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Federal Order 33

TRANSPORTATION ANALYSIS FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST ORDER

MAY 2008

Staff Paper
10-02

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Transportation Analysis for Producer Milk Associated With the Mideast Order May 2008

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This staff paper details the hauling assessments paid by producers, and the delivery distance to the first delivery point, of milk marketed by producers associated with the Mideast Marketing Area, Federal Order 33, for May 2008. The results show that hauling assessments vary significantly due to multiple factors including delivery volume, delivery distance and competitive groups of producers and handlers. Large farms pooled on the Mideast Marketing Area face diminishing marginal costs related to transportation assessments.

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TRANSPORTATION ANALYSIS FOR PRODUCER MILK ASSOCIATED WITH THE MIDEAST ORDER MAY 2008

By John Newton

Introduction

This study analyzes the hauling assessments paid by milk producers and the delivery distance to the first delivery point of milk marketed by producers associated with the Mideast Marketing Area, Federal Order 33, for May 2008.[1]

The hauling assessments and delivery distances were analyzed to determine the weighted average hauling assessment, the weighted average hauling assessment per hundredweight (cwt), the weighted average delivery distance, the weighted average mileage rate factor (MRF) and the weighted average percentage of hauling assessments as a function of milk value (POMV). Additionally, the transportation variables were analyzed to determine variations by production region (state) and producer size. An effort was also made to identify a statistical relationship among the hauling assessments as a function of delivery volume, delivery distance, the number of surrounding producers and the number of surrounding plants (pool and non pool) among other variables.

In May 2008, there were a total of 7,483 producers who were associated with the market; hauling information was analyzed for 5,931 of these producers. The geographical region encompassed in this population includes: Ohio, Michigan, Indiana, West Virginia, Pennsylvania, Kentucky, Illinois, Iowa, Maryland, New York and Wisconsin.

Background

This staff paper builds on previous work performed by Mideast staff. In April 2008, the Mideast Market Administrator's Office released staff paper 08-02 which included hauling assessment per cwt, delivery distance and mileage rate factor statistics for April 2007. Results of the April 2007 analysis indicated that hauling assessments were subject to producer size, distance to the receiving plant, and competition for milk supplies.

Variations of this study are performed by Dairy Programs staff in both the Upper Midwest and Pacific Northwest Orders for producers associated with those marketing areas.

At the time of this analysis the staff paper published by the Pacific Northwest indicated that the weighted average hauling assessment was 56.64 cents per cwt for May 2007. Similarly, Upper Midwest research indicated that the weighted average hauling

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The author would like to thank David Walker, Paul Huber, Sharon Uther and William Pollock for their comments on earlier versions of this paper and Ron Gjurkovitsch for his assistance with data collection.

[1] Hauling assessments represent the transportation costs incurred by the milk producer when transporting milk from the farm to the processor. Hauling assessments may not represent the total costs of milk delivery from the farm, as hauling assessments reflected on producer payrolls are often subsidized.

assessment was 27.74 cents per cwt for May 2008.[2]

In addition to the staff papers published by the Upper Midwest and Pacific Northwest, the New York Department of Agriculture and the California Department of Food and Agriculture conduct similar hauling analyses.

The Milk Hauling Study conducted by the New York Department of Agriculture (2008) indicated that milk hauling costs in New York are partially determined by the number of farm pickups per day and the delivery distance. Annual average hauling assessments ranged from 50 to 60 cents per cwt from 1991 through 2008. More recent information, calculated using January through March 2009 data, indicated that producer hauling and stop charges averaged 58 cents per cwt in the New York marketing area.

The ranch-to-plant portion of the California milk hauling study (2009) indicated that hauling assessments per cwt averaged 44.53 cents per cwt in March 2008 and 44.73 cents per cwt in October 2008. The California hauling study is based on hauler invoices supplied by the dairy cooperatives operating in that market. The per cwt assessment calculated included stop charges, surcharges and weight charges paid by producers at the ranch.

Comparisons made to hauling and stop charge assessments in other marketing areas/states do not indicate a difference in the actual milk hauling costs; rather, they serve only to denote the differences in assessments paid by producers in each marketing area/state.

[2] The geographical region represented in the 2007 analysis conducted by the Pacific Northwest office includes California, Idaho, Oregon, Utah and Washington. The geographical region represented in the 2008 analysis conducted by the Upper Midwest office includes Illinois, Iowa, Michigan, Minnesota, North Dakota, South Dakota and Wisconsin.

Related Studies

Over the years economists have conducted analyses relating to hauling costs and bulk milk assembly costs. Jacobson and Fairchild (1969) defined the hauling assessments as a linear function of the volume of milk transported, where the intercept represented the stop charge paid by the producer and costs increased uniformly per cwt delivered. This analysis estimated that transportation costs were linear and that average costs and marginal costs were equal.

In 1993 Gallagher, Thraen and Schnitkey estimated a translogarithmic total cost function using survey data from Ohio producers and found that total cost is substantially lower for delivery volume output relative to delivery distance output. Gallagher et al. found that cost functions based strictly on delivery volume or on volume per mile driven would substantially over-charge large volume producers and under-charge small volume producers – representing a situation where large producers would subsidize the transportation of their smaller counterparts. By arguing that a majority of the costs of transporting milk are incurred prior to and during milk pickup, Gallagher et al. suggested that the milk assembly process, not transportation, was the most expensive part of milk transportation; thus, stop charges were significantly undervalued and volume assessments were overvalued.

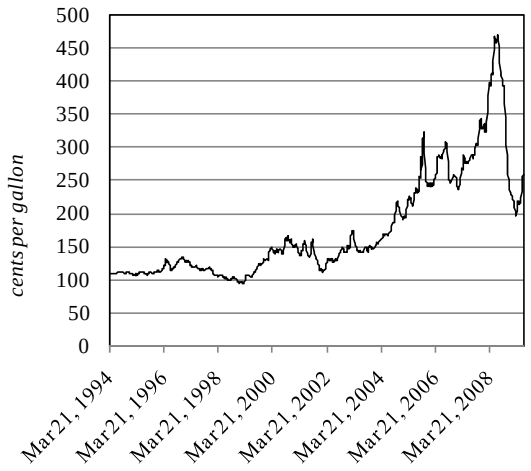
In 1996, a report issued by the Agricultural, Resource and Managerial Economics Department at Cornell University provided a detailed assessment of the milk hauling sector of the United States. In that publication Pratt and Guiguet concluded that the structure of the hauling industry reflected not only technological changes in the industry, but also industry consolidation where fewer and larger farms were serviced by fewer and larger hauling firms.

Several problem areas that constrain hauling efficiency were also identified. Such constraints include but are not limited to: government limitations on load size and labor hours, limitations related to haulers "owning" their routes, road conditions, milk co-mingling, route overlapping and milk unloading and rinsing times. Due to the constraints identified as well as other hauling limitations such as unreliable daily processor demand, milk hauling continues to be an expensive component in the dairy product supply chain.

In a subsequent report examining the characteristics of milk assembly Erba along with Pratt, Wasserman and Alexander (1998) noted that milk hauling assessments were determined through negotiations based on factors such as route mileage, number of farm pickups, farm location and delivery point. Erba et al. noted, however, that when contracting a hauler for a milk route, producers may not choose the best available rate; instead choosing a hauler based on a hauler's performance, personal relationship, accuracy of milk weights, delivery time and sampling techniques.

Collectively, the results of the aforementioned studies indicate that while hauling assessments vary depending on factors such as delivery volume, route mileage, and farm pickups; hauling assessments also are subject to discrete factors such as the hauler-producer relationship.

Another factor influencing transportation costs is the price of fuel. Diesel prices represent only a fraction of the total transportation costs; but the volatility in diesel prices makes the costs of supplying milk very unpredictable. When fuel prices soared in 2006-2008 there was industry pressure to address diesel prices and their impact on milk transportation. Results of that pressure lead to industry hearings to adjust the Class I differential price surface in southeastern U.S. and implementation of a variable mileage rate factor for transportation credits in the Southeast and Appalachian orders.



Source: Energy Information Administration

Figure 1. Midwest (PADD II) Diesel Retail Price by All Sellers

Figure 1 displays the weekly average diesel rates 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).[3] PADD II most accurately represents the states included in the Mideast Marketing Area. Announced PADD I (Sub district IC) and PADD III are used to determine the variable mileage rate factor for the Appalachian, Southeast and Florida Orders.[4]

Volatile transportation costs and shifting supply and demand conditions make transporting milk very expensive. Producers, handlers, haulers and cooperatives all share in the costs of moving

[3] Published by the Energy Information Administration (www.eia.doe.gov)

[4] The variable mileage rate factor shifts in relation to fuel prices and determines the monthly payout per cwt for milk eligible to receive transportation credits in the Appalachian and Southeast Orders.

raw milk and finished goods along the supply chain through assessments, the class I differential price surface, surcharges, premiums and transportation credits. For the purpose of this study no attempt was made to analyze fuel surcharges, premiums, or transportation credits.

Data and Methodology

The data was collected from producer payrolls submitted by handlers and cooperatives to the Market Administrator's Office. As handlers and cooperatives generally submit their entire payrolls, the data not only includes producer milk pooled on the Mideast Order, 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 May 2008 over 250 million pounds were voluntarily de-pooled due to unusual price relationships.[5] For the purpose of this study, the hauling and delivery data associated with those producers with de-pooled milk was included. 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. Several of the cooperatives pooling on the Mideast Order do not submit their payrolls electronically. Data not submitted electronically was omitted from this analysis. As a result, there is a significant difference in the number of producers and delivery volume in this study and the number of producers and delivery volume as pooled on the Mideast Federal Order during May 2008.

Hauling assessments are identified as the hauling deductions shown on the producer payrolls submitted to the Market Administrator's Office. The hauling deductions represent the transportation costs incurred by the milk producer when transporting raw milk from the farm. Many of the observed assessments likely include stop charges incurred by the milk producer. Stop charges are a function of farm pickups and do not represent farm to plant transportation expenses. The hauling assessments appearing on the producer payrolls do not reflect the actual cost of milk transportation nor do they necessarily reflect the total costs of farm pickup and delivery to the plant. As observed by Freije (2007), hauling assessments reflected on producer payrolls often are subsidized to some extent.

For this study delivery 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. No attempt was made to account for milk reloads or to estimate milk assembly miles. Assembly miles are miles traveled to collect the raw milk, assembly miles plus the distance from the last farm pickup to the receiving plant would represent total delivery miles (Gallagher et al.).

The MRF was calculated by dividing the hauling assessments per cwt by the delivery distance. The MRF represents the per cwt per mile assessments paid by producers for transporting milk. For the purposes of this analysis weighted average MRFs are given by the equation:

(1)
$$m_i = 100\left(\frac{\sum_{i=1}^{n}\frac{y_i}{z_i}}{\sum_{i=1}^{n} x_i}\right);$$

where for producer *i*,
x = delivery pounds
y = hauling assessment
z = delivery distance

[5] In May 2008 the producer price differential announced at the Cuyahoga County Zone Rate of $2.00 cwt was $(0.65) cwt.

m = is the weighted average mileage rate factor. It is the opinion of this researcher that calculating the MRF for each producer provides a more accurate measurement of per cwt per mile hauling assessments.

The POMV (percent of milk value) is calculated by dividing the total hauling assessment per producer by the total value of farm milk at component tests. The total value of farm milk at component tests did not include authorized assignments or producer premiums.

The descriptive statistics detailed in this analysis include weighted average, mean, standard deviation and where applicable the minimum and maximum values observed in the data population. Weighted averages are given by the equation:

(2)

$$\bar{x} = \frac{p_1 x_1 + p_2 x_2 + \ldots + p_i x_i}{p_1 + p_2 + \ldots + p_i}$$

where for producer *i*

x = the hauling assessment or delivery distance

p = delivery volume

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.

The data population was also analyzed using Ordinary Least Squares (OLS) regression analysis. OLS was used to determine the hauling assessment as a function of delivery volume, delivery distance, quantity of surrounding producers and the quantity of surrounding plants (pool and non pool) among other variables.

Descriptive Statistics for May 2008

For May 2008, the hauling assessments assessed to producers were over six million dollars. For comparative purposes, the total hauling assessments assessed to producers in April 2007 was slightly over five million dollars. Table 1 includes transportation statistics for May 2008.

Table 1. Descriptive Statistics

Variable	May 2008	April 2007
Hauling Assessment ($)		
Weighted Average	4,332.92	3,205.74
Mean	1,019.42	850.53
SD	1,672.21	1,225.22
Max	45,431.98	
Min	15.77	
Hauling Assessment ($/cwt)		
Weighted Average	0.5032	0.4587
Mean	0.6909	0.6095
SD	0.3676	0.2659
Max	6.3142	
Min	0.0100	
Delivery Distance (miles)		
Weighted Average	88.4	86.8
Mean	68.0	69.2
SD	58.2	58.4
Max	413.7	
Min	0.7	
Mileage Rate Factor ($/cwt/mile)		
Weighted Average	0.01582	0.00529
Mean	0.02629	0.00880
SD	0.08219	0.00455
Max	2.82251	
Min	0.00005	
Percent of Milk Value (%)		
Weighted Average	2.81	*
Mean	3.79	*
SD	1.96	*
Max	32.85	
Min	0.06	

* Information unavailable.

The weighted average hauling assessment for the market was $4,332.92, which represented 2.81 percent of the farm milk value and a 35 percent increase from the April 2007 weighted average hauling assessment.

The weighted average hauling assessment per cwt was 50.32 cents, which represented a 10 percent increase from April 2007. The range of hauling assessments per

cwt within one standard deviation of the mean was 32.33 to 105.84 cents per cwt.[6]

The weighted average delivery distance was 88.4 miles, which represented a marginal increase from the April 2007 weighted average delivery distance of 86.8 miles. For May 2008, the range of delivery distances within one standard deviation of the mean was 9.8 to 126.2 miles.

The weighted average MRF was $0.01582 per cwt per mile.

The weighted average calculation puts comparatively less weight on producers with little delivery volume. Therefore, when comparing the weighted average and the mean for each category it becomes apparent that smaller producers tend to have lower hauling assessments, higher hauling assessments per cwt, shorter delivery distances, higher per cwt per mile hauling assessments, as well as a higher percent of milk value allocated to transportation expenses.

Transportation Analysis by State

For this section, transportation statistics were analyzed by the production region. Of the states included in this analysis, Ohio, Michigan, Indiana, West Virginia, Pennsylvania and Kentucky are states located or partially located within the Mideast Marketing Area.

