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# Variations in Local Prices for Farm Products and Supplies in Missouri

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## ABSTRACT

This study was undertaken as the result of interest manifested by Missouri farmers in the question of differences in prices of farm products and supplies in local communities. It was designed to show: (1) the extent of these variations, (2) some of the factors responsible for local price differences, (3) and incidentally, to test the reliability of farm price data collected monthly by the Missouri Crop Reporting Service. Special price reporters scattered over the State furnished actual price quotations from individual dealers, monthly during the year 1927.

Comparisons of these two series of prices indicate that for most commodities the regular "farm price" quotations are reliable thermometers of price movements for the State as a whole. Correlation between the respective series for individual towns also showed a fairly high degree of association, although averages for small areas like counties, and in some cases districts, are believed not to be reliable.

The analysis of variations in price between towns indicates that popular conceptions of such differences are greatly exaggerated. A fairly well defined degree of negative association between prices of farm products and prices of supplies was found to exist. There was a fairly distinct tendency for towns which are high or low in rank for one farm product to occupy similar positions with respect to other products.

It was found difficult to measure the influence of freight rates on local prices because of variations in primary markets, and compensating influences which frequently cause prices to be relatively high in towns having low freight rates, and vice versa. Coefficients of correlation and regression indicate that on the whole differences in freight rates are fully reflected in local prices, but with great unevenness as between individual commodities and towns.

Maps showing geographic differences in local prices for some commodities correspond fairly closely with expectations based on a qualitative analysis of conditions, but in other cases there appears to be no logical basis for sectional differences encountered.

The volume of local production of the respective commodities appears to have no well defined influence on local prices except for some commodities like corn and oats. Prices for farm products are slightly lower and for supplies higher in inland as compared with railroad towns. The size of town apparently has little or no effect on prices except for towns having a population of 5000 or more, when prices for farm products are generally higher and for supplies lower. Prices of farm products were no higher and of supplies no lower in towns having cooperative agencies handling the respective commodities than in towns having only private dealers. Dealers in the respective towns were uniform in prices paid or charged for individual farm products or supplies about 38 per cent of the time, and such variations as existed between dealers were uniformly small. Little relation between number of local dealers and local prices was found to exist.

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# Variations in Local Prices for Farm Products and Supplies in Missouri

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Farmers have long suspected that "price discrimination" exists in their respective localities. This belief is based partly upon the difference between the central market and the local price. Frequently in reading market reports and making comparisons grade differentials are disregarded. The belief is also based upon observed or rumored instances of differences in price between local points, such as the exaggerated reports regarding grain prices at nearby local points in the United States and Canada in the fall of 1929. An even more potent cause of suspicion are deductions based upon the apparently existing state of local competition, or lack of it. It is an elementary principle of economics that only one price will normally exist in a given market for a given commodity (assuming equal quality and service), yet the mere demonstration of this principle leads many to suspect that local prices are held down by collusion between buyers. Even the learned president of a prominent state university, writing on price control<sup>1</sup>, cited uniform coal, ice, flour and sugar prices at local trading points as evidence of such collusion and resulting partial monopoly.

The intense interest which farmers take in this question is evidenced in many ways. The hundreds of poorly organized and managed local associations which have continued to receive the intensely loyal support of members who could in many cases obtain somewhat more for their products from private competitors furnish outstanding evidence of the belief in the inadequacy of local competition and unreasonable differences in prices as between local trading points.

Economists and marketing specialists have been generally unable to confirm or deny these suspicions regarding local price discrimination or variations, mainly because of the lack of satisfactory primary data. The attention of those engaged in price analysis has been centered upon the factors affecting general commodity price levels and not upon those which cause local variations in price. Such attention as has been given in economic theory to these factors has usually involved undemonstrated assumptions with respect to actual price situations or conditions of competition.

1. Van Hise, C. R., "*Conservation and Regulation in the United States*": "It therefore may be said without fear of contradiction that in the matter of prices there is cooperation between concerns of the same class for every standard article for all or a large part of the United States. This is inevitable under modern conditions, because it is so much more profitable to cooperate than to compete. The same class of dealers will all have standard articles, for which they will charge like prices. . . . At the country cross roads the two or three groceries charge the same prices for sugar or flour. . . . In almost every city there are daily or weekly agreements by the dealers in regard to prices to be charged for standard articles that day or week. In a great city there may be scores of dealers in coal; in the little town, two. In each case the price will be the same for each dealer in a community. Precisely the same is true for ice."

**Two Objectives.**—This study was intended: (1) To discover the extent of variations in local prices for farm products and farm supplies in Missouri. (2) To measure the influence of some of the more tangible factors responsible for these variations. (3) To test the reliability of the “farm price” data collected by the Missouri Crop Reporting Service, and used frequently in research in agricultural prices in Missouri.

#### SOURCE OF DATA

**Accuracy Desired.**—The accuracy of price quotations must be considered from two standpoints: (1) the accuracy or representativeness of state, district, or county *averages*, and (2) the degree of accuracy with which the individual quotations making up the average represent the price situation in their respective localities.

Averages of prices for wide areas such as a state may be sufficiently representative even though very few of the individual quotations making up the average are correct, due to the presence of compensating errors. On the other hand, a small number of individual price quotations might each picture the local situation with absolute accuracy, yet when combined into a state average become quite unrepresentative because of the inadequate sample.

In the present study it was necessary to have price quotations which accurately represented the local situation as well as that for the State as a whole or its various districts.

**Accuracy of Missouri Crop Reporting Service “Farm Prices”.**—Two alternative methods of obtaining data for this study were available. Special price quotations could be arranged or the “farm prices” obtained by the Missouri Cooperative Crop Reporting Service (Bureau of Agricultural Economics and State Board of Agriculture) from its regular price reporters could be used. Missouri is one of the few states in which local price quotations are obtained directly by the state statistician. These reports are made monthly by local merchants and are combined into a state average without any weighting except that incident to the geographical distribution of reports. This state average is combined with similar data obtained directly by the Washington office, before publication in Crops and Markets. But since only the state statistician’s reports are available for districts and counties, the comparisons made herein are based on such reports, and not upon the Bureau’s final estimation.

No statistical test which can be applied in determining the accuracy of an average of a number of price quotations are applicable in determining the accuracy with which the individual quotations represent the situation in their respective local communities. Statistical studies<sup>2</sup> which

<sup>2</sup> Sarle, C. F., “Reliability and Adequacy of Farm Price Data”, Department Bulletin 1480, U. S. D. A.

have been made show that the B. A. E. "farm prices" are remarkably accurate thermometers of price movements covering wide areas such as the state, contrary to the assumptions of many who have based their judgment upon casual observations of the methods used in collecting these data. It was shown in the study to which reference has been made that for most commodities and states the relative probable error is below 2.5 per cent, which means that it is practically certain that the state averages are not more than 10 per cent "off" in either direction. For the more important commodities and states this percentage is much smaller.

Yet it is apparent that the smaller the area covered and the number of reports gathered, the greater are the chances of error. In Table 1 is shown the distribution of egg price quotations obtained by the Missouri Crop Reporting Service by counties, for January, 1927, as well as the county averages, average deviations, and coefficients of variation based thereon. It will be seen that the variation within even such a small geographical unit as the county is large.

This marked variation in prices between nearby points does not *necessarily* mean that the data do not accurately represent the price situations in those localities. On the contrary, five markedly different quotations in one county making up an average having a relative probable error of 10 per cent (or a range of practical total probability of 40% on either side of the average) may be separately and collectively more accurate for that locality than a state average with a relative probable error of 2.5 per cent, for reasons previously noted. The difficulty is that we cannot be at all sure of this. The variation may be due to inaccuracies in reporting. In the latter event these price data would be unsatisfactory for local comparisons.

Another important objection to the exclusive use of the regular "farm price" reports in this study was the fact that the local trading points covered by these reports vary widely from month to month and it is therefore practically impossible to compare prices at different points during any adequate consecutive period of months. This lack of continuity in the reports from individual towns does not appreciably affect the accuracy of the state averages calculated from the reports, but does make them of small value for local comparisons. Another weakness of the regular reports is the broadness of the commodity designations or grades. In connection with state averages this weakness in the individual reports is again largely offset by compensating errors, but this does not apply to local comparisons, for which purpose it is necessary to have as specific as possible designations of grade, kind or quality. An additional objection was the relatively small number of commodities included in the regular reports. For example, quotations on feeds and other supplies were lacking, yet are important items to consider in comparing local prices.

TABLE 1.—DISTRIBUTION OF EGG PRICE QUOTATIONS OBTAINED BY THE MISSOURI CROP REPORTING SERVICE (B. A. E.), BY COUNTIES  
JANUARY, 1927

County	PRICE PER DOZEN															No. of Quotations	Average Price	Average Deviation	Coef. of Variability			
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42					43	44	45
Andrew			3		1														4	.31	.015	4.83
New Madrid													2						3	.43	.043	10.00
Cape Gir.	1						1	2		1									5	.32	.048	15.00
Webster			3			1	1	1			1								7	.33	.024	7.27
Reynolds			2																3	.32	.023	7.19
Carter								2	1										3	.36	.003	0.83
Newton	1		1		1			1											4	.29	.029	10.00
McDonald				1	1														3	.32	.007	2.19
Lawrence			1			1		1											3	.33	.017	5.15
Barton			1	2		1		1											5	.32	.014	4.38
Barry	1			1				1											3	.31	.023	7.42
Washington			1		1					1	1								4	.35	.030	8.57
Warren				2					1			1							4	.34	.033	9.71
St. Louis													2		1				3	.41	.010	2.44
St. Francis							1	1				1							3	.36	.017	4.72
Perry								1			2	2							5	.38	.010	2.63
Lincoln			1					3			1								5	.34	.020	5.88
Franklin			1					3											4	.34	.018	5.29
Polk			3																3	.30	----	0.00
Phelps				1			1	2											4	.34	.013	3.82
Miller					2	1													3	.32	.003	0.94
Maries							2		1	1									4	.35	.013	3.71
Howard			4																4	.30	----	0.00
Cole										1	1	2							4	.38	.013	3.42
Camden						3													3	.32	----	0.00
Boone			1	2	3	2													8	.32	.005	1.56
Vernon			2	1	1														4	.31	.008	2.58
Lafayette										1			1						3	.41	.030	7.31
Jackson							2				1								3	.35	.017	4.86

Cass-----			4	3													7	.32	.004	1.25
Bates-----		1			2												3	.31	.024	7.74
Shelby-----		3		1	1												5	.33	.013	3.94
Monroe-----	2		2		2												6	.32	.012	3.75
Lewis-----				3				1									4	.32	.013	4.06
Clark-----				1	2												3	.34	.018	5.29
Audrain-----	2	1	4														7	.34	.003	0.88
Putnam-----	1				1		1										3	.31	.009	2.90
Carroll-----	3	1															4	.33	.023	6.97
Harrison-----	2												1				3	.30	.003	1.00
Gentry-----	1			1									1				3	.33	.043	13.00
Buchanan-----	3		1														4	.34	.039	10.88

**Special Local Price Reports.**—For these and other reasons it was decided to obtain special price reports for a period of one year, taking all practicable precautions to insure the accuracy of the report for each and every locality. Where sectional averages rather than individual local prices were desired Missouri Crop Reporting Service “farm prices” could also be used, because of the greater number of reports. Thus, the two sets of prices have been used as supplementary to each other in this study.

For the same reasons that the local representativeness of the regular price reports cannot be statistically determined it is impossible by such methods to check on the local accuracy of the special reports obtained in connection with this study. The only way of arriving at a judgment on this point is an examination of the methods used in collecting the data, which will therefore be outlined in some detail.

**Methods of Collecting the Price Data.**—Several possible methods of obtaining the price data were investigated before the plan used was finally adopted. It was believed that an arrangement might be made with country newspapers throughout the State to obtain weekly price quotations for products bought and sold by farmers locally. Tentative arrangements were made to furnish newspapers cooperating in this project with up-to-date news on agricultural prices in return for their support in obtaining the weekly price quotations. A hearty response was received from many editors, but the number was too small and poorly distributed over the State to warrant using this method of obtaining the price data. Cooperation with local merchants as a method of obtaining the reports was discarded because of the tendency toward lack of continuity in their reports, the possibility of bias, and the fact that the Missouri Crop Reporting Service was already using this method. It was found impossible to obtain the reports through farmers’ community associations, of which there are a large number in Missouri. The task of making such reports regularly was sufficiently arduous to preclude such a request of local city or county officials.

For these reasons, it was decided to rely upon the cooperation of local school officials. Letters were sent to all of the school superintendents in Missouri asking them to recommend at least four advanced students in the local high school who were willing to cooperate for the period of one year in making the rounds of business houses and obtaining price quotations from the merchants, as well as check quotations from farmers covering actual transactions. Arrangements were made to award suitably inscribed testimonials, signed by several high state officials including the State Superintendent of Schools and Secretary of the State Board of Agriculture, as an expression of appreciation to those completing the

work. A specially prepared monthly economic information service was also offered as an inducement. The prospective reporters who had been recommended by their school superintendents were asked to sign pledges so worded as to eliminate at the start many of those who would not take the work seriously. One thousand and ten of these pledges were signed and returned. The average age of the boys was 16.3 years, 59 per cent being farmers' sons living in the country and the remainder residents of the town for which they agreed to report.

Complete and specific written instructions regarding the manner in which the price quotations were to be obtained, grades to be followed, precautions to avoid biased or unrepresentative quotations, types of dealers to be included, date to which the quotations applied, and similar points, were then sent to the prospective reporters. The cooperation of the school superintendents or high school principals was sought in impressing each reporter with the need for accuracy. To avoid any misunderstanding on the part of local merchants an "official" identification card bearing the signature of the State Statistician was given each reporter for possible use in explaining his activities. In order to obtain an adequate number of reports it was found necessary to use follow-up letters each month. In doing so, special efforts were made to insure obtaining quotations for the first of the month, preferably from neighbors who had sold or bought products on those days, also from the books rather than the memory of the merchant. A complete file was kept of the activities of each reporter and town. When a reporter moved out of the locality or discontinued reporting, special efforts were made to replace him with another in order that the continuity of reports for the particular town and commodities would not be broken.

**Commodities Included.**—The commodities for which reports were obtained were as follows: shelled corn, soft wheat, oats, flour (best grade), shorts, tankage, bran, acid phosphate, butterfat, eggs, heavy hens, light hens, fryers, heavy male birds, butcher hogs, fat lambs, good butcher cattle and veal calves.

**Prices For Individual Dealers.**—The price quotations were reported on the form shown in Figure 1. The quotations were called for by individual dealers for the following reasons: (1) reporters would be much less likely to record a mere guess or estimate, (2) a comparison of separate dealers' quotations frequently furnish leads as to the character of the reports or called for letters to the reporters asking for explanations, and (3) comparisons by types of dealers and towns having different numbers of dealers could be made.

**Corrections and Checks.**—The reports were carefully edited as received. Where discrepancies seemed to exist specially prepared form letters were used in writing to reporters in attempting to clear up the



doubtful items. Thus, the reports were edited when received, corrected when necessary and possible, and again edited during tabulation. While these efforts to insure accuracy reduced the number of reports finally available for comparison they were necessary in order to make the reports locally representative.

TABLE 2.—DISTRIBUTION OF SPECIAL PRICE REPORTS

Number of reporters starting (having made at least one report).....	860
Number of reporters completing year (12 reports).....	344
Number of reporters reporting for at least 6 months.....	429
Number of reporters reporting for at least 9 months.....	363
Number of towns starting (at least one report).....	316
Number of towns completing year (12 reports on at least one commodity).....	189
Number of reporters per town at start.....	2.72
Average number of reports per month.....	629
Average number of towns reported per month.....	309
Number of reporters per town per month.....	2.04

**Number of Reports.**—Despite continuous efforts to maintain consecutive reports for each town and commodity the “mortality” among reporters was rather high, as shown in Table 2. No compromise with accuracy from a local standpoint was made in order to increase the total number of reports or widen the territory covered. For some commodities, notably the livestock items, the number of reports was too small to furnish a representative sample for most purposes. Whenever this was true the commodities in question have been eliminated from consideration.

### COMPARISON OF MISSOURI CROP REPORTING SERVICE FARM PRICES AND SPECIAL PRICE REPORTS

A comparison of the Missouri Crop Reporting Service (regular) “farm prices” and the special price reports for a representative month, March, 1927, covering four commodities: wheat, corn, butterfat and eggs, is given in Table 3. For each commodity the number of regular reports is greater than the number of special price reports. The state price averages calculated entirely independently by these two methods are remarkably similar, as shown by the percentage differences. The relatively large difference for corn may be largely accounted for by the large differences in price as between importing and exporting sections, and the somewhat dissimilar geographic distribution of the reports constituting the two price series. Any state average of corn prices is likely to be less representative than for a commodity like butterfat, as shown by the respective coefficients of variability and probable errors.

