May 2010 Transportation Analysis

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Methodology

This study analyzes the hauling assessments paid by milk producers and the delivery distance to the first delivery point of milk marketed by producers pooling on the Mideast Marketing Area, Federal Order 33 (FMMO 33), during May 2010.

Hauling assessments 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 necessarily reflect the total costs of farm pickup and delivery to the plant.

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.

Data

There were 5,672 producers included in this analysis and the geographical region encompassed in this population includes: Illinois, Indiana, Kentucky, Maryland, Michigan, New York, Ohio, Pennsylvania, West Virginia and Wisconsin.

The data includes only producers whose payroll information was submitted electronically. For the purposes of calculating representative weighted averages, producers with depooled milk, and who pooled milk on multiple orders were included in this analysis provided they also pooled milk on FMMO 33 during May 2010. 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 FMMO 33 during May 2010.

May 2010 Summary

The producers included in this study marketed approximately 1.24 billion pounds of milk in May 2010, and the average delivery volume was 218,910 lbs.

Table 1. Transportation Statistics FMMO 33, May 2010 and May 2009

	May 2010	May 2009
Milk Milk Marketings	1,241,660,074	1,209,330,304
Total Hauling Assessments ($)	6,233,739.55	5,770,376.74
Weighted Average		
Hauling Assessment ($)	4,400.01	4,230.05
Hauling Assessment ($/cwt)	0.5020	0.4772
Delivery Distance (miles)	105.0	102.7
Mileage Rate Factor ($/cwt/mile)	0.0145	0.0161
Simple Average		
Hauling Assessment ($)	1,099.04	1,024.39
Hauling Assessment ($/cwt)	0.7166	0.6876
Delivery Distance (miles)	87.8	80.8
Mileage Rate Factor ($/cwt/mile)	0.0243	0.0284

During May 2010, total hauling assessments paid by producers included in this analysis was approximately $6.2 million dollars.

The market wide May 2010 weighted average hauling assessment was $4,400.01, $169.96 more than May 2009. The weighted average hauling assessment per cwt was 50.20 cents, 2.5 cents higher than May 2009.

The weighted average delivery distance was 105.0 miles, 2.3 miles greater than the May 2009 weighted average.

The weighted average mileage rate factor (MRF) was 1.45 cents per cwt per mile, marginally lower than May 2009.

For comparative purposes Table 1 contains descriptive statistics for May 2010 and 2009. Comparisons to previous years are available online at www.fmmaclev.com.

The weighted average calculation puts comparatively less weight on producers with little delivery volume. Therefore, when comparing the weighted average and

the simple average for each category it becomes apparent that smaller producers tend to have lower total hauling assessments, higher hauling assessments per cwt, shorter delivery distances and higher per cwt per mile hauling assessments.

Transportation Analysis by Percentile Group

In order to examine the impact producer size has on hauling assessments and delivery distance; producers associated with the marketing area were divided into 10 equally sized percentile groups. Percentile groups were determined using producer identification codes and delivery volume. There were 5,672 producers included in this study, so each percentile group contained 567 producers (Two additional producers were included in group one to balance). Percentile group one represents producers with the smallest delivery volume and group ten represents producers with the largest delivery volume.

Weighted average hauling assessments by percentile group ranged from $222.45 for producers in percentile group one to $7,182.25 for producers in percentile group ten. Of the $6.2 million dollars paid by the producers included in this study, producers delivering the largest volumes of milk (percentile group ten) paid approximately 42 percent of the assessments and accounted for more than 54 percent of the 1.2 billion pounds delivered. Figure one details percentages of hauling assessments and delivery volume by percentile group.

