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The Railroad Shippers' Forecasts and the Illinois Employers' Labor Force Anticipations: A Study in Comparative Expectations

ROBERT FERBER

UNIVERSITY OF ILLINOIS

How comparable are different types of anticipations data with each other? It is not yet clear to what extent one set of anticipations is representative of others for similar magnitudes, mainly because of the difficulty of locating comparable sets. Invariably, differences are found in questioning procedures, reporting practices, compilation of data, industry coverage, distance in the future to which the anticipation applies, period covered, and other factors.

This paper reports an analysis of two sets of anticipations data: the Illinois employers' labor force anticipations and the Midwest region railroad shippers' carloadings forecasts. Both sets of data—although not exactly comparable—are issued as actual figures as well as anticipations, from which a rough estimate can be made of how much the differences between the two series reflect actual diverse trends or inherent differences in the characteristics of the anticipations data. For example, the railroad shippers' forecasts for the region are issued quarterly by thirty-two major industry classifications, several of which are directly comparable with the labor force industry breakdowns.

After a brief outline of the way the labor force anticipations and the railroad shippers' forecasts are prepared, to see sources of similarity and dissimilarity between them, the two sets of data are examined for:

1. Similarities between anticipations made at about the same time
2. Degree of correspondence over time between errors in the two series
3. Similarities between the factors that appear to influence each series.

Nature of the Forecasts

LABOR FORCE ANTICIPATIONS

Since 1946, Illinois employers have been asked by the Illinois Department of Labor (as part of a federal Bureau of Employment Security

NOTE: This study is an outgrowth of the project on expectations and business fluctuations sponsored by the Merrill Foundation and conducted at the University of Illinois under the direction of Franco Modigliani. The author is indebted to the University Research Board and to the Bureau of Economic and Business Research of the University of Illinois for assistance which made this study possible. He would also like to thank Nai Ruenn Chen and Fadil Zuwaylif for aid with the statistical analysis.

program) to report at the end of each month the actual size of the labor force employed that month and the anticipated size two months and four months in advance. For the Chicago labor market area the Labor Department compiles and publishes the data by firm and by industry group every second month.

Coverage. All business firms in Illinois with twenty-five or more workers are asked to cooperate except in the Chicago–Calumet labor market area, where coverage is restricted to firms with sixty-five or more employees (about 80 per cent of all manufacturing employment).

Response Rates. While exact records are not kept on response rates, considerably more than half of the firms report labor force anticipations. For sales volume, employment, and other indicators of economic importance, the rate of return is much larger because reports are obtained from practically all leading firms in the Chicago area—by mail or, failing that, by telephone or personal interview. But the tendency of many firms to skip an occasional month creates perplexing gaps in both the anticipated and actual employment data.

Representativeness of Replies. How far the anticipations represent the official outlook of a firm where such exists, and what level of management is responsible for them, is difficult to tell. Because of the confidential nature of the replies, only circumstantial evidence is available; the titles of those to whom questionnaires are addressed suggest that data are usually supplied by a personnel manager or his assistant, and only occasionally by a production manager or vice-president. The signatures on returns are often not those of the person addressed but of someone of lower rank, such as a clerk. In the opinion of the Department of Labor analysts, if a low-ranking signer has worked up the data, the personnel manager or another higher official is invariably consulted. But concrete evidence on the matter is lacking.

Meaning of Anticipations. The anticipations reported by the respondents are not forecasts in the sense of predicting what is likely to happen. Rather they are more in the nature of conditional expectations, as suggested by the question used: "Provided an adequate supply of labor will be available, what will your total employment be on: (a) [15th of month two months hence]? (b) [15th of month four months hence]?"

The conditional aspect is most important during labor shortages, as in the immediate postwar years, or during and shortly after a strike, when replies are of little value for gauging actual business conditions. On the other hand, when manpower supplies are adequate, the anticipations would seem to be equivalent to predictions of future employment. This is true for nearly all of the period covered by the present study (July 1952 to the end of 1955) except for periods of major work stoppages.

