staff paper details the hauling charges, the mileage rate factor, and the hauling distance, to the first delivery point, of milk marketed by producers associated with the Mideast Marketing Area, Federal Order 33, for April 2007. Additionally, the statistical relationship of the hauling charges as a function of the production volume, delivery distance and the quantity of surrounding producers was quantified – see estimator below. Results of this study indicate that diminishing marginal costs pertaining to hauling charges exists in dairy farming. The weighted average hauling charge for the producers included in this study was 45.87 cents per hundredweight. The weighted average hauling distance for the producers included in this study was 86.75 miles. The weighted average mileage rate factor for the producers included in this study was $0.00529 per cwt per mile.

$$(HC)_i = 335.19 + 0.588(D)_i + 0.003(P)_i - 0.594(C)_i$$

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TRANSPORTATION ANALYSIS FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST ORDER APRIL 2007

APRIL 2008

John Newton[1]

1. INTRODUCTION

This study analyzes the hauling charges paid by producers, the hauling distance to the first delivery point, and the mileage rate factor of milk marketed by producers associated with the Mideast Marketing Area, Federal Order 33, for April 2007.

The hauling charges and hauling distances were analyzed to determine the weighted average hauling charge per hundredweight (cwt), the weighted average hauling distance, and the weighted average mileage rate factor. Hauling charge, hauling distance, and the mileage rate factor were tested for variations by region and producer size. An effort was also made to identify a statistical relationship among the hauling charges as a function of production volume[2], delivery distance, and the number of surrounding producers.

In April 2007, there were a total of 7,789 producers who were associated with the market; hauling information was analyzed for 5,922 of these producers. The geographical region encompassed in this population includes: Ohio, Michigan, Indiana, West Virginia, Pennsylvania, Kentucky, Illinois, Maryland, New York, and Wisconsin.

2. BACKGROUND

Research into the hauling charge, the hauling distance, and the mileage rate factor for producer milk at the farm level for producers associated with the Mideast Order has never been published. A variation of this study has historically been performed by Upper Midwest and Pacific Northwest staff for producers associated with Federal Order 30, 124 and 131[3]. The staff papers from Federal Order 30 and the Pacific Northwest indicate that hauling charges are influenced by the distance to the Class I market, the production volume, hauling distance and competitive clusters of producers and handlers. These variables will be tested to determine if a statistical relationship exists in Federal Order 33.

[1] Assisting Mr. Newton were Ron Gjurkovitsch, William Pollock, and Sharon Uther of the Mideast Market Administrator's Office.
[2] For this analysis milk production represents the aggregate delivery total
[3] Pacific Northwest includes Federal Order 124 and 131.

It should be noted that the staff papers conducted by Federal Order 30 and the Pacific Northwest did not incorporate hauling distance or the mileage rate factor into the transportation analysis.

The latest staff paper published by the Pacific Northwest indicates that the weighted average hauling charge was 53.27 cents per cwt for May 2006. It is likely that due to changes in diesel rates the weighted average hauling charge in the Pacific Northwest has increased from 2006 levels. The most recent staff paper from Federal Order 30 indicates that the weighted average hauling charge was 25.00 cents per cwt for May 2007.

Staff papers in Order 30 used two discrete variables to measure the impact location has on hauling charges. If a county contained a supply or pool distributing plant in which the producer resided, the dummy values were assigned accordingly. For this transportation analysis, the weighted average hauling distance replaced the use of discrete variables (measuring location) in the regression analysis.

A brief market survey indicated that base haul rates have a very wide price range depending on the associated hauling costs. Factors influencing the haul rate per loaded mile include but are not limited to: backhaul charges, fuel, maintenance, licensing, state regulations on labor, state highway weight restrictions, labor fees, taxes, and insurance. During the Federal Order 5 transportation credit hearings in January 2006, Jeff Sims (Assistant Secretary of Dairy Cooperative Marketing Association, Inc. and of Southern Marketing Agency) provided testimony that supported a base rate of $1.91 per loaded mile for dairy transportation[4]. Sims testimony was based on average haul rates from October and November, 2003. Using $1.91 as a base rate, the per hundredweight per mile rate (mileage rate factor) is $0.00397 per mile[5].

Since October 2003, the time frame used to estimate the base haul rate in Sims' testimony, diesel fuel rates have raised significantly. Depending on location, the typical 4-week average October 2003 diesel prices were $1.50 per gallon; at the time of this analysis 4-week average April 2008 diesel prices were over $4.00 per gallon. Figure 2.1 shows the 4-week moving average diesel rates[6] for the Midwest Petroleum Administration for Defense Districts (PADD II: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, and Wisconsin). PADD II most accurately represents the states included in the Mideast Marketing Area. Announced diesel fuel prices from

[4] Average hauling rate observed in the Southeast.
[5] Using 48,000 as tanker capacity.
[6] Published by the Energy Information Administration (www.eia.doe.gov).

PADD I (Subdistrict IC) and PADD III are used to determine the variable Mileage Rate Factor[7] for the Southeast, Appalachian, and Florida Orders.

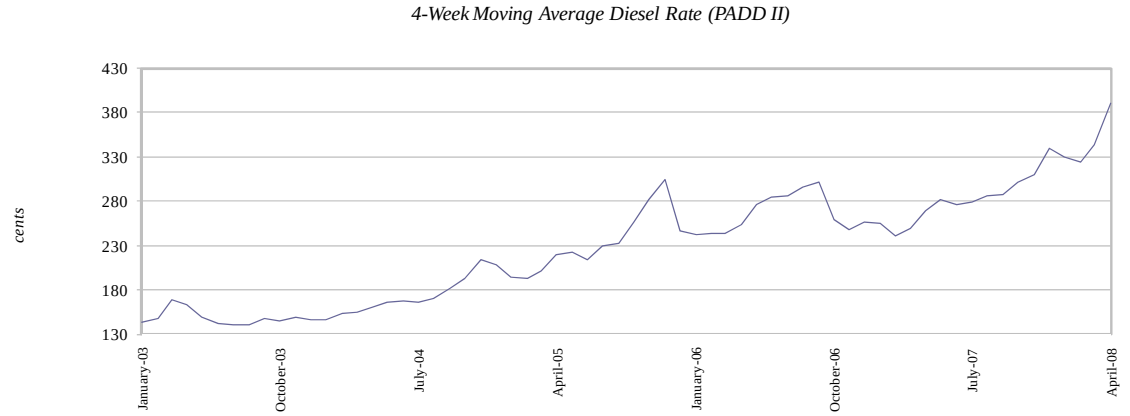


FIGURE 2.1-4-Week moving average diesel rate (PADD II)

As mentioned earlier, fuel price represents only a fraction of the total haul rate per loaded mile. The uncertainty in fuel prices can make the costs of supplying/procuring milk very difficult for producers, cooperatives, and handlers. At the end of the day, consumers, producers, handlers, and cooperatives all share in the costs of moving raw milk and finished goods along the supply chain through assessments, Class I differential price surfaces, premiums, and transportation credits. For the purpose of this study, no attempt was made to analyze Class I differential price surfaces, premiums, or transportation credits.

3. DATA AND METHODOLOGY

The data was collected from producer payrolls submitted by handlers and cooperatives to the Market Administrator's office. As handlers generally submit their entire payrolls, the data not only includes producer milk pooled on Federal Order 33, but also milk pooled on other orders and milk associated with the market but not pooled due to price fluctuations and/or price relationships among federal orders. It is important to note that in April 2007 nearly 60 million pounds of milk were voluntarily de-pooled due to unusual price relationships. For the purpose of this study, the hauling and delivery data associated with those producers was included. Additionally, the producer payrolls submitted to this office also included producers who were not associated with Federal Order 33. Producers who appeared on the payrolls submitted to this office but who did not pool milk on Federal Order 33 were *not* included in this analysis.

[7] The variable mileage rate factor is used to calculate transportation credit payouts in the Appalachian, Southeast, and Florida Orders.

Some data was omitted for simplicity. Data omitted included: producers owning their own fleet, producers whose payroll was not submitted electronically, producers whose delivery distance was unavailable at the time of this study, and producers who showed zero dollars ($0.00) in reported hauling fees. As a result, there is a significant difference in the number of producers and milk production in this study and the number of producers and milk production as pooled on the Mideast Federal Order.

For the purpose of this study the hauling charges are identified as the hauling deductions shown on the producer payrolls submitted to the Market Administrator's office. It is likely that the observed hauling charges do not reflect the actual cost of milk transportation. As observed by Freije (2007), in the Upper Midwest hauling charges reflected on producer payrolls are often heavily subsidized. The subsidies are likely due to factors such as competition among handlers and cooperatives for milk supplies.

It is possible for payrolls submitted to this office to include stop charges within hauling charges on producer payrolls. For the purpose of this study, no attempt was made to separate stop charges and hauling charges.

For this study hauling distances were approximated using the shortest hard-surface highway distance from the county seat of the applicable producer to the actual location of the receiving plant. The shortest hard-surface highway distance was then calculated between the receiving plant and the origination point. Since a producer may have deliveries to multiple receiving plants, a weighted average delivery distance was calculated from aggregated producer deliveries by producer ID. No attempt was made to account for milk reloads or diversions.

The mileage rate factor was calculated by dividing the hauling charges per cwt by the hauling distance. The mileage rate factor represents the per cwt per mile charges paid by producers for transporting milk.

In order to calculate the weighted averages included in this study, the observed rate or distance was weighted using the production pounds. For each analysis the rate or distance was multiplied by the production volume. The sum product was then divided by the sum of total production to determine the weighted average. Example 3.1 details the function used to calculate the weighted average hauling charge, hauling distance, and mileage rate factor:

$$\bar{x} = \frac{p_1 x_1 + p_2 x_2 + \ldots + p_n x_n}{p_1 + p_2 + \ldots + p_n}$$

Where, x represents the observed rate or distance for producer n:

$$[x_1, x_2, ..., x_n]$$

And, production, p, is observed for producer n:

$$[p_1, p_2, ..., p_n]$$

Example 3.1-Weighted average function

Calculating the weighted average allows producers with little or no production volume to contribute less to the weighted mean than producers with a high production volume. Where the simple average would weigh all values equally, the weighted average weighs each accordingly, thereby providing a better understanding of the transportation charges and distances for milk associated with the Mideast Marketing Area.