Weighted average hauling assessments per cwt ranged from $1.11 per cwt for producers in percentile group one to 38.95 cents per cwt for producers in percentile group ten. The decline in per cwt assessments as delivery volume increases indicates the presence of diminishing marginal costs in milk transportation. Similar relationships between the hauling assessment and delivery volume were also observed in the findings of Freije and Espe of the Upper Midwest and Pacific Northwest orders, respectively.
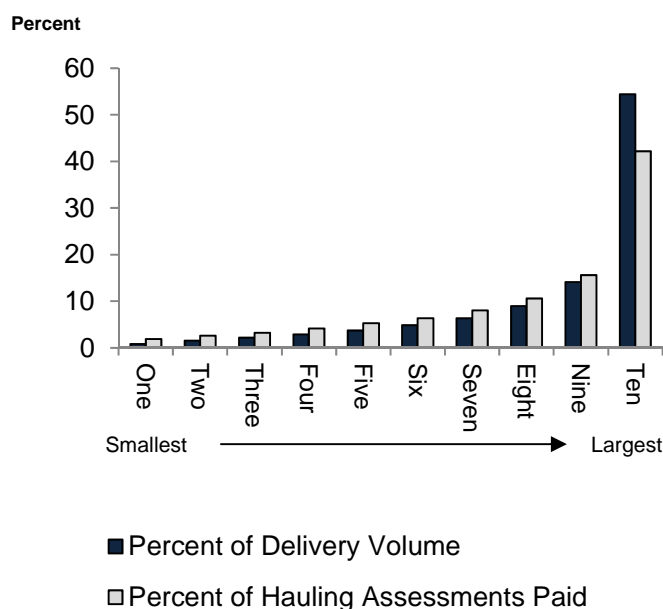
Weighted average delivery distances were similar among many of the percentile groups. The observed increase in

the weighted average delivery distance for producers delivering larger quantities of milk is likely a function of multiple factors such as their ability to direct ship from the farm, and their role in balancing milk demand in deficit areas.

Weighted average MRF ranged from 4.53 cents per cwt per mile for producers in percentile group one to 0.83 cents per cwt per mile for producers in the largest percentile group.

In order to put the percentile groups into perspective consider that the top three percentile groups (eight, nine and ten) accounted for more than 77 percent of the milk included in this analysis. Additionally, the top percentile group alone accounted for more milk than the total class I milk volume pooled on FMMO 33 during May 2010 (526 million lbs).

Figure 1. Percentages of Hauling Assessments Paid and Milk Delivery Volume by Percentile Group
FMMO 33, May 2010

■ Percent of Delivery Volume
□ Percent of Hauling Assessments Paid

Table 2. Weighted Average Transportation Statistics by Percentile Group, May 2010

Percentile Group	Delivery Volume	Average Delivery Volume	Total Hauling Assessment	Total Hauling Assessment	Delivery Distance	Mileage Rate Factor
			$	$/cwt	miles	$/cwt/mile
One	10,715,589	18,832	222.45	1.1099	104.4	0.0453
Two	19,658,547	34,671	286.78	0.8192	90.0	0.0298
Three	27,112,685	47,818	360.95	0.7498	84.6	0.0231
Four	35,827,134	63,187	458.49	0.7219	86.2	0.0212
Five	46,667,900	82,307	582.45	0.7043	82.7	0.0247
Six	60,494,841	106,693	704.31	0.6580	78.0	0.0280
Seven	79,115,354	139,533	890.53	0.6348	85.0	0.0190
Eight	111,377,658	196,433	1,173.77	0.5914	85.1	0.0181
Nine	175,476,314	309,482	1,758.40	0.5551	80.0	0.0208
Ten	675,214,052	1,190,854	7,182.25	0.3895	123.4	0.0083
Weighted Average			4,400.01	0.5020	105.0	0.0145

Transportation Analysis by State

For this section transportation statistics were analyzed by the state. Milk from ten states was included in this analysis; of the ten states, Ohio, Michigan, Indiana, West Virginia, Kentucky and Pennsylvania are states located or partially located within FMMO 33.

Producer size varies dramatically throughout the region. Producer size is estimated using average delivery volume. Average delivery volume ranges from 71,429 pounds for producers in Maryland to 346,125 pounds for Michigan producers.