THE RAILROAD SHIPPERS' FORECASTS[1]

United States railroad shipping is served by thirteen regional boards, each "shippers' advisory board" composed of representatives—usually traffic managers—of the firms which ship heavily by rail. The boards advise the Association of American Railroads (AAR) on shipping problems, bring grievances to its attention, and, among other functions, since 1927 they have prepared quarterly forecasts of railroad carloadings for the AAR. Because the procedure varies among the regional boards, only the methods used by the Midwest Shippers' Advisory Board will be described here.

The Board covers the states of Iowa, Wisconsin (excluding the northwestern tip near Minneapolis), Illinois (excluding the St. Louis area), and the western part of Indiana. The Chicago metropolitan area is the chief center of the region's industrial activity.

About six weeks before the beginning of each calendar quarter, the Board asks the shippers of the region to forecast their freight-car requirements for the next quarter and to transmit their forecasts promptly to the chairman of the appropriate commodity group (thirty-two in all) for their products. Commodity-group totals are sent by the secretary of the Board (a paid AAR official) to the AAR office in Washington for publication with the forecasts of the other regional boards.

Response to the forecast requests in the Midwest region appears to be generally good, and emphasis on securing data from the larger shippers has made the representation in each commodity group well over half of total shipments. Indirect evidence suggests that the forecasts are sincere attempts at accuracy without deliberate bias even though the commodity-group chairman is a shipper himself. (The forecasts for other regions are sent directly to each board's secretary.) For two commodity groups, automobiles and coal, the forecasts are reported by the industry associations, though presumably after consultation with the individual firms.

Unlike the question on labor force anticipations, the shippers' forecast question is phrased to refer specifically to the level of carloadings in the corresponding quarter of the preceding year. In some cases commodity-group chairmen ask for forecasts, not in absolute figures, but as the expected percentage change from the corresponding quarter of the previous year. By this means shippers apparently try to avoid corrections for the sharp seasonal oscillations characteristic of most types of railroad shipments. Employment anticipations are not a part of the railroad shippers' forecasts, which are nearly always made by the traffic managers of the firms.

[1] This section is based on Robert Ferber, *The Railroad Shippers' Forecasts* (Studies in Business Expectations and Planning, No. 1, Bureau of Economic and Business Research, University of Illinois, 1953), which contains a more detailed discussion of the data.

INDUSTRIES SELECTED FOR COMPARISON

Eight industry classifications used for the labor force anticipations are listed with seven apparently closely corresponding Midwest shippers' forecasts:[2]

LABOR FORCE ANTICIPATIONS		RAILROAD SHIPPERS' FORECASTS
No. of Firms	*Title*	*Title*
4	Food, excluding meat packing	Food products
5	Meat packing	Livestock
12	Iron and steel	Iron and steel
2	Cans	Other metals
4	Other fabricated metals	
7	Nonelectrical machinery	Machinery and boilers
8	Transportation equipment, excluding farm machinery	Vehicles and parts
3	Automobiles and parts	Automobiles and trucks