Producer size varies dramatically throughout the region. Producer size is estimated using average delivery volume. Average delivery volume for producers located in Maryland was 70,090 pounds, while average delivery volume for producers located in Michigan was 298,495 pounds. Figure 2 details average delivery pounds by state for May 2008. Dark shaded areas denote states within the Mideast Marketing Area.

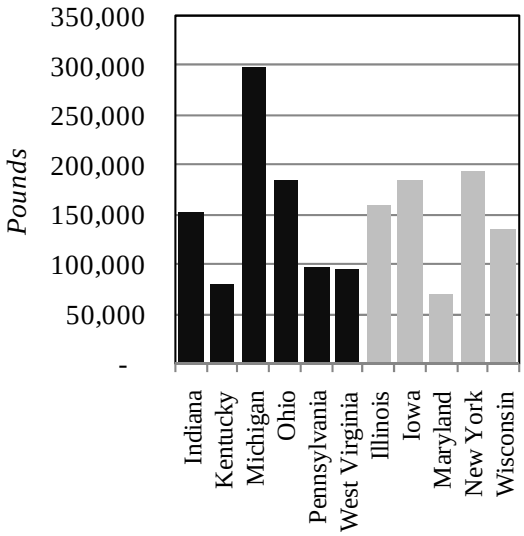


Figure 2. Average Deliveries by State for May 2008

Kentucky had the smallest portion of milk included in this analysis at 0.09 percent, while Michigan had the largest share of the market in this study at 47.73 percent. The states included in the Mideast Marketing Area represented 92.47 percent of the milk included in this analysis.

Of the states included in this study, Iowa had the lowest weighted average hauling assessment at $133.34, $4,199.58 less than the market weighted average. Michigan had the highest weighted average hauling assessment at $5,839.50, $1,506.58 more than the market weighted average. Michigan was the only state included in this analysis to have a weighted average hauling assessment greater than the market weighted average.

Weighted average hauling assessments per cwt ranged from $0.0674 for Iowa producers to $1.1608 for Maryland producers. However, Iowa and Maryland combined represented less than one percent of the milk included in this analysis.

[6] For a normal distribution, 68 percent of all observations are within one standard deviation of the mean.

Table 2. State Transportation Statistics

State	Total Delivery Pounds	Average Delivery Pounds	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Delivery Distance *(miles)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Indiana	152,043,699	152,808	3,013.47	0.5825	94.5	0.02594	3.24
Kentucky	1,125,434	80,388	1,215.76	0.9531	55.9	0.01899	5.35
Michigan	571,617,025	298,495	5,839.50	0.4436	104.8	0.01101	2.48
Ohio	319,937,392	185,363	3,706.05	0.5620	71.7	0.01631	3.10
Pennsylvania	56,403,074	97,415	1,772.16	0.8903	70.0	0.03453	4.91
West Virginia	6,277,539	95,114	1,825.40	0.8578	118.7	0.01837	4.55
Illinois	10,589,766	160,451	1,545.04	0.2733	28.6	0.00942	1.55
Iowa	2,582,131	184,438	133.34	0.0674	64.6	0.00106	0.38
Maryland	3,013,890	70,090	1,088.08	1.1608	84.4	0.02074	6.38
New York	15,490,744	193,634	3,762.26	0.5578	60.5	0.01376	3.06
Wisconsin	58,446,894	134,981	272.10	0.1499	37.2	0.01746	0.84
Total	1,197,527,588						
Weighted Average			4,332.92	0.5032	88.4	0.01582	2.81

Aside from Iowa, Wisconsin had the second lowest weighted average hauling assessment per cwt at 14.99 cents. The low weighted average hauling assessment observed for Wisconsin is supported by the findings of the Upper Midwest marketing area. Research by the Upper Midwest Market Administrator's Office indicated that weighted average hauling assessments per cwt for Wisconsin producers ranged from 6.74 to 26.83 cents depending on delivery volume. There is a significant difference in the hauling assessment for Wisconsin producers compared to producers in other states. Stop and volume assessments often are used as negotiating tools by cooperatives, handlers and haulers when attempting to procure additional milk supplies. Since Wisconsin has a large population of dairy producers within close proximity of each other it is likely that the competitive landscape (agglomeration effect) has helped to drive down hauling assessments for producers in that region. Another contributor to the low hauling assessments could be the low weighted average delivery distance associated with Wisconsin milk.

Weighted average delivery distances ranged from a low of 28.6 miles for Illinois producers to a high of 118.7 miles for West Virginia producers. Delivery distance is a function of pooling practices and supply locations. For example, a portion of the milk from states outside the marketing area is diverted milk pooled on the Mideast Order but not delivered to facilities located within the Mideast geographical region, which may result in a lower weighted average delivery distance. Additionally, Michigan and Indiana historically have high weighted average delivery distances because they contain reserve supplies of milk used to meet the fluid milk demands in southern portions of the Mideast marketing area and in southeastern portions of the U.S.

Weighted average MRF averaged slightly over 1.5 cents per cwt per mile for all states included in this analysis. The weighted average MRF ranged from a low of 0.1 cents per cwt per mile for Iowa producers to a high of 3.4 cents per cwt per mile for Pennsylvania producers. When analyzing the relationship between hauling assessments, producer size and delivery distances, weighted average MRF statistics are not surprising. For example, a majority of the Pennsylvania milk pooled on the Mideast Order remains in western Pennsylvania or is delivered to the

Table 3. Percentile Group Transportation Statistics

Percentile Group	Delivery Pounds	Average Delivery Pounds	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Delivery Distance *(miles)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
One	11,043,795	18,592	221.67	1.0638	76.3	0.04543	5.73
Two	21,177,069	35,712	288.76	0.7961	65.5	0.03150	4.30
Three	29,156,088	49,167	364.57	0.7351	64.3	0.02705	3.99
Four	37,709,440	63,591	449.42	0.7021	64.0	0.02528	3.84
Five	48,316,064	81,477	550.43	0.6748	62.7	0.02490	3.70
Six	62,127,500	104,768	679.02	0.6445	61.9	0.02651	3.56
Seven	80,713,319	136,110	812.21	0.5908	64.2	0.02013	3.26
Eight	111,015,883	187,211	1,101.68	0.5805	68.3	0.02015	3.22
Nine	168,783,474	284,626	1,616.16	0.5527	70.1	0.02073	3.08
Ten	627,484,956	1,058,153	7,367.88	0.3952	108.1	0.00928	2.22
Total	1,197,527,588						
Weighted Average			4,332.92	0.5032	88.4	0.01582	2.81

Northeastern part of Ohio – neither location has a long delivery distance compared to other observed milk flows. Pennsylvania is also populated with relatively small producers who tend to have higher weighted average hauling assessments per cwt. The high transportation costs are spread over fewer miles resulting in a weighted average MRF for Pennsylvania producers moderately higher than other observed MRFs.

Weighted average POMV ranged from 0.38 percent for producers in Iowa, to 6.18 percent for producers located in Maryland. The milk total from both states represented a very small portion of the milk included in this analysis. When interpreting the state statistics consider that the data only applies to milk associated with the Mideast marketing area; as a result, transportation statistics presented in this analysis may not be representative of all milk marketed in a particular state.

The following section will delve into the transportation statistics as they relate to producer size.

Transportation Analysis by Producer Size

In order to examine the impact producer size has on hauling assessments and delivery distance; producers associated with the market were divided into 10 equally sized percentile groups. Percentile groups were calculated based on producer identification codes (identification number and base number) and aggregate pounds delivered per producer id.

In total there were 5,931 producers included in this study; therefore, each percentile group contained approximately 593 producers based on milk volume. Percentile group one represents producers with the smallest delivery volume and group ten represents producers with the largest delivery volume. In order to put the percentile group measurements into perspective it must be considered that producers in percentile group one averaged deliveries of 18,592 pounds and supplied 0.92 percent of the milk in this analysis; while producers in percentile group ten averaged deliveries of 1,058,153 pounds and supplied 52.40 percent of the milk in this analysis. Additionally, the top three percentile groups supplied over 75 percent

of the milk included in this analysis. Moreover, of the producers included in this analysis, the top seven percent can supply enough fluid milk to meet the Class I production demands of the entire market. Figure 3 details the cumulative percentages of milk supplied and hauling assessments by percentile group.

Weighted average hauling assessments by percentile group ranged from $221.67 for producers in percentile group one to $7,367.88 for producers in percentile group ten. Of the six million dollars assessed to producers in this study, the bottom ninety percent of producers account for 58.9 percent of the total hauling assessments while the top ten percent of producers account for the remaining 41.0 percent; 3.4 and 2.6 million dollars respectively. Also note that the bottom ninety percent of producers supplied 47.6 percent of the milk, compared to 52.4 percent supplied by the top ten percent.

Weighted average hauling assessments per cwt ranged from a high of $1.06 for producers in percentile group one to a low of 39.52 cents for producers in percentile group ten. Hauling assessments per cwt decreased incrementally from percentile group one to percentile group ten. Similar relationships between the hauling assessment and delivery volume were also observed in the findings of Freije and Espe.

Weighted average delivery distances ranged from a low of 61.9 miles for producers in percentile group six to a high of 108.1 miles for producers in percentile group ten. As seen in Table 3, weighted average delivery distances do not vary significantly for percentile groups one through nine.

Weighted average MRFs ranged from a high of 4.5 cents per cwt per mile for producers in percentile group one to a low of 0.9 cents per cwt per mile for producers in percentile group ten. This is likely a reflection of stop charges, which become less prevalent as producer size increases.

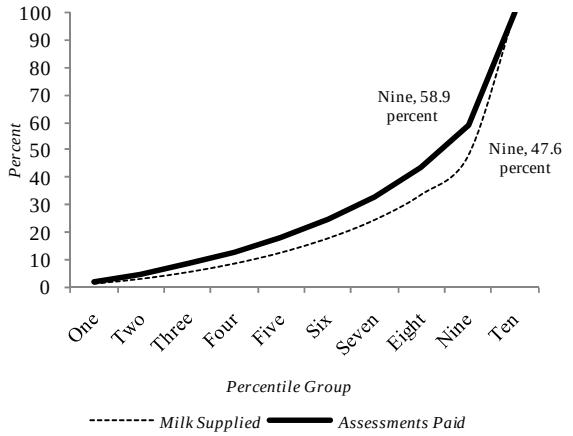


Figure 3. Cumulative Percentages of Milk Supplied and Assessments Paid by Percentile Group

POMV was the greatest for producers in the smallest percentile group at 5.75 percent, and the smallest for producers in the largest percentile group at 2.24 percent.

Transportation Analysis by Subgroup

For this section, the data was divided into multiple subgroups. Each subgroup was analyzed to determine the weighted average hauling assessments and the weighted average delivery distance. Specifically of interest was how the transportation statistics varied from state to state among homogenously sized producer groups.

The states selected for this section included Wisconsin, New York and the six states located or partially located in the Mideast Marketing Area. States outside of the marketing area with less than one percent of the milk included in this analysis were omitted.

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. Subgroups with fewer than three producers were not included in this analysis.

Weighted average hauling assessment by subgroup was the lowest for producers in Wisconsin with deliveries less than 60,000 pounds at $141.13. Producers in Michigan with deliveries greater than two million pounds had the highest weighted average hauling assessment at $13,707.60. Among homogenously sized producer groups the largest spread in weighted average hauling assessments was $5,049.72. This difference was observed when comparing Indiana and Michigan producers with deliveries greater than two million pounds.

Weighted average hauling assessments per cwt were the highest for producers in Kentucky with deliveries less than 60,000 pounds at $1.1634. Producers in Wisconsin with deliveries between 500,000 and one million pounds had the lowest weighted average hauling assessment per cwt at $0.0816. Excluding Wisconsin, all subgroups containing producers delivering less than 500,000 pounds had weighted average hauling assessments per cwt greater than the market average. In general hauling assessments per cwt decreased as producer deliveries increased. The only states to go against this trend were New York, Pennsylvania and West Virginia.

Weighted average delivery distances did not vary significantly within each state; additionally, weighted average delivery distances did not vary significantly among similarly sized producers. The most noticeable increases in delivery distances were observed in the producer groups representing producers delivering greater than one million pounds. The delivery distances within each subgroup correspond with the state patterns observed in the state analyses. For example, West Virginia producers, due to their distance from the Class I market, and the lack of nearby manufacturing facilities, have longer weighted average delivery distances than producers in other subgroups. Similarly, Wisconsin weighted average delivery distances by subgroup are noticeably shorter than other states due to the quantity of milk diverted on the Mideast Order but delivered to facilities located in Wisconsin. Producers located in Wisconsin delivering 250,000 to 500,000 pounds had the lowest weighted average delivery distance at 32.8 miles. Producers in Indiana with deliveries greater than two million pounds had the longest weighted average delivery distance at 209.1 miles.

The MRF is a function of the ability to spread the transportation costs over a quantity of miles. The higher the denominator the lower the MRF will be. Therefore, when comparing weighted average hauling assessments per cwt and weighted average delivery distances, weighted average MRF values by subgroup are not surprising. Not only do the largest producer groups have the lowest weighted average hauling assessments per cwt, but on average they also have longer weighted average delivery distance. The largest producer groups generally have weighted average MRFs less than 1.0 cents per cwt per mile. Producers in Indiana with deliveries greater than two million pounds had the lowest weighted average MRF at 0.1 cents per cwt per mile. On the other hand, smaller producers generally have the highest weighted average hauling assessments per cwt and moderately lower delivery distances. Consequently, the weighted average MRF on average is greater than 2.0 cents per cwt per mile for producers delivering less than 500,000 pounds. Producers in Indiana with deliveries

between 90,000 and 125,000 pounds had the highest weighted average MRF at 5.343 cents per cwt per mile – 3.76 cents higher than the market weighted average.

Finally, as the POMV data indicates, smaller producers pay a larger portion of their milk value in transportation charges. Producers in Kentucky delivering less than 60,000 pounds have the highest weighted average POMV at 6.12 percent versus producers in Wisconsin delivering between 500,000 and one million pounds who have the lowest weighted average POMV at 0.47 percent – a difference of 5.64 percent.

The transportation disparities among homogenously sized producers from state to state are likely due to multiple factors within each state. Factors could include transportation regulations, distance to the Class I market, pooling practices of producers within each state, and the competition for milk supplies in the market among others.

Models

For this section OLS regression analysis was used to quantify the linear relationship between the hauling assessments and delivery volume, delivery distance, quantity of surrounding producers and the quantity of surrounding plants (pool and non-pool).