New York producers pooling on FMMO 33 had the highest weighted average hauling assessment at $6,882.32, which was $2,482.31 higher than the market weighted average. Wisconsin producers pooling on FMMO 33 had the lowest weighted average hauling assessment at $403.26, which was $3,996.75 less than the market weighted average.
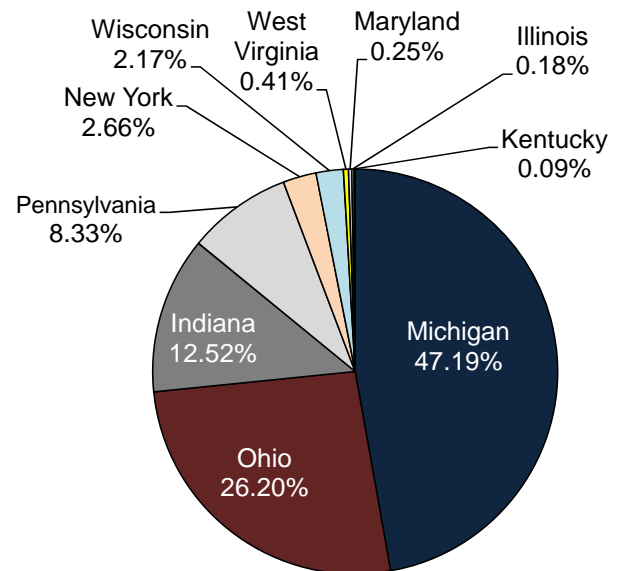
Weighted average hauling assessments per cwt ranged from $0.15 for Wisconsin producers to $1.05 for producers in Maryland. The low weighted average hauling assessment observed for Wisconsin is supported by the findings of the Upper Midwest marketing area. Research by the Upper Midwest indicated that weighted average hauling assessments per cwt for Wisconsin producers was 14.8 cents per cwt during May 2009. 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 bid 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 38.7 miles for producers in Wisconsin to 132.0 miles for producers in Pennsylvania. Delivery distance is a function of pooling practices and supply locations. For example, a portion of the milk from states outside the marketing area could be diverted milk pooled on FMMO 33 but not delivered to facilities located within the FMMO 33 geographical region, resulting in a lower weighted average delivery distance.

Weighted average MRF ranged from a low of 0.91 cents per cwt per mile for Michigan producers to a high of 2.89 cents per cwt per mile for Indiana producers.

Figure 2. Percent of Delivery Volume by State FMMO 33, May 2010

Table 3. Weighted Average Transportation Statistics by State, May 2010

State	Delivery Volume	Average Delivery Volume	Farm Count	Total Hauling Assessment	Total Hauling Assessment	Delivery Distance	Mileage Rate Factor
				$	$/cwt	miles	$/cwt/mile
Illinois	2,195,698	99,804	22	1,064.21	0.8107	86.5	0.0128
Indiana	155,458,760	160,267	970	3,051.77	0.5797	79.3	0.0289
Kentucky	1,142,025	76,135	15	1,173.81	0.9389	77.7	0.0155
Maryland	3,142,878	71,429	44	900.39	1.0458	131.6	0.0143
Michigan	585,989,863	346,125	1,693	4,990.64	0.4100	116.0	0.0091
New York	32,975,109	291,815	113	6,882.32	0.6276	123.0	0.0093
Ohio	325,323,540	190,470	1,708	4,491.75	0.5346	92.4	0.0139
Pennsylvania	103,391,802	119,528	865	3,412.50	0.8101	132.0	0.0278
West Virginia	5,078,146	80,605	63	1,184.03	0.8776	123.6	0.0230
Wisconsin	26,962,253	150,627	179	403.26	0.1494	38.7	0.0134
Weighted Average				4,400.01	0.5020	105.0	0.0145

Transportation Analysis by Size and State

For this section, the data was divided into multiple subgroups. Each subgroup was analyzed to determine the weighted average hauling assessment 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 transportation differences among homogenously sized producers from state to state are likely due to multiple factors within each state. Factors could include: state regulations on load size and labor hours, road conditions, farm location relative to the delivery point, unpredictable processor demand and milk balancing, and the competition for milk supplies in the area among others.