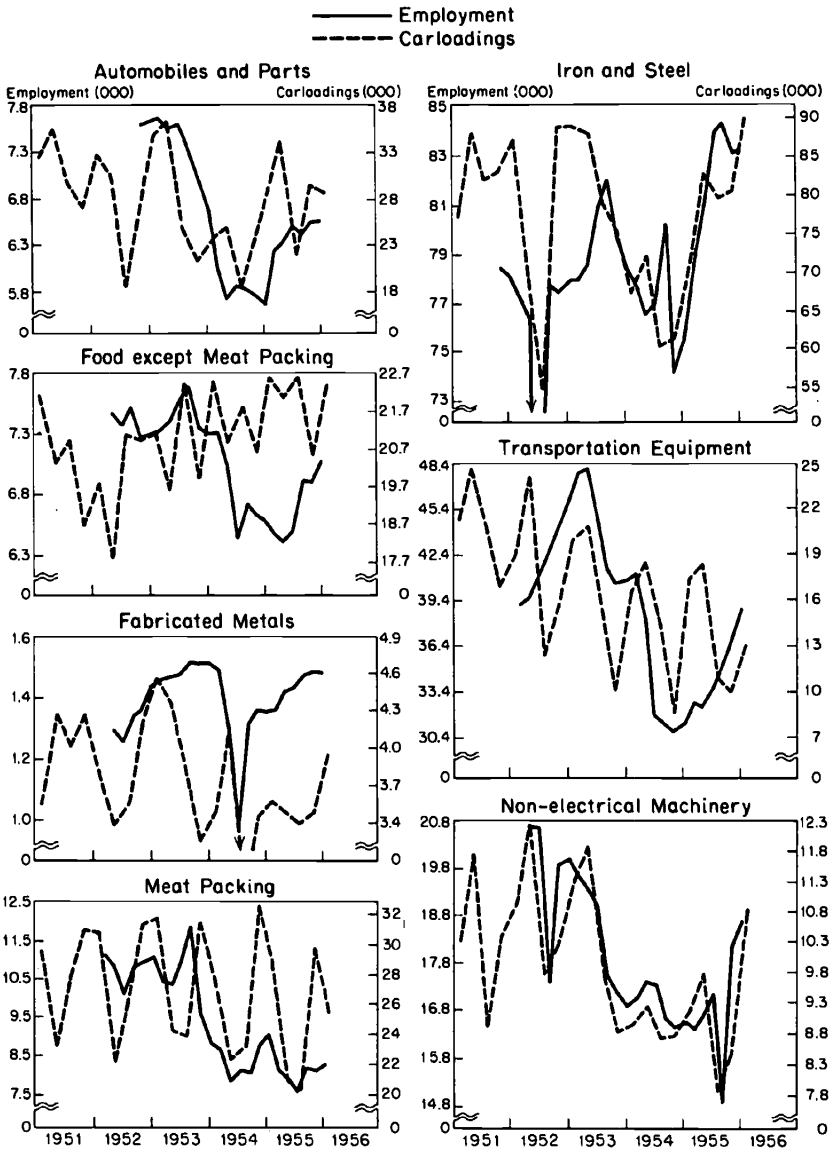
Exact correspondence cannot be established because the shipper members of each commodity group are not publicly identified. Their number in most of the commodity groups is, however, undoubtedly many times larger than the number of firms in the corresponding labor force–industry classifications. The one saving feature is that the discrepancy in coverage for most industries is probably offset by the large size of the firms—generally the largest in an industry—whose labor anticipations were analyzed in this study. The largest firms in the labor market area and the Midwest shippers' region are usually in the Chicago area, except for the meat packing and automobile industries. Two of the biggest meat packing firms could not be included in the study because of lack of data. Only three firms (plants) are included from the automobiles and parts industry. How well these firms represent trends and outlook of the industry in the area—around Chicago, made up of many small and medium-sized plants —is open to question. Nevertheless, all seven industries were used in the analysis.

Comparison of the actual aggregated employment of the member firms in the seven industries with the total carloadings reported for each industry is shown in Chart 1. At best only rough correspondence can be expected, partly because of the differing coverage in the two series and partly because of the fundamental differences between fluctuations in carloadings and in

[2] Correspondence between the meat packing and livestock categories is based on the fact that activity in both categories is centered in the big meat packing plants in Chicago. Shipments made by these plants are included under "livestock" (with the exception of canned meat products), but an appreciable portion of the total is undoubtedly accounted for by other sources.