The data population was also analyzed using Ordinary Least Squared (OLS) regression analysis. OLS was used to determine the statistical relationship among the hauling charges as a function of the production volume, delivery distance, and the quantity of surrounding producers.

4. DESCRIPTIVE STATISTICS FOR APRIL 2007

Altogether, for April 2007 the hauling charges assessed to producers accounted for over five million dollars. The weighted average hauling charge for all producer milk included in this study was 45.87 cents per cwt. For comparative purposes, the weighted average hauling charge for the market was also calculated for November 2006. In November 2006 the weighted average hauling charge was 45.46 cents per cwt.

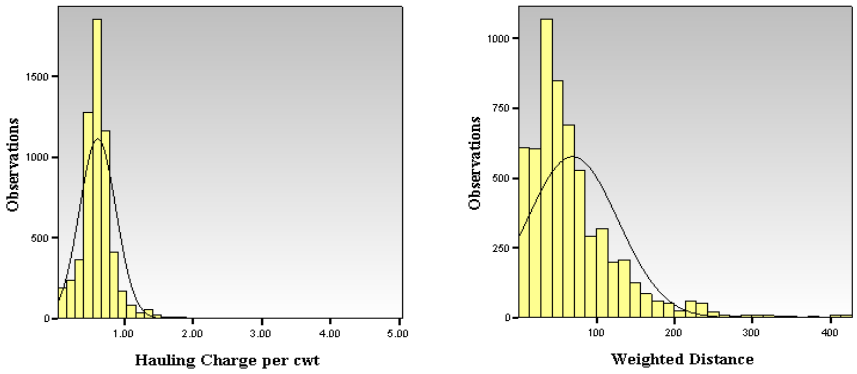


FIGURE 4.1-Frequency distributions of hauling charges per cwt and hauling distances

For April 2007, the range of hauling charges within one standard deviation[8] of the mean was 34.37 to 87.54 cents per cwt. The standard deviation of the data population was 26.59 cents per cwt[9]. Figure 4.1 shows the frequency distributions for hauling charges per cwt and the hauling distances.

The weighted average hauling distance to the first delivery point for all producer milk included in this study was 86.75 miles. For comparative purposes, the weighted average hauling distance for the market was also calculated for November 2006. In November 2006 the weighted average hauling distance was 94.20 miles. For April 2007, the range of hauling distances within one standard deviation of the mean was 10.80 miles to 127.66 miles.

The weighted average mileage rate factor was $0.00529 per cwt per mile for April 2007 – an increase of ten percent from November 2006 levels. The average mileage rate factor for the data population was $0.00880 per cwt per mile – only four percent higher than November 2006 levels.

Comparing the weighted averages and the means indicates that smaller producers tend to have higher hauling charges per cwt, lower hauling distance, and a higher mileage rate factor than their larger counterparts.

TRANSPORTATION STATITISTICS FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST MARKET

November 2006

	Weighted Average	Mean	Standard Deviation	Lower Limit	Upper Limit
Hauling Rate *per cwt.*	$ 0.45461	$ 0.60546	$ 0.25600	$ 0.34946	$ 0.86147
Hauling Distance *miles*	94.20	71.45	67.06	4.38	138.51
Mileage Rate *$ per cwt per mile*	$ 0.00483	$ 0.00847			

April 2007

	Weighted Average	**Mean**	**Standard Deviation**	**Lower Limit**	**Upper Limit**
Hauling Rate *per cwt.*	**$ 0.45872**	**$ 0.60952**	**$ 0.26585**	**$ 0.34368**	**$ 0.87537**
Hauling Distance *miles*	**86.75**	**69.23**	**58.43**	**10.80**	**127.66**
Mileage Rate *$ per cwt per mile*	**$ 0.00529**	**$ 0.00880**			

TABLE 4.1-Transportation descriptive statistics for November 2006 and April 2007

[8] For a normal distribution, 68 percent of all observations are within one standard deviation of the mean.
[9] The average statistical mean and standard deviations will vary depending on how the data is segregated.

5. TRANSPORTATION ANALYSIS BY STATE

For this section, hauling charges and delivery distances were analyzed by the production region. Of the states included in this analysis, Ohio, Michigan, Indiana, West Virginia, Pennsylvania, and Kentucky are states located within the Mideast Marketing Area.

Producer size varies dramatically throughout the region. The average monthly delivery total for producers located in Illinois was 67,182 pounds, while producers in Michigan averaged deliveries of 279,288 pounds. Figure 5.1 details average delivery pounds and market share by state for April 2007. For the bar charts in this section, yellow shaded areas denote states within the Mideast Marketing Area.

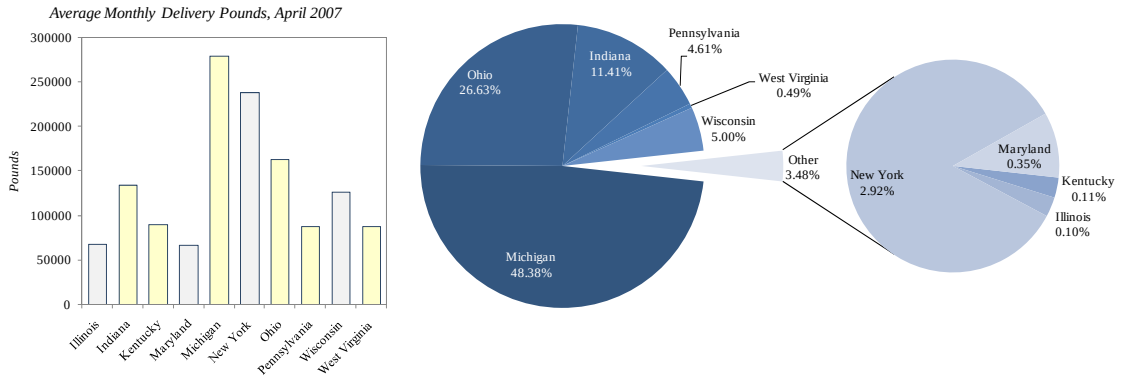


FIGURE 5.1-Average delivery pounds and market share by state

Participation varied dramatically by region. Illinois had the smallest market share at 0.10 percent, while Michigan had the largest share of the market in this study at 48.38 percent. The states included in the Mideast Marketing Area represented 91.63 percent of the milk included in this analysis.

Of the states included in this study, Wisconsin had the lowest weighted average hauling charge per cwt at 15.70 cents, 30.17 cents per cwt less than the market weighted average. The low weighted average observed for Wisconsin is supported by the findings of Freije. Order 30 staff papers indicated that hauling charges for Wisconsin producers historically have been heavily subsidized. On the contrary, Kentucky had the highest weighted average hauling charge of 83.41 cents per cwt, 37.54 cents higher than the market weighted average. Important to note however, is that Kentucky and Wisconsin combined to represent less than 6 percent of producer milk deliveries included in this study. The weighted average hauling charge for producers located in the Mideast Marketing Area (Kentucky, Ohio, Michigan, Indiana, West Virginia, and Pennsylvania) ranged from a low of 41.05 cents per cwt in Michigan, to 83.41 cents per cwt in Kentucky. Figure 5.2 details weighted average hauling charges by state for the Mideast Marketing Area.

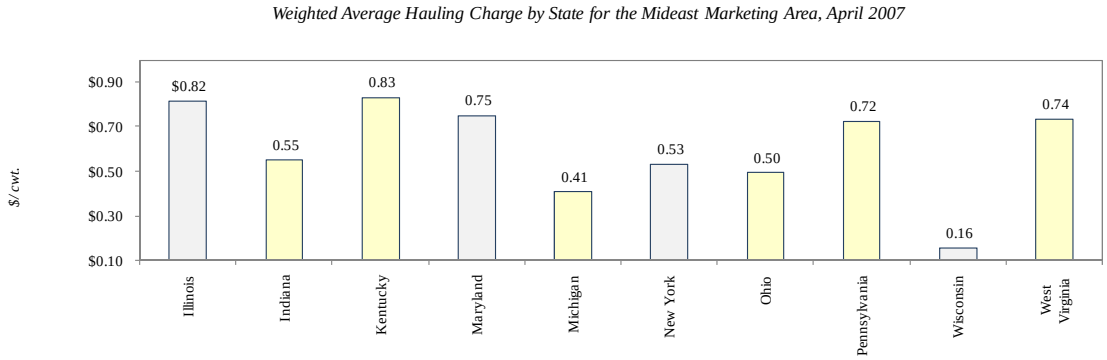
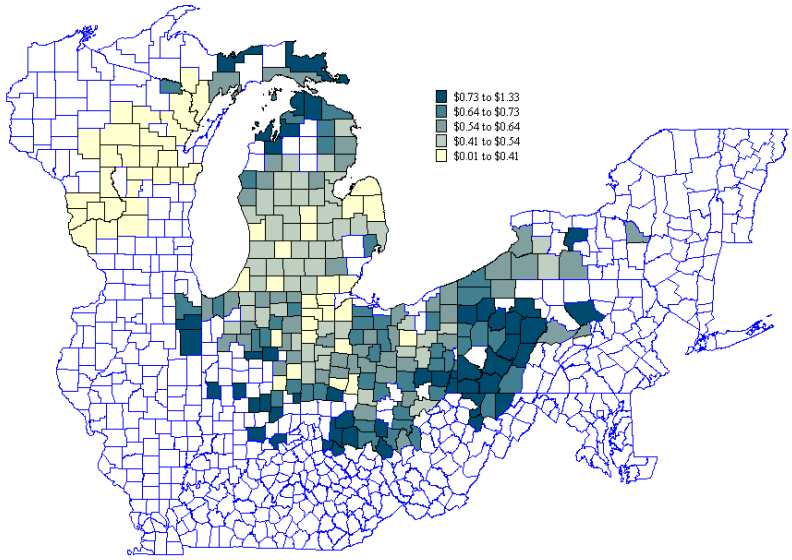


FIGURE 5.2-Weighted average hauling charge by state

A more in depth look at state level hauling charges can be seen in Map 5.1. As demonstrated in the thematic map, weighted average hauling charges per cwt vary considerably within each state. Map 5.1 excludes restricted data.



MAP 5.1-Weighted hauling charges by county

Of the states included in this analysis, Maryland had the smallest variation in hauling charges with a standard deviation of 10.99 cents per cwt. Opposite Maryland was West Virginia, whose 56.35 cents per cwt standard deviation indicates a fairly wide range of hauling charges assessed to producers.