The deviations from the mean for the two series of reports were likewise very similar, as shown in the table, as were, of course the coefficients of variation and probable errors of the averages. It will be observed that in no case was four times the relative probable error greater than 3.72, that for the special prices for corn. This means that

TABLE 3.—A COMPARISON OF THE B. A. E. AND SPECIAL PRICES FOR MARCH, 1927

Commodity	Wheat		Corn		Butterfat		Eggs	
	B. A. E.	Special	B. A. E.	Special	B. A. E.	Special	B. A. E.	Special
Type of Report.....	180	129	285	148	216	175	300	187
No. of Towns.....	1.230	1.264	.703	.754	.451	.464	.193	.181
Average Price.....		+2.76		+7.25		+2.88		-6.22
Percentage Difference*.....	\$.0573	\$.0832	\$.0825	\$.0981	\$.0297	\$.0235	\$.0109	\$.0078
Average Deviation From Mean.....	\$.0823	\$.1080	\$.1093	\$.1260	\$.0400	\$.0394	\$.0179	\$.0116
Standard Deviation from Mean.....	6.69	8.54	15.55	16.71	8.87	8.49	9.27	6.41
Coefficient of Variability.....	\$.0041	\$.0064	\$.0044	\$.0070	\$.0018	\$.0020	\$.0007	\$.0006
Probable Error of Mean.....	\$.33	\$.51	\$.62	\$.93	\$.34	\$.43	\$.36	\$.32
Relative Probable Error of Mean.....	1.32	2.04	2.48	3.72	1.36	1.72	1.44	1.28
4x Relative P. E.....								

\*Percentage which Special Prices are Higher or Lower than B. A. E. Prices.

based on the showing for this month, the state averages for these commodities are practically certain to be correct within a range, plus or minus from the average, of this percentage or less, a highly satisfactory degree of accuracy for both the regular and special price reports so far as the state averages are concerned.

The same comparison was not made for other commodities because of the dissimilarity of the kinds or grades of commodities for which quotations were available.

Another method used for checking or comparing the two series of prices was correlation. This was done for the state as a whole, by districts, and by individual towns, using several representative commodities.

TABLE 4.—DIFFERENCE BETWEEN STATE AVERAGES OF SPECIAL AND B. A. E. PRICES FOR EGGS, BUTTERFAT, AND CORN, AND COEFFICIENT OF CORRELATION FOR ALL THREE COMBINED

	Special	B. A. E.	Difference	
EGGS	January	.3445	.3255	.0190
	February	.2710	.2466	.0244
	March	.1813	.1922	— .0109
	April	.1922	.1933	— .0011
	May	.1816	.1800	— .0016
	June	.1503	.1538	— .0035
	July	.1795	.1811	— .0016
	August	.1926	.2055	— .0129
	September	.2472	.2622	— .0150
	October	.3046	.3277	— .0231
	November	.3452	.3600	— .0148
	December	.3777	.3755	.0022
		Net Average Difference.....	.0015	
	Ave. Monthly Difference.....	.0108		
	(disregarding signs)			
BUTTERFAT	January	.4427	.4177	.0250
	February	.4313	.4366	— .0053
	March	.4612	.4588	.0024
	April	.4499	.4511	— .0012
	May	.4020	.3822	.0198
	June	.3747	.3622	.0125
	July	.3591	.3633	— .0042
	August	.3572	.3522	.0050
	September	.3724	.3655	.0069
	October	.4121	.4100	.0021
	November	.4206	.4277	— .0071
	December	.4411	.4444	— .0033
		Net Average Difference.....	.0063	
	Ave. Monthly Difference.....	.0079		
	(disregarding signs)			
CORN	January	.7535	.6666	.0869
	February	.7602	.6955	.0647
	March	.7737	.6833	.0904
	April	.7618	.6944	.0674
	May	.8129	.7766	.0363
	June	.9908	.9544	.0364
	July	1.0671	1.0133	.0538
	August	1.0903	1.0611	.0292
	September	1.1210	1.0311	.0899
	October	1.0557	.9455	.1102
	November	.9122	.7588	.1534
	December	.8701	.7844	.0857
		Average Difference.....	.0753	
Coefficient of Correlation (all three commodities combined)				
.9954 ± .0010				

The comparison of state averages, by months, for eggs, butterfat and corn, is shown in Table 4. The coefficient of correlation for all three commodities combined (36 pairs) was  $.9954 \pm .0010$ , showing a very high degree of association. In this table are also shown the actual monthly differences in price. It will be observed that the special price reports are generally higher than those of the Crop Reporting Service. For eggs the average monthly difference, disregarding signs, was \$.0108, but the *net* average difference was only \$.0015. For butterfat the differences were even less, but for corn the average was \$.0753, probable reasons for which have previously been mentioned.

TABLE 5.—RELATION BETWEEN SPECIAL AND B. A. E. PRICE REPORTS FOR CORN EGGS AND BUTTERFAT, BY DISTRICTS AND MONTHS, AS INDICATED BY COEFFICIENTS OF CORRELATION

Commodity	Coefficient of Correlation	Probable Error	Average Monthly Difference	
			Net	Signs Disregarded
Corn.....	.9237	.0095	\$.078	\$.080
Eggs.....	.9674	.0042	.002	.013
Butterfat.....	.7124	.0320	.004	.015

A similar comparison by districts (108 pairs) is shown in Table 5, which also gives the average difference between the monthly district quotations, both net and disregarding signs. Obviously, the degree of association to be expected is less as the area covered decreases, due to the smaller influence of compensating errors in the averages correlated. Yet the correlation by districts is very high for eggs and corn, and quite a distinct relationship exists in the case of butterfat, even though the coefficient of correlation is lower than for the other two commodities.

Similar measures of association between the respective prices for individual towns are shown in Table 6. The degree of association is quite high except for wheat.

TABLE 6.—CORRELATION BETWEEN PRICE QUOTATIONS FROM REGULAR (B. A. E.) AND SPECIAL PRICE REPORTERS FOR INDIVIDUAL TOWNS

Commodity	Number of Pairs	Coefficient of Correlation	Probable Error of Coefficient
Eggs.....	315	.9117	.0064
Butterfat.....	411	.6206	.0235
Corn.....	190	.8073	.0170
Wheat.....	169	.1280	.5103

Coefficients of correlation may prove to be rather treacherous tools when used in this way unless certain fundamental limitations are kept in mind. A commodity having a very marked seasonal variation may show a much higher degree of association between the two series than another with a more stable price level, even though the actual difference in the accuracy of the individual observations is negligible. This is true, of course, since both pairs rise and fall together because

affected by a similar influence. When the latter is absent the errors of observation or of sampling have a much greater effect in lowering the coefficient. This factor might have been partially overcome by using first differences, which, however, would remove only the cumulative effect of the seasonal variation, or by eliminating the seasonal trend. The latter was impossible in this case because of the short period included.

The interpretation of these coefficients must also be conditioned by the relation between the fluctuations in the two series and the minimum error of observation. It is said, for instance, that corn prices cannot be accurately estimated by a reporter in less than five cent intervals. Therefore, if the fluctuations are small, say within a range of five to ten cents, the error of observation would be very large relative to the fluctuations in the two series compared, and the degree of association indicated would tend to be small. This factor may have been partly responsible for the low correlation between the wheat prices for individual towns.

The general results of these comparisons confirm by an entirely different approach the results of Sarle's study of the reliability of the regularly obtained farm price quotations. The latter are used in many important ways, and their accuracy has been frequently questioned. Results of this kind justify economists and others in placing greater confidence in analyses based on these quotations.

### DIFFERENCES IN LOCAL PRICES

Differences in price as between local points were found to be considerably less than seems to be commonly assumed. In Table 7 are given the average price, average deviation,<sup>3</sup> and coefficient of variation, by commodities, for all towns reporting. With the exception of the livestock items, only two commodities had a coefficient of variation based on the average deviation of more than 10 per cent and the average coefficient for all commodities was only 7.90 per cent. Omitting livestock, the average was still lower, 6.59 per cent. The livestock items are of doubtful accuracy due to the difficulty arising from grade differences and lack of sufficient representative quotations.

These variations in yearly average prices by towns are, however, likely to be misleading, because of the compensating monthly variations which are ironed out in the yearly averages. This is shown in Table 8, which is a comparison of prices by months, with averages and measures of variation, for three important commodities: eggs, butterfat, and corn. The variation encountered by months is greater than

3. The average deviation has been used where additional analyses did not necessitate use of the standard deviation, because the original intention was to publish as a popular bulletin, and because of the large number of such measures involved. It was believed the change in publication plans did not warrant recalculation as standard deviations.

TABLE 7.—AVERAGE PRICES FOR ALL TOWNS AND MEASURES OF VARIATION, BY COMMODITIES

Commodity	Number of Towns Reporting	Average Price	Average Deviation From Average Price	Coefficient of Variation
Corn, bu.-----	93	\$.918	\$.0814	8.86
Wheat, bu.-----	77	1.286	.0574	4.46
Oats, bu.-----	80	.527	.0608	11.53
Flour, 50 lbs.----	163	2.248	.0891	3.96
Shorts, cwt.-----	144	1.952	.0942	4.83
Tankage, cwt.----	103	4.132	.2079	6.75
Bran, cwt.-----	140	1.620	.0829	5.12
Fertilizer, ton---	30	27.066	2.4730	9.14
Butterfat, lb.-----	129	.410	.0167	4.07
Eggs, doz.-----	160	.248	.0102	4.09
Chickens, lb.-----	116	.218	.0138	6.33
Heavy Hens, lb.---	149	.183	.007	3.81
Light Hens, lb.---	138	.154	.0103	6.69
Male Birds, lb.---	131	.095	.0120	12.66
Hogs, lb.*-----	41	.103	.0064	6.20
Lambs, lb.*-----	27	.131	.0141	10.77
Butcher Cattle, lb.*-----	36	.091	.0164	17.98
Veal Calves, lb.*	35	.113	.0169	14.96
Average-----	----	----	----	7.90
Average (omit- ting livestock)	----	----	----	6.59

\*Data for livestock, particularly cattle, are of doubtful accuracy, for reasons given in text.

that indicated by Table 7 (after allowing for the difference between the average and standard deviations as bases of the coefficients<sup>3</sup>). The average coefficient of variation is 11.49, being highest for corn, due to the greater variation in geographical factors affecting corn prices. There apparently is no distinct seasonal variation in the coefficients of variation, as indicated by the last column, although there does appear to be some tendency for egg and butterfat prices to vary more from town to town in the months when changes in supplies and market prices are most pronounced.

The variation in local prices by districts, for the year as a whole, is shown in Table 9. Some districts, such as numbers six and nine, have a noticeably greater variation than the others, for all three commodities. Yet in few cases, except for corn, are the coefficients of variation based on the standard deviation greater than 10%.

The variations in prices are shown in more detail, for individual towns, in Table 10. Since complete yearly averages were not available for all commodities for each town, the number of commodities included in each comparison is indicated. Where the number of commodities is less than three the comparison probably is not significant. The first four columns in this table show the percentage of the average prices for all towns and commodities represented by the average prices for the individual towns, for both farm products and supplies. It is calculated as follows: first, the average price for all towns for each individual commodity was obtained, and the percentages of this average represented by the averages for the individual towns; and these were then averaged for each town. Farm products and supplies were calculated separately because of their opposite significance. The next column shows

TABLE 8.—AVERAGE PRICE, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION, BY MONTHS, FOR ALL DISTRICTS: EGGS, BUTTERFAT AND CORN

Months	EGGS			BUTTERFAT			CORN			Average of Coefficients
	Average Price	Standard Deviation	Coefficient of Variation	Average Price	Standard Deviation	Coefficient of Variation	Average Price	Standard Deviation	Coefficient of Variation	
January-----	.344	.027	7.88	.443	.035	8.00	.753	.126	16.75	10.88
February-----	.271	.032	11.68	.431	.032	7.48	.760	.126	16.53	11.90
March-----	.181	.012	6.61	.461	.046	9.95	.774	.173	22.37	12.97
April-----	.192	.017	9.04	.450	.032	7.18	.762	.120	15.69	10.64
May-----	.182	.030	16.31	.402	.035	8.75	.813	.118	14.51	13.19
June-----	.150	.018	12.20	.375	.031	8.29	.991	.102	10.27	10.25
July-----	.180	.015	8.12	.359	.037	10.29	1.067	.141	13.17	10.53
August-----	.193	.013	6.84	.357	.046	12.77	1.090	.157	14.38	11.33
September-----	.247	.023	9.35	.372	.055	14.76	1.121	.130	11.59	11.90
October-----	.305	.028	9.30	.412	.036	8.73	1.056	.138	13.09	10.37
November-----	.345	.032	9.15	.421	.042	10.01	.912	.164	18.00	12.39
December-----	.378	.031	8.25	.441	.031	6.92	.870	.171	19.64	11.60
Average-----	.247	.023	9.56	.410	.038	9.43	.914	.139	15.50	11.49

Average Coefficient of Variation = 11.49

TABLE 9.—AVERAGE PRICE, STANDARD DEVIATION AND COEFFICIENT OF VARIATION, BY DISTRICTS: EGGS, BUTTERFAT AND CORN

Districts	EGGS			BUTTERFAT			CORN		
	Average Price	Standard Deviation	Coefficient of Variation	Average Price	Standard Deviation	Coefficient of Variation	Average Price	Standard Deviation	Coefficient of Variation
1	.2427	.0153	6.32	.4150	.0241	5.80	.8784	.0926	10.54
2	.2426	.0141	5.82	.4267	.0339	7.95	.8911	.0931	10.45
3	.2479	.0180	7.24	.4205	.0345	8.19	.9445	.0839	8.88
4	.2498	.0247	9.88	.4023	.0340	8.44	.8417	.1084	12.88
5	.2461	.0170	6.91	.4015	.0296	7.37	.9509	.1306	13.73
6	.2584	.0364	14.07	.4340	.0678	15.62	1.0156	.1332	13.11
7	.2421	.0137	5.65	.3894	.0173	4.44	.8706	.1144	13.14
8	.2458	.0190	7.73	.3886	.0277	7.12	1.0156	.1528	15.04
9	.2590	.0336	12.96	.4104	.0462	11.26	.8626	.1338	15.52

Average Coefficient of Variation (based on standard deviation) = 9.85

TABLE 10.—PRICES IN INDIVIDUAL TOWNS COMPARED WITH STATE AVERAGE, AND VARIATIONS BY COMMODITIES\*

Towns	Farm Products		Supplies		Average Percent- Variation of Individual Com- modities From Average For All Towns	Average Devia- tion by Com- modities From Average Percent- age Variation
	No. of Com- modities	% of Av- erage for all towns	No. of Com- modities	% of Av- erage for all towns		
Adrian.....	9	94.7			7.9	5.3
Advance.....	2	98.0			2.0	.8
Alma.....	7	93.6	4	99.7	6.0	5.1
Alton.....	3	116.5	1	97.4	13.1	7.7
Ashton.....	3	98.1	1	93.8	3.6	2.3
Ava.....	2	106.7	3	93.4	8.1	3.6
Auxvasse.....	7	102.9	4	101.6	6.6	5.7
Barnard.....	7	95.2	4	97.9	5.4	2.6
Bates City.....	7	104.1	1	102.7	3.4	3.4
Belle.....	6	104.4	1	108.6	5.3	3.7
Bethany.....	11	97.1	4	96.0	3.9	2.1
Bernie.....	6	100.2			3.6	2.2
Bevier.....	9	102.8	3	91.9	5.9	2.9
Bloomsdale.....	10	102.0			8.4	4.9
Bowling Green.....	4	100.4	4	95.0	4.9	2.4
Brookline.....	13	99.1	5	101.6	7.8	3.9
Browning.....	6	99.9	4	92.3	5.7	2.6
Brumley.....	6	102.4	2	106.5	6.4	5.3
Burlington Junction.....	4	91.3	1	101.0	8.2	6.9
California.....	7	98.6	3	96.3	3.4	1.6
Callao.....	10	99.0	3	97.8	5.1	4.3
Cameron.....	10	99.5	5	98.1	3.8	1.9
Canton.....	3	90.8	1	97.4	8.8	6.3
Cape Girardeau.....	12	108.5	5	89.5	10.6	5.1
Centralia.....	13	105.2	4	99.7	6.7	6.4
Chamois.....	12	110.2	5	99.9	9.2	5.8
Chapel Hill.....	10	100.2	3	102.5	6.8	6.4
Charleston.....	3	104.5			4.5	3.2
Cherry Box.....	8	106.9	3	107.2	8.6	9.7
Clarksdale.....			1	100.5	0.5	0.0
Clarence.....	9	98.8	5	97.9	2.8	2.1
Clearmont.....	6	101.1	3	96.4	9.7	7.1
Clifton Hill.....	6	100.2			3.9	3.6
Coldwater.....	5	98.4			2.8	1.0
Cole Camp.....	10	100.2			4.5	2.2
Concordia.....	6	104.9			7.7	5.7
Clinton.....	13	99.6	5	92.8	7.7	3.6
Cowgill.....	9	95.1	4	98.2	4.8	3.6
Crane.....	6	102.1	5	93.7	7.6	4.0
Darlington.....	8	96.1	4	99.0	4.8	5.0
Desloge.....	4	129.2	1	100.3	23.5	11.8
Dexter.....	6	103.7	3	115.4	9.8	6.5
Diamond.....	3	91.3	4	104.2	6.1	3.0
Doniphan.....	1	99.5			.5	0.0
Durham.....	7	100.7	4	101.4	5.0	3.2
Eagleville.....	4	94.2	4	98.4	4.8	3.2
Easton.....	6	98.4	2	93.9	4.4	3.2
Economy.....	5	96.9	1	95.6	4.0	3.3
Eldon.....	13	124.7	3	97.8	22.0	25.1
Elkland.....	6	97.2	4	104.2	4.8	2.0
Ewing.....	10	102.6	5	98.9	4.5	3.1
Exeter.....	3	113.6	3	100.6	5.2	2.5
Fairfax.....	3	85.8	4	97.4	8.4	5.7
Farmington.....	10	116.9	4	103.1	15.5	10.9
Fillmore.....	13	99.0	4	98.8	5.4	4.4
Flemington.....	9	93.7	5	93.0	7.8	2.8
Freeburg.....	9	105.3	4	104.2	6.0	3.4
Gallatin.....	6	108.0	1	92.7	9.4	10.2
Garden City.....	8	99.4	3	95.9	8.5	6.6
Gentry.....	4	102.4	1	96.7	3.2	1.5
Gideon.....			2	105.1	9.3	5.1
Gilliam.....	8	88.2	4	98.3	8.4	6.2
Glenwood.....	4	98.4	3	97.7	3.0	2.8
Gower.....	7	104.1	4	99.4	4.1	3.2
Graham.....	8	103.8	3	95.5	7.6	4.9
Green City.....	8	98.2	4	98.7	3.8	2.7
Guilford.....	9	91.1	4	97.6	7.3	5.4

\*To prevent possible misinterpretation of this table, it should be noted that an average below 100 for farm products or above 100 for supplies may be due to various factors such as freight rates, and does not indicate unfair practices by or lack of competition among local dealers. The table is designed to show only the extent of price variations.