Additionally, it is possible for a producer to choose a hauler based on criteria other than rate. Service criteria could include a hauler's performance, personal relationship, accuracy of milk weights, delivery time and sampling techniques.

Table 4. Weighted Average Hauling Assessment by Size and State, May 2010

Percentile Group	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	West Virginia	Wisconsin
					$					
One	364.42	238.77	244.35	317.34	181.30	232.49	213.52	276.36	258.30	147.51
Two	R	270.37	R	491.66	254.35	289.91	277.33	347.66	373.38	152.69
Three	R	352.71	R	561.36	310.53	370.70	362.26	432.26	450.63	175.23
Four	659.77	449.91	600.48	688.81	403.09	467.54	427.68	562.30	600.26	162.98
Five		643.28	R	886.87	470.34	587.51	578.43	702.28	740.86	191.63
Six		754.66	R	1,054.89	597.42	745.23	730.74	880.46	872.22	194.22
Seven	1,181.18	917.26		1,263.11	799.16	965.41	891.36	1,161.65	1,101.92	205.39
Eight	1,640.36	1,237.16	R	R	1,054.76	1,327.16	1,193.80	1,590.00	1,643.35	223.30
Nine	R	1,827.32			1,709.73	2,231.25	1,783.78	2,243.48	R	302.11
Ten		5,871.20			6,647.07	9,713.42	8,716.95	9,551.55		987.70
Weighted Average	1,064.21	3,051.77	1,173.81	900.39	4,990.64	6,882.32	4,491.75	3,412.50	1,184.03	403.26

Table 5. Weighted Average Hauling Assessment per cwt. by Size and State, May 2010

Percentile Group	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	West Virginia	Wisconsin
					$/cwt					
One	1.6495	1.1515	1.1054	1.2775	0.9520	1.3078	1.0592	1.3438	1.5868	0.7509
Two	R	0.7679	R	1.3614	0.7330	0.8257	0.7974	0.9818	1.1266	0.4604
Three	R	0.7338	R	1.2238	0.6448	0.7398	0.7470	0.8993	0.9492	0.3769
Four	1.0398	0.7118	0.9785	1.0676	0.6327	0.7256	0.6760	0.8856	0.9236	0.2528
Five		0.7771	R	1.0080	0.5719	0.7404	0.7014	0.8420	0.9207	0.2266
Six		0.7059	R	1.0074	0.5552	0.6964	0.6819	0.8283	0.8669	0.1769
Seven	0.8392	0.6510		0.9385	0.5714	0.6606	0.6408	0.8199	0.7637	0.1475
Eight	0.8214	0.6273	R	R	0.5308	0.6836	0.6025	0.7962	0.8091	0.1139
Nine	R	0.5797			0.5290	0.6466	0.5694	0.7441	R	0.1022
Ten		0.4492			0.3456	0.5956	0.4039	0.7285		0.1019
Weighted Average	0.8107	0.5797	0.9389	1.0458	0.4100	0.6276	0.5346	0.8101	0.8776	0.1494

Table 6. Weighted Average Delivery Distance by Size and State, May 2010

Percentile Group	Illinois	Indiana	Kentucky	Maryland	Michigan	New York	Ohio	Pennsylvania	West Virginia	Wisconsin
					miles					
One	81.6	47.6	224.3	212.3	104.7	175.9	98.9	149.5	77.8	56.5
Two	R	48.8	R	69.6	101.8	152.2	70.3	147.7	102.5	32.2
Three	R	60.1	R	97.2	84.7	131.3	65.2	144.5	132.7	43.7
Four	89.9	63.7	41.9	136.3	73.5	132.2	68.9	137.9	108.0	44.7
Five		60.3	R	122.2	82.6	122.9	64.9	137.8	92.1	49.4
Six		58.1	R	177.3	73.7	158.8	71.2	118.8	112.4	35.7
Seven	115.2	60.4		75.6	76.8	173.7	74.7	144.2	174.2	31.3
Eight	74.9	60.4	R	R	84.9	192.2	78.1	119.3	93.0	42.1
Nine	R	61.2			83.9	164.8	71.2	121.7	R	44.4
Ten		106.7			130.3	101.2	116.9	132.9		32.4
Weighted Average	86.5	79.3	77.7	131.6	116.0	123.0	92.4	132.0	123.6	38.7