Of the states included in this study, Wisconsin had the lowest weighted average hauling distance of 39.95 miles, 46.80 miles less than the market average. On the contrary, Indiana had the highest weighted average hauling distance of 103.78 miles, 17 miles

higher than the market average. The weighted average hauling distance for producers located in the Mideast Marketing Area (Kentucky, Ohio, Michigan, Indiana, West Virginia, and Pennsylvania) ranged from a low of 49.20 miles in Kentucky to 103.79 miles in Indiana[10]. Figure 5.3 details weighted average hauling distances by state for the Mideast Marketing Area.

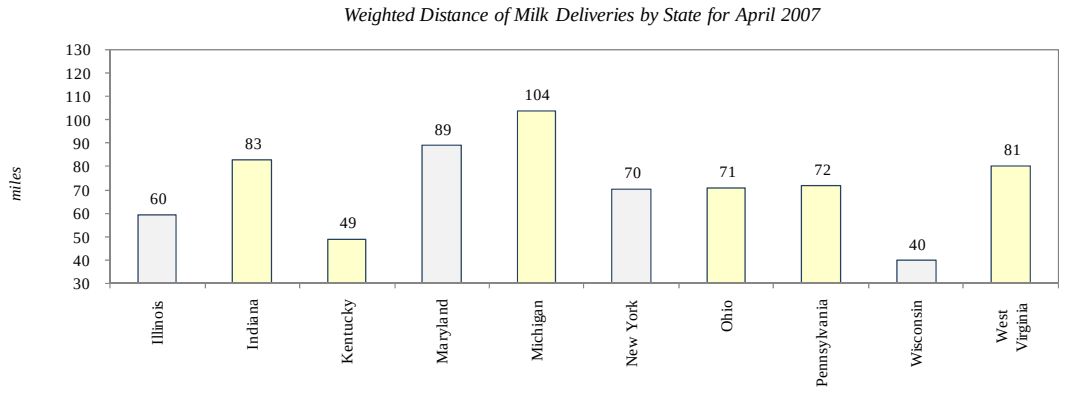


FIGURE 5.3-Weighted average hauling distances by state

In table 5.1, the simple average delivery distance of 67.17 miles when compared to the weighted average of 86.75 miles implies that producers with large delivery volume, who have more impact on the weighted average, tend to have longer delivery distances than their smaller counterparts.

TRANSPORTATION STATISTICS BY STATE FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST MARKET
April 2007

				Hauling Charge			Hauling Distance			Mileage Rate		
State	Total Pounds	Average Delivery	Market Share	Weighted Average	Simple Average	Standard Deviation	Weighted Average	Simple Average	Standard Deviation	Weighted Average	Simple Average	Standard Deviation
				$/cwt			*miles*			*$ per cwt per mile*		
Illinois	1,142,100	67,182	0.10%	$ 0.8179	$ 0.8700	$ 0.1974	59.57	62.34	31.71	$ 0.01373	$ 0.01396	$ 0.00622
Indiana	125,309,132	134,308	11.41%	0.5536	0.6991	0.2646	82.95	66.79	63.77	0.00667	0.01047	0.00415
Kentucky	1,164,163	89,551	0.11%	0.8341	0.9112	0.1334	49.20	44.92	28.40	0.01695	0.02028	0.00470
Maryland	3,797,186	66,617	0.35%	0.7528	0.8086	0.1099	89.12	89.08	37.42	0.00845	0.00908	0.00294
Michigan	531,205,663	279,288	48.38%	0.4105	0.5494	0.2281	103.78	84.28	69.93	0.00396	0.00652	0.00326
New York	32,091,790	237,717	2.92%	0.5333	0.6059	0.1509	70.49	81.74	51.77	0.00757	0.00741	0.00292
Ohio	292,453,864	163,200	26.63%	0.4963	0.6264	0.1997	70.94	59.60	48.46	0.00700	0.01051	0.00412
Pennsylvania	50,625,180	87,891	4.61%	0.7247	0.8159	0.2493	71.88	68.74	36.12	0.01008	0.01187	0.00690
Wisconsin	54,863,229	126,122	5.00%	0.1570	0.2449	0.1813	39.95	43.24	37.59	0.00393	0.00566	0.00482
West Virginia	5,386,112	86,873	0.49%	0.7369	0.9477	0.5635	80.52	70.97	48.95	0.00915	0.01335	0.01151
TOTAL OR AVERAGE	**1,098,038,419**	**133,875**	**100%**		**$ 0.7079**	**$ 0.2278**		**67.17**	**45.41**		**$ 0.01091**	**$ 0.00515**
WEIGHTED AVERAGE				**$ 0.4587**			**86.75**			**$ 0.0053**		

TABLE 5.1-Transportation statistics by state

Also included in Table 5.1 is the weighted average mileage rate factor for each state. Of the states included in this analysis Kentucky had the highest weighted average mileage rate factor at $0.01695 per cwt per mile, while Wisconsin had the lowest weighted

[10] These distances apply only to milk included in this study. It is possible that when all deliveries are analyzed the observed weighted distances could be different than the values reported in this analysis.

average mileage rate factor at $0.00393 per cwt per mile. Of the states within the Mideast Marketing Area, Kentucky had the highest weighted average mileage rate factor, while Michigan had the lowest weighted average mileage rate factor at $0.00396 per cwt per mile. Figure 5.4 details the weighted average mileage rate factor for all states included in this analysis.

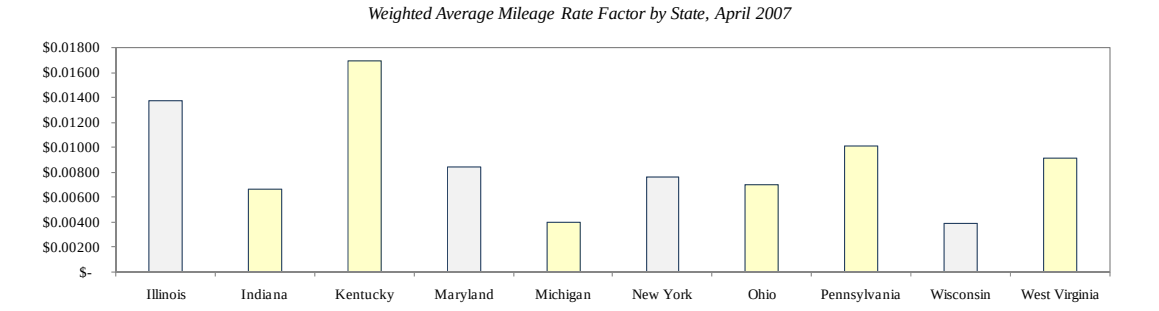


FIGURE 5.4-Weighted average mileage rate factor by state

Summing up, it is apparent that states with larger producers have a lower weighted average hauling charge per cwt, higher weighted average delivery distance and a lower weighted average mileage rate factor. The grounds for the differences between larger and small producers making up each state is likely due to multiple factors such as: the distance to the Class I market, competition for milk supplies, milk quality, quantity of nearby supply plants, number of stops needed to reach tanker capacity, and the need for Class I markets to reach farther as local milk sheds are exhausted. The following section will analyze the transportation variables as a function of producer size.

6. TRANSPORTATION ANALYSIS BY PRODUCER SIZE

In order to examine the impact producer size has on hauling charges and delivery distances, producers associated with the market were divided into 10 groups with the same number of producers. Percentile groups were calculated using their aggregated pounds delivered and producer ID number. In total there were 5,922 producers included in this study; therefore, each percentile group included 592 producers based on milk volume. Percentile one represents producers with the smallest delivery total, and group ten represents producers with the highest aggregate delivery pounds. In order to put this into perspective, percentile group ten averaged deliveries greater than 900,000 pounds. On the other hand, percentile group one averaged deliveries of 18,830 pounds. Figure 6.1 details average delivery pounds and market share by percentile group for April 2007.

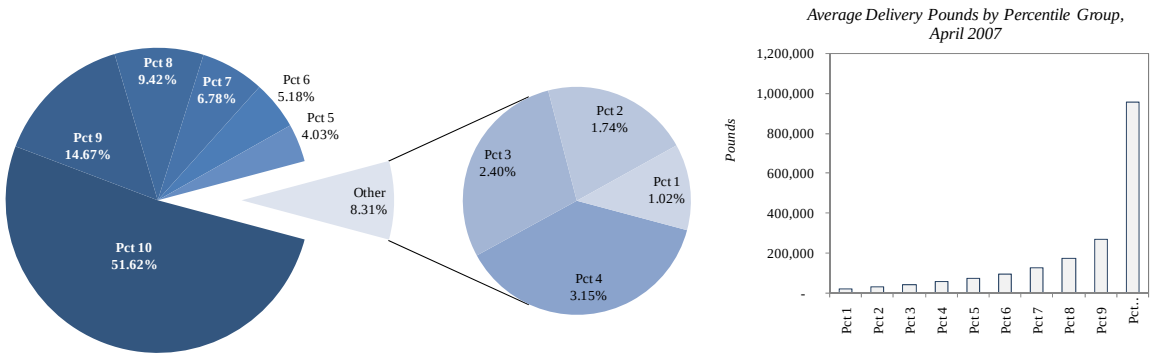


FIGURE 6.1-Average delivery pounds and market share by percentile group

The smallest group of producers included in this study represented only 1.02 percent of the deliveries; whereas the largest group of producers represented 51.62 percent of the deliveries. Additionally, more than 75 percent of producer deliveries are provided by the top three percentile groups.