TABLE 10.—PRICES IN INDIVIDUAL TOWNS COMPARED WITH STATE AVERAGE, AND VARIATIONS BY COMMODITIES—CONTINUED

Towns	Farm Products		Supplies		Average Percent- age Variation of Individual Com- modities From Average For All Towns	Average Devia- tion by Com- modities From Average Percent- age Variation
	No. of Com- mod- ities	% of Av- erage for all towns	No. of Com- mod- ities	% of Av- erage for all towns		
Hale.....	6	99.5	3	99.4	4.0	2.2
Halltown.....	6	101.3	4	97.4	4.5	3.0
Hamilton.....	7	98.0	5	96.2	3.5	1.6
Hancock.....	6	91.7	3	106.5	9.1	3.4
Hannibal.....	7	105.1	3	101.5	5.1	3.8
Harris.....	12	96.2	4	100.0	6.7	4.0
Higbee.....	7	98.3	3	94.3	4.7	1.7
Hopkin.....	6	92.4			8.4	4.8
Houstonia.....	1	106.2	1	105.3	5.8	.4
Holcomb.....	2	100.8	4	115.9	10.9	10.3
Holland.....	1	117.9	1	98.7	9.6	8.3
Hunter.....	2	116.0	4	104.2	10.1	7.7
Hunnewell.....	6	99.8	3	97.7	3.4	.9
Huntsville.....	9	96.9	5	104.2	5.5	5.0
Independence.....	7	137.6	2	95.2	30.3	24.0
Iantha.....	9	93.8	4	97.2	7.3	4.1
Irontdale.....	3	103.3	1	95.9	4.7	2.1
Jenkins.....	10	90.3	3	99.7	9.1	7.6
Jericho Springs.....	6	90.6	3	104.3	8.4	4.1
Joplin.....			5	98.7	13.4	12.8
Kennett.....	10	94.2	3	110.3	12.2	7.6
Kingsville.....	7	97.3	5	97.5	4.4	1.6
Knox City.....	9	99.1	4	100.6	4.2	2.3
La Belle.....	9	100.8	4	100.8	4.9	3.6
La Grange.....	6	106.7	4	96.0	5.6	3.7
Lakenon.....	5	99.9	4	100.5	3.4	2.5
La Plata.....	7	99.5	4	98.5	5.7	3.9
Leeton.....	8	100.2	3	96.8	3.5	2.3
Lemons.....	2	102.9	2	100.0	2.3	1.3
Lentner.....	7	100.5	4	96.8	2.0	1.2
Lexington.....	6	98.9	3	105.9	5.2	3.5
Licking.....	10	104.6	5	106.5	7.0	5.4
Louisiana.....	9	103.6			6.3	4.0
Luray.....	6	104.5	4	96.6	4.2	2.7
Luebbering.....	4	116.0	4	100.8	10.2	5.8
McBride.....	2	100.5	1	100.3	1.4	.8
McFall.....	1	98.0	4	96.8	3.0	1.5
McGee.....	7	94.4	1	102.2	9.0	3.9
Marquand.....	6	103.9	5	97.2	7.6	4.3
Mansfield.....	13	94.6	5	97.4	7.2	5.2
Marshfield.....	10	102.6	3	96.5	6.0	2.9
Matthews.....	13	97.3	4	109.2	8.6	5.8
Maywood.....	7	100.3	4	105.9	4.7	3.3
Merwin.....	9	94.8	1	102.7	5.8	4.4
Metz.....	6	98.1	4	99.1	2.6	1.4
Millersville.....	11	98.6	3	108.3	7.4	6.0
Milo.....	8	106.2	5	94.7	5.9	4.5
Moberly.....	5	108.5			10.6	6.2
Monett.....	2	90.7	3	94.4	7.1	2.6
Monticello.....	5	98.3	4	105.2	4.5	3.2
Montrose.....	9	94.1	5	95.9	5.3	3.0
Morrisville.....			4	96.7	4.6	3.2
Naylor.....	8	101.1	3	102.7	8.7	5.2
New Florence.....	2	97.4	1	109.2	4.8	2.9
New Hampton.....	6	95.1	4	96.2	5.2	3.6
Nettleton.....			2	97.1	2.9	.2
Neosho.....	13	91.7	5	96.9	9.1	6.5
New Haven.....	9	108.0	4	95.8	6.9	5.4
New Point.....	5	93.3	3	101.1	4.6	4.0
New London.....	4	100.1	3	103.0	2.4	1.7
Nodaway.....	13	102.9	5	105.2	6.6	5.0
Novelty.....	6	101.1	3	103.5	3.2	1.6
Odessa.....	4	98.5	3	100.3	2.8	2.2
Olean.....	7	101.0	3	98.1	3.1	2.4
Otterville.....	4	94.8			5.2	2.5
Owensville.....	3	109.4	4	103.2	6.5	5.0
Parnell.....	5	95.8	4	97.0	4.9	2.4

TABLE 10.—PRICES IN INDIVIDUAL TOWNS COMPARED WITH STATE AVERAGE, AND VARIATIONS BY COMMODITIES—CONTINUED

Towns	Farm Products		Supplies		Average Percent- age Variation of Individual Com- modities From Average For All Towns	Average Devia- tion by Com- modities From Average Percent- age Variation
	No. of Com- mod- ities	% of Av- erage for all towns	No. of Com- mod- ities	% of Av- erage for all towns		
Pollock.....	6	99.1	4	100.8	2.6	1.7
Pennsboro.....	4	91.0	2	97.7	6.8	5.9
Potosi.....	8	107.0	4	108.3	9.7	4.7
Powersville.....	10	91.1	4	102.8	8.8	4.9
Prairie Home.....	10	102.2	4	107.2	7.3	6.0
Purdy.....	4	98.2	3	91.4	4.7	3.4
Puxico.....	10	105.3	5	103.9	7.1	6.5
Raymondville.....	3	96.9	3	101.2	5.0	3.0
Ravenwood.....	5	92.5	4	95.0	6.8	5.0
Rayville.....	8	104.5	4	101.6	4.8	4.6
Republic.....	6	98.8	2	104.0	4.1	2.0
Revere.....	6	98.4	4	100.2	4.2	2.4
Rhineland.....	9	101.8	4	104.7	6.6	3.5
Rich Hill.....	4	88.8	4	95.9	7.8	4.4
Romance.....	5	90.0	3	113.2	11.2	8.7
Rolla.....	9	111.8	5	102.2	10.2	6.7
Russellville.....	8	102.8	4	98.8	4.1	2.3
Savannah.....	8	102.5	4	98.2	3.1	1.8
Schell City.....	9	93.4	5	95.0	6.0	3.1
Seneca.....	8	90.8	5	98.1	7.8	4.3
Shelbina.....	3	107.6	4	100.0	3.6	3.4
Skidmore.....	7	96.5	4	93.1	5.5	3.6
So. Greenfield.....	6	94.6	3	94.9	5.3	3.1
Sparta.....	5	98.0	1	99.1	6.0	3.3
Stanberry.....	2	115.3	1	91.7	13.0	8.8
Stanton.....	3	105.2	3	108.4	6.8	2.4
Strasburg.....	9	101.1	3	95.5	4.4	2.2
St. Claire.....	2	107.8	4	98.0	3.9	2.8
St. Genevieve.....	6	107.1	2	104.6	6.6	5.8
Steelville.....	7	105.4	3	102.7	6.2	6.0
St. Joseph.....	9	106.6	5	105.3	6.8	3.4
Stewartville.....	8	100.6	3	93.9	3.7	1.9
Stet.....	4	98.6	3	100.5	4.3	2.1
Sturgeon.....	3	101.0	4	98.6	2.7	2.2
Sullivan.....	1	100.5	1	98.2	1.2	.6
Swedeborg.....	1	98.6	1	94.6	3.4	2.0
Syracuse.....	6	98.4	1	100.2	2.1	2.3
Tenmile.....	5	102.3	4	104.2	5.4	2.9
Tarkio.....	5	98.1			4.7	3.3
Thomas Hill.....	5	107.2	2	107.1	7.5	7.8
Tipton.....	7	95.4	4	99.0	3.6	2.5
Ulman.....	11	94.4	3	106.3	7.8	5.3
Unionville.....	6	97.4	4	104.1	4.6	3.7
Van Buren.....	6	96.1	2	104.2	6.4	4.2
Warrensburg.....	4	100.7	5	97.4	2.2	1.2
Waynesville.....	5	101.3	3	105.6	6.8	5.2
Urich.....	10	91.4	3	92.5	8.3	4.7
Wheeling.....	5	99.9	4	96.0	2.8	1.4
Windsor.....	9	91.5	5	95.2	8.0	5.9
Winnigan.....	6	101.2	4	102.3	3.5	2.3
Winona.....	2	93.9	1	97.4	4.9	2.7
Wyaconda.....	6	103.5	5	100.4	3.6	3.1
Yates.....	4	98.0	3	101.4	2.2	1.7
Average.....	6.6		3.4		6.4	4.3

Coefficient of negative concurrent deviations (farm products and supplies) = .4969 ± .0394.

the average variation from 100 of the individual commodity percentages for each town, and the last column the average deviation of the individual commodity percentages included in this average.

This table, particularly the fifth column, indicates in a different way the relatively small variations in local prices. When the many factors involved, such as freight rates, volume of business, local competition and errors of observation, are taken into account an average variation from 100 of only 6.4 seems very small, particularly in connection with the mean deviation from this average of only 4.3 per cent. In order to prevent any possible misinterpretation of the figures for individual towns, it should be noted that an average below 100 for farm products or above 100 for supplies does not necessarily indicate any unfair practice by local dealers, since there may be good reasons for the differences, such as volume of business or freight rates. The table is designed to show only the extent of price variations.

For several reasons, prices of supplies would be expected to be relatively high in towns in which farm commodity prices were low, and vice versa. This would be true if prices were influenced only by the degree of local competition, freight rates and similar factors. However, some other factors might tend to offset the above. For example, corn is included with farm products, yet in some communities would be more in the nature of a supply item. The actual directional relationship is indicated by the coefficient of concurrent deviations, which was  $-.4969 \pm .0394$ , a fairly well defined negative association. This does not entirely agree with the findings summarized in Table 11.

This analysis is carried somewhat farther in Table 11. Individual towns might be above or below one hundred (the average for all towns) in the case of different commodities. In Table 10 such differences would be compensating within each group (farm products or supplies), thus reducing the average variation from 100. In Table 11 is shown the relation between the percentage rank in price for individual commodities and the respective ranks of the same towns for all other farm products or supplies. The first column shows the percentage of towns which were higher or lower than the average for the respective commodities, which were similarly high or low for all other farm products or supplies combined. The second column shows the average difference, for all these towns, between their respective percentage rankings for the commodity indicated and for all other farm products or supplies combined, signs disregarded. In the last column are the average deviations for the individual towns. The average difference for all commodities was 6.2 per cent, but if the livestock items had been omitted this figure would have been smaller.

TABLE 11.—RELATION BETWEEN RANK IN PRICE FOR ONE COMMODITY AND RANK IN PRICE FOR ALL OTHER FARM PRODUCTS OR SUPPLIES

Commodity	Percentage having Same Rank for Individual Commodity & Average*	Average Difference Signs Disregarded**	Average Deviation***
Corn.....	69.8	6.8	4.4
Wheat.....	65.7	5.0	3.8
Oats.....	75.0	8.9	4.9
Flour.....	71.7	4.2	2.7
Shorts.....	81.2	2.8	2.2
Tankage.....	69.9	3.7	2.5
Bran.....	81.4	3.1	2.2
Fertilizer.....	80.0	6.7	5.7
Butterfat.....	57.8	4.4	2.8
Eggs.....	62.8	4.2	2.5
Chickens.....	67.0	5.4	3.1
Heavy Hens.....	69.4	4.3	2.9
Light Hens.....	73.7	5.2	3.6
Male Birds.....	73.4	10.4	6.2
Hogs.....	61.5	5.2	3.3
Lambs.....	76.9	9.2	8.9
Butcher Calves.....	70.5	13.0	9.2
Veal Calves.....	63.6	9.9	6.1
Average.....	70.6	6.2	4.3

\*Percentage of towns higher or lower than average for this commodity which had similar rank for average of all other farm products or supplies.

\*\*To get this figure: (1) percentage which price for this town for this commodity was of average for all towns; (2) percentage which this town's average for all other farm products or supplies combined was of average for all towns; (3) for each town, for each commodity, the difference between (1) above and (2) above was calculated. The average difference for all towns for each commodity is shown in this column.

\*\*\*This column shows the average deviation from the average in the second column, or how the individual towns varied in the relationship between their individual commodity rankings and their rankings for all other commodities.

This table indicates a rather distinct tendency for towns which are high or low in rank for any one commodity to occupy a similar position with respect to other commodities. The low average difference for individual and all commodities also indicates that the difference in rank for different commodities is not great. This is also shown by Table 10, for individual towns rather than commodities.

**Seasonal Variation by Towns.**—While space limits obviously preclude any detailed description of differences in seasonal variation in prices in the different towns, it was believed worthwhile to include a summary measure of such differences, as shown in Table 12. The seasonal variation was first calculated for each town as a percentage of the average price for the year, and the average monthly deviations calculated. These were then averaged for all towns, by commodities, the results being given in the second column. The average deviation of individual towns from this commodity average was then calculated (column 3) and expressed as a percentage of the commodity average (column 4).

TABLE 12.—SEASONAL VARIATION IN PRICES, BY COMMODITIES, EXPRESSED AS AVERAGE DEVIATION FROM AVERAGE PRICE FOR YEAR

Commodity	Number of Towns	Average Monthly Percentage Deviation From Average Price For Year	Average Deviation From Mean of Average Deviations	Coefficient of Variation	Average Monthly Percentage Deviation From Average Price For Year, Prices in Nearest Primary Market
Corn.....	93	15.5	3.343	21.57	14.1
Wheat.....	77	4.8	1.669	34.78	3.3
Oats.....	80	8.5	3.462	40.74	4.8
Flour.....	163	2.6	.950	36.52	----
Shorts.....	144	5.9	1.258	21.32	----
Tankage.....	103	3.8	1.411	37.12	----
Bran.....	140	3.8	1.234	32.47	----
Fertilizer.....	30	3.6	2.780	77.22	----
Butterfat.....	129	9.0	1.388	15.43	7.4
Eggs.....	160	28.0	1.901	6.79	23.9
Chickens.....	116	16.4	4.069	24.81	----
Light Hens.....	138	14.8	2.972	20.09	----
Heavy Hens.....	151	10.9	1.789	16.42	----
Male Birds.....	131	19.5	6.496	33.00	----

The seasonal variation is lowest for supplies, small grains and butterfat, and highest for poultry and eggs and corn. The reasons for this are obvious. Supplies of the former group of products vary less during the year, small grains are affected by the exchange trading, supplies are less perishable and continuously produced, and butter prices during the year in question were fairly stable.

Market prices were not readily available for all of the products in question, but for six commodities the seasonal variation in such prices bears a very close relation to the seasonal variation in the local price, as shown in the last column of the table.

### RELATION BETWEEN LOCAL PRICES AND FREIGHT RATES

**Adjustments for Differences in Rates.**—In comparing prices paid for farm products or charged for supplies in individual towns it seemed necessary or desirable to first adjust each local price for differences in freight rates to the central market, leaving as far as possible only local conditions to be reflected in the price differences.

However, it was found that the inaccuracy of such adjustments for freight rates precluded their use. The most important objection was the practical impossibility of determining the correct rate to use. Various dealers having different volumes of business ship to various markets. Some produce goes direct to central markets like Kansas City while a portion goes to nearby district assembling plants (such as Chillicothe), from which the carload rate to the eastern markets may be little or no higher than from the so-called central market. This is true, for example, of butterfat and eggs. For a commodity like corn it would be quite unsatisfactory to make rate adjustments because certain territories change from an exporting to an importing basis, or vice versa, at various times during the year. Again, in comparing prices in towns with and without cooperative elevators or exchanges it would be undesirable to adjust tankage or other feed prices on the basis of either a carload or l. c. l. basis, without accurate data on local volume of business for the commodity in question which it was impracticable to obtain.