The hauling equation is given by:

(3)

$$y_i = \beta_0 + \beta_1 p_i + \beta_2 p_i^2 + \beta_3 c_i + \beta_4 h_i + \beta_5 d_i + \beta_6 d_i^2 + \beta_7 l_i + \varepsilon_i$$

where for producer i (i=1,…5,931):

y = represents the hauling assessment as reflected on the producer payroll

p = represents total delivery pounds

c = represents the quantity of producers in the same county

h = represents the quantity of pool and non-pool facilities in the same county

d = represents delivery distance

l = represents the value added via the Class I price surface.

SPSS and Eviews model output are contained in Appendix D. Appendix D includes all variables, their appropriate t-statistics and their p-values. Where identified in Table 4 the appropriately calculated t-values were greater in absolute value than the critical t-values; resulting in a rejection of the applicable null hypothesis.

For this analysis, all regression equations were inferior model specifications relative to equation m. The results of the equation m explained a statistically significant portion of the variation in hauling assessments. The estimates indicated a positive coefficient term for delivery volume and delivery distance. The estimates indicated negative coefficients for pounds squared, distance squared, the quantity of surrounding producers and the quantity of pool and non-pool plants in the same county.

In other dairy production regions of the United States several of the predictor variables used in this analysis are thought to be highly correlated. In order to ensure multicollinearity was not present in the estimated models, variance inflation factors (VIF) were calculated for each β. Results of the VIF calculations indicated that multicollinearity was not an issue in the model estimations.

White's Test

As producer delivery volume increases the variability in hauling assessments increases, indicating that the variance of the error term is not constant across the data population. The possibility of heteroskedasticity must be considered for this analysis. Results of a White's Heteroskedasticity Test were greater than the critical chi squared value, so the null

Table 4. Determinants of Hauling Assessment

Variable	Hauling Assessment Equation (a)	(b)	(c)	(d)	(m)
Intercept	425.7202 *	316.0205 *	256.0659 *	346.9053 *	256.0659 *
Measure of Producer Size					
Delivery Pounds (p)	0.00316 *	0.00396 *	0.00396 *	0.00397 *	0.00396 *
Delivery Pounds Sqrd (p^2)		-1.92E-10 *	-1.92E-10 *	-1.92E-10 *	-1.92E-10
Measures of Competition					
Producer Cluster (c)	-0.5784 *	-0.5769 *	-0.5519 *	-0.5880 *	-0.5519 *
Handler Cluster (h)	-59.7513 *	-63.8954 *	-54.6368 *	-70.8563 *	-54.6368 *
Measures of Distance					
Delivery Distance (d)	0.4195 *	0.3973 *	1.8129 *		1.8129 *
Delivery Distance (d^2)			-0.0055 *		-0.0055 *
Price Surface Value (l)				-53.3309	
R	0.7599	0.7724	0.7733	0.7730	0.7733
Adjusted R^2	0.7597	0.7728	0.7730	0.7726	0.7730
F	4,688.249	4,034.315	3,367.481	4,030.611	3,367.481

Note: Single (*) asterisk indicates a computed t-value greater than the critical t-value at α=.05, p-values are contained in Appendix D.

hypothesis of constant error terms was rejected, indicating the presence of heteroskedasticity. In order to account for this problem, White's heteroskedasticity corrected standard errors were estimated (regression equation *m*). Since heteroskedasticity does not bias the OLS estimates, but underestimates the variance and standard errors, the coefficients values did not change as a result of this correction.

Model Results

The higher hauling assessments paid by larger producers appear to be a function of the volume of milk being transported. The negative coefficient for pounds squared indicates statistically that while hauling assessments do increase there is a marginal decrease in hauling assessments as volume increases, holding all else constant. The scale of the pounds squared data makes the coefficient very small but non-zero.

The previous transportation analysis conducted by this office had included an OLS regression for per cwt assessments; however, since per cwt assessments are a function of delivery pounds the estimator would incorrectly measure the significance of the coefficients. For this and future analyses per cwt assessments will not be subject to OLS.

It is appropriate that counties with a large population of milk producers have lower hauling charges due to increased competition - the significantly negative coefficient for producer cluster supports this conclusion. As the population of surrounding producers increases the population of handlers, haulers and cooperatives attempting to procure additional milk supplies should also increase. As a result, incentives such as decreased hauling assessments may be used to guarantee milk procurement.

The significantly negative coefficient for handler cluster indicates that the close proximity of a pool or non pool plant considerably lowers the hauling assessment.

The presence of a pool or nonpool plant within the same county likely decreases the assessment because not only does it minimize delivery distance and lower transportation costs, but it gives the producer more bargaining power (negotiated hauling assessments) with haulers, cooperatives or handlers attempting to procure the milk supply.

In order to quantify the effect of delivery distance on hauling assessments paid by producers, delivery miles and a variable measuring the value added through the Class I differential price surface were incorporated into the model. The location adjustment variable falls into this category because the purpose of the price surface is to help offset the transportation and marketing costs associated with fluid milk. As anticipated, the coefficient for location adjustment indicated that location adjustments and hauling assessments were negatively correlated; however, the appropriately calculated t-value was not greater in absolute value than the critical t-value so the null hypothesis could not be rejected. It is likely that in this market study there were not enough variations in location adjustment values to provide statistically significant results. Perhaps a larger market scope where more inter-order milk movement is analyzed would provide statistically significant results.

Previous transportation analyses conducted by Mideast staff indicated that delivery distance and hauling assessments were positively correlated; therefore, the result of the model when incorporating delivery distance was not unexpected. For this analysis delivery distance and hauling assessments were positively correlated. The calculated t-value indicated that delivery distance was significant at the five percent level. As pointed out by Gallagher et al. the initial hauling cost is highest at the point of on farm milk assembly, then with each additional mile the additional cost of moving the milk decreases. In order to test this theory a distance squared variable was included. The coefficient and calculated t-statistic for distance squared indicates statistically that hauling assessments diminish as the delivery distance increases. As demonstrated with pounds squared, the magnitude of the distance squared data makes the coefficient very small but non-zero. When models were estimated using delivery distance as the single-independent variable the coefficients were statistically significant yet the models had very poor adjusted R-squared. This indicates that delivery distance alone does not have significant explanatory power for determining the hauling assessment.

When analyzing the topography of the Mideast Marketing Area, it is apparent that distance is not homogeneous. One mile traveled in eastern Ohio which borders the Appalachian Mountains does not equate to one mile traveled in the western Ohio plains. It is possible that discrete variables and an interaction term capturing terrain could be incorporated into future analyses to measure the impact of delivery distance and terrain on hauling assessments.

In summary, OLS regression analysis indicated that hauling assessments were statistically dependent on producer size, competitive clusters of producers and handlers and delivery distance, holding all else constant.

Conclusion

This study determined the weighted average transportation statistics for producers associated with the Mideast Marketing Area for May 2008. Additionally, this study attempted to quantify the statistical relationship between hauling assessments and variables such as

delivery volume and delivery distance among others.

The hauling assessments assessed to producers included in this analysis amounted to over six million dollars for May 2008. The weighted average hauling assessment was $4,332.92 – approximately 2.81 percent of milk value; the weighted average hauling assessment per cwt was 50.32 cents; the weighted average delivery distance was 88.4 miles; and the weighted average MRF was 1.582 cents per cwt per mile.

The data included in this analysis indicates that hauling assessments vary significantly due to multiple factors. Factors influencing the variations include delivery pounds, delivery distance and competitive groups of producers and handlers. Factors likely influencing milk transportation but not quantified in this analysis likely include fuel prices, state regulations, weight restrictions, taxes, geography, nature of milk supply, labor and demand characteristics.

While transportation costs continue to be an important concern throughout the industry, what is apparent is that producers, cooperatives, consumers and handlers all share in the cost of moving raw milk, intermediate goods and finished products along the supply chain. Effectively managing these costs is essential in order to ensure that an adequately supply of milk is available to meet the demands of the consumer.

Possible alleviations for the high transportation costs include technological improvements in transportation, improvements in fuel efficiency, more efficient transportation routes, incentives to increase the quantity of milk being produced in deficit areas, more efficient packaging, and further cooperation among marketing agencies when procuring farm milk.

Future Studies

This analysis will be updated annually by the Mideast Market Administrator's Office using May data. For comparative purposes, May data is also used in staff papers published by the Upper Midwest and Pacific Northwest Orders.

Areas of interest for future research, or for separate analysis would include:

- Incorporate discrete variables and interaction terms to capture the impact of terrain on hauling assessments.

For questions, comments or more information concerning this analysis, please contact: John Newton, Agricultural Economist, Federal Order 33.

References

Energy Information Administration Diesel Fuel Rates. 23 Nov. 2008. Energy Information Administration. www.eia.doe.gov

Hauling Rates for Ranch to Plant. 2009. California Department of Food and Agriculture. www.cdfa.ca.gov/dairy

Gallagher, E., C. Thraen and G. Schnitkey. "Milk Assembly Costs in the Greater Ohio Area: A Multiproduct Analysis." Review of Agricultural Economics 15(1993):75-88.

Erba, M., Pratt, J., Wasserman, W., Alexander, C. (1998). Characteristics of Milk Assembly. *Department of Agricultural, Resource, and Managerial Economics.* Cornell University, Ithaca, New York

Espe, Lori. "Analysis of Hauling Charges and Producer Milk by Location and Size Range of Production May 2007." Pacific Northwest Staff Paper 08-02. December 2008.

Freije, Corey. "Milk Hauling Charges in the Upper Midwest Marketing Area May 2007." Upper Midwest Marketing Area Staff Paper 07-02. December 2007.

Freije, Corey. "Milk Hauling Charges in the Upper Midwest Marketing Area May 2006." Upper Midwest Marketing Area Staff Paper 06-05. December 2006.

Jacobson, R. and G. Fairchild. "Hauling Costs and Rates in bulk Milk Assembly." The Ohio Agricultural Research and Development Center, The Ohio State University, 1969.

Patterson, David. "Milk Hauling Study" New York Department of Agriculture and Markets Division of Milk Control and Dairy Services" April 2008

Pollock, Gene. Statistical Methodology. Loudonville: Mohican, 1993.

Pratt, J., A. Novakovic, M. Stephenson, P. Bishop & E. Erba. (1996). U.S. Dairy Sector Simulator-A Spatially Disaggregated model of the U.S. Dairy Industry. *Department of Agricultural, Resource, and Managerial Economics.* Cornell University, Ithaca, New York.

Studenmund, A.H.. Using Econometrics: A Practical Guide. Addison Wesley Longman: New York, 2001.

Werner, Chris. "Analysis of Hauling Charges and Producer Milk by Location and Size Range of Production May 2006." Pacific Northwest Staff Paper 07-01. January 2007.

APPENDIX A

MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Illinois	Carroll	22.6	119.87	0.0849	0.00383	0.48
	Grundy	R	R	R	R	R
	Iroquois	83.6	1,308.58	1.0172	0.01226	5.78
	Jo Daviess	27.2	129.02	0.0639	0.00240	0.36
	Kankakee	53.8	1,208.23	0.9205	0.01886	5.27
	Ogle	R	R	R	R	R
	Rock Island	R	R	R	R	R
	Stephenson	22.2	3,924.51	0.2483	0.01126	1.47
	Whiteside	R	R	R	R	R
	Will	27.7	1,093.47	0.8158	0.03255	4.63
	Winnebago	R	R	R	R	R
Indiana	Adams	54.1	2,510.49	0.4968	0.01086	2.76
	Allen	35.2	1,984.42	0.6885	0.07122	3.86
	Bartholomew	124.2	734.53	0.8392	0.01093	4.58
	Boone	39.7	1,145.73	0.8798	0.02252	4.72
	Carroll	R	R	R	R	R
	Cass	59.2	3,654.07	0.5685	0.00971	3.18
	Clay	R	R	R	R	R
	Clinton	R	R	R	R	R
	Dearborn	R	R	R	R	R
	Decatur	98.5	581.99	0.7430	0.01356	3.87
	DeKalb	67.1	4,427.74	0.6750	0.01471	3.86
	Delaware	21.8	1,079.23	0.6138	0.02821	3.48
	Elkhart	69.8	1,556.61	0.5850	0.06745	3.33
	Fayette	145.9	2,182.73	0.7021	0.00519	4.01
	Fountain	R	R	R	R	R
	Franklin	139.8	2,165.03	0.8924	0.00659	4.93
	Fulton	42.8	1,153.29	0.5861	0.03451	3.40
	Grant	32.9	866.06	0.8581	0.02609	4.63
	Hamilton	R	R	R	R	R
	Hancock	R	R	R	R	R
	Hendricks	54.3	1,476.73	1.0643	0.02369	5.30
	Henry	94.3	7,721.98	0.3231	0.00565	1.79
	Howard	47.9	785.89	0.9406	0.01966	5.22
	Huntington	199.5	5,296.13	0.3355	0.00391	1.87
	Jackson	122.0	1,668.95	0.7062	0.00613	3.70
	Jasper	R	R	R	R	R
	Jay	62.7	1,367.60	0.5895	0.01043	3.31
	Jefferson	152.8	470.89	0.4284	0.00473	2.39
	Johnson	R	R	R	R	R
	Kosciusko	67.9	1,133.80	0.5774	0.01246	3.28
	LaGrange	62.1	824.33	0.6557	0.01750	3.66
	Lake	29.4	1,360.06	0.6928	0.02401	3.93
	LaPorte	119.6	4,239.95	0.6229	0.00784	3.57
	Marshall	138.9	3,921.20	0.5270	0.00651	2.92