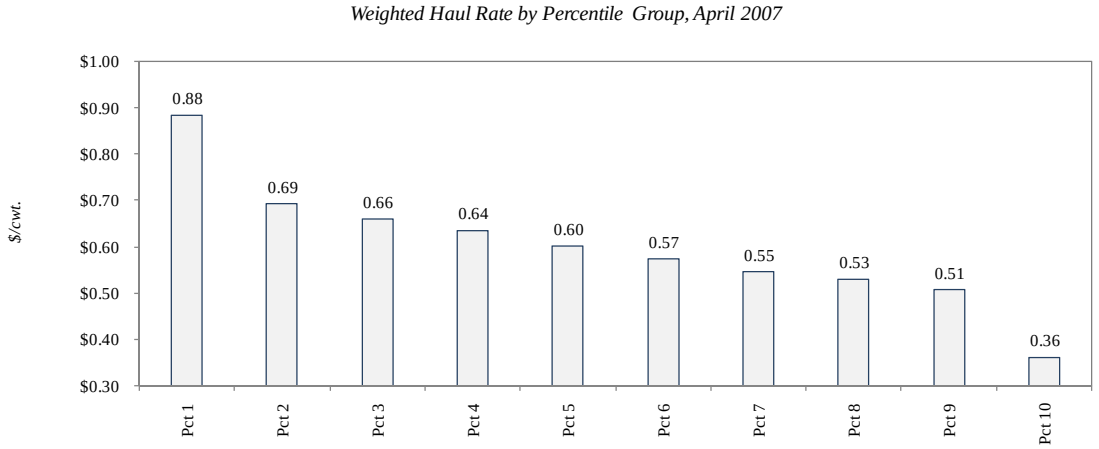


FIGURE 6.2-Weighted average hauling charges by percentile group

Analysis of hauling charges per cwt by percentile group suggests that in general as producer delivery volume increases, the weighted average hauling charge per cwt decreases. Producers in percentile group one, averaging deliveries of 18,830 pounds in April 2007, have a weighted average hauling charge of 88.33 cents per cwt – 42.45 cents higher than the market weighted average hauling charge. Producers in the largest percentile group, averaging deliveries of 954,200 pounds in April 2007, have a weighted average hauling charge of 36.13 cents per cwt – 9.74 cents less than the market average. The variation in weighted average hauling charges between the smallest and largest percentile groups is 52.20 cents per cwt. In addition, percentile groups one through nine

have a weighted average hauling charge per cwt greater than the market weighted average of $0.4587 per cwt. Figure 6.2 details weighted average hauling charges by percentile group for the Mideast Marketing Area.

Percentile group one had the highest spread of hauling charges with a standard deviation of 50.09 cents per cwt. The range of average hauling charges within one standard deviation of the mean for percentile group ten was 27.53 to 55.44 cents per cwt.

Analysis of hauling distances by percentile group suggests that in general the weighted average delivery distance remains relatively even for percentile groups one through nine. However, from percentile group nine to percentile group ten the weighted average hauling distance increases over 46 percent. It is important to consider that percentile group ten captures producers who manufacture a tanker load per day. Figure 6.3 details weighted average hauling distances by percentile group for the Mideast Marketing Area.

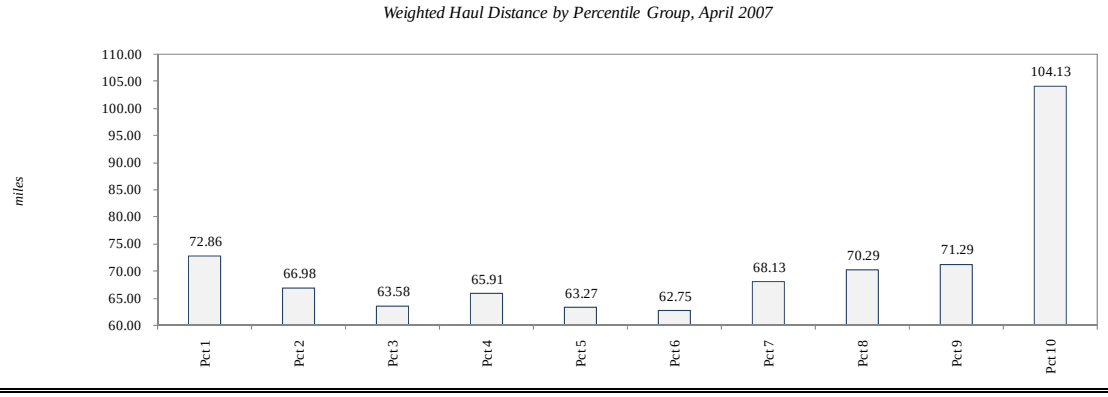


FIGURE 6.3-Weighted average hauling distances by percentile group

Producers in percentile group one have a weighted average hauling distance of 72.86 miles – 13 miles less than the market weighted average hauling distance. Producers in the largest percentile group have a weighted average hauling distance of 104.13 miles – 17 miles higher than the market average. The variation in weighted average hauling distance between the smallest and largest percentile groups is 31 miles. Furthermore, percentile groups one through nine have a weighted average hauling distance notably lower than the market weighted average of 86.75 miles.

The standard deviation of hauling distance for the data population was 57.59 miles based on percentile group. Percentile group six had the lowest spread of hauling distances with a standard deviation of 49.19 miles. The range of average hauling charges within one standard deviation of the mean for percentile group ten was 12.90 to 157.68 miles. When analyzing the simple average and standard deviation by percentile group hauling distances do not vary significantly as a function of producer size. In fact, there is very

little variation observed between the weighted average and simple average for percentile groups one through nine. It is likely that within percentile group ten, hauling distances vary dramatically causing the weighted average to be much greater than the simple average.

TRANSPORTATION STATISTICS BY PERCENTILE GROUP FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST MARKET
April 2007

				Hauling Charge			Hauling Distance			Mileage Rate		
Percentile	Total Pounds	Average Delivery	Market Share	Weighted Average	Simple Average	Standard Deviation	Weighted Average	Simple Average	Standard Deviation	Weighted Average	Simple Average	Standard Deviation
				$/cwt			*miles*			*$ per cwt per mile*		
Pct 1	11,147,245	18,830	1.06%	$ 0.8833	$ 0.9275	$ 0.5009	72.86	74.24	71.19	$ 0.0121	$ 0.0125	$ 0.0070
Pct 2	19,137,009	32,326	1.82%	0.6916	0.6950	0.2010	66.98	66.93	52.25	0.0103	0.0104	0.0038
Pct 3	26,354,142	44,517	2.51%	0.6607	0.6612	0.1843	63.58	63.79	52.94	0.0104	0.0104	0.0035
Pct 4	34,555,362	58,371	3.27%	0.6355	0.6358	0.1785	65.91	65.98	53.17	0.0096	0.0096	0.0034
Pct 5	44,247,134	74,742	4.15%	0.6020	0.6033	0.1997	63.27	63.43	51.63	0.0095	0.0095	0.0039
Pct 6	56,878,297	96,078	5.28%	0.5739	0.5750	0.1925	62.75	62.84	49.19	0.0091	0.0092	0.0039
Pct 7	74,442,966	125,748	6.87%	0.5453	0.5449	0.1833	68.13	67.69	55.61	0.0080	0.0081	0.0033
Pct 8	103,398,825	174,660	9.37%	0.5302	0.5313	0.1679	70.29	70.54	55.30	0.0075	0.0075	0.0030
Pct 9	161,082,851	272,099	14.67%	0.5075	0.5069	0.1431	71.29	71.50	62.19	0.0071	0.0071	0.0023
Pct 10	566,794,588	954,200	51.01%	0.3613	0.4148	0.1395	104.13	85.29	72.39	0.0035	0.0049	0.0019
TOTAL OR AVERAGE	**1,098,038,419**	**185,157**	**100%**		**$ 0.6096**	**$ 0.2091**		**69.22**	**57.59**		**$ 0.0089**	**$ 0.0036**
WEIGHTED AVERAGE				**$ 0.4587**			**86.75**			**$ 0.0053**		

TABLE 6.1-Transportation statistics by percentile group

The weighted average mileage rate factor was greatest for producers in percentile group one at $0.0121 per cwt per mile. Producers in percentile group ten had the lowest weighted average mileage rate factor at $0.0035 per cwt per mile. Producers in percentile groups one through nine had weighted average mileage rate factors much greater than the weighted average mileage rate factor for the entire population. Quite the opposite, producers in the largest percentile had a weighted average mileage rate factor less than the market weighted average. Figure 6.4 details the weighted average mileage rate factor by percentile group.

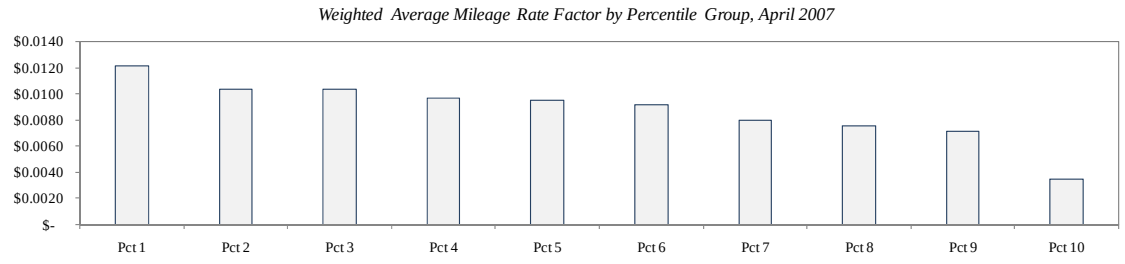


FIGURE 6.4-Weighted average mileage rate factor by percentile group

Reviewing the percentile data indicates that weighted average transportation statistics are indeed influenced by producer size. It is likely that large producers have a greater delivery distance due to the need for the deficit Class I market to reach farther as local milk sheds are exhausted. Large producers would also have to look farther because as they meet local demand, they need to find destinations outside their area to receive their

milk. An example of Class I markets reaching farther would be Cincinnati handlers procuring milk from Michigan milk sheds. Alternatively, milk quality likely influences delivery distances. Large producers, who traditionally have lower somatic cell counts[11] (SCC), are more attractive to distant markets seeking high quality milk for fluid milk manufacturing.

In addition to a longer delivery distance, larger producers have a lower hauling charge per cwt and mileage rate factor than smaller producers. The lower charges are likely the result of competition among handlers and cooperatives for milk supplies. Additionally, these two statistics can be misleading, because larger producers usually have higher hauling charges; however, since they have a higher delivery volume and longer delivery distance the hauling charge per cwt ratio and the mileage rate factor appear lower than the charges smaller producers face.

As demonstrated in the previous sections, hauling charges and hauling distance vary significantly by producer size and state. The following section will attempt to measure both factors simultaneously. For example, how do hauling charges vary by percentile group within each state?

7. TRANSPORTATION ANALYSIS BY SUBGROUP

For this section, the data was divided into multiple distinct subsets. Each subset was analyzed to determine the weighted average hauling charge, the weighted average hauling distance, and the weighted average mileage rate factor within a homogeneous group. For each state, producers were grouped based on their total deliveries for the month.