For these and similar reasons it was decided to make all comparisons without adjustments for freight rates. The justification for this policy lies in the reasonably uniform distribution of quotations over the State, as shown by dot maps for each commodity. For example, Figure 2 shows the distribution of price reports on tankage from towns having only privately operated dealers, and those also having cooperatives, by counties. The chart shows that the reports from each class of dealers came from proportionately the same parts of the State. Another and more convenient way of expressing this is by simple correlation of the number of private

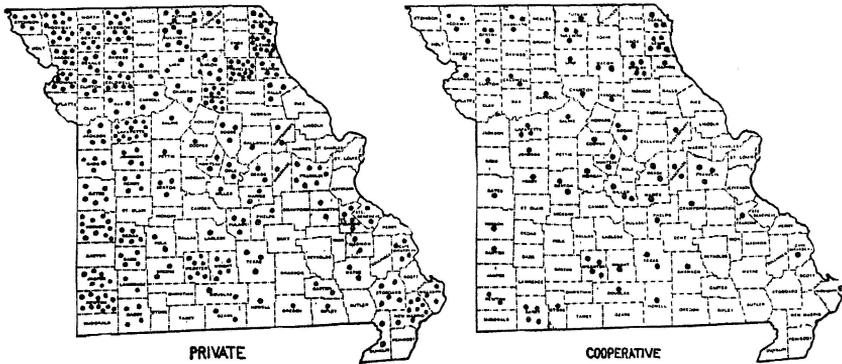


Fig. 2.—Distribution of Price Reports for Tankage from Towns Having Only Privately Owned Dealers, and Those Also Having Cooperatives, by Counties.

and cooperative towns reporting from each county. The data composing Figure 2 show a correlation of  $.5950 \pm .0476$ . For wheat the coefficient of correlation was  $.4345 \pm .0604$ . For other comparisons approximately the same conditions obtain.

Therefor, the question of the effect of freight rates on local prices has been treated separately from the other factors affecting local prices.

**Method of Determining Relationship.**—It is extremely difficult to satisfactorily measure the influence of freight rates on local prices. The freight rate structure is very complicated. Many important variations from any general relationship which may exist are to be expected. The problem may be best illustrated with a concrete example, eggs. As previously noted, they may be shipped from the local point to some large city, such as St. Louis or even New York, or to nearby assembling points like Sedalia or Springfield. A combination l. c. l. and carload rate then would have to be compared with a straight l. c. l. rate. Still more important complicating factors arise. A town with a high freight rate may have much local competition for the product in question. In Columbia, for instance, butterfat supplies are barely sufficient to cover local needs, and prices are commonly higher than at other points having lower rates to points where the larger creameries are located. During part of the year this condition is also true of eggs.

Some might assume that with a sample of sufficient size these local differences in competition and other price affecting factors would be compensating, and therefor tend to “iron themselves out” in any correlation between freight rates and prices. But this assumption is not justified except in so far as the different factors offset each other within an individual town. For example, if  $x_1 = \text{price}$ ,  $x_2 = \text{freight rates}$ ,

and  $x_3$  = number of local dealers, or volume of business transacted locally, or some similar factor, it is obvious that the relationship between  $x_1$  and  $x_2$  will be affected by  $x_3$ , provided there is correlation between  $x_3$  and either  $x_1$  or  $x_2$ , regardless of the number of samples included in the calculation. Nevertheless, simple correlation<sup>4</sup> between  $x_1$  and  $x_2$  will be the most satisfactory measure of the relationship existing between the two factors considered, since the application of multiple or partial correlation to this problem is impracticable because of the limitations of the data.

Therefore, the relationship has been determined, and is shown herein, in three ways: (1) coefficient of correlation, which shows the relative or proportionate importance of freight rates as a factor affecting local prices, as compared with all the other factors involved; (2) coefficient of regression, which shows quantitatively the amount of change in the dependent factor (price) which accompanies changes in the independent factor (freight rates); (3) the probable error of estimate, which shows the accuracy with which the regression coefficient measures this quantitative relationship; and (4) charts showing regression lines and the scatter of individual cases about the line.

The freight, baggage or express rates used are those to the nearest of the two cities, St. Louis and Kansas City, or to the most logical of these two assembling points from the standpoint of transportation routes and trade practices.

#### **The Importance of Freight Rate Differences as Related to Price.—**

Differences in freight rates are of varying importance, particularly as compared to price, in the case of different commodities. This is shown in Table 13. The coefficients of variation in freight rates to the central markets varied from 8.04, for chickens (express) to 23.68 for tankage. Expressed as a percentage of the average price for each commodity, the rates varied from 1.74 per cent for butterfat to 10.35 per cent for male birds. But the differences in the rate between the high and low points, when expressed as a similar percentage of the average price, do not correspond with the above figures at all, due to the greater differences in rates for different commodities, as shown in the last four columns. The variation in the percentage differences was from 1.76 for cattle to 13.68 for tankage.

#### **Relation Between Freight or Express Rates and Prices in Individual Towns.—**

The relation between local prices and freight rates is shown for all commodities included in the study, in Table 14, as indicated by the coefficients of correlation and regression, the probable error of estimate, and the increase or decrease in price per hundredweight

4. A linear relationship has been assumed throughout this bulletin, notwithstanding the tendency of price data to assume curvilinear relationships. It is believed the results are not materially affected.

TABLE 13.—DIFFERENCES IN FREIGHT OR EXPRESS RATES AS RELATED TO PRICE

Commodity	No.	Average Freight or Express Rate	Average Deviation of Freight Rates	Coefficient of Variation of Freight Rates	Average Freight or Express Rate as Per Cent of Average Price	Freight or Express Rate			Difference as Percentage of Average Price
						High	Low	Difference	
Corn, bu.....	91	7.06	1.12	15.87	7.60	11.48	3.36	8.12	8.85
Wheat, bu.....	76	8.22	1.26	15.33	6.39	13.80	3.60	10.20	7.93
Oats, bu.....	80	3.97	.58	14.52	7.53	6.56	1.92	4.64	8.80
Flour, 50 lbs.....	160	7.10	.90	12.68	3.16	9.75	3.25	6.50	2.89
Shorts, cwt.....	142	12.80	.85	13.28	6.56	17.50	6.00	11.50	5.89
Tankage, cwt.....	102	33.80	4.01	23.67	8.18	67.00	10.50	56.50	13.68
Bran, cwt.....	137	13.00	.85	13.08	8.03	20.50	6.00	14.50	8.95
Fertilizer, ton.....	29	250.00	53.40	21.36	9.24	410.00	140.00	270.00	9.98
Butterfat, lb.....	128	.71	.15	21.64	1.74	1.26	.38	.88	2.13
Eggs, doz.*.....	159	1.99	.17	8.65	8.08	2.54	1.24	1.30	5.29
Chickens, lb.....	116	.98	.08	8.04	4.51	1.12	.62	.50	2.29
Heavy Hens, lb.....	149	.98	.08	8.63	5.37	1.42	.62	.80	4.37
Light Hens, lb.....	137	.98	.09	9.14	6.38	1.42	.62	.80	5.19
Male Birds, lb.....	131	.98	.08	8.11	10.35	1.42	.62	.71	7.47
Hogs, lb.....	40	.22	.05	22.46	2.12	.33	.12	.21	2.09
Lamb, lb.....	27	.26	.05	18.22	1.98	.42	.17	.25	1.91
Butcher Cattle, lb.....	36	.20	.04	22.51	2.22	.30	.14	.16	1.76
Veal Calves, lb.....	35	2.30	.04	17.36	20.35	3.90	1.50	2.40	21.24

\*In making the calculations for eggs, one dozen eggs was figured as weighing two pounds.

TABLE 14.—RELATION BETWEEN FREIGHT, BAGGAGE, OR EXPRESS RATE TO NEAREST CENTRAL MARKET AND LOCAL PRICE CHARGED FOR SUPPLIES OR PAID FOR FARM PRODUCTS

Commodity	Coefficient of Correlation	Coefficient of Regression (in cents per unit)*	Probable Error of Estimate	Average Rise or Fall in Price in Dollars Per Hundredweight Resulting From One Dollar Difference in Rate Per Hundredweight**
Bran.....	+ .3096	+ 1.0855 (cwt.)	± .1827	+1.09
Shorts.....	+ .4031	+ 2.1311 (cwt.)	± .2506	+2.13
Tankage.....	+ .1410	+ .9374 (lb.)	± .4355	+ .94
Fertilizer.....	+ .4989	+12.3596 (tons)	± 2.4155	+ .62
Corn.....	+ .0004	+ .0017 (bu.)	± 2.8900	+ .003
Oats.....	+ .2138	+ .6530 (bu.)	± .2198	+2.03
Wheat.....	— .1869	— .8315 (bu.)	± .3367	— 1.19
Butterfat.....	— .4135	— .0299 (lb.)	± .0036	— 2.99
Eggs.....	— .5955	— .0624 (doz.)	± .0036	— 3.12
Chickens 2-3 lbs.....	— .0282	— .0025 (lb.)	± .0056	— .25
Male Birds.....	— .1741	— .0460 (lb.)	± .0151	— 4.60
Light Hens.....	— .1716	— .0197 (lb.)	± .0064	— 1.97
Veal Calves.....	— .1427	— .0050 (lb.)	± .0039	— .50
Hogs.....	— .1218	— .0160 (lb.)	± .1051	— 1.60

\*This shows effect on price, in cents per unit—dozen, ton, bushel, hundredweight, etc. (indicated after coefficient)—of one cent per hundredweight difference in rates.

\*\*Calculated from regression coefficient; see note in text regarding accuracy as related to probable error.

resulting from a difference of one dollar per hundredweight in freight rates. The individual commodity regression lines are shown in Figure 3. It will be noted that the probable error is in many cases very large. This is due to the influence of the other factors previously noted, such as local competition or volume of business, which in individual cases tends to offset the effect of freight rates. The probable error may be more significant to some readers when it is explained that there is a 75 per cent chance that the effect on price of, in this case, a one cent difference in the freight rate, will be as much as or greater than the regression coefficient minus the probable error of estimate. In other words, the coefficient of regression indicates the absolute relationship, while the probable error is a measure of its dependability or distinctness.

**Commodity Differences.**—The effect of freight rates on price seems to be most *distinct* (as distinguished from quantitative greatness) in the case of eggs, mill feeds (bran and shorts) and fertilizer. This is to be expected, since the basic central market is more likely to be the same in each case, and local conditions, quality, and other factors more similar.

There seems to be little relation between value in relation to weight of the commodities and the extent to which prices are affected by differences in rates. Poultry, eggs and butterfat, commodities having high value relative to weight, show large differences, but so also do shorts, oats and wheat.

The fact that apparently no relationship exists for corn is probably explained by the importing and exporting situation in various counties, which are counterbalancing. The positive relationship (price increases with higher freight rate) shown for oats is probably due to the fact that a majority of the counties of the State must import some oats for feed, and at relatively few points are any exported.

The low average (signs disregarded) coefficient of correlation, .2430, is due to the many factors previously discussed which make so difficult the determination of the effects of freight rates.

On the whole, differences in freight rates seem to be fully reflected in local prices, but with much unevenness as between commodities, and even more between individual towns.

### SECTIONAL DIFFERENCES IN PRICE

Mainly because of the relation between freight rates and farm prices it has been assumed that "farm prices tend to align themselves in zones somewhat similar to belts of rainfall."<sup>5</sup> Studies of geographical differences in farm prices over wide areas<sup>6</sup> have shown that this is true

5. Sarle, C. F., *Reliability and Adequacy of Farm Price Data*, U. S. Department of Agriculture Bulletin 1480.

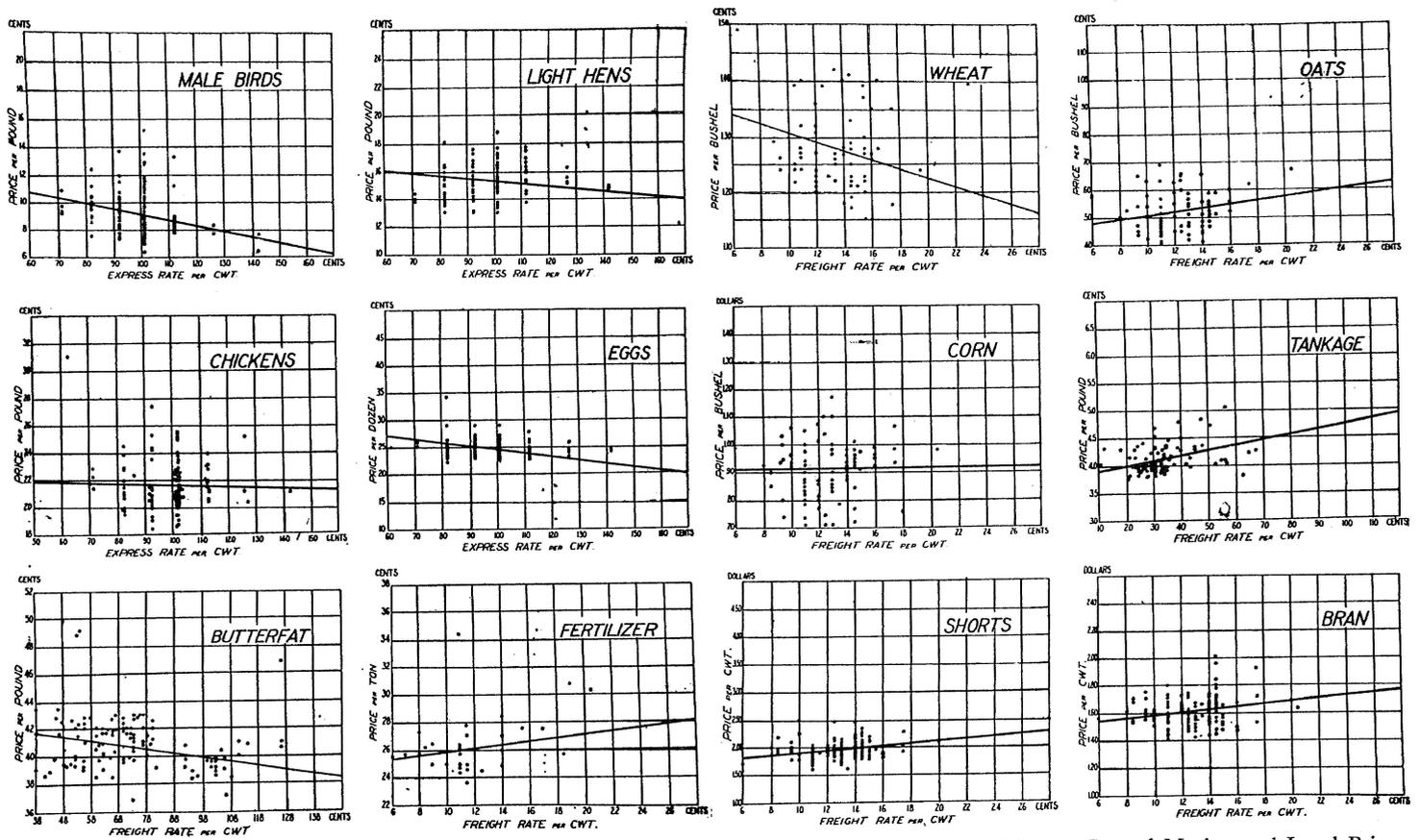


Fig. 3.—Regression Lines showing the Relation Between Freight, Baggage or Express Rates to Nearest Central Market and Local Prices Charged for Supplies or Paid for Farm Products.

in a general way. Wheat prices, for instance, advance gradually from the interior to the seaboard. But the present study indicates that within areas as large even as a state it is very difficult to outline any definite isographic tendencies in farm prices, except for commodities having marked sectional differences, such as corn.

The reasons for this are obvious. There is such a wide variation in local prices due to other than sectional factors that the effects of the latter are frequently covered up by other price differences. This is not true over wide areas because differences in transportation charges are relatively greater. The marked variation in prices within areas as small as districts or even counties, as previously shown, indicates the difficulty of establishing any isographic tendencies within a State.

In mapping prices in Missouri for preliminary study both monthly and yearly average prices were used for individual towns, and county and district averages of the B. A. E. prices for the single year 1927 and periods of years. By using monthly prices, quotations from many more points are available, but the reports are less representative and more apparent discrepancies exist in any maps made with them. In reports for a year or longer compensating differences tend to iron out such discrepancies. Since county averages for the B. A. E. quotations are quite unsatisfactory for this purpose it was found advisable to use the special reports for the yearly prices and B. A. E. district averages for a five year period, 1925-29.

The general unreliability of "isographic" maps of prices is shown in Figure 4, in which average prices by districts for the periods 1927, 1925-29, and 1921-29 are shown. The three periods give appreciably different results. District 3, in the northeast corner of the State, comes within the highest price group for 1927, the lowest for 1925-29, and the mid-group for 1921-29. Similar variations for other districts are observed. These changes simply indicate that the factors influencing sectional differences in price are changing, or that the apparent sectional differences are due to chance, and that no constant geographic tendencies are present, within the limits indicated by the changes. The danger of basing one's conception of the geographic features of farm prices on any one set of data are therefore apparent. For some purposes, the longer periods may furnish a less reliable indication of these relationships than a short one.

Another difficulty connected with the demonstration of geographic tendencies in farm prices arises because of the necessity of grouping, with arbitrarily fixed class limits. Thus, towns or areas located on either side of the group lines may be similar in price, yet necessarily be shown as materially differing. This would not apply to real isographic

6. Series on *Geographical Phases of Farm Prices*, U. S. Department of Agriculture Bulletins 594, 696, and 755, by L. B. Zapolon.