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MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Indiana (cont.)	Miami	56.7	959.31	0.7054	0.01327	3.99
	Montgomery	66.8	1,100.13	1.3530	0.02029	7.61
	Morgan	35.0	702.79	0.9502	0.02713	5.30
	Noble	89.2	2,114.57	0.6059	0.01243	3.38
	Owen	R	R	R	R	R
	Parke	90.5	975.96	1.2759	0.01422	7.17
	Porter	40.4	892.07	0.7893	0.02051	4.47
	Pulaski	73.8	5,713.91	0.5336	0.01115	3.04
	Randolph	124.5	6,387.91	0.2795	0.00254	1.58
	Ripley	R	R	R	R	R
	Rush	82.2	1,269.13	0.7734	0.01196	4.25
	Shelby	28.8	1,064.01	0.8042	0.02970	3.59
	St. Joseph	59.7	1,109.63	0.6305	0.01449	4.40
	Starke	R	R	R	R	R
	Steuben	73.5	2,982.30	0.6816	0.00997	3.80
	Switzerland	R	R	R	R	R
	Tippecanoe	66.7	3,065.01	0.8000	0.01200	4.50
	Tipton	R	R	R	R	R
	Union	R	R	R	R	R
	Wabash	208.2	9,426.53	0.4115	0.00413	2.31
	Wayne	27.0	969.94	0.7735	0.19991	4.35
	Wells	166.1	6,163.39	0.3687	0.00825	2.06
	White	78.3	1,384.48	0.6560	0.00836	3.62
	Whitley	30.2	1,532.27	0.6607	0.03136	3.80
Iowa	Dubuque	63.6	135.83	0.0679	0.00108	0.39
	Jackson	R	R	R	R	R
Kentucky	Bracken	39.9	716.50	1.0309	0.02586	5.59
	Mason	57.4	1,471.76	0.9285	0.01619	5.22
	Metcalfe	R	R	R	R	R
Maryland	Allegany	R	R	R	R	R
	Garrett	84.8	1,093.76	1.1550	0.02067	6.14
Michigan	Alcona	171.2	3,059.87	0.6418	0.00400	3.53
	Alger	41.5	869.12	0.7218	0.01742	4.02
	Allegan	61.3	5,404.29	0.4266	0.01062	2.39
	Alpena	192.0	1,670.31	0.6270	0.00331	3.46
	Antrim	101.6	1,635.82	0.8309	0.00818	4.59
	Arenac	145.2	2,771.18	0.5000	0.00506	2.83
	Baraga	60.8	1,654.17	0.8409	0.01383	4.60
	Barry	77.3	6,736.22	0.4212	0.01169	2.38

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MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Michigan (cont.)	Bay	68.0	2,060.23	0.5845	0.00933	3.27
	Berrien	124.8	4,015.71	0.3621	0.01304	2.09
	Branch	92.7	4,774.22	0.4923	0.00650	2.78
	Calhoun	70.2	9,527.22	0.5396	0.01023	3.04
	Cass	27.2	470.07	0.6775	0.02489	3.67
	Charlevoix	108.5	1,592.07	0.6540	0.00600	3.61
	Cheboygan	163.8	2,280.68	0.8679	0.00530	4.93
	Chippewa	268.2	1,586.72	0.8536	0.00318	4.75
	Clare	82.1	2,537.19	0.5223	0.00932	2.95
	Clinton	64.8	7,470.45	0.3149	0.01364	1.83
	Delta	62.9	846.59	0.5926	0.00937	3.30
	Dickinson	68.2	874.77	0.3414	0.00502	1.90
	Eaton	58.2	812.31	0.5757	0.00990	3.19
	Emmet	132.5	1,919.56	0.9618	0.00726	5.51
	Genesee	20.3	1,736.42	0.5074	0.10984	2.92
	Gladwin	107.0	2,246.02	0.8097	0.00824	4.44
	Grand Traverse	331.3	591.52	0.7742	0.00234	4.27
	Gratiot	130.8	9,717.67	0.3029	0.00503	1.73
	Hillsdale	91.1	2,943.07	0.5018	0.00704	2.87
	Huron	152.5	7,046.44	0.3175	0.00255	1.81
	Ingham	98.9	3,992.01	0.5388	0.00910	3.05
	Ionia	96.9	8,058.36	0.3796	0.00753	2.15
	Iosco	139.4	1,967.31	0.5788	0.00454	3.31
	Isabella	51.7	3,376.41	0.4931	0.01216	2.84
	Jackson	95.0	2,836.02	0.5152	0.00671	2.92
	Kalamazoo	20.7	3,004.56	0.5838	0.02936	3.38
	Kalkaska	R	R	R	R	R
	Kent	72.2	5,180.69	0.4133	0.03029	2.31
	Lake	31.2	882.84	0.5681	0.01822	3.19
	Lapeer	46.5	1,190.32	0.5012	0.01448	2.85
	Leelanau	93.3	891.27	0.9133	0.01037	4.99
	Lenawee	190.6	24,569.45	0.5510	0.02895	3.02
	Livingston	103.5	3,841.14	0.5006	0.00940	2.85
	Mackinac	219.1	2,130.10	0.6004	0.00274	3.37
	Macomb	37.0	457.19	0.6653	0.01890	3.66
	Mason	82.3	2,755.29	0.7647	0.00932	4.32
	Mecosta	57.2	1,976.84	0.5538	0.01170	3.13
	Menominee	38.4	916.99	0.1956	0.00525	1.10
	Midland	R	R	R	R	R
	Missaukee	122.6	4,733.45	0.5455	0.00904	3.07
	Monroe	60.5	873.30	0.4501	0.01246	2.33
	Montcalm	107.4	2,205.09	0.4833	0.00668	2.72
	Montmorency	170.7	1,592.31	0.6948	0.00429	3.90
	Muskegon	64.3	1,902.15	0.5086	0.01680	2.85
	Newaygo	51.6	2,443.48	0.5290	0.01051	2.95
	Oakland	R	R	R	R	R
	Oceana	63.9	1,377.48	0.7526	0.01178	4.22

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MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Michigan (cont.)	Ogemaw	174.2	2,446.85	0.5186	0.00399	2.95
	Osceola	29.1	2,889.95	0.5632	0.02821	3.20
	Oscoda	107.1	1,041.68	0.7181	0.00676	3.97
	Otsego	R	R	R	R	R
	Ottawa	56.7	3,305.39	0.4325	0.01653	2.44
	Presque Isle	171.9	2,442.66	0.6999	0.00410	3.94
	Saginaw	138.7	2,029.83	0.5424	0.01073	3.05
	Sanilac	151.9	5,809.31	0.4190	0.00366	3.06
	Schoolcraft	R	R	R	R	R
	Shiawassee	66.3	2,161.64	0.5158	0.01880	2.40
	St. Clair	71.5	1,025.71	0.5408	0.00779	4.46
	St. Joseph	186.7	1,349.88	0.1902	0.01183	2.96
	Tuscola	114.0	3,327.64	0.4067	0.00622	2.32
	Van Buren	42.2	3,102.38	0.6125	0.01631	3.44
	Washtenaw	31.4	1,931.83	0.6106	0.02480	3.48
	Wexford	42.1	1,693.59	0.5740	0.01526	3.21
New York	Cattaraugus	49.1	2,085.98	0.5378	0.01200	2.87
	Chautauqua	74.9	1,233.24	0.6564	0.00899	3.58
	Erie	24.1	1,209.60	0.5513	0.06872	2.98
	Livingston	73.7	1,588.29	0.5528	0.00877	3.10
	Monroe	R	R	R	R	R
	Wyoming	57.1	6,918.65	0.4922	0.01252	2.69
Ohio	Adams	114.9	877.51	1.1259	0.01067	5.69
	Allen	111.9	1,820.03	0.7745	0.00700	4.44
	Ashland	53.0	2,962.45	0.6343	0.01294	3.56
	Ashtabula	38.7	3,340.93	0.6645	0.01899	3.69
	Athens	85.4	1,294.65	0.8710	0.01024	4.82
	Auglaize	63.6	1,117.68	0.6291	0.01425	3.49
	Belmont	82.1	878.22	0.8386	0.02186	4.56
	Brown	160.4	915.50	1.3046	0.01154	6.26
	Butler	168.6	1,013.38	0.9897	0.00609	5.37
	Carroll	225.9	840.22	0.7921	0.00351	4.36
	Champaign	111.3	1,385.20	0.7423	0.01125	3.86
	Clark	137.1	10,296.41	0.3515	0.00497	1.94
	Clermont	R	R	R	R	R
	Clinton	R	R	R	R	R
	Columbiana	174.4	2,028.15	0.7085	0.00416	3.84
	Coshocton	34.6	1,053.37	0.7359	0.02461	4.00
	Crawford	74.0	3,203.39	0.6860	0.00941	3.85
	Darke	45.9	1,916.39	0.6069	0.01424	3.36
	Defiance	79.9	10,206.48	0.5475	0.00764	3.12
	Delaware	38.5	749.13	0.7463	0.01939	4.13
	Fairfield	35.8	1,005.33	0.7551	0.02512	4.04

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State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Ohio (cont.)	Fayette	R	R	R	R	R
	Franklin	R	R	R	R	R
	Fulton	81.2	2,612.65	0.5738	0.00916	3.20
	Gallia	72.2	2,396.68	0.8952	0.01437	4.84
	Geauga	21.9	2,347.24	0.6395	0.04091	3.57
	Greene	139.3	836.82	0.8369	0.00801	4.30
	Guernsey	59.8	1,153.34	0.9071	0.01773	4.81
	Hamilton	R	R	R	R	R
	Hancock	80.6	2,598.88	0.6169	0.00776	3.31
	Hardin	148.9	16,529.56	0.3242	0.00276	1.81
	Harrison	68.6	942.38	0.8606	0.01534	4.68
	Henry	129.8	3,336.05	0.3673	0.00407	2.10
	Highland	157.2	1,714.55	1.1182	0.00740	5.58
	Holmes	21.6	1,734.72	0.6123	0.04668	3.33
	Huron	64.4	948.55	0.7923	0.01255	4.32
	Jackson	87.0	465.92	1.0976	0.01261	5.85
	Jefferson	61.0	1,012.74	0.7303	0.02178	4.06
	Knox	82.1	2,348.23	0.6725	0.01329	3.74
	Lawrence	66.2	882.86	1.0064	0.01521	5.40
	Licking	50.4	1,452.01	0.7216	0.10679	3.87
	Logan	73.0	1,977.01	0.6893	0.01282	3.78
	Lorain	26.7	1,131.92	0.7779	0.03397	4.31
	Madison	149.9	7,883.92	0.3718	0.00290	2.05
	Mahoning	48.9	3,683.64	0.5797	0.01576	3.23
	Marion	127.7	21,705.11	0.5603	0.00514	3.05
	Medina	47.8	1,862.21	0.5783	0.01475	3.20
	Meigs	88.5	1,834.19	0.8114	0.00988	4.52
	Mercer	59.9	2,608.11	0.4862	0.01007	2.72
	Miami	43.8	1,139.01	0.6676	0.02145	3.67
	Monroe	88.9	1,102.93	0.9276	0.01141	5.09
	Montgomery	56.1	828.60	0.7858	0.01485	4.24
	Morgan	67.9	1,439.73	0.6481	0.00955	3.51
	Morrow	65.1	3,389.56	0.8224	0.01261	4.48
	Muskingum	39.7	1,272.22	0.8930	0.02281	4.85
	Ottawa	R	R	R	R	R
	Paulding	98.6	6,201.79	0.2941	0.00417	1.66
	Perry	R	R	R	R	R
	Pickaway	127.4	4,948.04	0.4598	0.00467	2.50
	Pike	101.1	1,772.24	0.8836	0.00902	4.72
	Portage	31.2	1,663.70	0.5943	0.01967	3.32
	Preble	103.0	1,376.89	0.8497	0.01542	4.61
	Putnam	65.1	5,013.39	0.3202	0.00445	1.78
	Richland	52.5	1,242.33	0.7896	0.01582	4.44
	Ross	87.1	671.06	0.8813	0.01058	4.67
	Sandusky	36.0	831.82	0.7624	0.02831	4.12
	Scioto	106.9	882.76	0.7192	0.00673	3.94
	Seneca	79.8	1,124.68	0.7847	0.01211	4.32

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Ohio (cont.)	Shelby	63.6	1,437.02	0.5890	0.01295	3.26
	Stark	27.1	2,155.50	0.5365	0.04913	2.99
	Summit	R	R	R	R	R
	Trumbull	21.5	2,017.75	0.7711	0.03583	4.25
	Tuscarawas	32.0	1,974.83	0.5762	0.02135	3.26
	Union	63.3	1,198.36	0.7386	0.01297	4.01
	Van Wert	120.8	1,850.17	0.3732	0.00381	2.08
	Vinton	R	R	R	R	R
	Warren	R	R	R	R	R
	Washington	99.1	2,267.74	0.5689	0.00575	3.17
	Wayne	32.4	2,081.88	0.4708	0.02110	2.61
	Williams	107.0	8,597.21	0.2756	0.00278	1.57
	Wood	147.6	7,777.32	0.3069	0.00262	1.69
	Wyandot	77.7	376.06	0.8432	0.01084	4.47
Pennsylvania	Adams	R	R	R	R	R
	Allegheny	R	R	R	R	R
	Armstrong	93.3	1,685.46	0.8515	0.00949	4.71
	Beaver	56.6	980.76	0.8340	0.01488	4.57
	Bedford	R	R	R	R	R
	Butler	67.6	1,057.25	0.9227	0.01598	5.03
	Cambria	111.1	1,151.79	1.0953	0.00986	6.22
	Cameron	R	R	R	R	R
	Centre	110.8	1,015.13	0.5821	0.00570	3.14
	Clarion	82.7	1,981.16	0.9962	0.01359	5.45
	Clearfield	118.5	1,829.80	1.1120	0.00943	5.99
	Clinton	59.8	1,002.98	0.6241	0.01090	3.41
	Crawford	43.0	2,060.84	0.8105	0.02090	4.46
	Elk	105.4	1,172.38	1.2703	0.01205	6.98
	Erie	41.5	2,412.30	0.8101	0.05504	4.45
	Fayette	56.1	2,059.31	0.9602	0.34708	5.21
	Forest	R	R	R	R	R
	Greene	76.6	1,558.74	1.1005	0.02144	6.15
	Indiana	88.6	1,860.70	0.9660	0.01129	5.30
	Jefferson	120.2	995.81	1.0156	0.00889	5.35
	Lawrence	66.6	1,489.51	0.8269	0.01752	4.39
	McKean	R	R	R	R	R
	Mercer	27.0	1,134.02	0.6996	0.04426	3.82
	Somerset	93.6	2,220.84	0.9683	0.01438	5.21
	Venango	39.4	1,921.16	0.9480	0.02428	5.38
	Warren	78.4	2,123.88	0.7067	0.00907	3.67
	Washington	81.6	1,531.61	0.9176	0.01855	5.07
	Westmoreland	57.9	1,380.65	1.0010	0.02094	5.43
West Virginia	Barbour	129.9	738.30	1.1750	0.00904	6.48

(continued on the following page)