Producers were grouped based on the following aggregate delivery criteria: less than 60,000 pounds; between 60,000 and 90,000 pounds; between 90,000 and 125,000 pounds; between 125,000 and 190,000 pounds; between 190,000 and 250,000 pounds; between 250,000 and 500,000 pounds; between 500,000 and one million pounds; between one million and two million pounds and more than two million pounds.

As seen in Table 7.1, weighted average hauling charges vary dramatically by state depending on aggregate delivery total. Producers in Wisconsin who have deliveries between five hundred thousand and one million pounds have a weighted average hauling charge of $0.1004 per cwt. In fact, Wisconsin is the only state in this study to have weighted average hauling charges less than the market weighted average for all producer subgroups. In contrast, producers in West Virginia who average deliveries less than 60,000 pounds have a weighted average hauling charge of $1.02 per cwt.

[11] SCC increases in response to pathogenic bacteria found in milk.

WEIGHTED AVERAGE HAULING CHARGES BY STATE AND DELIVERY POUNDS

April 2007

Producer Size	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	Wisconsin	West Virginia	**Simple Average** 1/
						per cwt.					
less than 60,000	$ 0.9272	$ 0.7368	$ 1.0085	$ 0.8621	$ 0.6221	$ 0.6683	$ 0.7054	$ 0.8379	$ 0.3749	$ 1.0245	**$ 0.7768**
60,000 to 90,000	0.8002	0.7019	0.8796	0.7438	0.5491	0.5820	0.6350	0.7816	0.2172	0.7534	**0.6644**
90,000 to 125,000		0.6794	R	0.7112	0.5334	0.5885	0.6050	0.7278	0.1728	0.7297	**0.5935**
125,000 to 190,000	0.7809	0.6205	R	0.6795	0.5165	0.6183	0.5722	0.7096	0.1317	0.6781	**0.5897**
190,000 to 250,000		0.5819			0.5031	0.5607	0.5451	0.7003	0.1125	0.5886	**0.5132**
250,000 to 500,000		0.5592	R	R	0.4865	0.5358	0.5124	0.6308	0.1035	0.6894	**0.5025**
500,000 to 1 million		0.4822			0.4199	0.5033	0.4257	0.6367	0.1004	R	**0.4280**
1 million to 2 million		0.3541			0.3774	0.4790	0.2823	R	R		**0.3732**
more than 2 million		0.2500			0.2563	R	0.2474				**0.2512**
Simple Average	**$ 0.8361**	**$ 0.5518**	**$ 0.9440**	**$ 0.7492**	**$ 0.4738**	**$ 0.5670**	**$ 0.5034**	**$ 0.7178**	**$ 0.1733**	**$ 0.7440**	

R: Restricted

TABLE 7.1-Weighted average hauling charges by state and delivery pounds

Of the states within the Mideast Marketing Area, Ohio producers with average deliveries over two million pounds have the lowest weighted hauling charge at 24.74 cents per cwt. Second to West Virginia, Kentucky producers who average less than 60,000 pounds have a weighted average hauling charge of $1.0085 per cwt.

Indiana has the largest spread in weighted average hauling charges at 48.68 cents per cwt. Of the producers included in this study Illinois had the lowest spread of weighted average hauling charges at 14.63 cents per cwt. Of the states in the Mideast Marketing Area, Kentucky has the lowest spread of weighted average hauling charges at 12.89 cents per cwt.

Producer size and location have a sizeable impact on the weighted average hauling charge per cwt assessed. This section will also test to determine if the same variables have a significant impact on the weighted average hauling distance of producer milk. Table 7.2 details weighted average hauling distance by delivery pounds and producer location.

WEIGHTED AVERAGE HAULING DISTANCE BY STATE AND DELIVERY POUNDS

April 2007

Producer Size	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	Wisconsin	West Virginia	**Simple Average** 1/
						miles					
less than 60,000	61.43	64.47	31.82	89.42	78.93	87.18	55.99	70.17	49.13	66.53	**65.51**
60,000 to 90,000	52.37	65.55	34.91	84.59	78.85	62.91	55.45	67.57	45.72	68.37	**61.63**
90,000 to 125,000		59.46	R	92.24	77.87	90.47	53.54	68.08	38.56	86.74	**70.87**
125,000 to 190,000	63.65	65.41	R	60.27	90.62	104.51	64.30	71.35	38.49	75.80	**70.49**
190,000 to 250,000		60.82			92.96	78.25	63.09	66.89	37.97	48.58	**64.08**
250,000 to 500,000		67.76	R	R	81.30	63.74	61.06	68.94	37.52	112.50	**70.40**
500,000 to 1 million		77.37			84.11	71.72	64.75	97.75	40.47	R	**72.70**
1 million to 2 million		146.62			103.47	54.76	100.71	R	R		**101.39**
more than 2 million		142.37			149.17	R	146.39				**145.98**
Simple Average	**59.15**	**83.31**	**33.37**	**81.63**	**93.03**	**76.69**	**73.92**	**72.97**	**41.12**	**76.42**	

R: Restricted

TABLE 7.2-Weighted average hauling distances by state and delivery pounds

Similar to hauling charges, weighted average hauling distances vary dramatically by state depending on aggregate delivery total. Producers in Kentucky who average fewer than sixty thousand pounds have the minimum weighted average hauling distance at 31.82 miles. It is also important to point out the low weighted average distances for Wisconsin. The relatively low delivery distances for Wisconsin are caused by pooled diversions that did not leave the state of Wisconsin. Conversely, producers in Michigan who have deliveries greater than two million pounds have the highest weighted average delivery distance of 149.17 miles.

Of the states within the Mideast Marketing Area, Kentucky producers with average deliveries less than 60,000 pounds have the lowest weighted average hauling distance. Producers in Michigan averaging more than two million delivery pounds had the greatest weighted average hauling distance in the Mideast Market. The difference in weighted average delivery distances between the two locations and producer groups is over 117 miles.

Ohio also had the largest independent spread in weighted average hauling distances at 93 miles. Of the subgroups included in this study Kentucky had the lowest spread of weighted average hauling distances at 3 miles. Of the states in the Mideast Marketing Area, Pennsylvania has the lowest spread of weighted average hauling distances at 32 miles (Kentucky excluded).

As anticipated, the weighted average hauling distance usually remained steady as producer deliveries increased. Once the one million pound threshold was reached the weighted average distance traveled generally increased significantly. The one million to two million pound range and the more than two million pound range are significant because they capture producers producing at least a tanker load per day (48,000 pounds).

WEIGHTED AVERAGE MILEAGE RATE BY STATE AND DELIVERY POUNDS

April 2007

Producer Size	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	Wisconsin	West Virginia	**Simple Average** 1/
					$ per cwt per mile						
less than 60,000	$ 0.0151	$ 0.0114	$ 0.0317	$ 0.0096	$ 0.0079	$ 0.0077	$ 0.0126	$ 0.0119	$ 0.0076	$ 0.0154	**$ 0.0131**
60,000 to 90,000	0.0153	0.0107	0.0252	0.0088	0.0070	0.0093	0.0115	0.0116	0.0048	0.0110	**0.0115**
90,000 to 125,000		0.0114	R	0.0077	0.0068	0.0065	0.0113	0.0107	0.0045	0.0084	**0.0084**
125,000 to 190,000	0.0123	0.0095	R	0.0113	0.0057	0.0059	0.0089	0.0099	0.0034	0.0089	**0.0084**
190,000 to 250,000		0.0096			0.0054	0.0072	0.0086	0.0105	0.0030	0.0121	**0.0080**
250,000 to 500,000		0.0083	R	R	0.0060	0.0084	0.0084	0.0091	0.0028	0.0061	**0.0070**
500,000 to 1 million		0.0062			0.0050	0.0070	0.0066	0.0065	0.0025	R	**0.0056**
1 million to 2 million		0.0024			0.0036	0.0087	0.0028	R	R		**0.0044**
more than 2 million		0.0018			0.0017	R	0.0017				**0.0017**
Simple Average	**$ 0.0142**	**$ 0.0079**	**$ 0.0284**	**$ 0.0094**	**$ 0.0055**	**$ 0.0076**	**$ 0.0080**	**$ 0.0100**	**$ 0.0041**	**$ 0.0103**	

R: Restricted

TABLE 7.3-Weighted average mileage rate by state and delivery pounds

When the weighted average mileage rate factor was calculated by subgroup it was discovered that mileage rate factors vary considerably by percentile group within each state. Producers in Ohio and Michigan who have deliveries greater than two million pounds have a weighted average mileage rate of $0.0017 per cwt per mile. On the other hand, producers in Kentucky with deliveries less than 60,000 pounds have a weighted average mileage rate factor of $0.0317 per cwt per mile.

When analyzing the mileage rate factors by subgroup, it is interesting to note that for the most part producers who have deliveries below the one million pound threshold have a mileage rate factor greater than the market weighted average. The only states to go against this trend are New York and Wisconsin. In fact, the only producers in Wisconsin who have a mileage rate factor above the market weighted average are producers delivering less than 60,000 pounds.

The disparity among homogenously sized producers from state to state is likely due to market conditions within each state. Likely factors include: state regulations, milk quality, tolls, distance to the Class I market, and the number of surrounding producers.

8. REGRESSION ANALYSIS

OLS regression analysis was used to determine if there was a linear relationship between hauling charges and the production volume, delivery distance, and the quantity of surrounding producers.

Using the data population several models were constructed to test the relationship of the aforementioned factors.

The concepts of the models were:

1. Single-independent variable model of hauling charge as a function of delivery pounds
2. Single-independent variable model of hauling charge as a function of delivery distance
3. Hauling charge as a function of delivery pounds and distance traveled
4. Hauling charge per cwt as a function of delivery pounds, distance traveled and producer cluster
5. Hauling charge as a function of delivery pounds, distance traveled and producer cluster

Hauling charge *(HC)* is the dependent variable in all models. Model 8.7 measures the hauling charges per cwt *(HR)*.

Delivery Pounds *(P)* is a quantitative variable; as delivery pounds increase, the observed hauling charge should increase. The estimated coefficient for delivery pounds should be positive (8.2), holding all else constant. It is expected that for the estimator measuring hauling charges per cwt the coefficient should be negative – resulting in a hypothesis similar to example 8.1.