CHART I

Aggregated Employment of Sample Firms and Railroad Carloadings in the Midwest Region, by Industry, 1951–1956



employment. Fluctuations arise from inventory changes and from sharp seasonal variations, particularly marked in railroad carloadings. Good correspondence between the two series is exhibited in four industries—

iron and steel, nonelectrical machinery, meat packing, and transportation equipment. Some rough correspondence is shown in automobiles and parts, whereas very little if any is displayed in food or other metals.

Data are not available to explain the differences in correspondence. However the four industries with good correspondence are all highly oligopolistic, and the few firms in the employment anticipations sample could constitute a much larger portion of their industries and be more representative of them than do the firms in the industries with poor correspondence. In any event, lack of correspondence between actual magnitudes does not preclude correspondence in direction between the anticipations and forecasts.

Similarities and Correspondence

DIRECTION OF THE ANTICIPATIONS

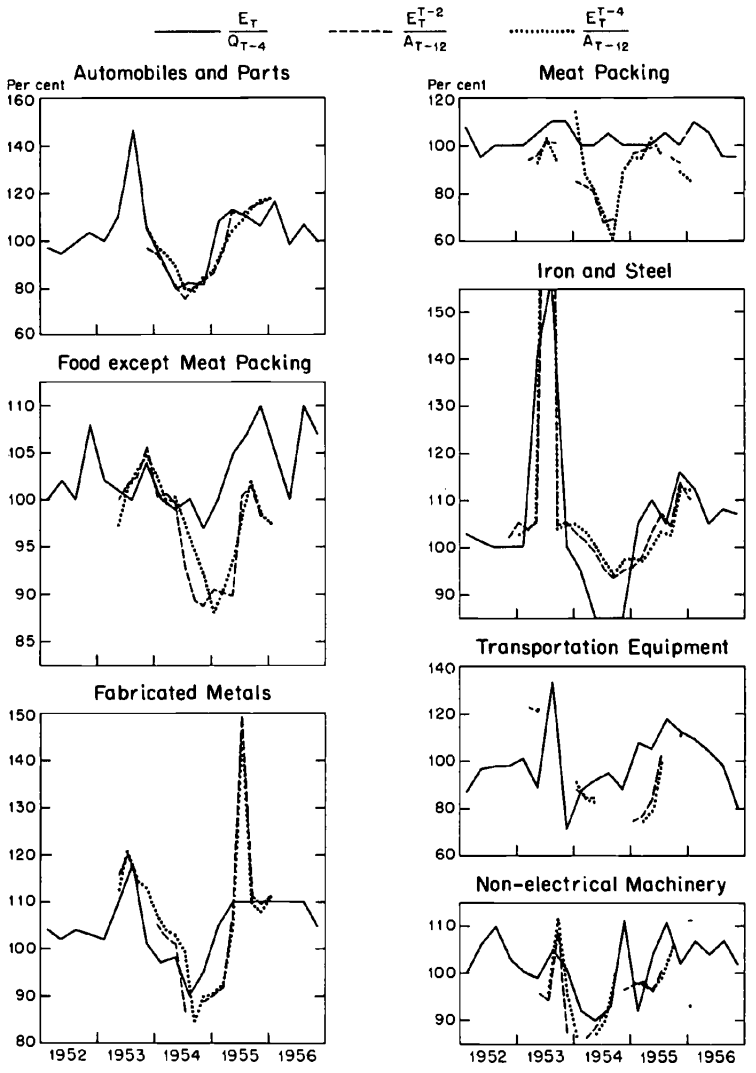
The direction of movement of the two sets of anticipations can be determined by comparing the level of actual employment and carloadings in one year either with the level at the corresponding time the year before or with the immediately preceding actual figure (i.e. the most recent available to the forecaster at the time of reporting an anticipation). The first method will eliminate the seasonal factor insofar as this does not change from year to year and will be more realistic, for carloadings at least, because railroad shippers' forecasts are based on the level of carloadings a year earlier.