APPENDIX A

MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance (miles)	Hauling Assessment ($)	Hauling Assessment ($/cwt)	Mileage Rate Factor ($/cwt/mile)	Percent of Milk Value (%)
West Virginia (cont.)	Brooke	132.3	606.75	0.7000	0.00529	3.75
	Grant	R	R	R	R	R
	Greenbrier	R	R	R	R	R
	Hardy	R	R	R	R	R
	Harrison	R	R	R	R	R
	Jackson	57.7	1,688.34	0.8417	0.02001	4.43
	Marshall	92.1	425.98	0.9351	0.02650	5.24
	Mason	108.3	1,060.75	0.6761	0.00689	3.57
	Monongalia	155.5	644.51	0.7341	0.00472	4.02
	Ohio	69.8	512.87	0.8432	0.13854	4.58
	Preston	150.8	3,037.42	0.9365	0.00997	4.83
	Randolph	R	R	R	R	R
	Roane	R	R	R	R	R
	Taylor	138.6	581.15	1.2839	0.00926	6.47
	Wetzel	R	R	R	R	R
	Wirt	R	R	R	R	R
	Wood	R	R	R	R	R
Wisconsin	Adams	R	R	R	R	R
	Brown	R	R	R	R	R
	Calumet	26.7	224.52	0.2359	0.00884	1.35
	Clark	45.7	245.20	0.1694	0.00412	0.95
	Columbia	41.1	395.24	0.1299	0.00334	0.75
	Crawford	50.7	206.34	0.1698	0.00335	0.95
	Dane	64.6	179.46	0.1325	0.00212	0.76
	Dodge	44.0	261.49	0.1840	0.00431	1.04
	Florence	R	R	R	R	R
	Fond du Lac	10.1	265.37	0.1668	0.05461	0.94
	Grant	55.2	120.06	0.1500	0.00304	0.84
	Green	32.3	90.96	0.1444	0.00447	0.81
	Green Lake	R	R	R	R	R
	Iowa	47.3	125.05	0.0881	0.00197	0.50
	Juneau	28.0	318.04	0.1666	0.00739	0.94
	La Crosse	R	R	R	R	R
	Lafayette	28.5	134.35	0.0716	0.00252	0.40
	Langlade	65.3	263.70	0.1534	0.00236	0.89
	Lincoln	R	R	R	R	R
	Manitowoc	200.4	158.01	0.2748	0.00137	1.50
	Marathon	46.2	168.98	0.3115	0.00704	1.78
	Marinette	26.3	911.99	0.1023	0.00390	0.60
	Marquette	R	R	R	R	R
	Oconto	57.0	150.00	0.2999	0.00527	1.68
	Outagamie	1.1	290.92	0.1377	0.12806	0.77
	Ozaukee	R	R	R	R	R
	Portage	43.5	155.29	0.2574	0.00608	1.48
	Richland	1.4	203.04	0.1607	0.13592	0.91

(continued on the following page)

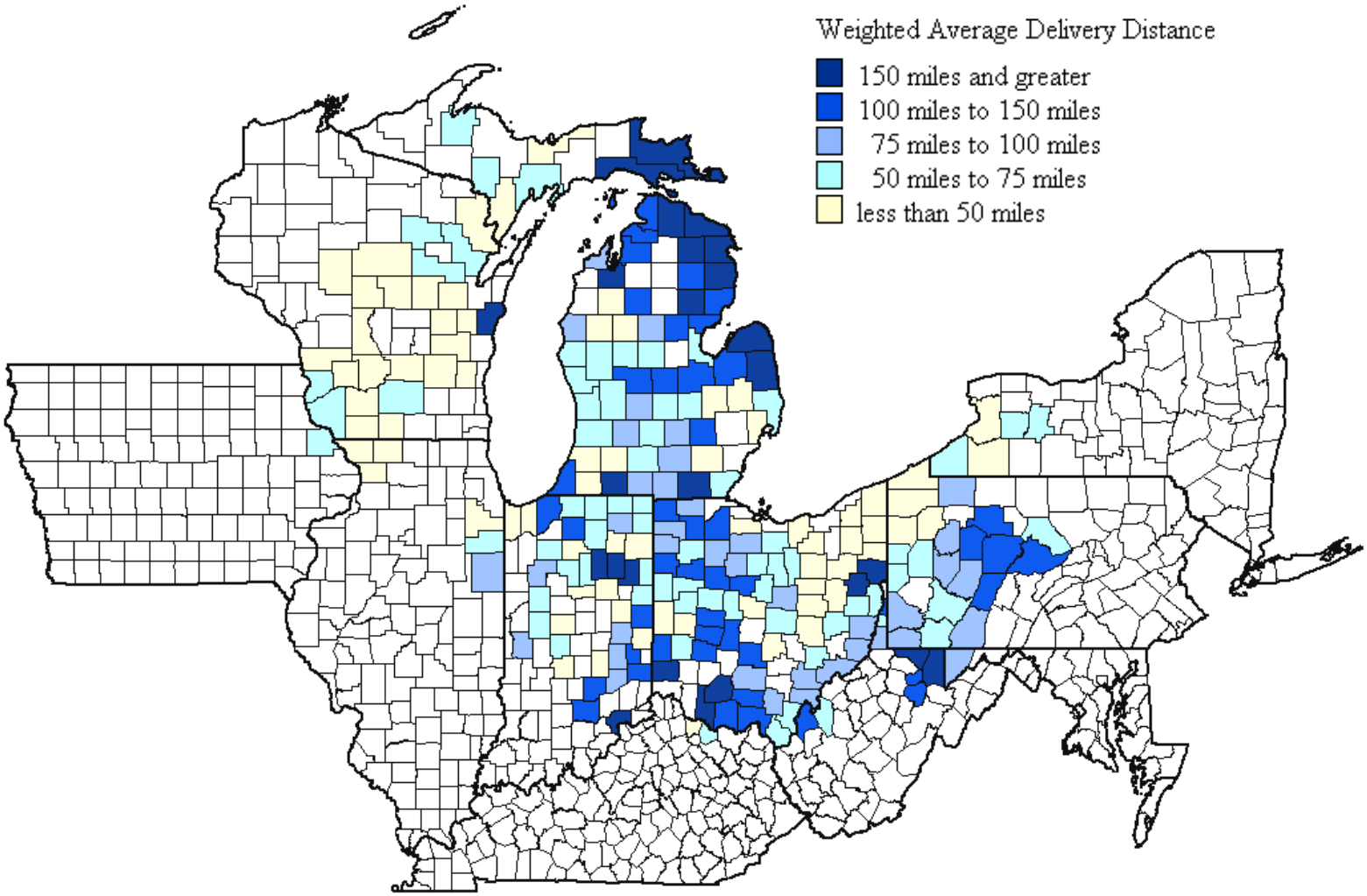
APPENDIX A

MIDEAST MARKETING AREA WEIGHTED AVERAGE TRANSPORTATION STATISTICS BY STATE AND COUNTY FOR MAY 2008

State	County	Delivery Distance *(miles)*	Hauling Assessment *($)*	Hauling Assessment *($/cwt)*	Mileage Rate Factor *($/cwt/mile)*	Percent of Milk Value *(%)*
Wisconsin (cont.)	Sauk	30.6	307.16	0.1424	0.00624	0.80
	Shawano	59.8	426.98	0.1505	0.00263	0.83
	Taylor	R	R	R	R	R
	Vernon	34.5	208.96	0.1393	0.00404	0.80
	Washington	36.1	208.68	0.1906	0.00558	1.09
	Waupaca	34.5	225.89	0.1665	0.00510	0.92
	Waushara	R	R	R	R	R
	Winnebago	26.1	231.01	0.1081	0.00450	0.62
	Wood	30.5	176.67	0.1580	0.00518	0.90

R: Restricted information not included.

WEIGHTED AVERAGE DELIVERY DISTANCE BY STATE AND COUNTY FOR MAY 2008 1/



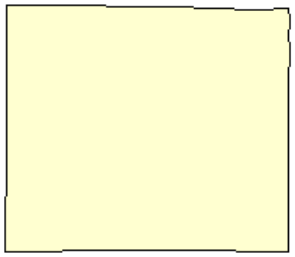
1/ Restricted information not included.

Maximum:

Grand Traverse County, Michigan

Weighted Average Delivery Distance: 331.1 miles

Minimum:



Outagamie County, Wisconsin

Weighted Average Delivery Distance: 1.1 miles

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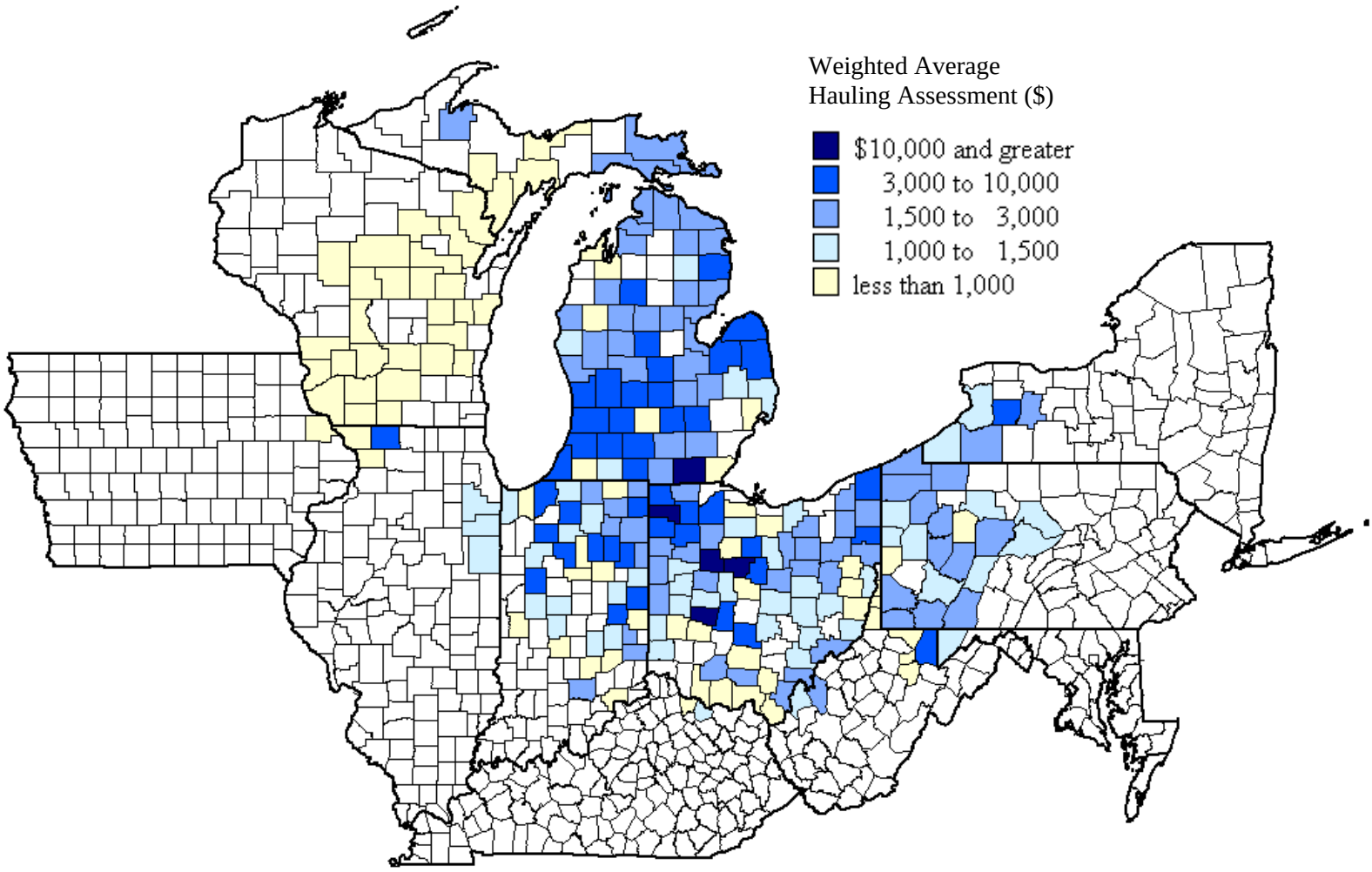
WEIGHTED AVERAGE HAULING ASSESSMENT BY STATE AND COUNTY FOR MAY 2008 1/



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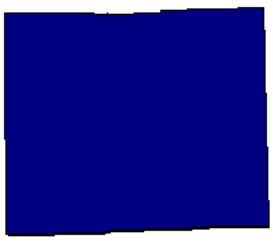
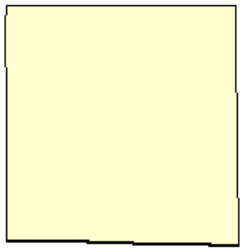


Lenawee County,
Michigan

Weighted Average
Hauling Charge: $24,569.43

Minimum:



Green County,
Wisconsin

Weighted Average
Hauling Charge: $90.96

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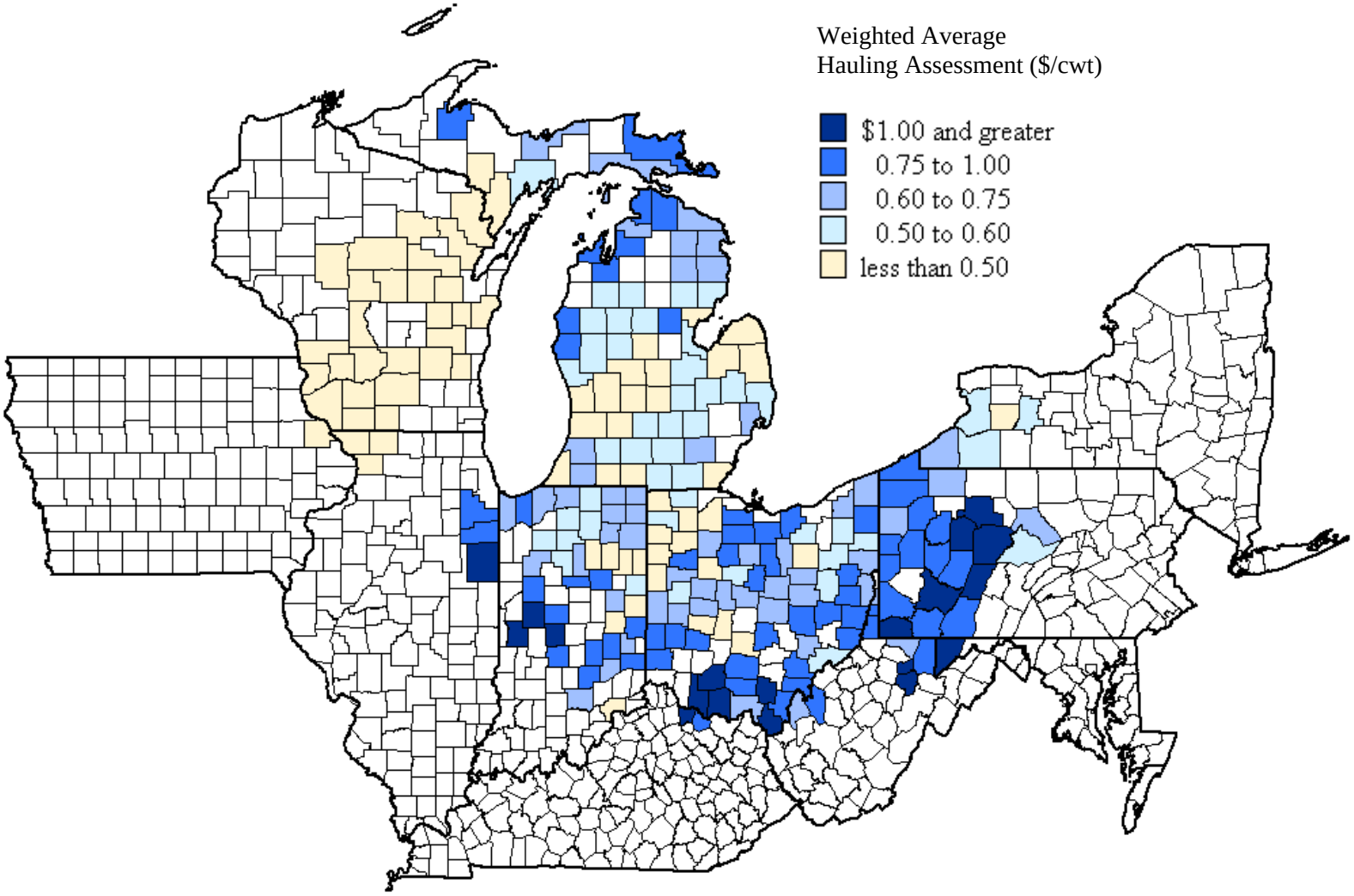
WEIGHTED AVERAGE HAULING ASSESSMENT PER CWT BY STATE AND COUNTY FOR MAY 2008 1/