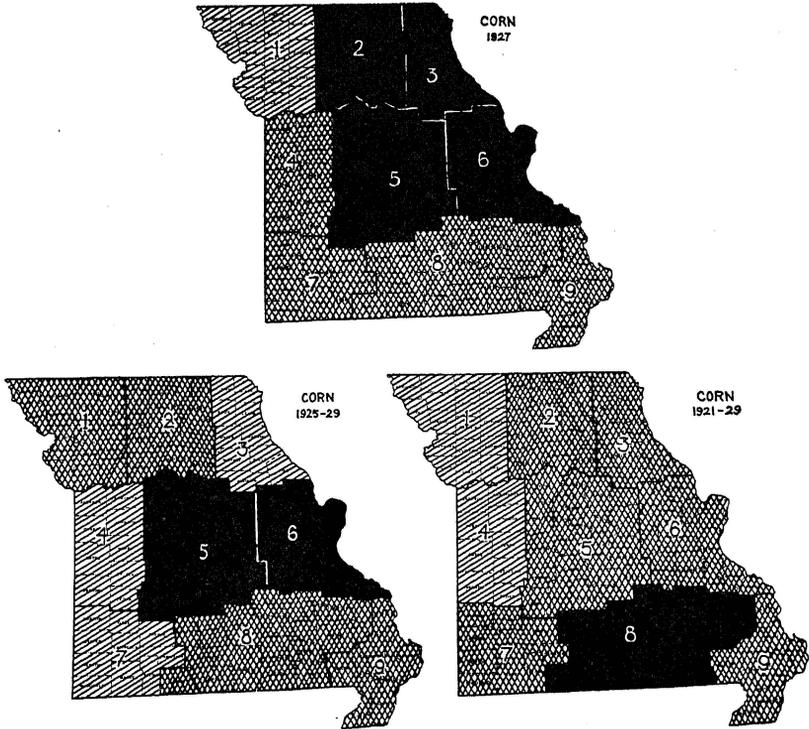


Fig. 4.—Average Prices (B. A. E.) by Crop Reporting Districts, for Corn, 1927, 1925-29 and 1921-29.

maps, for the construction of which the available data were insufficient:

Even aside from this feature there are necessarily many exceptions within any territorial price grouping. For example, one town may have higher butterfat prices than the surrounding territory purely because of local conditions, such as an exceptional demand for sweet cream for ice cream manufacture. For the annual data (special price reports) the percentage of all towns represented by those falling without the respective price grouping of the territory in which they are situated was 13.17, varying by commodities from 2.91 to 17.05 per cent. If these individual towns having prices varying from those of the surrounding territory happen to be located close to the edge of the "isographic" lines used to differentiate between groups the line is likely to be rather irregular, and unaccountable protrusions or indentations will be observed. If smoothed out the effect is as shown in Figure 5, and this smoothing has been followed to some extent in mapping the prices based on the special price reports for 1927. Thus, the latter as finally

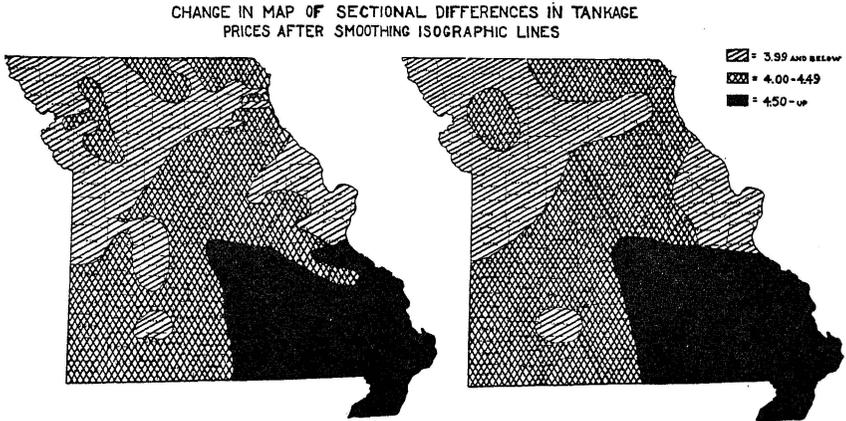


Fig. 5.—Effect of Smoothing on Map of Tankage Prices.

prepared represent only general tendencies, and the casual reader among farmers or local business men is warned not to take too seriously the ranking, whether high or low, of the territory in which his own town is located. That town may be the exception noted above.

**Sectional Differences in Corn and Hog Prices.**—Corn probably has the most pronounced and significant sectional differences in price of any important farm commodity. Because corn and hogs are so closely associated in many respects they will be treated together in this section. Three maps of corn prices, based on averages for crop reporting districts, have been shown in Figure 4. A more satisfactory map, based on the special price reports for 1927, is shown in Figure 6.

The section of the State north of the Missouri River is generally considered a corn surplus area, and that south of the river a corn deficit area. While this is true in a very general way, the maps of corn prices show that a line drawn from north to south through the eastern borders of Harrison, Johnson and Dade counties would result in two east and west sections more nearly approximating the surplus and deficit areas. This relation between surplus and deficit areas and price is plainly shown in a comparison of Figure 6 and Figure 7.

In order to compare prices in strictly surplus and deficit areas crop reporting districts 1 (northwest Missouri) and 8 (south central Missouri) were selected.<sup>7</sup> For the period 1921-29 corn prices in district 1 were 13 cents higher than in district 8. This difference was slightly greater in the spring and summer and lowest in the fall and winter, although the seasonal variation in the spread was on the whole rather negligible.

7. The following discussion of corn and hog prices is largely a condensation of a paper by Mr. Preston Richards.

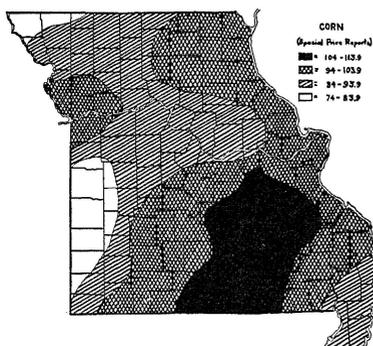


Fig. 6.—Regional Corn Prices in Missouri, Based on Special Price Reports for 1927.

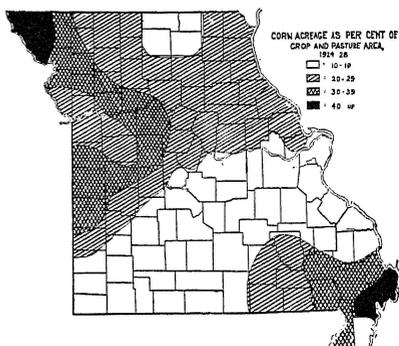


Fig. 7.—Corn Acreage as Per Cent of Crop and Pasture Area, 1924-28.

The spread between the two sections varied considerably from year to year. The largest difference was 25 cents. In one year, 1925, the price in northwest Missouri was 4 cents below that in the south central section, but in every other year the price in the former district was highest. One of the principal reasons for this year-to-year difference in the spread is the size of the corn crop. In 1924-25, for example, due to a short crop both districts probably were deficit areas, accounting for the negligible difference in price. In 1927 there was also a short crop and low spread between the two districts.

On the average, for this period, the Kansas City market price of corn was 1 to 5 cents above the northwest district price in all but three months, June, August and September. These are months when corn becomes locally scarce even in this district, most of the surplus has been shipped to market earlier in the season, and corn is then sometimes shipped back for feeding operations, making the prevailing local price the Kansas City price plus at least a portion of transportation and handling costs. The price of corn in south central Missouri varied from 8 to 15 cents above the Kansas City price during the year, the greatest difference coming in the summer and the least in the fall, when the district approaches more nearly the conditions of a surplus area.

Monthly or seasonal changes in corn prices in districts similarly situated as to corn production and uses were more similar than for northwest and south central Missouri, as shown by coefficients of correlation for monthly prices for 1924-28 between districts 1 and 2 of  $.93 \pm .012$  and districts 1 and 8 of  $.75 \pm .039$ . Prices in district 1 also have a closer relation to Kansas City prices than district 8, as shown by respective coefficients of correlation of  $.9174 \pm .014$  and  $.755 \pm .037$ .

It is interesting to note, although somewhat off the subject, that farmers who are able to obtain good yields of corn in the deficit production areas have a decided advantage over producers in the surplus districts, which has probably been capitalized in the value of the land. Land in south central Missouri with similar yields, allowing for one year of corn in a four-year rotation and an interest rate of 5 per cent, would be worth \$27 more per acre because of this price advantage.

Comparisons of hog prices over the same period, 1921-29, showed that the three southern districts, 7, 8 and 9, were relatively low in price, due probably to distance from market and the kind and quality of hog produced. Seasonal variations in hog prices for districts 1 and 8 were similar, with the former averaging \$1.33 per hundredweight higher. As a result of this and the opposite difference in corn prices, the corn-hog ratio for the southern sections, particularly district 8, is lower because of a high denominator and low numerator. During these years the corn-hog ratios of the two districts, 1 and 8, showed a difference of from 6.7 in 1921 to 1.9 in 1925. Since 1922 the spread between the two districts has not been greater than 4.6. The small difference in 1925 was occasioned by the short corn crop that year. It may be remarked that these comparisons indicate that a state corn-hog ratio is, except in a very general way, not significant, being too high for the southern districts and too low for the northern districts. This is particularly true in a state like Missouri, in which such varied conditions are encountered.

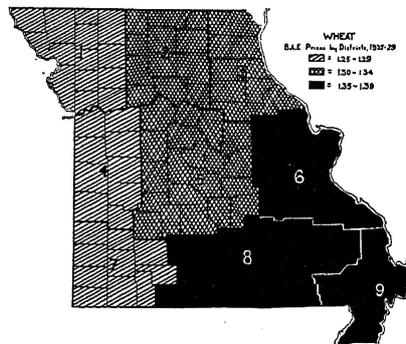


Fig. 8.—Average Prices of Wheat by Districts, 1925-29 (B. A. E.).

**Wheat.**—Special prices were not available for a sufficient number of towns to permit of satisfactory mapping. The same is true of county averages of B. A. E. prices. Figure 8 is based on district averages for the period 1925-29. Wheat prices are low along the western border

of the State, due to at least three factors: hard wheat is largely grown in the northwest district; Kansas City prices are lower than St. Louis; and there is less local milling demand than in some other areas. The highest prices in south central and southeast Missouri are probably due to the premium for soft wheat, lower freight rates, and a greater local milling demand which has less local wheat to draw upon. The northeast and central counties are affected by these conditions to a somewhat lesser extent.

**Butterfat.**—Maps of butterfat (sour cream) prices by districts for the period 1925-29 and for the special prices for 1927 are presented

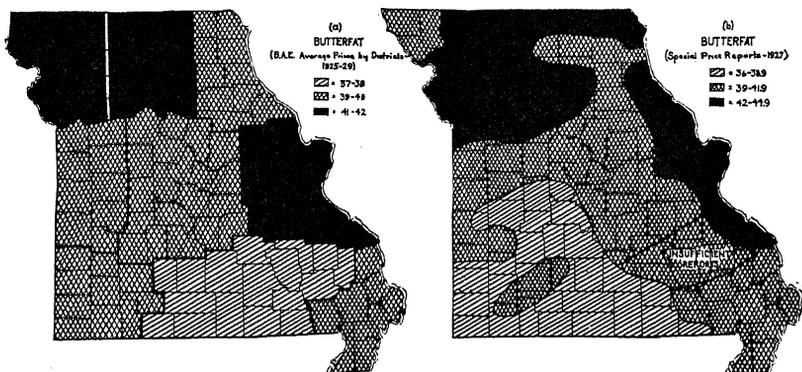


Fig. 9.—Butterfat Prices (a) by Districts, 1925-29 (B. A. E.), (b) Special Prices for 1927.

in Figure 9. Butterfat prices are highest in the territories supplying St. Louis, Kansas City and St. Joseph, but there is a large part of northwestern and north central Missouri in which sour cream prices are equally high. Competition in this district is heavy, coming from Omaha, Iowa points, St. Joseph, Kansas City, Chillicothe, Moberly, Trenton, and other regional assembly points. The fight for volume between creameries in this territory is undoubtedly the main cause of higher prices here, although somewhat lower transportation costs also are influential. There is also more competition from city and town milk markets in this area. The central and southeast areas are perhaps less favorably situated as to competition, but the demand for sweet cream from St. Louis and other markets throughout most of this area keeps butterfat prices above those in the southwestern and south central sections, which are more dependent upon cream stations and local or semi-local processing plants for a market.

**Eggs.**—Similar maps for eggs are shown in Figure 10. For this product, also, the effect of city markets is apparent. The high priced southeastern corner is probably the result of local consumption more

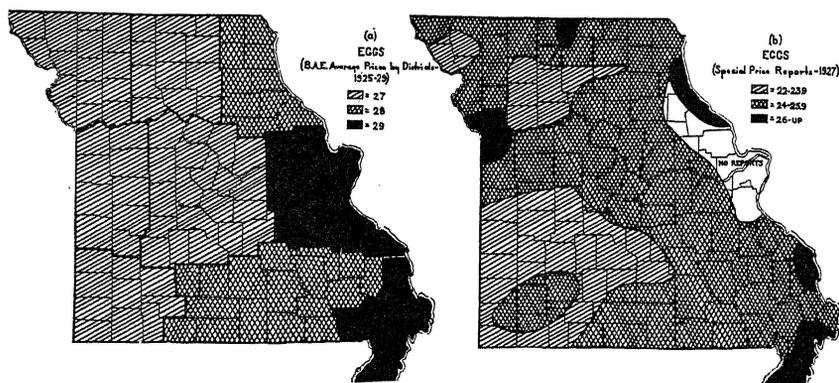


Fig. 10.—Egg Prices, (a) by Districts, 1925-29 (B. A. E.); (b) Special Prices for 1927.

nearly equalling or even exceeding production during a portion of the year. In a large part of the south central Ozark region it is probable that tourist consumption during the summer coupled with relatively light production keeps prices above the lower levels of the southwestern area (excepting the immediate Springfield territory). In general, it is obvious that nearness to markets like St. Louis causes prices in the eastern half of the State to be higher than in the western half.

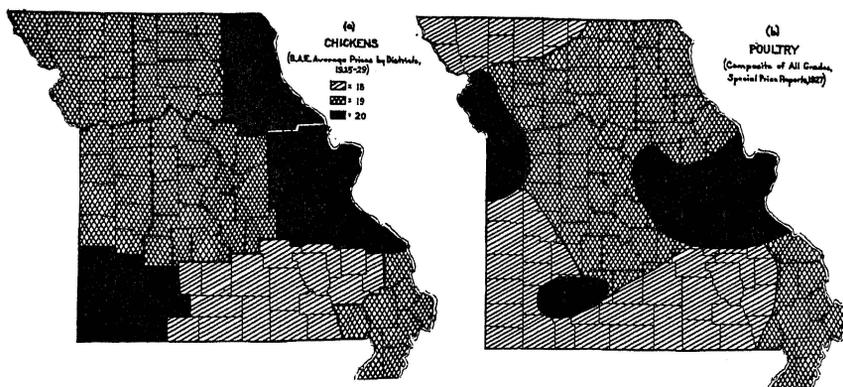


Fig. 11.—(a) Light Chicken Prices (B. A. E.) by Districts, 1925-29; (b) Composite Map of Poultry Prices, Based on Special Price Reports for Light Chickens, Light Hens, Heavy Hens, Male Birds, 1927.

**Poultry.**—Since the special price quotations for poultry are for several different kinds of poultry bought at country points (light chickens, light hens, heavy hens, male birds), they are not comparable with the B. A. E. reports. A composite map showing sectional differences

in prices for all these classes of poultry is shown in chart (a) of Figure 11, which also shows (chart b) light chicken prices for the years 1925-29. The composite map is necessarily very general in nature, and there are some doubtful areas, particularly in the central section, in which relative prices for the different kinds of poultry were not the same. However, it outlines the more marked geographic tendencies in poultry prices. The high priced area south and west of St. Louis is influenced by the city outlet and competition from nearby killing plants. This also applies to the Springfield and Kansas City territories, to a lesser extent. The medium prices in the southeastern corner are possibly due to relatively greater local consumption, as compared with other southern counties. Many of the big district killing or assembling plants are located in the central and more northern districts, which with greater local volume probably accounts largely for the somewhat higher prices in that area as compared with the south. The influence of this competition between assembly points is shown in the line from the Springfield territory to the St. Louis territory, indicating the effect of the railroad and hard road between these points, permitting both Springfield and St. Louis (also St. James and other points) to draw on this section. Only slightly farther south, where this competition is not present, prices are lower.

**Tankage.**—Prices of tankage have previously been shown in Figure 5. The influence of freight rates and proximity to local packing centers is fairly distinct. It is also apparent that volume of business in the various sections is of some influence, and this possibly accounts partially for the higher prices in the southeastern and south central districts which are closer to sources of supply than some other sections which are lower in price.