The second method would seem worth using only if the industries exhibited relatively little seasonal variation during the period in question. Otherwise misleading indications of correspondence would result because of the strong underlying seasonals in both series (e.g. meat packing, Chart 1). All industries in the sample exhibit sharp seasonal variation in carloadings, and it is impracticable to study movements for individual months or quarters of the few years covered by the study. Hence, only the first method is used here even though it may exaggerate the extent of agreement between the two series, which may differ little relative to the previous year but substantially relative to current levels. Chart 2 indicates the extent of correspondence between the two sets of anticipations.

For most of the industries, Chart 2 shows that the carloadings forecasts do correspond with the employment anticipations. For food, iron and steel, fabricated metals, automobiles and parts, and nonelectrical machinery, the general trend is much the same for both sets of expectations data. But the minor fluctuations do not often coincide and some of the more dramatic instances of correspondence are due primarily to abnormal levels of operation in those industries in the preceding year (such as the steel strike in the summer of 1952) causing the denominators of all three ratios for the same period to be unusually low. Almost no correspondence between the expectations data is apparent in the meat packing industry,

CHART 2

Anticipated Changes in Carloadings and Employment Relative to Actual Levels at the Corresponding Time of the Preceding Year, by Industry, 1952–1956



and the relatively few observations available for transportation equipment make that comparison inconclusive.

The close correspondence between the two-month and four-month employment anticipations indicates that the four-month ones, usually identical with the two-month anticipations, do not contribute much useful

information. More precise measures of correspondence between the two sets of expectations data are provided in Table 1. It presents simple determination coefficients between the shippers' forecasts and the two-month employment anticipations for the closest periods to which the expectations pertain and the closest times at which the expectations were prepared.

TABLE 1

Coefficients of Determination between Anticipated Change in Carloadings and Two-Month Employment Anticipations by Industry, 1951-1955

	OBSERVATIONS	COEFFICIENTS OF DETERMINATION	
		Pairing Time: *To Which Anticipations Pertain*[a]	*At Which Anticipations Made*
Food, except meat packing	11	0.07	0.10
Meat packing	10	.10	.13
Iron and steel	11	.62[b]	.45
Fabricated metals	10	.71[b]	.50
Nonelectrical machinery	9	.38	.43
Transportation equipment	6	.01[c]	.05[c]
Automobiles and parts	9	.75[b]	.60[b]

[a] Where one expectation based on time of preparation was equidistant between two expectations of the other magnitude, an average of the two was used as the corresponding observation. For example, the time to which forecasts pertain was obtained by averaging the January and March employment anticipations to yield a figure comparable to that of the shippers' expectations for the first quarter.

[b] Significantly different from zero at the 0.05 probability level.

[c] Negative correlation.

As the table shows, the results of the two comparisons are much the same. Fairly close correspondence between the two sets of anticipations is apparent in iron and steel, fabricated metals, and automobiles and parts, though the correlations are not always statistically significant. The correspondence in nonelectrical machinery is no greater than what could result from chance, and none is apparent for the other three industries.

ACCURACY OF THE ANTICIPATIONS

The labor force anticipations appear to be noticeably more accurate than the railroad shippers' forecasts when the four-month anticipations are compared with the three-month shippers' forecasts, as in Table 2. For only one of the seven industries (transportation equipment) is the average absolute percentage error larger for the four-month labor force anticipations than for the shippers' forecasts. For the other six industries, the four-month anticipations turn out to be more accurate, and for three of them considerably so. The two-month anticipations are more accurate still, with average percentage errors ranging between one-half and one-

TABLE 2

Average Absolute Percentage and Naïve Forecast Model Error of Labor Force Anticipations and of Railroad Shippers' Forecasts by Industry, July 1952–December 1955