(8.1)
$$H_0 : \beta_1 \geq 0$$
$$H_A : \beta_1 < 0$$

Distance traveled *(D)* is a quantitative variable; as delivery distance increases, the observed hauling charge should increase. The estimated coefficient for delivery distance should be positive, holding all else constant. Example 8.2 represents the hypothesis test for delivery pounds and delivery distance.

(8.2)
$$H_0 : \beta_1 \leq 0$$
$$H_A : \beta_1 > 0$$

Producer cluster *(C)* is a quantitative variable used to determine the amount of competition within each county. As producer count per county increases, the observed hauling charge should decrease. The estimated coefficient for cluster should be negative, holding all else constant.

(8.3)
$$H_0 : \beta_1 \geq 0$$
$$H_A : \beta_1 < 0$$

Examples 8.4 through 8.8 describe the models used in this analysis.

(8.4) $$(HC)_i = \beta_0 + \beta_1(P)_i + \in_i$$

(8.5) $$(HC)_i = \beta_0 + \beta_1(D)_i + \in_i$$

(8.6) $$(HC)_i = \beta_0 + \beta_1(D)_i + \beta_2(P)_i + \in_i$$

(8.7) $$(HR)_i = \beta_0 + \beta_1(D)_i + \beta_2(P)_i + \beta_3(C)_i + \in_i$$

(8.8) $$(HC)_i = \beta_0 + \beta_1(D)_i + \beta_2(P)_i + \beta_3(C)_i + \in_i$$

In all five models, the appropriately calculated t-values were greater in absolute value than the critical t-values; therefore the null hypotheses were rejected (Refer to examples 8.1 through 8.3 for the one-sided hypotheses tests).

Results of the regressions indicate that the hauling charge is in fact influenced by the abovementioned variables. The observed $\overline{R}^2$ for each estimator suggested that even though hauling charges are influenced by the independent variables such as delivery pounds, there are additional factors not captured in this data population that may have a greater impact on hauling charges. The effect of the additional factors not captured can be measured by subtracting the estimated values from the true values. Analysis of the error term can indicate the presence of underlying trends and possibly lead to the inclusion of additional variables. For this analysis, no attempt was made to analyze the error terms.

Figure 8.1 displays the predicted and actual hauling charges as a function of pounds, delivery distance and producer cluster. Figure 8.1 indicates that the regression estimator fits the data rather accurately. As previously mentioned, it is expected that in addition to pounds, delivery distance, and producer cluster the hauling charge is dependent on other variables not included in the estimator. Variables not captured could include: milk quality, tolls, state regulations, labor costs, and geography. The scatter plot represented in figure 8.8 has been drilled down to show the correlation between hauling charge and the aforementioned variables for random producers delivering less than 500,000 pounds.

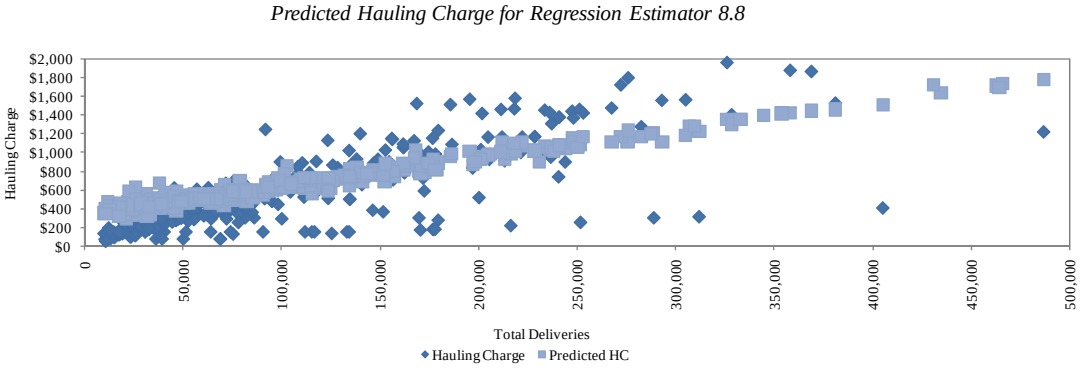


FIGURE 8.1-Regression estimator 8.8

Refer to examples 8.9 through 8.13 for the regression equations, including the calculated coefficients.

Example 8.9 was generated to determine how hauling charges were impacted by delivery volume. In example 8.9, the estimated coefficients identify a constant of $337.00 with an increase in hauling charges of 0.003 cents per pound delivered, holding all else constant.

(8.9) $$(HC)_i = 337.00 + 0.003(P)_i$$

t	=	43.52	156.74
$\bar{R}^2$	=	0.806	

Example 8.10 was generated to determine how hauling charges per cwt were impacted by delivery distance. In example 8.10, the estimated coefficients identify a constant of $625.34 with an increase in hauling charges of $3.25 per mile of delivery distance, holding all else constant.

(8.10) $$(HC)_i = 625.34 + 3.25(D)_i$$

t	=	25.64	12.08
$\bar{R}^2$	=	0.024	

Example 8.11 was generated to determine how hauling charges were impacted by delivery distance and pounds delivered. In example 8.11, the estimated coefficients identify a constant of $295.88 with an increase in hauling charges of $0.629 for every mile of delivery distance and an increase in hauling charges of $0.003 per pound delivered, holding all else constant.

(8.11) $$(HC)_i = 295.88 + 0.629(D)_i + 0.003(P)_i$$

t	=	26.74	5.19	154.812
$\bar{R}^2$	=	0.807		

Example 8.12 was generated to determine how hauling charges per cwt were impacted by delivery distance, pounds delivered and producer cluster. In example 8.12, the estimated coefficients identify a constant of $0.646 cents with an increase in hauling charges per cwt of $0.001 cents for every mile of delivery distance; a decrease in hauling charges per cwt of $0.019 per one hundred thousand pounds delivered; and a decrease in hauling charges per cwt of $0.001 per producer in the county, holding all else constant. The overall fit for this estimator is very poor, as indicated by the $\bar{R}^2$.

(8.12) $$(HR)_i = 0.646 + 0.001(D)_i - \left(\frac{0.01901}{100{,}000}\right)(P)_i - 0.001(C)_i$$

t	=	101.13	10.29	-22.93	-11.91
$\bar{R}^2$	=	0.110			

Example 8.13 was generated to determine how hauling charges were impacted by delivery distance, pounds delivered and producer cluster. In example 8.13, the estimated coefficients identify a constant of $335.19 dollars with an increase in hauling charges of $0.588 dollars for every mile of delivery distance; a increase in hauling charges of $0.003 dollars per pound delivered; and a decrease in hauling charges of $0.594 dollars per additional producer, holding all else constant.

(8.13) $$(HC)_i = 335.19 + 0.588(D)_i + 0.003(P)_i - 0.594(C)_i$$

t	=	24.46	4.85	155.11	-4.84
$\bar{R}^2$	=	0.807			

The difference in coefficient signs for delivery pounds between examples 8.12 and 8.13 can cause some confusion as to the real impact of delivery pounds. Since hauling per cwt is a ratio of hauling charges to delivery pounds it is possible for the hauling charge per cwt to decrease as delivery pounds increase ***and*** for the hauling charge to increase as delivery pounds increase.

9. CONCLUSION

This study determined the weighted average hauling charges per cwt, the weighted average hauling distance, and the weighted average mileage rate factor by state and delivery volume for April 2007. Additionally, the statistical relationship of the hauling charges as a function of the production volume, delivery distance, and the number of surrounding producers was quantified. Results of this study indicate that diminishing marginal costs pertaining to hauling exists in dairy farming.

The weighted average hauling distance for the producers included in this study was 86.75 miles, the weighted average hauling charge was 45.87 cents per cwt, and the weighted average mileage rate factor was $0.00529 per cwt per mile – which equates to a weighted average base rate of $2.54 per loaded mile.

The data suggests that hauling milk in some states is more expensive than other states. The price variations are likely due to differences at the state level such as taxes, tolls, state regulations, weight restrictions, and geography among others. Hauling charges are likely also significantly dependent on competition for milk supplies. Handlers and cooperative may use hauling charges as a negotiating tool when attempting to procure

new or retain existing milk supplies. The incorporation of more variables to capture the effects of taxes and regulations, among other things, would provide more insight into the relationship between state and hauling charges.

When delivery volume is considered, it is appropriate that larger producers have a lower hauling charge per cwt relative to smaller producers. Since hauling per cwt is a ratio of hauling charges to delivery pounds it is possible for the hauling charge to increase while simultaneously decreasing the charge per cwt. Furthermore, it is likely that as delivery volume increases (due to producer size) fewer stops are needed to reach tanker capacity. By reducing the number of stops needed, the associated transportation costs should decrease – making the per cwt comparison seem even more unbalanced. On the whole, the hauling charges increase as delivery pounds increase. Diminishing marginal costs explains the relationship between the hauling charge and the hauling charge per cwt.

Furthermore, it is appropriate that the larger farms have a higher weighted average delivery distance. As the amount of milk manufactured in a particular region increases, the hauling distance must increase because as local demand is met, dairy farms and/or cooperatives would have to look to a broader area to sell additional product. Additionally, as Class I markets use up the supply of milk within their milk shed, the plants must look farther to meet local demand. Large producers have the capability of meeting those needs. In addition, as indicated by SCC, larger producers on average have higher quality milk than their smaller competitors. The higher quality milk is likely more attractive to distant Class I markets.

While transportation costs continue to be an important concern throughout the industry, what is apparent, is that producers, cooperatives, and handlers all share in the cost of moving raw materials and finished goods along the supply chain.

10. FUTURE STUDIES

This analysis was the first of this type conducted by this office concerning transportation data.

Areas of interest for future research in this transportation analysis, or for separate analyses would include:

- Analyzing transportation statistics over an extended period of time.
- Analyze the price surface to determine if changes in the zone differentials have a significant impact on hauling charges.

- Analyze hauling charges in other markets to determine if the presence of, or changes made to transportation credit language significantly impacts rates assessed to producers.
- Incorporate hauling charges paid by manufacturing facilities.
- Incorporate variables to measure the presence of a supply or pool distributing plant.
- Incorporate milk quality and component measurements into the transportation analysis.
- Incorporate a variable to measure the number of farm pickups for each producer.

For questions or more information concerning this analysis, please direct questions to: John Newton, Marketing Specialist, Federal Order 33.