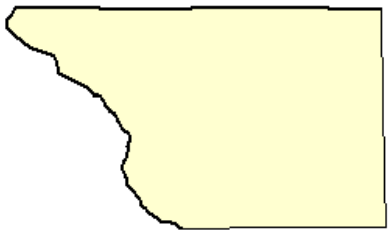
1/ Restricted information not included.

Maximum:

Montgomery County, Indiana

Weighted Average Hauling Charge per cwt: $1.3530 per cwt

Minimum:



Jo Daviess County, Illinois

Weighted Average Hauling Charge per cwt: $0.0639 per cwt

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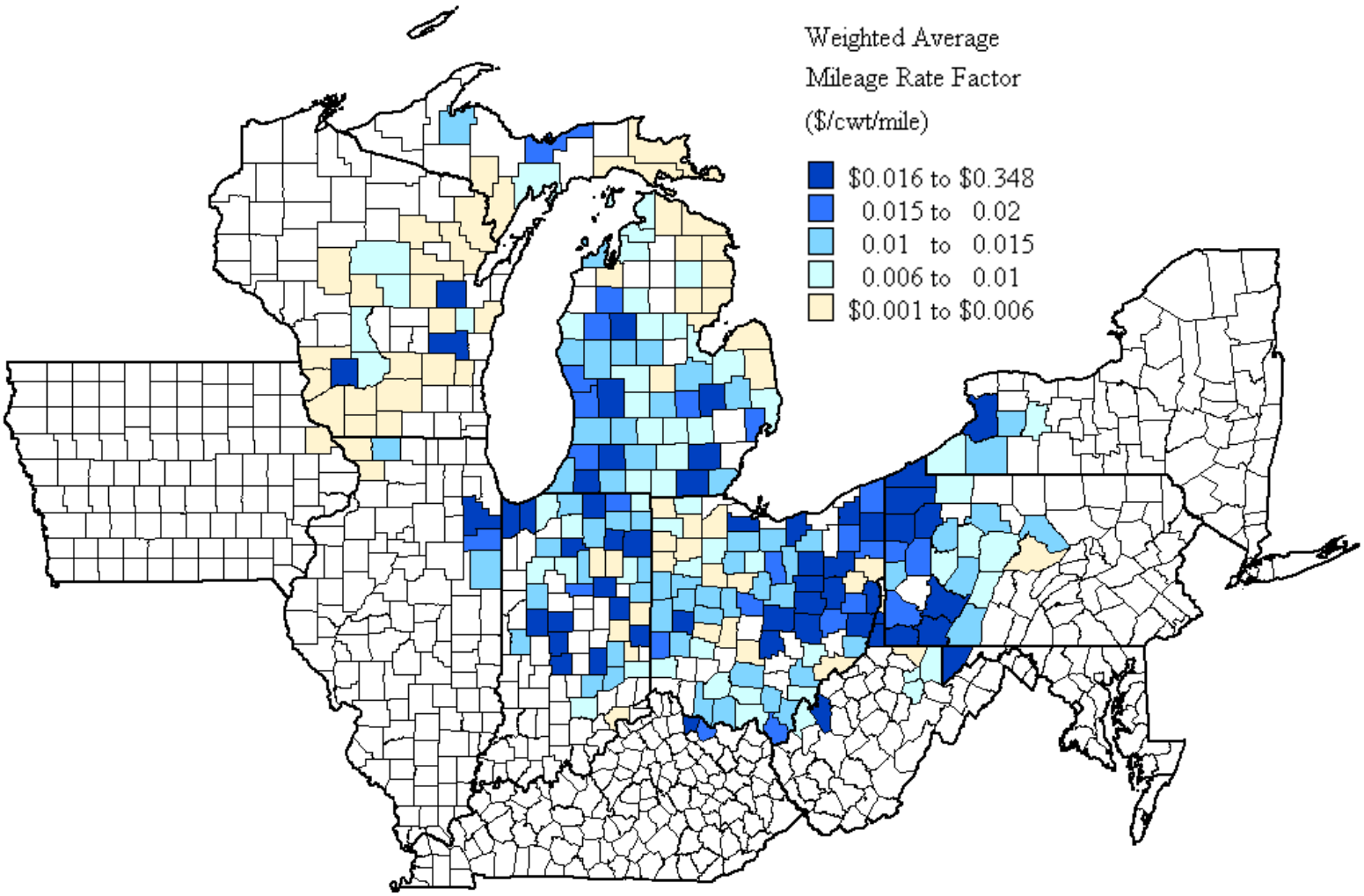
WEIGHTED AVERAGE MILEAGE RATE FACTOR BY STATE AND COUNTY FOR MAY 2008 1/



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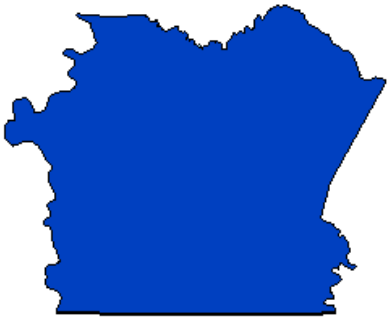
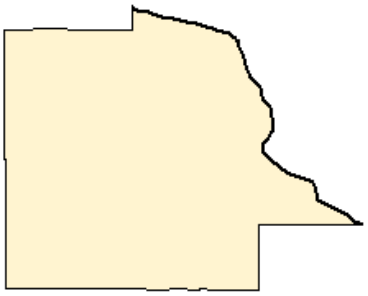


Fayette County, Pennsylvania

Weighted Average Mileage Rate Factor: $0.34708 per cwt per mile

Minimum:



Dubuque County, Iowa

Weighted Average Mileage Rate Factor: $0.00108 per cwt per mile

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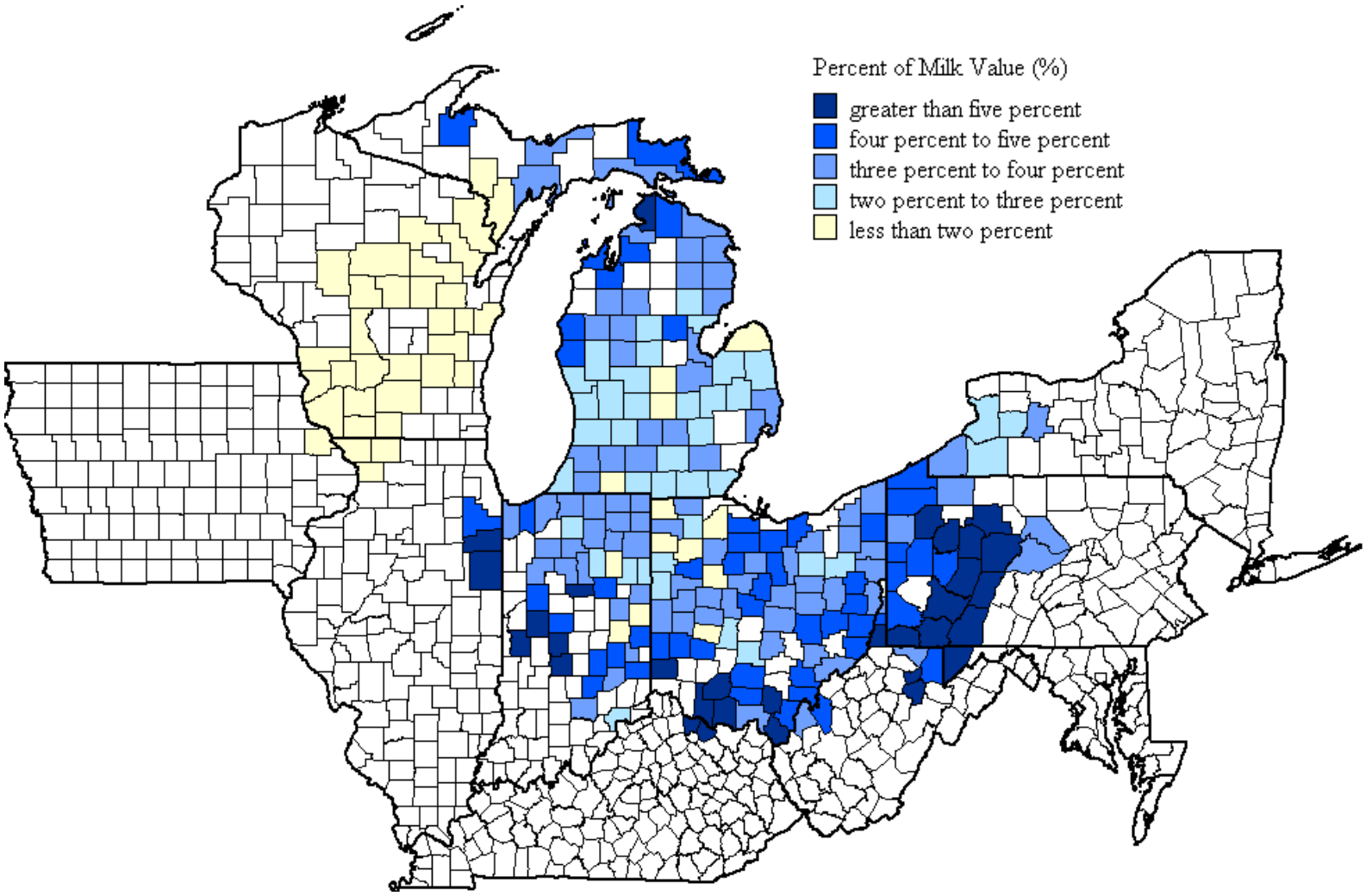
WEIGHTED AVERAGE PERCENT OF MILK VALUE BY STATE AND COUNTY FOR MAY 2008 1/



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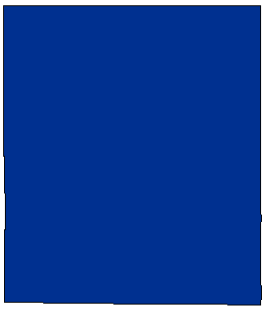
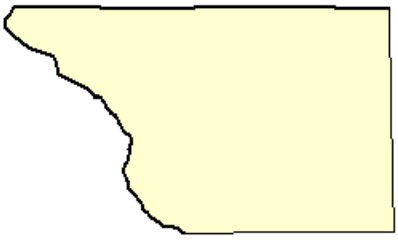


Montgomery County, Indiana

Weighted Average Percent of Milk Value: 7.61 percent

Minimum:



Jo Daviess County, Illinois

Weighted Average Percent of Milk Value: 0.36 percent

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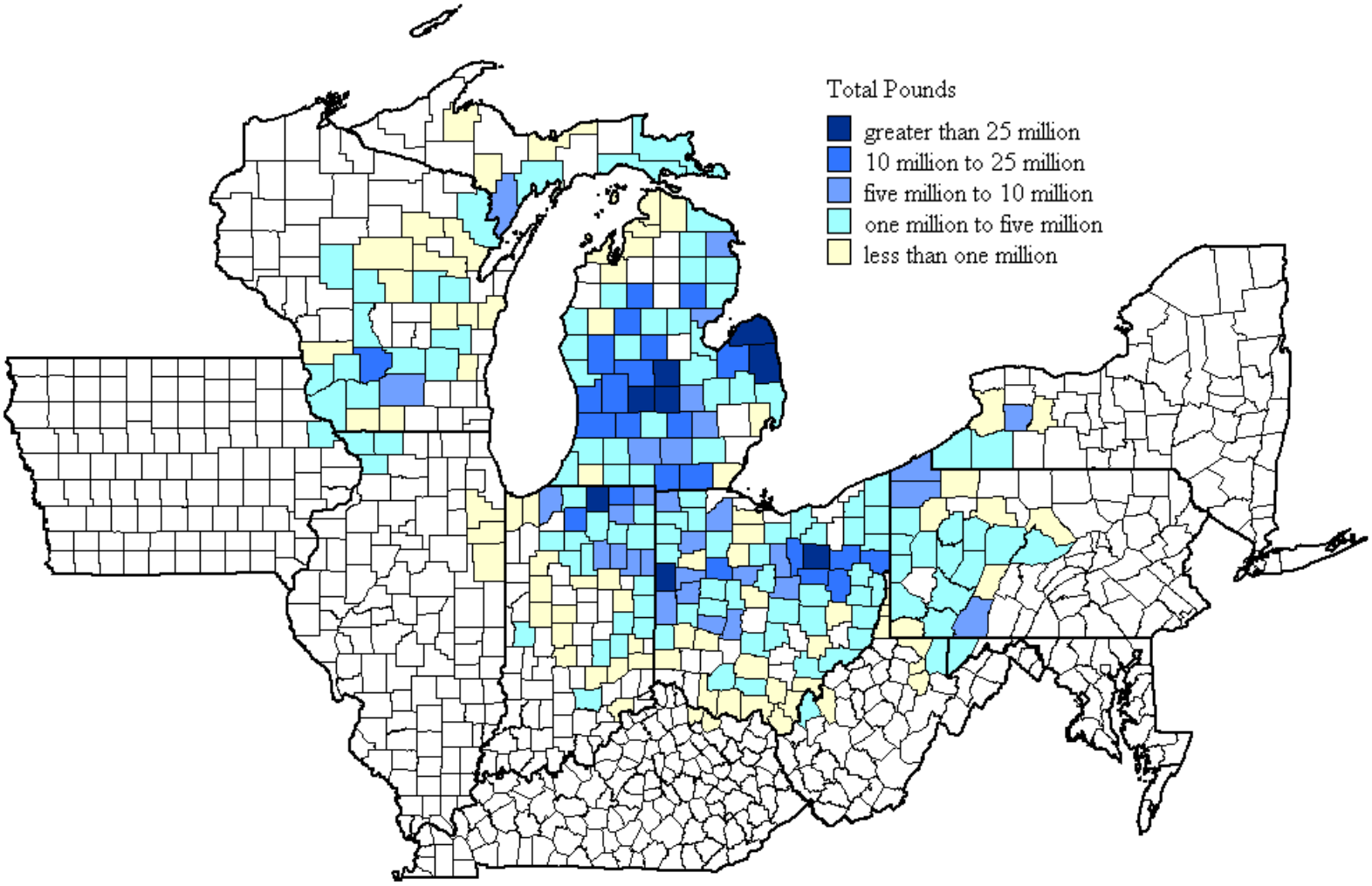
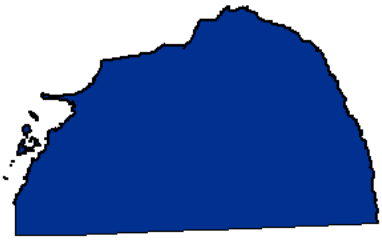
TOTAL POUNDS
BY STATE AND COUNTY FOR MAY 2008 1/



1/ Restricted information not included. Contains only pounds included in this analysis.