	OBSERVATIONS			AVERAGE ABSOLUTE PERCENTAGE ERROR[a]		
	Labor Force Anticipations		*Shippers'*	*Labor Force Anticipations*		*Shippers'*
	2-mo.	*4-mo.*	*Forecasts*	*2-mo.*	*4-mo.*	*Forecasts*
Food, except meat packing:						
Actual	21	21	14	2.4	3.7	4.9
Naïve model				2.3	5.6	7.4
Meat packing:						
Actual	17	17	14	5.5	8.2	9.3
Naïve model				5.9	13.6	8.2
Iron and steel:						
Actual	20	19	11	1.9	2.9	9.0
Naïve model				2.1	3.8	17.8
Fabricated metals:						
Actual	19	21	13	2.0	3.0	12.2
Naïve model				4.6	7.8	16.0
Nonelectrical:						
Actual	16	16	14	2.8	6.4	8.5
Naïve model				4.6	6.7	7.6
Transportation equipment:						
Actual	14	10	13	2.8	5.7	4.0
Naïve model				8.5	19.9	27.0
Automobiles and parts:						
Actual	19	17	12	4.2	6.6	16.6
Naïve				3.2	9.2	19.6

Errors clearly influenced by work stoppages were excluded.

[a] See text footnote 5.

sixth of the errors in the corresponding shippers' forecasts. Both series do better, generally, than "naïve model" extrapolations of level.

That the phenomena are not due to a few extreme errors here and there but are fairly representative of the situation is supported by the data in Table 3. Here the comparison between the two series is of the extent of overestimation and the prevalence of relatively large errors (over 5 per cent) in each direction. With few exceptions, errors of the latter type are far more frequent among the shippers' forecasts than among the labor force anticipations of either length. Although the sample sizes in each case are small (Table 2), the results are sufficiently uniform to be fairly conclusive. Thus, all four instances in which all the errors in one direction exceeded 5 per cent occurred in shippers' forecasts; six of the seven instances in which none of the errors in one direction exceeded 5 per cent occurred in labor force anticipations; and the seventh instance, in the shippers' forecasts, was the only one based on a sample of only four observations.

TABLE 3

Direction of Errors of Labor Force Anticipations and of Railroad Shippers' Forecasts by Industry, July 1952–December 1955 [a]

	PERCENTAGE OF OVERESTIMATES, TOTAL			PERCENTAGE OF OVERESTIMATES EXCEEDING 5%			PERCENTAGE OF UNDERESTIMATES EXCEEDING 5%		
	Labor Force Anticipations		*Shippers' Forecasts*	*Labor Force Anticipations*		*Shippers' Forecasts*	*Labor Force Anticipations*		*Shipper Forecas*
	2-mo.	*4-mo.*		*2-mo.*	*4-mo.*		*2-mo.*	*4-mo.*	
Food, except meat packing	57	48	29	17	30	50[b]	11	18	40
Meat packing	59	41	64	30	57	100	72	50	40[b]
Iron and steel	55	68	45	0	0	60	0	33	50
Fabricated metals	58	48	62	9	10	62	0	20	100[b]
Nonelectrical machinery	69	75	72	18	33	80	0	25[b]	25[b]
Transportation equipment	43	40	77	33	25[b]	30	0	40[b]	0[b]
Automobiles and parts	90	76	42	41	38	100[b]	50[b]	50[b]	100

[a] Based on the same observations as in Table 2.

[b] Based on five observations or less.

Table 3 also indicates some slight tendency toward overestimation in both sets of forecasts. The phenomenon varies considerably by industry and also by source of anticipation, but it tends to bear out the "permanent optimism" hypothesis advanced in the previous study of the railroad shippers' forecasts.[3] The uniformly negative signs resulting from averaging the percentage error of each set of anticipations for each industry attest to the prevalence of overestimation (Table 4). The values are not high (for the shippers' forecasts somewhat lower than those obtained in the

TABLE 4

Average Percentage Error of the Two Sets of Anticipations by Industry, July 1952–December 1955

	Labor Force Anticipations		*Shippers' Forecasts*
	2-month	*4-month*	
Food, except meat packing	−1.0	−0.8	1.3
Meat packing	−1.1	−1.7	−6.2
Iron and steel	−0.5	−0.5	−2.5
Fabricated metals	−0.9	0.1	−3.9
Nonelectrical machinery	−2.2	−3.6	−6.4
Transportation equipment	−1.0	−1.3	−3.1
Automobiles and parts	−3.3	−4.9	−1.2

The percentage error is based on the formula: (actual minus anticipation) divided by actual.