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APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Illinois	Grundy	R	R
	Iroquois	1.01	86.04
	Kankakee	0.74	60.32
	Will	0.69	40.69
Indiana	Adams	0.44	59.62
	Allen	0.61	82.30
	Bartholomew	R	R
	Boone	R	R
	Carroll	R	R
	Cass	0.57	72.03
	Clinton	R	R
	Decatur	0.89	177.25
	DeKalb	0.69	58.66
	Delaware	0.56	19.00
	Elkhart	0.56	54.80
	Fayette	R	R
	Fountain	R	R
	Fulton	0.58	37.74
	Grant	0.74	31.00
	Hamilton	R	R
	Hancock	R	R
	Hendricks	0.90	67.00
	Henry	0.30	110.28
	Howard	0.81	50.18
	Huntington	0.41	128.40
	Jackson	0.79	81.31
	Jasper	R	R
	Jay	0.54	76.91
	Jefferson	0.76	116.29
	Johnson	0.91	182.33
	Kosciusko	0.54	39.82
	LaGrange	0.63	74.17
	Lake	0.63	34.67
	LaPorte	0.56	123.34
	Madison	R	R
	Marshall	0.49	105.26
	Miami	0.65	60.11
	Montgomery	R	R
	Noble	0.51	111.87
	Owen	R	R
	Parke	0.87	156.99
	Porter	0.65	110.85
	Pulaski	0.53	72.15
	Randolph	0.26	150.27
	Rush	0.72	78.11
	Shelby	0.87	114.27
	St. Joseph	0.45	48.34
	Starke	R	R
	Steuben	0.63	82.21

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Indiana (cont.)	Tippecanoe	R	R
	Tipton	R	R
	Union	0.74	118.62
	Vigo	R	R
	Wabash	0.64	63.68
	Wayne	0.70	37.62
	Wells	0.57	102.95
	White	0.60	74.14
	Whitley	0.65	36.00
Kentucky	Bracken	0.90	52.98
	Mason	0.80	47.00
Maryland	Allegany	R	R
	Garrett	0.75	88.74
Michigan	Alcona	0.60	201.92
	Alger	0.80	44.00
	Allegan	0.43	71.85
	Alpena	0.53	219.93
	Antrim	0.74	131.72
	Arenac	0.47	147.52
	Barry	0.38	84.96
	Bay	0.51	103.98
	Berrien	0.40	92.05
	Branch	0.47	121.26
	Calhoun	0.49	82.75
	Cass	0.46	29.83
	Charlevoix	0.64	119.46
	Cheboygan	0.78	144.85
	Chippewa	0.77	221.25
	Clare	0.47	87.05
	Clinton	0.31	58.57
	Delta	0.64	68.00
	Dickinson	0.30	75.62
	Eaton	0.43	63.44
	Emmet	0.82	148.94
	Genesee	0.47	56.86
	Gladwin	0.54	106.84
	Grand Traverse	0.76	87.81
	Gratiot	0.23	139.19
	Hillsdale	0.52	93.88
	Huron	0.32	158.37
	Ingham	0.53	104.73
	Ionia	0.42	44.20
	Iosco	0.56	151.82
	Isabella	0.45	63.12
	Jackson	0.50	116.65
	Kalamazoo	0.49	23.23
	Kent	0.43	28.29

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Michigan (cont.)	Lake	0.57	31.00
	Lapeer	0.44	58.08
	Leelanau	0.82	96.45
	Lenawee	0.26	166.80
	Livingston	0.44	106.82
	Mackinac	0.60	172.08
	Macomb	0.64	44.08
	Manistee	R	R
	Mason	0.68	65.79
	Mecosta	0.47	64.97
	Menominee	0.24	47.29
	Midland	0.42	69.86
	Missaukee	0.52	136.22
	Monroe	0.36	44.17
	Montcalm	0.45	108.31
	Montmorency	0.71	174.42
	Muskegon	0.47	13.21
	Newaygo	0.49	55.76
	Oakland	R	R
	Oceana	0.56	49.01
	Ogemaw	0.52	147.78
	Osceola	0.53	32.93
	Oscoda	0.67	124.38
	Ottawa	0.39	43.44
	Presque Isle	0.69	218.78
	Saginaw	0.50	130.89
	Sanilac	0.41	166.24
	Shiawassee	0.48	76.54
	St. Clair	0.47	85.99
	St. Joseph	0.33	141.76
	Tuscola	0.39	116.25
	Van Buren	0.54	46.55
	Washtenaw	0.57	37.34
	Wexford	0.57	47.01
New York	Allegany	0.51	4.00
	Cattaraugus	0.56	76.56
	Chautauqua	0.59	95.62
	Cortland	R	R
	Erie	0.58	18.97
	Madison	0.63	38.02
	Monroe	R	R
	Ontario	0.74	143.46
	Schuyler	R	R
	St. Lawrence	R	R
	Steuben	0.57	10.00
	Wyoming	0.50	63.92

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Ohio	Adams	0.95	110.34
	Allen	0.63	129.16
	Ashland	0.55	71.45
	Ashtabula	0.56	43.81
	Athens	0.71	57.98
	Auglaize	0.53	55.34
	Belmont	0.76	61.59
	Brown	1.18	141.31
	Butler	R	R
	Carroll	0.69	54.18
	Champaign	0.60	87.76
	Clark	0.30	158.55
	Clermont	R	R
	Columbiana	0.60	71.73
	Coshocton	0.62	28.61
	Crawford	0.56	86.37
	Darke	0.49	88.97
	Defiance	0.32	79.05
	Delaware	0.63	46.65
	Fairfield	0.67	36.54
	Fayette	R	R
	Franklin	0.68	88.98
	Fulton	0.39	140.13
	Gallia	0.64	63.60
	Geauga	0.62	28.15
	Greene	0.88	113.37
	Guernsey	0.73	45.02
	Hancock	0.51	65.84
	Hardin	0.34	93.81
	Harrison	0.72	51.81
	Henry	0.26	162.23
	Highland	0.95	142.75
	Holmes	0.53	29.32
	Huron	0.66	72.55
	Jackson	0.90	90.38
	Jefferson	0.68	36.63
	Knox	0.58	61.26
	Lawrence	0.80	71.00
	Licking	0.63	42.99
	Logan	0.59	82.21
	Lorain	0.64	34.21
	Madison	0.35	170.91
	Mahoning	0.51	51.74
	Marion	0.64	61.00
	Medina	0.47	47.79
	Meigs	0.72	54.05
	Mercer	0.46	80.69
	Miami	0.56	49.27
	Monroe	0.72	52.68
	Montgomery	0.67	68.86

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Ohio (cont.)	Morgan	0.60	35.00
	Morrow	0.67	70.85
	Muskingum	0.72	46.10
	Ottawa	R	R
	Paulding	0.26	182.62
	Perry	R	R
	Pickaway	0.43	129.74
	Pike	0.73	122.97
	Portage	0.66	28.97
	Preble	0.69	63.63
	Putnam	0.41	142.91
	Richland	0.69	61.90
	Ross	0.58	111.75
	Sandusky	0.69	20.48
	Scioto	0.68	133.00
	Seneca	0.65	68.08
	Shelby	0.49	52.98
	Stark	0.48	41.89
	Summit	R	R
	Trumbull	0.63	26.93
	Tuscarawas	0.44	49.60
	Union	0.61	50.77
	Van Wert	0.31	207.67
	Vinton	R	R
	Warren	R	R
	Washington	0.51	2.40
	Wayne	0.40	39.77
	Williams	0.33	92.17
	Wood	0.28	132.95
	Wyandot	0.71	79.26
Pennsylvania	Allegheny	R	R
	Armstrong	0.71	85.24
	Beaver	0.70	54.21
	Bedford	R	R
	Butler	0.70	73.11
	Cambria	0.91	101.91
	Cameron	R	R
	Centre	0.63	101.07
	Clarion	0.79	94.77
	Clearfield	0.94	139.42
	Crawford	0.68	53.70
	Elk	1.09	105.32
	Erie	0.65	56.70
	Fayette	0.74	29.89
	Forest	R	R
	Greene	0.92	53.42
	Indiana	0.81	103.08
	Jefferson	0.79	63.53
	Lawrence	0.66	53.16

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Pennsylvania (cont.)	Lycoming	0.79	59.67
	McKean	R	R
	Mercer	0.74	23.74
	Somerset	0.71	88.32
	Union	0.58	51.43
	Venango	0.82	43.54
	Warren	0.61	110.34
	Washington	0.75	38.01
	Westmoreland	0.76	70.66
West Virginia	Barbour	1.29	136.00
	Brooke	0.70	20.00
	Grant	R	R
	Hardy	R	R
	Harrison	R	R
	Jackson	0.69	51.12
	Marshall	0.96	17.00
	Mason	0.63	60.12
	Monongalia	0.85	143.75
	Ohio	0.78	5.00
	Preston	0.66	106.75
	Randolph	R	R
	Roane	R	R
	Taylor	1.33	141.00
	Tyler	R	R
	Wetzel	R	R
	Wirt	R	R
	Wood	R	R
Wisconsin	Adams	R	R
	Calumet	0.21	26.48
	Clark	0.16	75.00
	Columbia	0.12	53.63
	Crawford	0.20	55.85
	Dane	0.17	61.81
	Florence	0.67	86.42
	Grant	0.21	44.55
	Green	R	R
	Iowa	0.18	37.99
	Juneau	0.15	32.17
	Lafayette	R	R
	Langlade	0.15	34.00
	Lincoln	0.22	196.00
	Manitowoc	0.25	129.31
	Marathon	0.19	10.00
	Marinette	0.11	23.05
	Marquette	0.20	37.60
	Oconto	0.31	56.65
	Outagamie	0.15	6.18
	Portage	0.25	115.57

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA HAULING CHARGES AND HAULING DISTANCE BY STATE AND COUNTY FOR APRIL 2007

State	County	Weighted Haul Rate	Weighted Haul Distance
Wisconsin (cont.)	Richland	0.15	3.36
	Sauk	0.15	27.21
	Shawano	0.17	56.93
	St. Croix	R	R
	Vernon	0.14	33.58
	Waukesha	R	R
	Waupaca	0.18	68.67
	Waushara	0.20	54.52
	Winnebago	0.11	18.43
	Wood	0.14	57.00