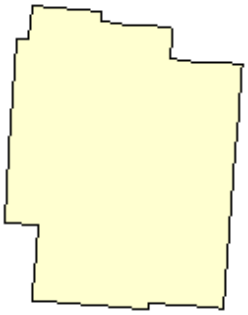
Maximum:



Huron County,
Michigan

Total Pounds:
61,291,264 pounds

Minimum:



Jackson County,
Ohio

Total Pounds:
104,340 pounds

APPENDIX C

Transportation Statistics by SubGroup for Producer Milk Associated with the Mideast Marketing Area, Selected States May 2008

State	Indiana	Kentucky	Michigan	New York	Ohio	Pennsylvania	West Virginia	Wisconsin	Average
Group Size				Total Pounds					
less than 60,000	14,797,679	172,859	18,689,580	982,266	18,029,675	9,820,247	1,004,192	4,317,492	8,476,749
60,000 to 90,000	13,348,036	285,917	18,311,125	692,495	22,087,836	8,545,676	695,895	6,663,989	8,828,871
90,000 to 125,000	12,999,777	R	22,828,168	840,651	29,346,454	6,554,611	930,656	7,276,857	11,539,596
125,000 to 190,000	18,639,711	R	37,468,738	1,983,226	38,977,120	10,611,952	1,124,111	12,376,285	17,311,592
190,000 to 250,000	11,675,108		30,646,494	843,702	30,616,722	6,071,731	R	8,024,206	14,646,327
250,000 to 500,000	26,689,120	R	97,363,200	3,018,046	56,681,094	9,512,949	1,685,459	13,147,461	29,728,190
500,000 to 1 million	16,047,600		90,254,432	3,376,074	40,170,681	1,931,185	R	5,044,593	26,137,428
1 million to 2 million	15,753,084		94,167,624	R	35,671,205	3,354,723		R	37,236,659
more than 2 million	22,093,584		161,887,664	R	48,356,605				77,445,951
Average	16,893,744	229,388	63,513,003	1,676,637	35,548,599	7,050,384	1,088,063	8,121,555	
Group Size				Average Delivery *(pounds)*					
less than 60,000	37,653	28,810	34,167	33,871	36,646	36,643	30,430	39,250	34,684
60,000 to 90,000	72,544	71,479	72,953	76,944	74,370	73,040	69,590	74,876	73,224
90,000 to 125,000	105,689	R	107,174	105,081	106,328	105,720	103,406	107,013	105,773
125,000 to 190,000	152,785	R	155,472	152,556	154,060	149,464	160,587	152,794	153,960
190,000 to 250,000	220,285		217,351	210,926	218,691	216,848	R	216,870	216,828
250,000 to 500,000	337,837	R	346,488	335,338	331,468	352,331	337,092	337,114	339,667
500,000 to 1 million	697,722		678,605	562,679	692,598		R	630,574	652,436
1 million to 2 million	1,432,099		1,405,487	R	1,321,156			R	1,386,247
more than 2 million	3,156,226		3,948,480	R	4,029,717				3,711,474
Average	690,315	50,145	774,020	211,056	773,893	155,674	140,221	222,642	
Group Size				Hauling Assessment ($)					
less than 60,000	$ 313.67	$ 399.17	$ 271.80	$ 260.50	$ 352.79	$ 439.36	$ 393.73	$ 141.13	$ 321.52
60,000 to 90,000	547.03	710.37	442.94	523.83	556.73	745.21	667.98	153.65	543.47
90,000 to 125,000	744.69	R	615.25	620.86	772.32	952.70	824.12	189.48	674.20
125,000 to 190,000	972.07	R	888.27	999.55	1,067.97	1,279.53	1,290.11	199.72	956.74
190,000 to 250,000	1,428.36		1,203.92	1,361.12	1,402.13	1,938.03	R	235.42	1,261.50
250,000 to 500,000	2,044.60	R	1,928.46	2,052.40	2,075.37	2,792.23	2,849.53	328.97	2,010.22
500,000 to 1 million	3,739.96		3,325.31	2,835.46	3,558.97	4,267.96	R	517.29	3,040.83
1 million to 2 million	6,087.11		5,666.15	R	4,914.06	6,819.59		R	5,871.73
more than 2 million	8,657.87		13,707.60	R	12,902.80				11,756.09
Average	$ 2,726.15	$ 554.77	$ 3,116.63	$ 1,236.25	$ 3,067.02	$ 2,404.33	$ 1,205.10	$ 252.24	
Group Size				Hauling Assessment ($/cwt)					
less than 60,000	$ 0.7826	$ 1.1634	$ 0.7018	$ 0.6245	$ 0.8360	$ 1.0768	$ 1.0621	$ 0.3905	$ 0.8297
60,000 to 90,000	0.7655	0.9910	0.5939	0.6651	0.7353	1.0069	0.9418	0.2136	0.7391
90,000 to 125,000	0.7304	R	0.5606	0.5856	0.7112	0.8982	0.7888	0.1769	0.6359
125,000 to 190,000	0.6610	R	0.5515	0.6513	0.6662	0.8479	0.7969	0.1347	0.6156
190,000 to 250,000	0.6651		0.5408	0.6414	0.6382	0.8822	R	0.1162	0.5807
250,000 to 500,000	0.5953	R	0.5240	0.5826	0.6084	0.7815	0.8039	0.0955	0.5702
500,000 to 1 million	0.5396		0.4769	0.5014	0.5021	0.6737	R	0.0816	0.4625
1 million to 2 million	0.4238		0.3881	R	0.3715	0.6133		R	0.4492
more than 2 million	0.2695		0.3022	R	0.2938				0.2885
Average	$ 0.6037	$ 1.0772	$ 0.5155	$ 0.6074	$ 0.5959	$ 0.8476	$ 0.8787	$ 0.1727	
Group Size				Delivery Distance (miles)					
less than 60,000	59.6	79.2	76.2	73.3	64.8	69.1	99.8	40.2	70.3
60,000 to 90,000	57.4	44.5	74.6	68.2	63.7	67.2	95.2	38.4	63.6
90,000 to 125,000	57.6	R	68.6	68.8	59.9	70.7	125.5	37.1	69.8
125,000 to 190,000	69.4	R	80.7	69.4	61.0	63.8	119.8	37.9	71.7
190,000 to 250,000	62.0		80.3	91.4	59.4	71.7	R	39.0	67.3
250,000 to 500,000	82.1	R	79.9	58.5	62.6	75.4	111.1	32.8	71.8
500,000 to 1 million	72.4		74.9	67.4	54.8	79.7	R	43.9	65.5
1 million to 2 million	125.7		112.6	R	81.2	74.5		R	98.5
more than 2 million	209.1		154.0	R	119.4				160.8
Average	88.4	61.8	89.1	71.0	69.6	71.5	110.3	38.4	

R: Restricted information not included.

(continued on the following page)

APPENDIX C

Transportation Statistics by SubGroup for Producer Milk Associated with the Mideast Marketing Area, Selected States May 2008

State	Indiana	Kentucky	Michigan	New York	Ohio	Pennsylvania	West Virginia	Wisconsin	Average
Group Size	Mileage Rate Factor ($/cwt/mile)								
less than 60,000	$ 0.03550	$ 0.02242	$ 0.01976	$ 0.01377	$ 0.02482	$ 0.05170	$ 0.04347	$ 0.03785	$ 0.03116
60,000 to 90,000	0.03950	0.02277	0.01736	0.02213	0.02208	0.03470	0.05002	0.02713	0.02946
90,000 to 125,000	0.05343	R	0.01841	0.00865	0.02237	0.02078	0.00716	0.01586	0.02095
125,000 to 190,000	0.03944	R	0.01333	0.01001	0.01893	0.02275	0.00889	0.01776	0.01873
190,000 to 250,000	0.03354		0.01150	0.00749	0.02201	0.04186	R	0.01532	0.02195
250,000 to 500,000	0.02545	R	0.01514	0.02085	0.01844	0.04777	0.00952	0.01519	0.02177
500,000 to 1 million	0.01782		0.01630	0.01198	0.01864	0.01048	R	0.00289	0.01302
1 million to 2 million	0.00467		0.00718	R	0.00820	0.01101		R	0.00777
more than 2 million	0.00144		0.00441	R	0.00267				0.00284
Average	$ 0.02787	$ 0.02259	$ 0.01371	$ 0.01355	$ 0.01757	$ 0.03013	$ 0.02381	$ 0.01886	
Group Size	Percent of Milk Value (%)								
less than 60,000	4.32	6.12	3.86	3.36	4.47	5.73	5.47	2.19	4.44
60,000 to 90,000	4.25	5.53	3.30	3.57	4.00	5.43	4.95	1.21	4.03
90,000 to 125,000	4.11	R	3.12	3.22	3.91	4.91	4.27	1.00	3.51
125,000 to 190,000	3.70	R	3.09	3.53	3.68	4.62	4.16	0.77	3.36
190,000 to 250,000	3.71		3.02	3.38	3.54	4.87	R	0.66	3.20
250,000 to 500,000	3.40	R	2.98	3.19	3.38	4.32	4.17	0.54	3.14
500,000 to 1 million	3.08		2.72	2.69	2.81		R	0.47	2.35
1 million to 2 million	2.40		2.22	R	2.08			R	2.23
more than 2 million	1.50		1.72	R	1.64				1.62
Average	3.38	5.82	2.89	3.28	3.28	4.98	4.60	0.98	

R: Restricted information not included.

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Figure 1. Frequency Distribution of Hauling Charges

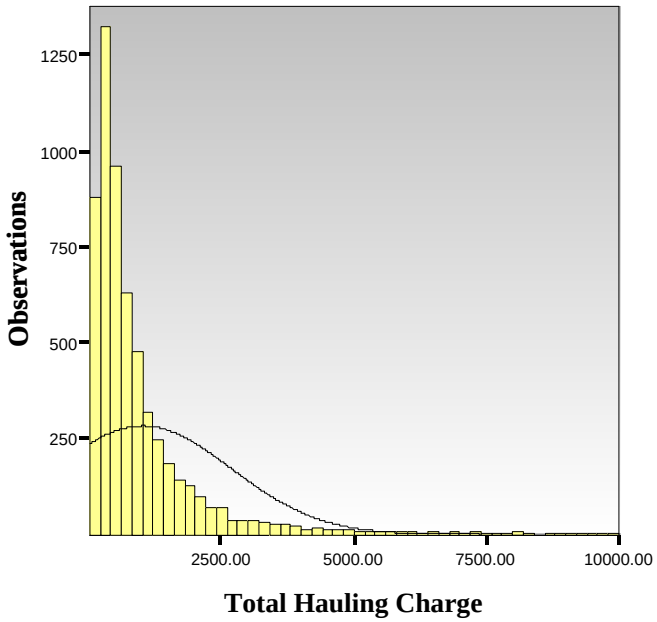
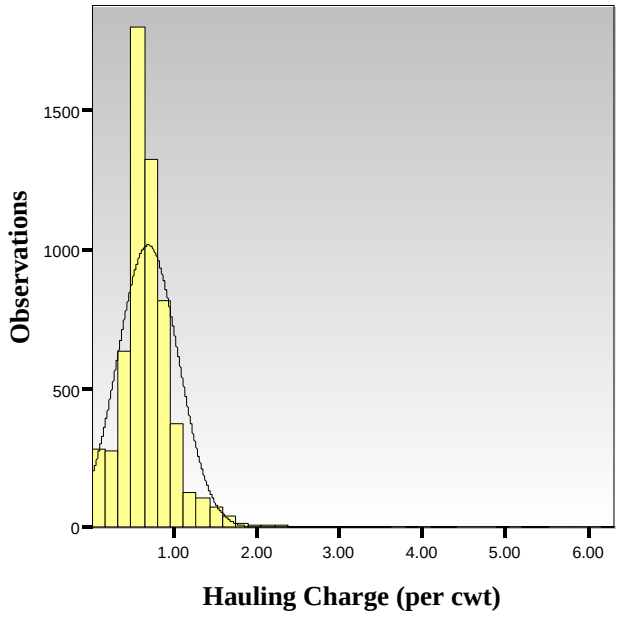