[3] Ferber, pp. 46ff.

earlier study)[4] but they are negative even for the transportation equipment labor force anticipations and for the shippers' forecasts of automobiles and parts carloadings, both characterized most frequently by underestimates (Table 3).

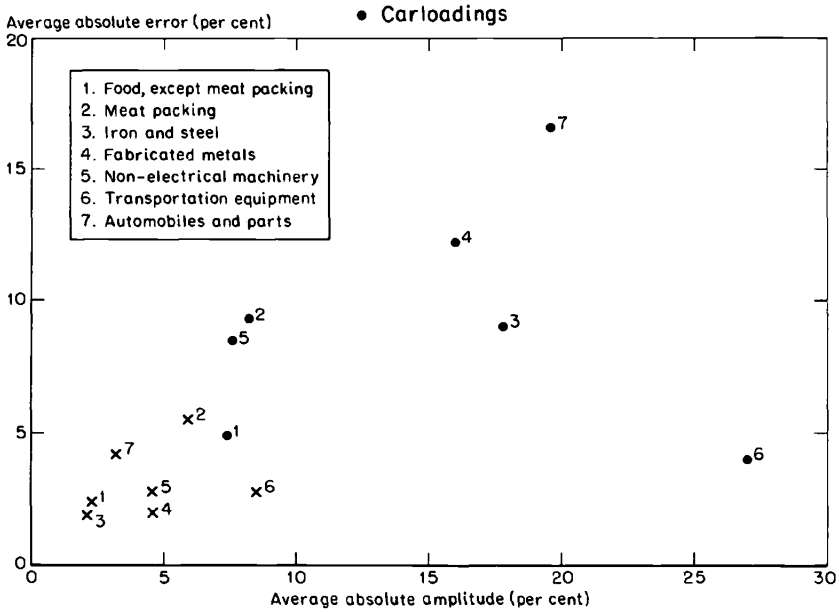
Influential Factors

EFFECT OF AMPLITUDE

Do the foregoing findings suggest an inherently greater accuracy in the labor force anticipations than in the railroad shippers' forecasts, or is there some other explanation for them? The absence of paired data by individual firms precludes testing various hypotheses, but one important

CHART 3

Scatter Diagram of Amplitude of Actual Magnitudes and Average Absolute Percentage Error of Anticipations, by Industry 1951–1956



possibility can be tested—that the observed differences are largely if not wholly explainable by the differential amplitudes of fluctuation in employment and in carloadings. Chart 1 suggests the existence of such differentials, and in Chart 3 the scatter diagram between the amplitudes and the corresponding average absolute percentage errors of the anticipations lends strong support to the hypothesis.

[4] *Ibid.*, Table 5, p. 50.

The amplitudes were based on estimates of the absolute average percentage change in the actual figures during the period of observation for each industry (Chart 1).[5] The average absolute percentage errors were taken from Table 2; the two-month anticipations were used for the labor force data.

Chart 3 leads to three conclusions:

1. The amplitude of fluctuations in carloadings, even after allowance for the two-month span, is generally considerably larger than that of employment in the same industry.
2. For both employment and carloadings, the average error of the forecasts tends to be positively correlated with amplitude. But the influence of changes in amplitude seems to be considerably greater for the railroad shippers' forecasts than for the labor force anticipations.
3. The difference in accuracy exhibited between the two sets of anticipations data is therefore explainable in large measure by the different amplitudes of the actual magnitudes.