R: Restricted, subgroup contains fewer than three producers.

Regression Analysis

OLS regression analysis was used to estimate the relationship between hauling assessments paid by producers pooling on FMMO 33 and delivery volume, delivery distance, and competition.

The model is given by:

$$Y = \mathbf{F}(\text{Pounds, Farms, Delivery Criteria, Competition})$$

Model Results

Results of the model indicate that hauling assessments paid by producers are a function of delivery volume, proximity to a processor and transportation conditions.

Hauling assessments are positively correlated with delivery volume; however, hauling assessments increase at a diminishing rate as reflected in the negative coefficient on pounds squared. The computed delivery volume elasticities for each of the three models were approximately 0.92 percent. The elasticity represents the percentage change response in the assessment paid by the producer corresponding to a one percentage change in delivery volume, holding all else constant. The elasticity is calculated by taking the partial derivative of the estimated model and evaluating it using the variable means.

Hauling assessments are positively correlated with topography near the farm. Topography was a binary variable included in the model to capture the effect of terrain on hauling assessments. Producers located in counties with sloped terrain paid on average between $214 and $222 more in hauling assessments relative to producers located in counties with flat terrain, holding all else constant.

Hauling assessments are negatively correlated with the proximity to a milk processor (fluid or manufacturing). The binary variables for U10 (processor within ten miles) and U50 (processor within 50 miles) were significantly negative. A processor within ten miles led to a $247 decrease in hauling assessments, holding all else constant. Meanwhile, a processor within fifty miles led to a $103 decrease in hauling assessments, holding all else constant.

The model results indicate a negative coefficient on delivery distance. This sign of the coefficient was unanticipated. It is likely that delivery distance is capturing an unobserved attribute, subsequently biasing the coefficient and resulting in the unexpected sign.

The significantly negative coefficient for farm count supports the hypothesis that counties with a large population of milk producers have lower hauling assessments. This is likely due to positive network externalities such as increased competition among handlers and haulers for milk supplies, and improved efficiency in milk assembly.

Table 7. OLS Regression Results, Determinants of Hauling Assessment

FMMO 33, May 2010

	Model One	Model Two
Intercept	142.56 **	234.38 **
	(38.54)	(48.84)
Pounds	0.00482 **	0.00482 **
	(0.00)	(0.00)
Pounds Squared	-4E-10 **	-4E-10 **
	(0.00)	(0.00)
Distance Criteria		
Delivery Miles	-0.30889 **	
	(0.11)	
Under 10 Miles		-247.00 **
		(47.15)
Under 50 Miles		-103.07 *
		(43.35)
Topography	222.47 **	214.25 **
	(23.21)	(22.28)
Producer Count	-0.20998 **	-0.17559 *
	(0.08)	(0.08)
R-Squared	0.738	0.739

1/ Heteroskedasticty consistent standard errors in parenthesis; *$p < 0.05$; **$p < 0.01$; (N=5,672)

Conclusion

The data included in this analysis indicates that hauling assessments vary significantly due to multiple factors. Factors influencing hauling assessments include delivery pounds, topography, the proximity to a processing plant and competition for milk supplies. Factors influencing milk transportation but not quantified in this analysis likely include fuel prices, state regulations, nature of milk supply and processor demand among others.

Transportation costs will continue to be an important concern throughout the industry. Producers and handlers share in the cost of moving raw milk, intermediate goods and finished products along the supply chain; as a result 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.

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