**Mill Feeds and Flour.**—In Figure 12 are shown price maps for bran (a), shorts (b), and flour (c). The number of towns for which average prices for the year (special price reports) were available for each commodity, and upon which the maps are based, were: bran 140, shorts 144, and flour 163. The percentages of these towns which were individually out of place in the final sectional divisions, or which fell without the class limits of their respective territories, were as follows: bran and flour 12 per cent, and shorts 10 per cent. Thus, there would seem to be sufficient data, and uniformity of these data, to establish fairly reliable geographic tendencies for most sections of the State. However, the actual results are difficult to explain. For example, bran is highest in price in the south central and southeastern sections, while flour is lowest in price in those areas. This apparent discrepancy possibly may be explained by lower volume of business and higher handling costs for bran in this area, and lower quality flour. The flour quotations specified "best" flour, and several first grade brand names were given to

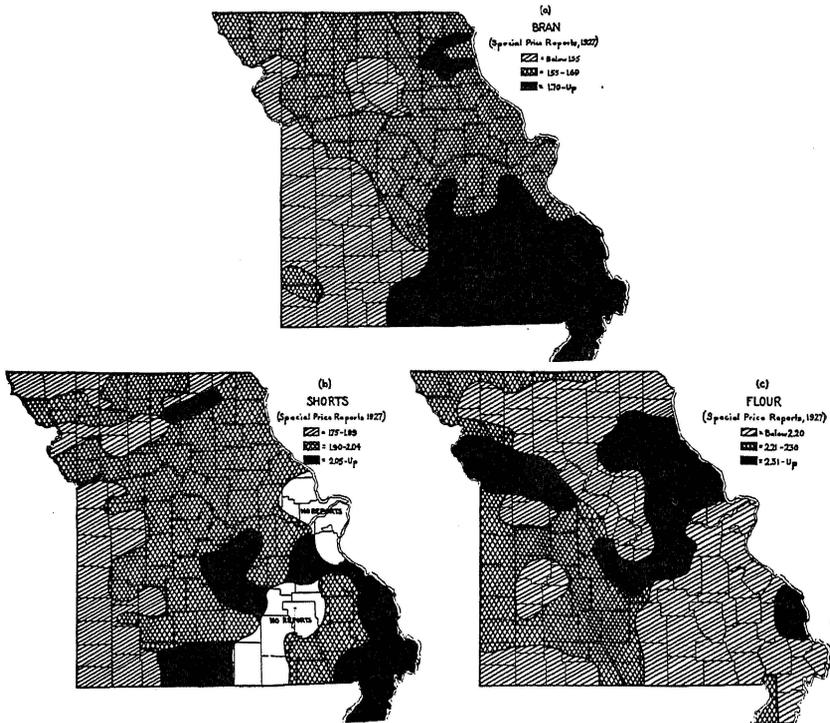


Fig. 12.—Regional Prices for (a) Bran, (b) Shorts, (c) Flour, Based on Special Price Reports for 1927.

reporters as examples, but in some of the more isolated or poorer sections these brands may not have been sold. There are few points of similarity between the maps for bran and shorts, except the high priced section of southeast Missouri, the low priced territory north of Kansas City, and several small areas.

#### FACTORS AFFECTING LOCAL PRICE VARIATIONS

Obviously, one of the best ways to find out why prices in any given town are relatively high or low is to visit the town and study local conditions. This, however, is manifestly impracticable where any considerable number of towns and commodities are involved. Moreover, the observations would necessarily be mainly qualitative in character, depending upon the judgment of the individual, and not well adapted to generalization. If an analysis of local price differences is to mean anything it must be based upon more objective data.

The more important factors which have been held responsible for local price differences are:

(1) *Freight rates.* As previously noted, the influence of freight or express rates is difficult to detect, is frequently obscured by other factors causing prices to be higher in towns having lower rates, and vice versa; but apparently, on the whole, rate differences are fully reflected in local prices.

(2) *Railroad and inland towns.* Many local trading points in Missouri are not located on a railroad, and are usually termed inland towns. Farm products bought from and supplies sold to farmers at these points must be hauled to or from the nearest railroad point. It might reasonably be expected that prices of farm products would be lower and supplies higher in these inland towns.

(3) *Volume of local production.* This is frequently an important factor, but its effects are very difficult to quantitatively measure. For example, a particular area may be low in butterfat production, and thus have only cream station outlets and relatively low prices. A similar area may be low in egg production, but because of summer resort demand have high local prices for eggs. Likewise, areas deficient in wheat production may have high prices due to local milling demand if water power is available, while another section identical in other respects may have low prices for wheat because of no local demand and poor facilities for shipping. Innumerable examples of conflicting circumstances and effects of this nature could be cited. In any statistical comparisons the cases in conflict cannot be eliminated, and serve to obscure any general relationship which might otherwise be found to exist.

(4) *Size of town.* For some commodities and under some circumstances the size of the town may be expected to have some influence on local prices. The local demand for eggs in some towns during a portion of the year is greater than local production, and the price becomes an importing rather than an exporting price. Higher or lower costs due to differences in rents, local wages of labor, etc., may affect local margins and therefor local prices. Many farmers believe that prices for supplies are lower and for farm products are higher in the larger towns. Others believe that lower costs and a greater need for business on the part of merchants in the smaller towns enables them to pay more or charge less.

(5) *Degree of local competition.* This is undoubtedly an important factor affecting local prices, but also is very difficult to measure. The competitive factors to be taken into account may be strictly local, or regional. The extent of local competition might be measured by the number of dealers handling the commodity in question; yet there is no reason for believing that six local produce buyers would furnish more competition than three wide awake dealers. Obviously, any classi-

fication of towns into groups having different numbers of dealers with uniform class intervals and arbitrarily fixed class limits is likely to show little association with price. Again, a town with only one or two local dealers may be located in an area having extreme competition between district assembly plants and city dealers, with a price higher than in other towns having numerous dealers. Three grain elevators in one town may provide healthy competition and good prices, while in another town having a lower volume of grain but the same number of dealers the volume per elevator may be so small as to cause high operating costs and force local margin agreements which result in lower prices to producers. These are only a few examples of conflicting circumstances surrounding this important price influence. It is exceedingly difficult, if not impossible, to measure the intensity of competition in any locality.

(6) Closely associated with the degree of local competition, but sufficiently important for separate mention, is the presence or absence of local cooperative marketing associations handling farm products and supplies. A tabulation of the regular farm price quotations made several years ago seemed to indicate that on the average, towns having cooperative associations dealing in the respective commodities had higher prices for farm products and lower prices for supplies.<sup>8</sup> The present study has made possible more definite conclusions on this point.

(7) In addition to the above there are a number of even more intangible factors affecting local prices, such as possible local agreements between dealers and rivalry between towns located near each other. Such influences cannot be statistically measured, and are not considered in the following partial analysis.

It was hoped that the simplified graphic method of multiple curvilinear correlation developed by Dr. Bean of the Bureau of Agricultural Economics could be used in determining the influence of the foregoing half dozen local price influences. However, upon trial it became evident the data were not adapted to this method of analysis, so each factor has been treated separately.

**Volume of Local Production.**—The various towns used in these tabulations were grouped according to the volume of local production of the respective commodities, as follows: low, light, medium, heavy high. The class intervals and limits for each of the commodity production groups are shown in Table 15A. The average prices and variation from the average for these groups are given in Table 15B. The averages are shown graphically in Figure 13.

8. See Missouri Bulletin 253, page 37.

TABLE 15A.—CLASS LIMITS FOR PRODUCTION GROUPS USED IN TABLE

Products and Units	Units of Production Per Acre of County in Which Town Is Located Which Constitute the Following Classes				
	Low	Light	Medium	Heavy	High
Corn, bushels per acre.....	0-1.999	2. -3.999	4. -5.999	6. -7.999	8.0 -up
Wheat, bushels per acre.....	0- .159	.16- .319	.32 - .479	.48- .639	.64-up
Oats, bushels per acre.....	0- .349	.35- .699	.7 -1.049	1.05-1.399	1.4 -up
Butterfat, milk cows per acre.....	0- .009	.01- .019	.02 - .029	.03- .039	.04-up
Eggs, chickens per acre.....	0- .249	.25- .499	.50 - .749	.75- .999	1. -up
Heavy Hens, chickens per acre.....	0- .249	.25- .499	.50 - .749	.75- .999	1. -up
Light Hens, chickens per acre.....	0- .249	.25- .499	.50 - .749	.75- .999	1. -up
Male Birds, chickens per acre.....	0- .249	.25- .499	.50 - .749	.75- .999	1. -up
Hogs, numbers per acre.....		0- .074	.075- .149	.150-up	
Sheep, numbers per acre.....		0- .020	.02 - .040	.04 -up	
Butcher Cattle, cattle per acre.....		0- .199	.2 - .399	.4 -up	
Veal Calves, milk cows per acre.....		0- .19	.02 - .039	.04 -up	

TABLE 15B.—AVERAGE PRICES AND VARIATION, BY COMMODITIES, FOR TOWNS GROUPED ACCORDING TO VOLUME OF LOCAL PRODUCTION\*

Commodities	Low				Light				Medium			
	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation
Corn.....	23	1.014	.069	6.84	20	.885	.087	9.80	20	.893	.067	7.58
Wheat.....	19	1.293	.056	4.33	19	1.312	.063	4.80	16	1.272	.071	5.55
Oats.....	20	.603	.052	8.61	15	.500	.058	11.52	17	.491	.042	8.51
Butterfat.....	12	.404	.012	2.52	42	.409	.015	3.57	58	.413	.021	5.16
Eggs.....	13	.253	.011	4.19	16	.256	.021	8.24	29	.246	.007	3.17
Chickens.....	5	.230	.009	4.00	11	.234	.018	7.65	20	.220	.012	5.27
Light Hens.....	9	.157	.011	6.75	11	.158	.012	7.47	27	.155	.009	5.48
Heavy Hens.....	10	.178	.009	5.22	15	.182	.009	4.76	25	.184	.007	3.80
Male Birds.....	7	.093	.017	17.96	12	.101	.012	12.28	27	.097	.013	13.28
Hogs*.....					22	.104	.008	8.12	17	.106	.008	7.19
Lambs*.....					15	.135	.022	16.30	6	.123	.007	5.86
Butcher Cattle*.....					8	.070	.018	24.86	18	.093	.011	11.64
Veal Calves*.....					15	.124	.018	14.52	14	.106	.013	12.17
Average for Commodities Having All Groups.....	131			6.60	17.9			7.79	26.6			6.47
Average for Commodities with Three Groups*.....					15			15.95	13.8			9.22

\*See Table B for class limits by commodities.

TABLE 15B.—AVERAGE PRICES AND VARIATION, BY COMMODITIES, FOR TOWNS GROUPED ACCORDING TO VOLUME OF LOCAL PRODUCTION—CONTINUED

Commodities	Heavy				High			
	Number of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	Number of Towns	Average Price	Average Deviation of Price	Coefficient of Variation
Corn.....	10	.882	.052	5.88	20	.879	.060	6.88
Wheat.....	9	1.254	.054	4.31	14	1.291	.058	4.49
Oats.....	12	.491	.044	9.02	16	.520	.042	8.00
Butterfat.....	8	.407	.028	6.88	9	.400	.014	3.40
Eggs.....	64	.245	.009	3.67	38	.244	.007	2.71
Chickens.....	47	.213	.012	5.63	33	.215	.013	6.05
Light Hens.....	56	.153	.011	7.39	35	.153	.009	5.88
Heavy Hens.....	63	.182	.007	3.68	36	.184	.006	3.26
Male Birds.....	52	.093	.011	12.26	33	.096	.011	11.56
Hogs*.....	5	.100	.002	2.20				
Lambs*.....	6	.127	.007	5.44				
Butcher Cattle*.....	10	.105	.011	7.75				
Veal Calves*.....	6	.103	.022	20.97				
Average for Commodities Having All Groups.....	25.7			6.53	26.0			5.81
Average for Commodities With Three Groups*.....	6.8			11.54				

\*See Table B for class limits by commodities.

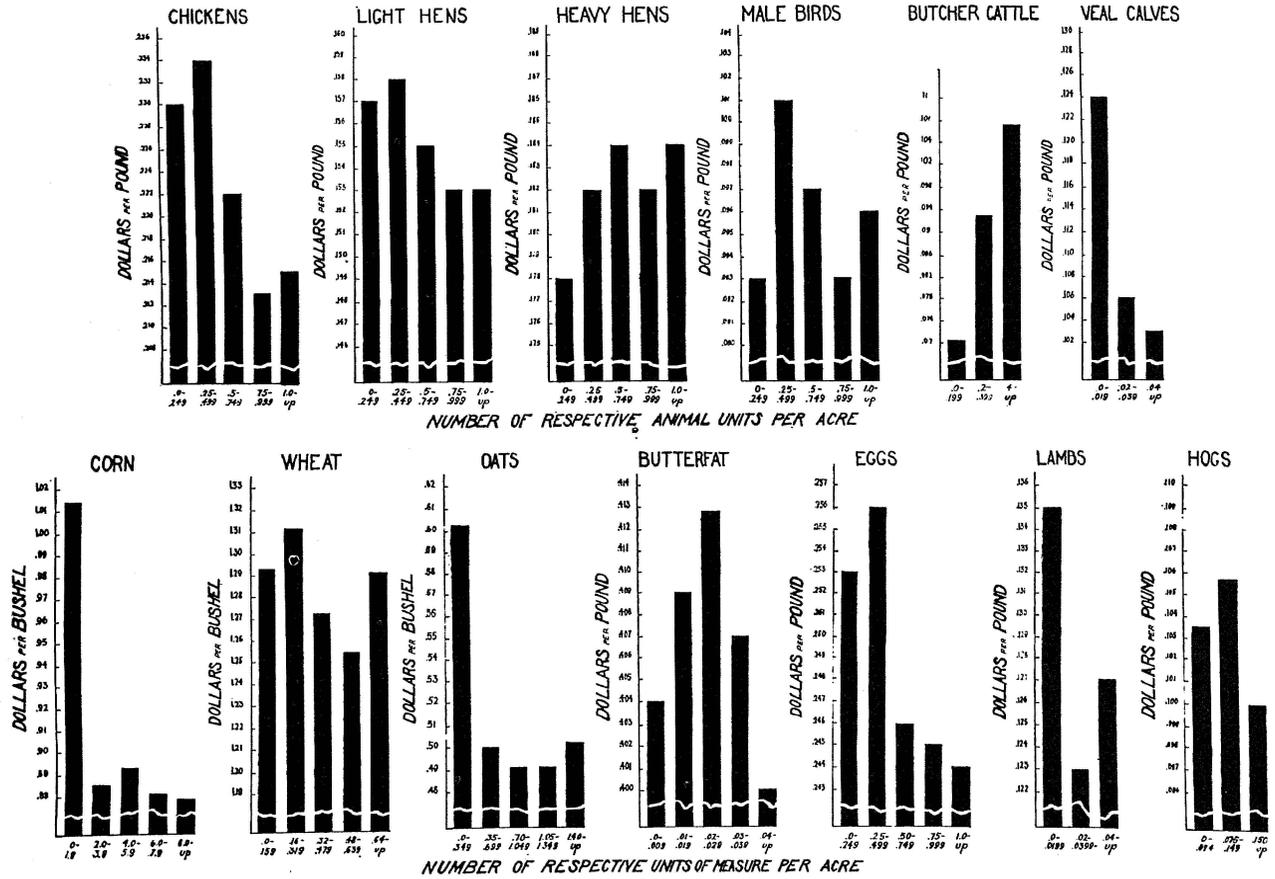


Fig. 13.—Average Prices of Towns Grouped According to Volume of Local Production. (See remarks in text regarding interpretation.)

In interpreting this chart the averages and coefficients of variation as given in Table 15B should receive attention, as otherwise the sometimes very small vertical scale interval may lead to an exaggerated idea of the difference between groups. This caution applies also to the succeeding charts of a similar nature. As a further aid in interpreting these charts Table 16 has been prepared. Only a few of the more important commodities have been included in this table because of the large amount of clerical work involved, and because the degree of association in most cases did not appear to warrant more detailed tests than is furnished by a mere inspection of the data. This table indicates the validity of the average differences between groups for the various price comparisons made, including that for volume of production. It includes the difference between the means of the groups indicated and the percentage chances of the existence of a difference between the means in the *direction* (not to the amount) indicated by the sign of the difference, if additional samples were used in the comparisons. This percentage is based on the fact that all of the cases to the right of the mean of the differences found in successive samples minus the standard error, would show such a directional influence.

TABLE 16.—SIGNIFICANCE OF AVERAGE DIFFERENCES BETWEEN GROUPS IN COMPARISONS OF LOCAL PRICES IN TOWNS HAVING VARYING NUMBERS OF DEALERS, POPULATION, AND VOLUME OF PRODUCTION IN TRADE TERRITORY

Class Number Reading From Left*	Difference Between Means (D)**	$\sigma$	$\frac{D}{\sigma_D}$	Approximate Percentage Chance of Difference***
Comparison: Number of Dealers				
EGGS				
1 and 5	.005	.002	2.083	98.12
1 and 2	— .003	.003	.859	80.51
2 and 3	.002	.003	.639	73.89
3 and 4	— .001	.003	.316	62.53
4 and 5	.007	.003	2.310	98.95
Average				82.80
WHEAT				
1 and 5	.076	.027	2.813	99.75
1 and 2	.014	.017	.840	79.75
2 and 3	.071	.028	2.533	99.43
3 and 4	.030	.037	.780	78.81
4 and 5	— .039	.039	.997	84.13
Average				88.37
Average all commodities				85.59
Comparison: Population				
EGGS				
1 and 3	.037	.018	2.110	98.25
1 and 2	.005	.008	.552	70.88
2 and 3	.032	.016	2.041	97.93
Average				89.02
BUTTERFAT				
1 and 3	.044	.019	2.258	98.80
1 and 2	.005	.004	1.210	88.68
2 and 3	.039	.020	1.957	97.50
Average				94.99

TABLE 16.—SIGNIFICANCE OF AVERAGE DIFFERENCES BETWEEN GROUPS IN COMPARISONS OF LOCAL PRICES IN TOWNS HAVING VARYING NUMBERS OF DEALERS, POPULATION, AND VOLUME OF PRODUCTION IN TRADE TERRITORY—CONTINUED

Class Number Reading From Left*	Difference Between Means (D)**	$\sigma$	$\frac{D}{\sigma_D}$	Approximate Percentage Chance of Difference***
Comparison: Population (Continued)				
CORN				
1 and 3	.050	.038	1.335	90.98
1 and 2	.011	.020	.538	70.54
2 and 3	.040	.038	1.050	85.31
Average				82.28
Average all commodities				88.76
Comparison: Volume of Local Production				
CORN				
1 and 5	-.135	.025	5.451	100.00
1 and 2	-.129	.030	4.254	99.99
2 and 3	.008	.030	.271	60.64
3 and 4	-.012	.028	.422	66.27
4 and 5	-.003	.026	.102	53.98
Average				76.18
BUTTERFAT				
1 and 5	.004	.007	.561	71.22
1 and 2	.005	.005	.965	83.39
2 and 3	.004	.004	.891	81.33
3 and 4	-.006	.013	.467	68.08
4 and 5	-.007	.014	.514	69.49
Average				74.70
EGGS				
1 and 5	-.009	.004	2.439	99.24
1 and 2	.003	.007	.397	65.54
2 and 3	-.010	.007	1.473	92.92
3 and 4	-.001	.002	.472	68.08
4 and 5	-.001	.001	.676	75.17
Average				80.19
Average all commodities				77.02
Comparison: Railroad and Inland				
TANKAGE				
1 and 2	.141	.062	2.272	98.84
Comparison: Railroad and Inland (Continued)				
BUTTERFAT				
1 and 2	-.006	.004	1.605	94.52
EGGS				
1 and 2	-.002	.002	.930	82.38
CORN				
1 and 2	.053	.037	1.440	92.50
FLOUR				
1 and 2	.028	.021	1.310	90.49
Average all commodities				91.75

\*Refers to classes or groups in the several tables and figures indicated.