Figure 2. Frequency Distribution of Hauling Charges per cwt

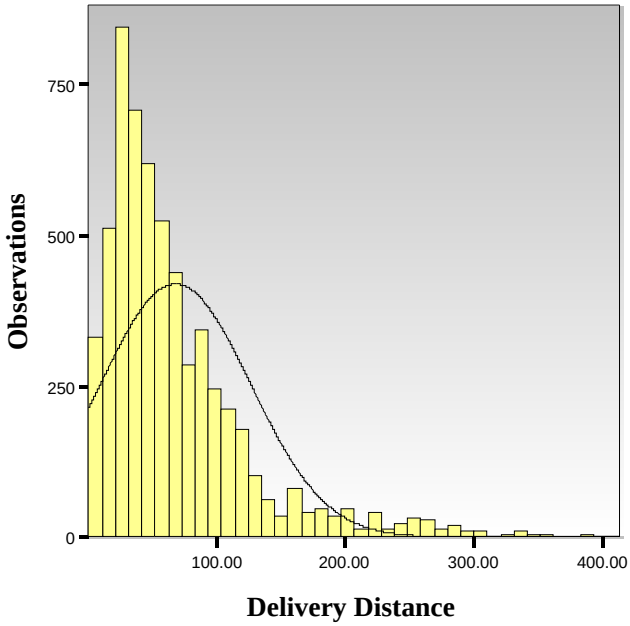


(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Figure 3. Frequency Distribution of Hauling Distance



(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (a)

Dependent Variable: HC
Method: Least Squares
Date: 10/08/08 Time: 09:36
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	425.7202	22.74292	18.71880	0.0000
POUNDS	0.003155	2.34E-05	134.5516	0.0000
CLUSTER	-0.578401	0.188386	-3.070300	0.0021
HANDLER	-59.75132	10.93831	-5.462575	0.0000
DISTANCE	0.419524	0.195121	2.150070	0.0316

R-squared	0.759877	Mean dependent var	1019.419
Adjusted R-squared	0.759715	S.D. dependent var	1672.208
S.E. of regression	819.6979	Akaike info criterion	16.25659
Sum squared resid	3.98E+09	Schwarz criterion	16.26223
Log likelihood	-48203.92	Hannan-Quinn criter.	16.25855
F-statistic	4688.249	Durbin-Watson stat	1.993357
Prob(F-statistic)	0.000000		

Regression Model (b)

Dependent Variable: HC
Method: Least Squares
Date: 10/08/08 Time: 09:38
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	316.0205	22.89964	13.80024	0.0000
POUNDS	0.003958	4.91E-05	80.66400	0.0000
POUNDS^2	-1.92E-10	1.04E-11	-18.47684	0.0000
CLUSTER	-0.576889	0.183198	-3.148996	0.0016
HANDLER	-63.89535	10.63944	-6.005520	0.0000
DISTANCE	0.397316	0.189751	2.093878	0.0363

R-squared	0.772959	Mean dependent var	1019.419
Adjusted R-squared	0.772767	S.D. dependent var	1672.208
S.E. of regression	797.1238	Akaike info criterion	16.20091
Sum squared resid	3.76E+09	Schwarz criterion	16.20767
Log likelihood	-48037.79	Hannan-Quinn criter.	16.20326
F-statistic	4034.315	Durbin-Watson stat	2.084517
Prob(F-statistic)	0.000000		

(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (c)

Dependent Variable: HC
Method: Least Squares
Date: 10/15/08 Time: 10:23
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	256.0659	30.90290	8.286147	0.0000
POUNDS	0.003958	4.90E-05	80.72015	0.0000
POUNDS^2	-1.92E-10	1.04E-11	-18.47325	0.0000
DISTANCE	1.812912	0.525712	3.448487	0.0006
DISTANCE^2	-0.005455	0.001889	-2.887094	0.0039
CLUSTER	-0.551890	0.183289	-3.011036	0.0026
HANDLER	-54.63678	11.10593	-4.919603	0.0000

R-squared	0.773278	Mean dependent var	1019.419
Adjusted R-squared	0.773048	S.D. dependent var	1672.208
S.E. of regression	796.6309	Akaike info criterion	16.19984
Sum squared resid	3.76E+09	Schwarz criterion	16.20773
Log likelihood	-48033.62	Hannan-Quinn criter.	16.20258
F-statistic	3367.481	Durbin-Watson stat	2.084192
Prob(F-statistic)	0.000000		

Regression Model (d)

Dependent Variable: HC
Method: Least Squares
Date: 10/08/08 Time: 10:16
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	346.9053	17.61239	19.69666	0.0000
POUNDS	0.003968	4.92E-05	80.71142	0.0000
POUNDS^2	-1.92E-10	1.04E-11	-18.48437	0.0000
CLUSTER	-0.588013	0.183492	-3.204567	0.0014
HANDLER	-70.85629	10.12539	-6.997885	0.0000
LOC_ADJ	-53.33088	127.1446	-0.419451	0.6749

R-squared	0.772797	Mean dependent var	1019.419
Adjusted R-squared	0.772606	S.D. dependent var	1672.208
S.E. of regression	797.4069	Akaike info criterion	16.20162
Sum squared resid	3.77E+09	Schwarz criterion	16.20838
Log likelihood	-48039.90	Hannan-Quinn criter.	16.20397
F-statistic	4030.611	Durbin-Watson stat	2.083697
Prob(F-statistic)	0.000000		

(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (e)

Dependent Variable: HC
Method: Least Squares
Date: 10/08/08 Time: 10:22
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	380.3580	11.68176	32.56000	0.0000
POUNDS	0.003165	2.33E-05	136.0512	0.0000

R-squared	0.757395	Mean dependent var	1019.419
Adjusted R-squared	0.757354	S.D. dependent var	1672.208
S.E. of regression	823.7139	Akaike info criterion	16.26586
Sum squared resid	4.02E+09	Schwarz criterion	16.26812
Log likelihood	-48234.41	Hannan-Quinn criter.	16.26664
F-statistic	18509.94	Durbin-Watson stat	1.993371
Prob(F-statistic)	0.000000		

Regression Model (f)

Dependent Variable: LOG(HC)
Method: Least Squares
Date: 10/20/08 Time: 09:48
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.505061	0.074842	-33.47152	0.0000
LOG(POUNDS)	0.773361	0.006479	119.3642	0.0000

R-squared	0.706148	Mean dependent var	6.389589
Adjusted R-squared	0.706098	S.D. dependent var	0.989191
S.E. of regression	0.536267	Akaike info criterion	1.591968
Sum squared resid	1705.076	Schwarz criterion	1.594223
Log likelihood	-4718.982	Hannan-Quinn criter.	1.592752
F-statistic	14247.81	Durbin-Watson stat	1.925436
Prob(F-statistic)	0.000000		

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APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (g)

Dependent Variable: HC
Method: Least Squares
Date: 10/08/08 Time: 10:23
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	267.5389	12.94078	20.67409	0.0000
POUNDS	0.003962	4.92E-05	80.55751	0.0000
POUNDS^2	-1.90E-10	1.04E-11	-18.24550	0.0000

R-squared	0.770295	Mean dependent var	1019.419
Adjusted R-squared	0.770217	S.D. dependent var	1672.208
S.E. of regression	801.5835	Akaike info criterion	16.21156
Sum squared resid	3.81E+09	Schwarz criterion	16.21494
Log likelihood	-48072.38	Hannan-Quinn criter.	16.21274
F-statistic	9939.501	Durbin-Watson stat	2.082266
Prob(F-statistic)	0.000000		

Regression Model (h)

Dependent Variable: HC
Method: Least Squares
Date: 10/15/08 Time: 10:38
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	705.3073	32.96756	21.39398	0.0000
DISTANCE	4.618086	0.368284	12.53948	0.0000

R-squared	0.025835	Mean dependent var	1019.419
Adjusted R-squared	0.025671	S.D. dependent var	1672.208
S.E. of regression	1650.605	Akaike info criterion	17.65601
Sum squared resid	1.62E+10	Schwarz criterion	17.65826
Log likelihood	-52356.89	Hannan-Quinn criter.	17.65679
F-statistic	157.2386	Durbin-Watson stat	0.527452
Prob(F-statistic)	0.000000		

(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (i)

Dependent Variable: HC
Method: Least Squares
Date: 10/15/08 Time: 10:37
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	686.3249	47.08286	14.57696	0.0000
DISTANCE	5.145811	1.004422	5.123156	0.0000
DISTANCE^2	-0.002111	0.003737	-0.564738	0.5723

R-squared	0.025888	Mean dependent var	1019.419
Adjusted R-squared	0.025559	S.D. dependent var	1672.208
S.E. of regression	1650.700	Akaike info criterion	17.65629
Sum squared resid	1.62E+10	Schwarz criterion	17.65967
Log likelihood	-52356.73	Hannan-Quinn criter.	17.65747
F-statistic	78.76976	Durbin-Watson stat	0.526633
Prob(F-statistic)	0.000000		

Regression Model (j)

Dependent Variable: POUNDS
Method: Least Squares
Date: 10/20/08 Time: 10:05
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	101527.2	12529.59	8.102992	0.0000
CLUSTER	-16.50856	104.3591	-0.158190	0.8743
DISTANCE	1316.273	106.7297	12.33277	0.0000
HANDLER	18950.32	6054.447	3.129984	0.0018

R-squared	0.025188	Mean dependent var	201909.9
Adjusted R-squared	0.024695	S.D. dependent var	459797.5
S.E. of regression	454084.6	Akaike info criterion	28.89063
Sum squared resid	1.22E+15	Schwarz criterion	28.89514
Log likelihood	-85671.16	Hannan-Quinn criter.	28.89220
F-statistic	51.04990	Durbin-Watson stat	0.053514
Prob(F-statistic)	0.000000		

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APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (k)

Dependent Variable: DISTANCE
Method: Least Squares
Date: 10/20/08 Time: 10:06
Sample: 1 5931
Included observations: 5931

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.41431	1.131834	68.39722	0.0000
CLUSTER	-0.040652	0.012530	-3.244482	0.0012
POUNDS	1.90E-05	1.54E-06	12.33277	0.0000
HANDLER	-17.30189	0.692614	-24.98058	0.0000

R-squared	0.121428	Mean dependent var	68.01782
Adjusted R-squared	0.120983	S.D. dependent var	58.20140
S.E. of regression	54.56723	Akaike info criterion	10.83742
Sum squared resid	17648135	Schwarz criterion	10.84193
Log likelihood	-32134.36	Hannan-Quinn criter.	10.83899
F-statistic	273.0584	Durbin-Watson stat	1.984179
Prob(F-statistic)	0.000000		

(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (l)

Heteroskedasticity Test: White

F-statistic	307.2454	Prob. F(25,5905)	0.0000
Obs*R-squared	3353.678	Prob. Chi-Square(25)	0.0000
Scaled explained SS	889939.0	Prob. Chi-Square(25)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/07/08 Time: 08:54
Sample: 1 5931
Included observations: 5931
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2599700.	868080.5	-2.994769	0.0028
POUNDS	31.45560	2.147232	14.64937	0.0000
POUNDS^2	-2.71E-05	1.45E-06	-18.70955	0.0000
POUNDS*(POUNDS^2)	6.83E-12	3.94E-13	17.32839	0.0000
POUNDS*DISTANCE	-0.194102	0.027569	-7.040653	0.0000
POUNDS*(DISTANCE^2)	0.000306	8.54E-05	3.587839	0.0003
POUNDS*CLUSTER	0.051753	0.013305	3.889697	0.0001
POUNDS*HANDLER	-13.95683	0.737425	-18.92645	0.0000
(POUNDS^2)^2	-5.98E-19	3.13E-20	-19.07554	0.0000
(POUNDS^2)*DISTANCE	8.44E-08	6.84E-09	12.33155	0.0000
(POUNDS^2)*(DISTANCE^2)	-1.46E-10	2.01E-11	-7.244156	0.0000
(POUNDS^2)*CLUSTER	-3.11E-08	3.25E-09	-9.585247	0.0000
(POUNDS^2)*HANDLER	7.62E-06	1.86E-07	40.97098	0.0000
DISTANCE	9280.341	29236.50	0.317423	0.7509
DISTANCE^2	92.05370	341.2442	0.269759	0.7874
DISTANCE*(DISTANCE^2)	-0.360994	1.530304	-0.235897	0.8135
DISTANCE*CLUSTER	70.60438	115.7272	0.610093	0.5418
DISTANCE*HANDLER	3788.006	8532.904	0.443929	0.6571
(DISTANCE^2)^2	0.000398	0.002249	0.176916	0.8596
(DISTANCE^2)*CLUSTER	-0.441290	0.453229	-0.973658	0.3303
(DISTANCE^2)*HANDLER	-0.338620	33.54870	-0.010093	0.9919
CLUSTER	-13901.80	11039.84	-1.259239	0.2080
CLUSTER^2	42.25770	39.01701	1.083058	0.2788
CLUSTER*HANDLER	-1722.485	3107.413	-0.554315	0.5794
HANDLER	1288857.	586361.5	2.198059	0.0280
HANDLER^2	95932.77	105267.6	0.911323	0.3622

R-squared	0.565449	Mean dependent var	633871.7
Adjusted R-squared	0.563461	S.D. dependent var	14621278
S.E. of regression	9660435.	Akaike info criterion	35.00901
Sum squared resid	5.51E+17	Schwarz criterion	35.03833
Log likelihood	-103793.2	Hannan-Quinn criter.	35.01920
F-statistic	307.2454	Durbin-Watson stat	2.582844
Prob(F-statistic)	0.000000		

(continued on the following page)

APPENDIX D

MIDEAST MARKETING AREA TRANSPORTATION ANALYSIS SPSS/EVIEWS OUTPUT

Regression Model (m)

Dependent Variable: HC
Method: Least Squares
Date: 11/07/08 Time: 08:57
Sample: 1 5931
Included observations: 5931
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	256.0659	27.43769	9.332636	0.0000
POUNDS	0.003958	0.000226	17.47968	0.0000
POUNDS^2	-1.92E-10	9.92E-11	-1.931246	0.0535
DISTANCE	1.812912	0.461529	3.928059	0.0001
DISTANCE^2	-0.005455	0.001756	-3.106330	0.0019
CLUSTER	-0.551890	0.116647	-4.731292	0.0000
HANDLER	-54.63678	12.02659	-4.542998	0.0000

R-squared	0.773278	Mean dependent var	1019.419
Adjusted R-squared	0.773048	S.D. dependent var	1672.208
S.E. of regression	796.6309	Akaike info criterion	16.19984
Sum squared resid	3.76E+09	Schwarz criterion	16.20773
Log likelihood	-48033.62	Hannan-Quinn criter.	16.20258
F-statistic	3367.481	Durbin-Watson stat	2.084192
Prob(F-statistic)	0.000000		