R: Restricted

APPENDIX B

SPSS OUTPUT

HAULING CHARGE AS A FUNCTION OF DELIVERY POUNDS

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SumOfPounds[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: SumOfHauling Rate

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898[a]	.806	.806	539.93514

a. Predictors: (Constant), SumOfPounds

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.16E+09	1	7162542593	24568.805	.000[a]
	Residual	1.73E+09	5920	291529.954		
	Total	8.89E+09	5921			

a. Predictors: (Constant), SumOfPounds

b. Dependent Variable: SumOfHauling Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	337.004	7.744		43.521	.000
	SumOfPounds	.003	.000	.898	156.744	.000

a. Dependent Variable: SumOfHauling Rate

HAULING CHARGE AS A FUNCTION OF DELIVERY DISTANCE

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hauling Data.Weighted Distance[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: SumOfHauling Rate

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.155[a]	.024	.024	1210.49068

a. Predictors: (Constant), Hauling Data.Weighted Distance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.14E+08	1	213896754.8	145.976	.000[a]
	Residual	8.67E+09	5920	1465287.697		
	Total	8.89E+09	5921			

a. Predictors: (Constant), Hauling Data.Weighted Distance

b. Dependent Variable: SumOfHauling Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	625.343	24.389		25.640	.000
	Hauling Data.Weighted Distance	3.253	.269	.155	12.082	.000

a. Dependent Variable: SumOfHauling Rate

HAULING CHARGE AS A FUNCTION OF DELIVERY POUNDS AND DISTANCE

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SumOfPounds, Hauling Data.Weighted Distance[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: SumOfHauling Rate

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898[a]	.807	.807	538.75425

a. Predictors: (Constant), SumOfPounds, Hauling Data.Weighted Distance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.17E+09	2	3585186923	12351.804	.000[a]
	Residual	1.72E+09	5919	290256.137		
	Total	8.89E+09	5921			

a. Predictors: (Constant), SumOfPounds, Hauling Data.Weighted Distance

b. Dependent Variable: SumOfHauling Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	295.887	11.062		26.749	.000
	Hauling Data.Weighted Distance	.629	.121	.030	5.194	.000
	SumOfPounds	.003	.000	.893	154.812	.000

a. Dependent Variable: SumOfHauling Rate

HAULING CHARGE AS A FUNCTION OF DELIVERY POUNDS AND CLUSTER

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	CountOfProducer ID, SumOfPounds[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: SumOfHauling Rate

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898[a]	.807	.807	538.76095

a. Predictors: (Constant), CountOfProducer ID, SumOfPounds

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.17E+09	2	3585165551	12351.423	.000[a]
	Residual	1.72E+09	5919	290263.359		
	Total	8.89E+09	5921			

a. Predictors: (Constant), CountOfProducer ID, SumOfPounds

b. Dependent Variable: SumOfHauling Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	376.205	10.815		34.784	.000
	SumOfPounds	.003	.000	.897	157.039	.000
	CountOfProducer ID	-.635	.123	-.030	-5.180	.000

a. Dependent Variable: SumOfHauling Rate

HAULING CHARGE AS A FUNCTION OF DELIVERY POUNDS AND DISTANCE AND CLUSTER

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hauling Data.Weighted Distance, CountOfProducer ID, SumOfPounds[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: SumOfHauling Rate

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.899[a]	.807	.807	537.73528

a. Predictors: (Constant), Hauling Data.Weighted Distance, CountOfProducer ID, SumOfPounds

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.18E+09	3	2392385201	8273.591	.000[a]
	Residual	1.71E+09	5918	289159.230		
	Total	8.89E+09	5921			

a. Predictors: (Constant), Hauling Data.Weighted Distance, CountOfProducer ID, SumOfPounds

b. Dependent Variable: SumOfHauling Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	335.196	13.703		24.461	.000
	SumOfPounds	.003	.000	.894	155.113	.000
	CountOfProducer ID	-.594	.123	-.028	-4.843	.000
	Hauling Data.Weighted Distance	.588	.121	.028	4.858	.000

a. Dependent Variable: SumOfHauling Rate

HAULING CHARGE PER CWT AS A FUNCTION OF DELIVERY POUNDS

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SumOfPounds[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Hauling per cwt

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.265[a]	.070	.070	.256

a. Predictors: (Constant), SumOfPounds

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.367	1	29.367	446.804	.000[a]
	Residual	389.097	5920	.066		
	Total	418.464	5921			

a. Predictors: (Constant), SumOfPounds

b. Dependent Variable: Hauling per cwt

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.642	.004		174.721	.000
	SumOfPounds	-1.77E-07	.000	-.265	-21.138	.000

a. Dependent Variable: Hauling per cwt

HAULING CHARGE PER CWT AS A FUNCTION OF DELIVERY DISTANCE

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hauling Data.Weighted Distance[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Hauling per cwt

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.098[a]	.010	.009	.265

a. Predictors: (Constant), Hauling Data.Weighted Distance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.031	1	4.031	57.575	.000[a]
	Residual	414.433	5920	.070		
	Total	418.464	5921			

a. Predictors: (Constant), Hauling Data.Weighted Distance

b. Dependent Variable: Hauling per cwt

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.579	.005		108.538	.000
	Hauling Data.Weighted Distance	.000	.000	.098	7.588	.000

a. Dependent Variable: Hauling per cwt

HAULING CHARGE PER CWT AS A FUNCTION OF DELIVERY POUNDS AND DISTANCE

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hauling Data.Weighted Distance, SumOfPounds[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Hauling per cwt

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.298[a]	.089	.089	.254

a. Predictors: (Constant), Hauling Data.Weighted Distance, SumOfPounds

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.174	2	18.587	288.540	.000[a]
	Residual	381.289	5919	.064		
	Total	418.464	5921			

a. Predictors: (Constant), Hauling Data.Weighted Distance, SumOfPounds

b. Dependent Variable: Hauling per cwt

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.601	.005		115.398	.000
	SumOfPounds	-1.90E-07	.000	-.284	-22.683	.000
	Hauling Data.Weighted Distance	.001	.000	.138	11.009	.000

a. Dependent Variable: Hauling per cwt

HAULING CHARGE PER CWT AS A FUNCTION OF DELIVERY POUNDS AND DISTANCE AND CLUSTER

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	CountOfProducer ID, SumOfPounds, Hauling Data.Weighted Distance[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Hauling per cwt

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.332[a]	.110	.110	.251

a. Predictors: (Constant), CountOfProducer ID, SumOfPounds, Hauling Data.Weighted Distance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.104	3	15.368	244.250	.000[a]
	Residual	372.359	5918	.063		
	Total	418.464	5921			

a. Predictors: (Constant), CountOfProducer ID, SumOfPounds, Hauling Data.Weighted Distance

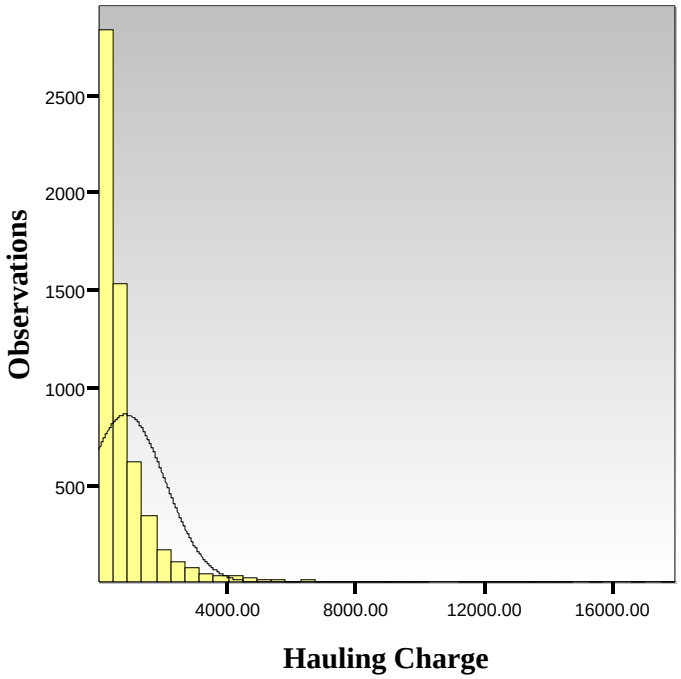
b. Dependent Variable: Hauling per cwt

Coefficients[a]

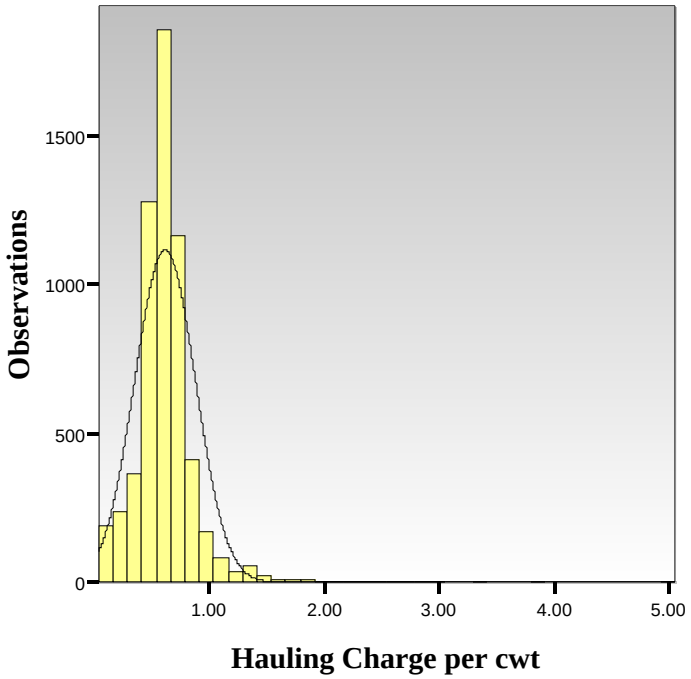
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.646	.006		101.133	.000
	SumOfPounds	-1.90E-07	.000	-.284	-22.932	.000
	Hauling Data.Weighted Distance	.001	.000	.128	10.292	.000
	CountOfProducer ID	-.001	.000	-.146	-11.913	.000

a. Dependent Variable: Hauling per cwt

FREQUENCY DISTRIBUTION OF HAULING CHARGES



FREQUENCY DISTRIBUTION OF HAULING CHARGE PER CWT



FREQUENCY DISTRIBUTION OF WEIGHTED DISTANCE