\*\*Difference between the average prices for each group.

\*\*\*Chances of a difference between the means in the direction indicated by signs (higher or lower as the second group average is higher or lower than the first group average).

It will be observed that according to this test the chances of such directional differences between the production groups for corn, butterfat and eggs are, on the average, about 77 per cent. To use a specific example the chances of corn prices being lower in towns falling in group five or two, as compared to group one, are practically 100 per cent, but the chances of the indicated directional difference between groups four and five are about even. In other words, this test is merely an elaboration of the relation between the respective averages for any two groups and their corresponding deviations as given in Table 15B and succeeding tables of similar nature.

In Table 17 are shown the coefficients of correlation and regression with their standard errors, for the comparisons of volume of production, size of town, and number of dealers, showing the abstract degree of association and quantitative relationship between local prices and these various factors, for a number of commodities. In interpreting these tables it should be remembered that the measures of relationship are likely to understate the case. For example, there may be a big difference between the first two groups (as for corn) and little difference between succeeding groups. The significant point then is that areas with very light production have markedly higher prices, but once production is sufficient to care for local needs there is little or no difference in price. The latter fact would lower the correlation coefficient and reduce its measure of validity, and the averages as plotted would show no difference between most groups, yet the significant relationship would remain. Thus, the apparent significance of the comparisons of group averages in these and similar tables and charts is dependent somewhat upon the grouping used, but no effort has been made to readjust the groupings to give maximum differences. This table, as well as Table 16, will be referred to again in connection with the other comparisons.

Quite obviously a detailed discussion of the various commodities included in this comparison of local prices and volume of production, as well as the other comparisons made later, would be impracticable. The reader who is sufficiently interested may himself make these detailed comparisons. For the entire group of products it appears that there exists no distinct relation between local prices and the volume of production in the surrounding territory. There are some exceptions to this general conclusion, such as corn and oats.

TABLE 17.—COEFFICIENTS OF CORRELATION AND REGRESSION SHOWING RELATION BETWEEN LOCAL PRICES AND NUMBER OF DEALERS, POPULATION, AND VOLUME OF PRODUCTION

Commodity	Number of Cases	Number of Dealers				Population*		Volume of Production*	
		Coefficient of Correlation **	Standard Error **	Coefficient of Regression *	Standard Error *	r Correlation Between Population Groups and Average Price	r Standard Error	r Correlation Between Production and Price	Standard Error of r
Corn.....	93	.188	.101	.014	.075	.123	.102	-.400	.087
Wheat.....	77	.877	.026	.027	.003	.401	.096	-.125	.112
Oats.....	80	.303	.011	.016	.006	-.115	.110	-.137	.110
Butterfat.....	129	-.114	.087			.215	.084	-.006	.088
Eggs.....	160					.328	.070	-.193	.076
Flour.....						.052	.078		
Tankage.....						-.119	.097		
Shorts.....						.344	.074		
Chickens.....						.358	.081		
Heavy Hens.....	149	.138	.080			.448	.066	.410	.068
Light Hens.....	138	.123	.084			.446	.068	-.091	.084
Male Birds.....	131					.071	.087	-.051	.087
Hogs.....	41					-.220	.149	-.038	.156
Lambs.....	27	.223	.182					-.135	.191
Butcher Cattle.....	36	.040	.166			-.162	.162	-.558	.115
Veal Calves.....	35							-.385	.144

\*Coefficient of regression and standard error were not calculated where there was an obvious lack of association.

\*\*Coefficients not calculated where there was an obvious lack of association.

\*\*\*No available data on volume of business for these commodities.

Railroad and Inland Towns.—The average prices and variation, for railroad and inland towns, by commodities, are shown in Table 18 and Figure 14. The validity of the directional differences in price as

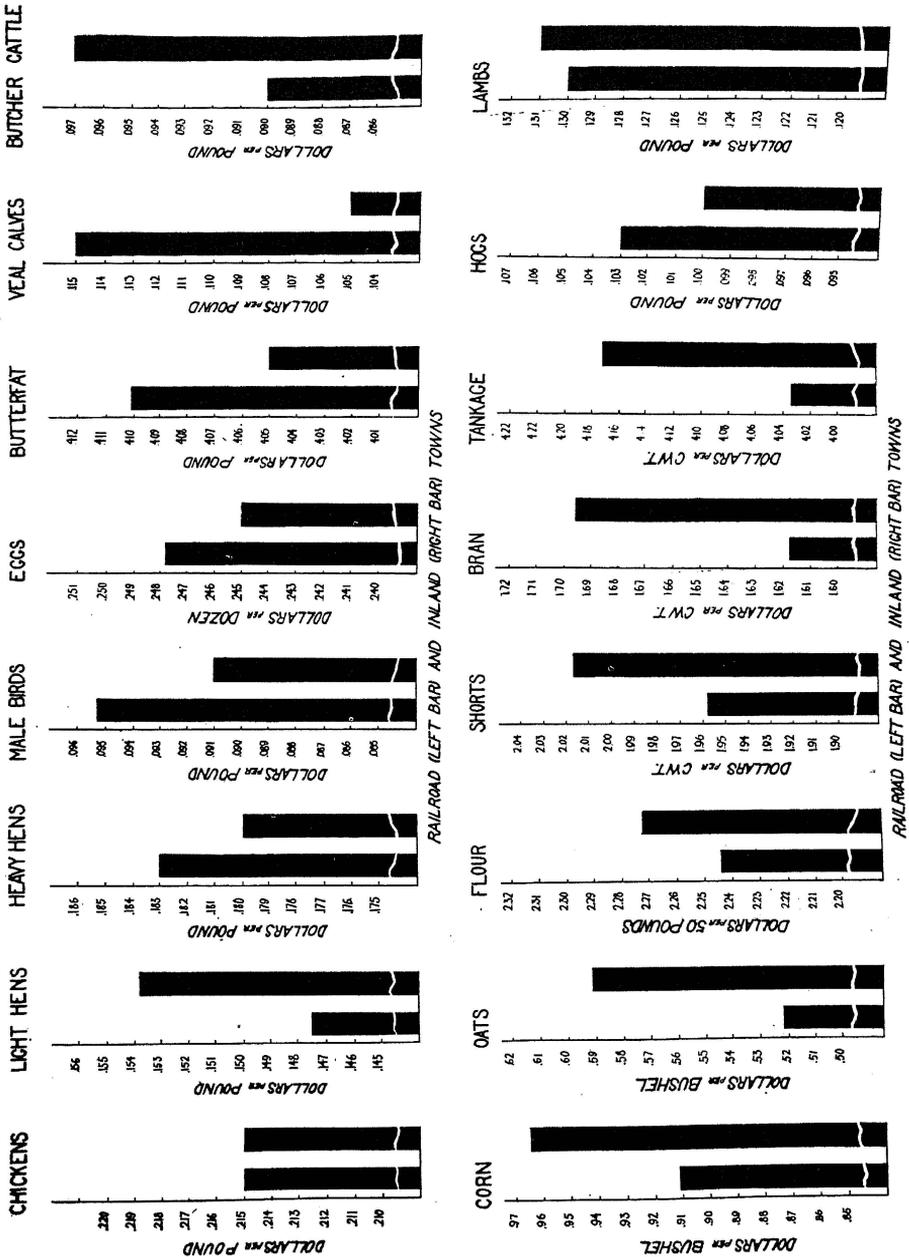


Fig. 14.—Average Prices of Railroad and Inland Towns. (See remarks in text regarding interpretation.)

TABLE 18.—AVERAGE PRICES, AND VARIATION, BY COMMODITIES, FOR RAILROAD AND INLAND TOWNS

Commodities	Railroad				Inland			
	Number of Cases	Average Price	Average Deviation of Prices	Coefficient of Variation	Number of Cases	Average Price	Average Deviation of Prices	Coefficient of Variation
Corn.....	83	.911	.077	8.40	10	.964	.089	9.21
Wheat.....	70	1.284	.063	4.91	7	1.304	.045	3.47
Oats.....	75	.522	.058	11.02	5	.591	.063	10.69
Flour.....	136	2.244	.092	4.10	27	2.272	.079	3.46
Shorts.....	121	1.948	.089	4.55	23	2.017	.097	4.83
Tankage.....	93	4.034	.186	4.61	13	4.172	.165	3.95
Bran.....	120	1.608	.079	4.88	20	1.696	.072	4.25
Butterfat.....	108	.411	.017	4.23	21	.405	.011	2.81
Eggs.....	132	.248	.010	3.84	28	.245	.008	3.22
Chickens.....	100	.215	.014	6.56	16	.215	.011	5.30
Heavy Hens.....	121	.183	.007	3.98	28	.180	.011	7.38
Light Hens.....	112	.154	.011	6.95	26	.148	.006	13.26
Male Birds.....	104	.095	.012	12.63	27	.091	.012	6.80
Hogs.....	34	.103	.006	6.02	7	.100	.007	9.01
Lambs.....	22	.130	.015	12.31	5	.131	.012	14.43
Butcher Cattle.....	30	.090	.017	18.78	6	.097	.014	15.33
Veal Calves.....	28	.115	.017	14.96	7	.105	.016	6.72
Average.....	83.1			7.84	13.7			

shown by the average prices for the two types of towns are given, for five commodities, in Table 16. It will be noted that the chances of such directional differences existing, for these commodities, are uniformly high, averaging 92 per cent. In general, the relationships shown were as anticipated, although it is impossible to account for the variable results with different kinds of poultry. For farm commodities, with few exceptions, prices are higher in the railroad towns, while for supplies which must be shipped in prices are lower in those towns. The fact that corn and oats show higher average prices for the inland towns is probably due to the fact that the latter are mostly located in deficit areas for these commodities, giving them the price characteristics of supply items.

Butterfat prices, it will be seen, average only \$.006 higher in the railroad towns. The mathematical chances of the price being as high or higher in railroad towns are 94 per cent, based on the variation in these data. A previous study of prices paid by 285 cream stations<sup>9</sup> showed no difference in the average prices of stations located in inland and railroad towns. This apparent discrepancy may be accounted for by the fact that all of the stations included in the latter study were operated by the same creameries, whereas in the present study many of the inland towns included probably bought for only local or district creameries, and are otherwise not as fortunately situated.

**Size of Town.**—The relation between local prices and the size of town are shown in Tables 17 and 19 and Figure 15. The reliability of the directional differences for three of the commodities shown in Table 19 and Figure 15 is indicated in Table 16.

While the correlation coefficients are generally low (Table 17), the relationship between size of town and price as shown by all the data is fairly distinct, although the reader is again warned that the vertical scale of the chart tends to emphasize this relationship, and should be interpreted in connection with the data in Table 19. For all farm products there seems to be little difference in price until the 5000 population group is reached, when prices uniformly are higher for farm products and lower for supplies (excepting bran and flour). It is evident that flour prices are considerably higher in the larger towns, probably due to higher retailers' costs and margins, and better quality. The fact that prices are not influenced to any extent by the size of town below the 5000 mark is also indicated in Table 16, which shows that the chances of the directional differences existing as indicated by the bar charts are much greater between either groups 1 and 3 or 2 and 3, than for groups 1 and 2. The low correlation coefficients are undoubtedly affected by this condition, and therefore do not portray the true degree of association existing.

9. See Missouri Research Bulletin 137, pp. 25-26.

TABLE 19.—AVERAGE PRICES, AND VARIATION, OF TOWNS GROUPED ACCORDING TO POPULATION, BY COMMODITIES

Commodities	1—999				1000—4999				5000—up			
	No. of Cases	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Cases	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Cases	Average Price	Average Deviation of Prices	Coefficient of Variation
Corn.....	63	.912	.083	9.10	26	.923	.062	6.76	4	.962	.057	5.90
Wheat.....	52	1.272	.050	3.95	19	1.299	.058	4.45	6	1.369	.106	7.77
Oats.....	53	.533	.061	14.59	22	.528	.057	11.46	5	.559	.058	10.39
Flour.....	123	2.248	.089	3.94	34	2.239	.090	4.01	5	2.306	.010	0.44
Shorts.....	104	1.957	.093	4.76	34	1.946	.089	4.59	6	1.901	.151	7.92
Tankage.....	76	4.138	.196	4.72	23	4.139	.222	5.36	4	3.968	.185	4.65
Bran.....	102	1.630	.079	4.80	32	1.588	.076	4.79	6	1.627	.133	8.17
Fertilizer.....	15	28.014	3.035	10.83	11	25.916	.777	3.00	4	26.676	2.696	10.11
Butterfat.....	97	.408	.015	3.71	29	.413	.018	4.33	3	.452	.027	5.95
Eggs.....	120	.244	.071	28.69	36	.249	.013	5.36	5	.281	.028	9.98
Chickens.....	82	.215	.012	5.36	29	.220	.018	6.06	5	.242	.028	11.48
Heavy Hens.....	109	.181	.005	2.93	34	.184	.004	2.17	6	.210	.025	12.05
Light Hens.....	102	.151	.009	5.92	30	.155	.009	5.68	6	.192	.034	17.65
Male Birds.....	96	.095	.012	13.07	31	.095	.011	12.00	4	.102	.004	3.92
Hogs.....	26	.105	.007	6.73	11	.100	.006	5.84	4	.099	.006	6.06
Lambs.....	17	.125	.010	7.86	6	.152	.041	26.71	4	.124	.008	6.07
Butcher Cattle.....	21	.095	.016	16.37	11	.086	.018	20.67	4	.086	.008	8.72
Veal Calves.....	22	.111	.012	10.97	9	.125	.025	19.80	4	.095	.025	25.97
Average.....	71.1			8.84	23.7			8.56	4.7			9.07

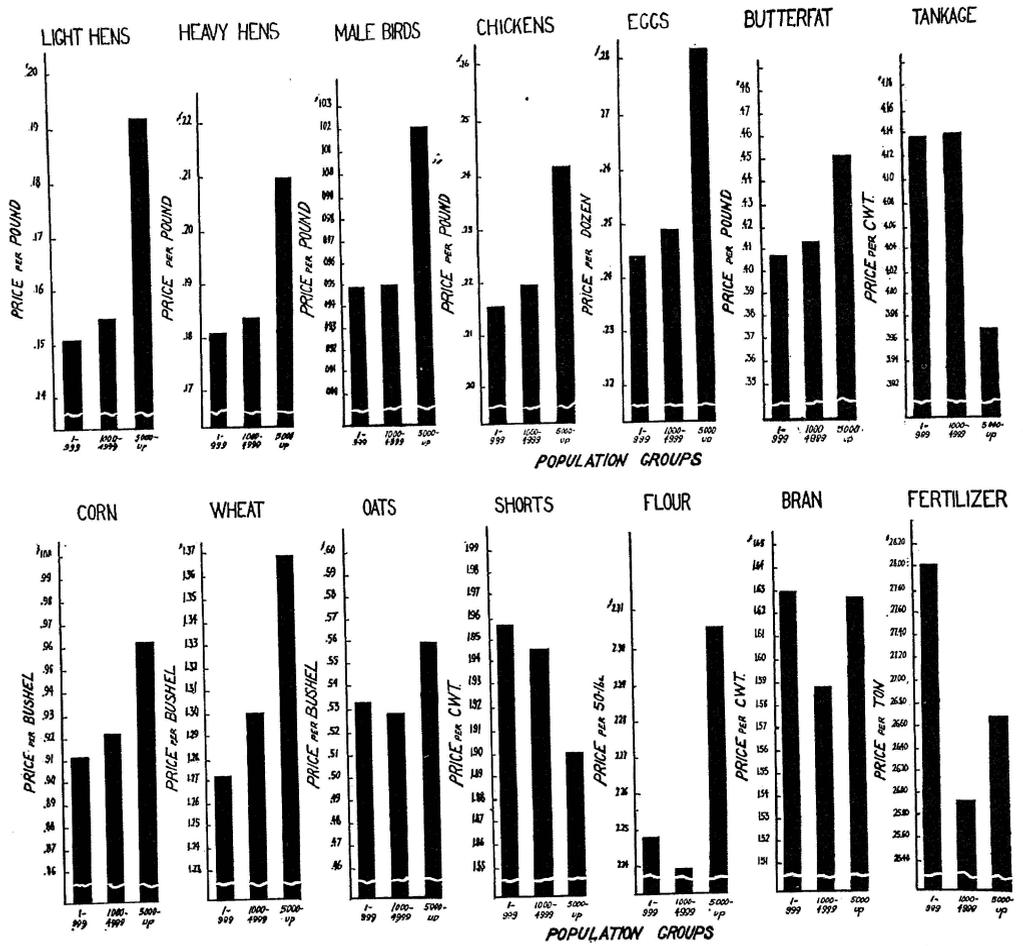


Fig. 15.—Average Prices of Towns Grouped According to Population. (See remarks in text regarding interpretation.)

**Number of Dealers.**—The relation between local prices and number of dealers is shown in Tables 16, 17 and 20, and Figure 16. Save for wheat there is little or no correlation shown. But again, this may be due to the fact that the number of dealers is significant only as between certain groups; i. e. that towns with 3 dealers would not have higher prices than those with 4 dealers, although one with four or five dealers might be distinctly higher than a town with only one dealer handling the commodity in question. For example, in Table 16 the chances of a directional difference as indicated by the group averages are in each case greater for groups 1 and 5 than for any other combination.

In general, it would appear that the effect on prices of number of dealers is not very distinct, marked or uniform, although there are some indications that prices of some commodities are so affected, including wheat, corn, oats, calves, poultry and eggs, flour and bran. There appears to be no relation in the case of butterfat, and this is confirmed by the study of cream station prices previously mentioned.<sup>10</sup> Of course, such relation as is evident actually may be due to other factors usually associated with number of dealers, such as the size of town,<sup>11</sup> and not to the greater competition supposedly resulting from a larger number of dealers. This suspicion is supported by the fact that flour is higher rather than lower in price in towns having several dealers. In such cases it is extremely difficult to distinguish between cause and effect or association.

Possibly the most significant conclusion which can be drawn from these data is that competition resulting from several dealers in a town is less important than commonly believed, for most products, and that regional competition from other towns is likely to largely offset lack of local competition. While these conclusions are based on negative results they appear to be justified.

**Private vs. Cooperative Towns.**—For many years one of the stock arguments for support of cooperative marketing associations has been their assumed beneficial effect on the local price level, admittedly an intangible result, hard to prove but generally accepted. The Missouri study previously referred to covered a period of two years, using Missouri Crop Reporting Service prices from 325 towns, although quotations on the individual commodities were available from only a portion of the total number included. The averages for towns having cooperative dealers were appreciably higher or lower, respectively, for farm products and supplies, than were those for the towns having only private dealers.

10. See Missouri Research Bulletin 137, pp. 25-26.

11. This particular factor might have been taken into account by using number of dealers per 1000 population, but it was believed that insofar as competition is influenced by number of dealers it is without regard to size of town: i. e., three dealers are likely to furnish as much competition in a town of 10,000 as in a town of 5,000.

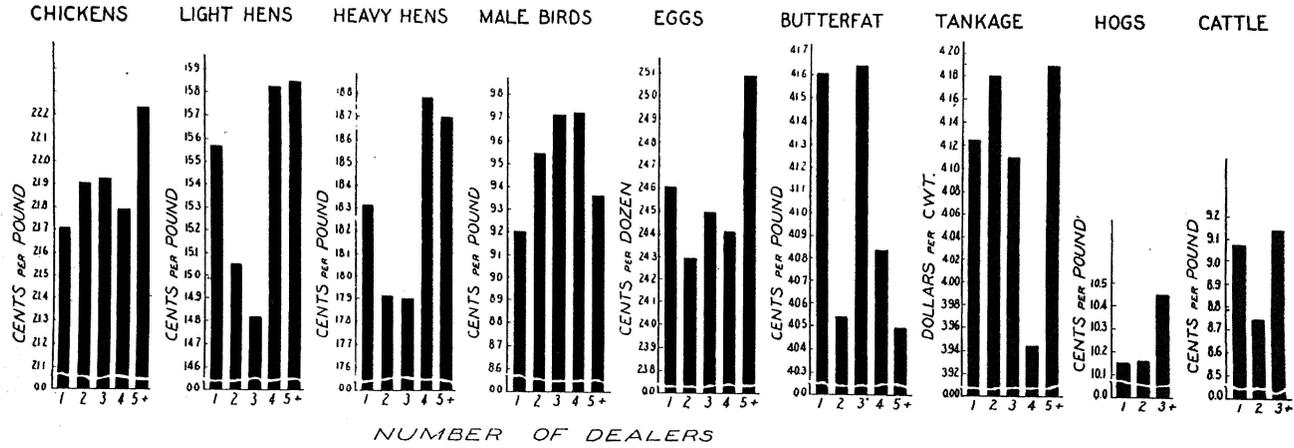
TABLE 20.—AVERAGE PRICES AND VARIATION, BY COMMODITIES, FOR TOWNS GROUPED ACCORDING TO NUMBER OF DEALERS IN TOWN

Commodities	One Dealer				Two Dealers				Three Dealers			
	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	No. of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation
Corn.....	30	.905	.074	8.13	26	.879	.083	9.49	12	.951	.075	7.86
Wheat.....	28	1.251	.030	2.40	23	1.265	.058	4.62	7	1.336	.050	3.72
Oats.....	27	.496	.045	9.01	25	.518	.067	12.97	6	.575	.061	10.53
Flour.....	23	.227	.111	4.89	22	2.218	.081	3.63	29	2.233	.065	2.89
Shorts.....	28	1.994	.124	6.23	30	1.931	.089	4.61	36	1.956	.071	3.65
Tankage.....	30	4.123	.223	5.40	29	4.180	.219	5.23	30	4.111	.175	4.25
Bran.....	26	1.660	.095	5.70	30	1.608	.075	4.64	35	1.619	.060	3.72
Butterfat.....	22	.416	.016	3.94	28	.405	.013	3.20	27	.416	.012	2.96
Eggs.....	22	.246	.008	3.41	28	.243	.007	2.76	26	.245	.006	2.57
Chickens.....	11	.217	.017	8.01	26	.219	.016	7.35	35	.219	.014	6.25
Heavy Hens.....	27	.183	.006	3.33	30	.179	.006	3.46	37	.179	.006	3.35
Light Hens.....	20	.156	.012	7.41	28	.152	.008	5.23	38	.148	.009	5.99
Male Birds.....	23	.092	.020	22.07	31	.096	.011	11.41	34	.097	.012	12.24
Fertilizer.....	21	26.924	1.865	6.93	3	26.457	2.35	8.89	6	27.867	3.540	12.69
Hogs*.....	15	.101	.003	3.16	11	.102	.005	4.70	15	.105	.010	9.72
Lambs*.....	12	.122	.008	6.50	8	.152	.033	21.51	7	.121	.008	6.76
Butcher Cattle*.....	13	.091	.014	15.10	7	.087	.013	14.93	16	.091	.020	21.80
Veal Calves*.....	14	.107	.014	13.43	7	.015	.015	13.35	14	.118	.020	17.23
Average for Commodities Having All Groups.....	28.5			7.02	27.4			6.05	27.1			5.38
Average for Commodities With Three Groups*.....	15.0			9.02	7.2			12.68	11.6			13.64

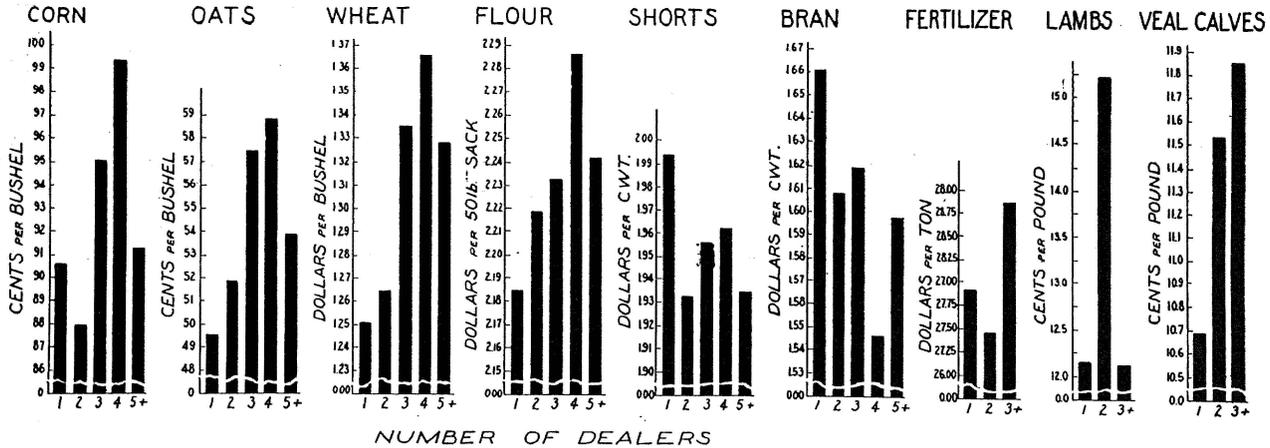
\*Only three groups. Third column is "Three or more dealers".

Commodities	Four Dealers				Five or More Dealers			
	Number of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation	Number of Towns	Average Price	Average Deviation of Prices	Coefficient of Variation
Corn.....	12	.993	.091	9.13	11	.912	.060	6.62
Wheat.....	9	1.366	.070	5.13	10	1.327	.066	4.99
Oats.....	13	.588	.055	9.51	9	.538	.050	9.33
Flour.....	27	2.286	.113	4.93	62	2.242	.081	3.59
Shorts.....	23	1.962	.105	5.33	27	1.934	.097	5.02
Tankage.....	5	3.943	.181	4.59	9	.419	.185	4.19
Bran.....	22	1.546	.108	7.00	27	1.597	.090	5.62
Butterfat.....	22	.408	.020	4.93	30	.405	.018	4.45
Eggs.....	24	.244	.011	4.38	60	.251	.012	4.86
Chickens.....	23	.218	.014	6.38	21	.222	.019	8.37
Heavy Hens.....	26	.188	.010	5.11	29	.186	.009	4.68
Light Hens.....	25	.158	.009	5.56	27	.159	.015	9.58
Male Birds.....	24	.097	.012	12.38	18	.093	.011	12.10
Fertilizer.....								
Hogs*.....								
Lambs*.....								
Butcher Cattle*.....								
Veal Calves*.....								
Average for Commodities Having All Groups.....	19.6			6.49	26.2			6.45
Average for Commodities With Three Groups*.....								

\*Only three groups. Third column is "Three or more dealers".



NUMBER OF DEALERS



NUMBER OF DEALERS

Fig. 16.—Average Prices of Towns Grouped According to Number of Dealers Handling the Respective Commodities. (See remarks in text regarding interpretation.)

When a cooperative has recently been established in a town, or membership campaigns are in progress, private dealers sometimes become "panicky" and pay prices which in the long run will not yield adequate margins, in order to hold their trade and cause trouble for the cooperative associations. They are sometimes supported in such efforts by the larger wholesale dealers to whom they sell, who are equally anxious to maintain the old set-up. In time, such temporarily "out-of-line" prices may be expected to return to normal. The local cooperatives as found in Missouri generally operate in exactly the same way as private dealers, paying current cash prices on a competitive basis, but returning any profits made under these circumstances to their members as patronage dividends. Thus, in order to present the best possible front the cooperative's manager is actually not interested in raising local price levels, something which would be difficult to demonstrate to members, but, on the contrary, the lower prices are kept the larger is the patronage dividend made possible. For this reason cooperatives are likely to keep strictly in line with competitive conditions, and local price wars started by either cooperatives or private competitors trying to oust them are now largely a thing of the past. This is only good business policy on the part of both groups.

Possibly due to the change, in this respect, which undoubtedly occurred in Missouri during the several years subsequent to the period included in the first study, or possibly to the inadequacy of the data used in the original averages, the present study indicates no tendency for prices to differ materially between cooperative and private towns, as shown in Table 21. The similar geographic distribution of the "private" and "cooperative" towns included in this comparison has previously been shown (see discussion of freight rates) by charts and correlation.

TABLE 21.—AVERAGE PRICES AND VARIATION FOR TOWNS WITH AND WITHOUT COOPERATIVE MARKETING ASSOCIATIONS HANDLING THE RESPECTIVE COMMODITIES\*

Commodity	Average Price		Amount Private Towns Are Higher (+) or Lower (-)		Probable Error of Difference Between Means
	Private	Cooperative	Amount	Per Cent	
Butterfat.....	.412	.407	+.005	+1.21	.0037
Eggs.....	.249	.244	+.005	+2.01	.0017
Chickens.....	.217	.216	+.001	+ .46	.0032
Heavy Hens.....	.181	.181	+.000	.00	.0000
Light Hens.....	.156	.152	+.004	+2.56	.0022
Male Birds.....	.097	.095	+.002	+2.06	.0024
Corn.....	.900	.920	-.020	-2.22	.0203
Wheat.....	1.280	1.270	+.010	+ .78	.0171
Oats.....	.533	.501	+.032	+6.00	.0167
Flour.....	2.257	2.226	+.031	+1.37	.0453
Bran.....	1.645	1.590	+.055	+3.34	.0174
Shorts.....	1.959	1.934	+.025	+1.28	.0164
Tankage.....	4.082	4.088	-.006	-.15	.0416
Fertilizer.....	27.900	26.220	+1.680	+6.02	1.1692

\*The "private" and "cooperative" towns were distributed in approximately the same territory, as shown by dot maps and correlation by counties.

The last column in Table 21, showing the probable error of the difference between the means, indicates that in the case of no commodity is the difference between the averages for each group significant or reliable.

**Variations in Price Within Towns.**—Many farmers and others (see introduction) believe that uniform prices charged by competing dealers located in the same town are an indication of monopoly or price agreements among dealers. Those familiar with the elementary principles of economics will recognize in such a condition merely the working out of the principle of one price in the same market, providing quality and service are equal, and market conditions are known to both buyers and sellers. There are many reasons, however, why prices may be expected to vary between dealers, such as differences in service rendered and credit given. Since the special price reports were obtained covering all of the individual dealers in each town handling each commodity, it was possible to show the extent to which price variations between dealers occurred.

For each town, for each commodity, the percentage of the twelve months which showed uniform prices for all dealers was calculated. These percentages were then averaged for all towns, by commodities, the results being given in Table 22, together with the probable error of each average. On the average, for all commodities and towns, prices were uniform for the dealers in each individual town 38.6 per cent of the time.

TABLE 22.—AVERAGE PER CENT, FOR ALL TOWNS, OF MONTHS IN WHICH PRICES WERE THE SAME FOR ALL DEALERS IN THEIR RESPECTIVE TOWNS, BY COMMODITIES

Commodity	Number of Towns	Average Per Cent	Standard Deviation	Probable Error
Corn.....	61	28.9	26.99	2.416
Wheat.....	45	29.9	28.18	2.835
Oats.....	51	34.7	29.41	2.772
Flour.....	133	16.6	22.45	1.308
Shorts.....	107	36.7	26.06	1.692
Tankage.....	74	39.0	31.82	2.495
Bran.....	110	34.0	24.55	1.578
Butterfat.....	106	62.0	24.49	1.605
Eggs.....	138	48.0	30.54	1.753
Chickens.....	114	40.0	26.98	1.700
Heavy Hens.....	119	53.0	26.94	1.659
Light Hens.....	117	37.0	27.38	1.706
Male Birds.....	112	42.0	27.87	1.773
Hogs.....	23	40.0	36.00	5.058
Average.....	94	38.6	27.83	2.167

The extent of price variations between dealers located in the same towns is shown in Table 23. The first column (a) is the average price for all towns included, by commodities. The second column (b) was obtained by first getting the average deviations of the individual dealers'

prices from the averages for their respective towns, and averaging these average deviations for all towns. The third column shows the extent of variation from this average deviation among individual dealers in these towns, and the last column shows the coefficient of variation ( $b \div a$ ). The latter measure summarizes the entire results in terms comparable by commodities. It shows that the price variation between dealers are uniformly small, except for the livestock items, which as previously noted are of doubtful accuracy.

TABLE 23.—VARIATION IN PRICE BETWEEN DEALERS LOCATED IN THE SAME TOWN\*

Commodity	Average of the Average Prices (a)	Average of the Average Deviations (b)	Average Deviation From the Average of the Average Deviations	Coefficient of Variation (b ÷ a)
Corn.....	.8596	.0193	.01315	2.24
Wheat.....	1.2888	.0316	1.457	2.45
Oats.....	.5279	.0214	.01617	4.05
Flour.....	2.2511	.0518	.0373	2.30
Shorts.....	1.9293	.0324	.0228	1.67
Tankage.....	3.9936	.0690	.0553	1.72
Bran.....	3.3923	.0239	.0188	.7
Butterfat.....	26.1177	.5242	.2602	2.008
Eggs.....	.4461	.0057	.0050	1.27
Heavy Hens.....	.2433	.0051	.0047	2.1
Light Hens.....	.1835	.0029	.0027	1.5
Male Birds.....	.1573	.0038	.0024	2.41
Hogs.....	.0958	.0057	.0038	5.94
Lams.....	.1341	.0035	.0028	2.61
Butcher Cattle.....	.1219	.0050	.0027	4.1
Veal Calves.....	.0860	.00705	.0048	8.19
Chickens.....	.1110	.0034	.0026	3.06
	.2161	.0067	.0053	3.1

\*See text for explanation of column headings