Because of the small number of observations (industries), no attempt was made to adjust the errors of the forecasts for differences in amplitude. Chart 3 suggests that there would remain some differences in accuracy in favor of the employment anticipations, but they would lend slight, if any, support to an assumption of "inherent" superiority for the employment anticipations.

CORRESPONDENCE BETWEEN ERRORS

Correspondence between the two sets of anticipations, abundantly evident in the direction of the anticipations, is not evident in the direction of their errors. Only for the food industry does any correspondence appear in Chart 4, and even here it is not close.

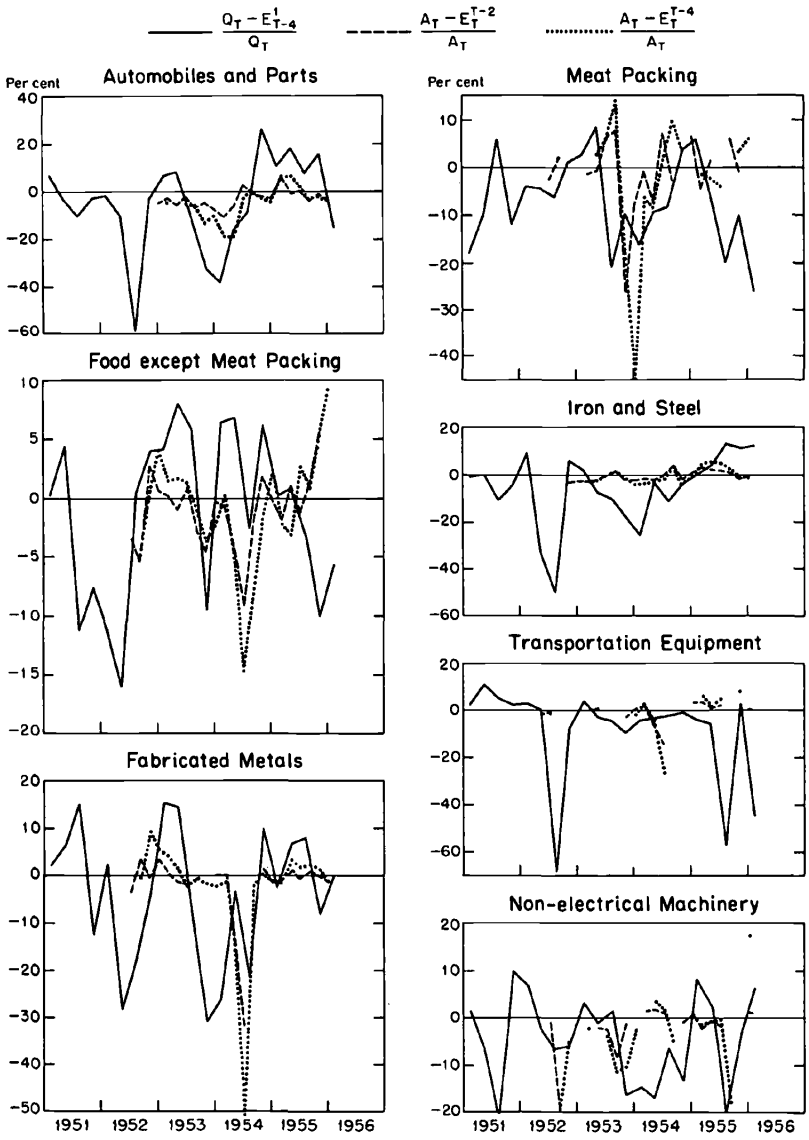
The results of an attempt to compare the direction of errors in the shippers' forecasts with that in the two-month employment anticipations

[5] The exact measure of amplitude varied with the extent of seasonality in each series. If relatively little seasonal variation was present (as defined below), the measure used was $\sum[(A_t - A_{t+2})/NA_{t+2}]$ for employment in month $t+2$, where N is the number of observations; this is the naïve model forecast error presented in Table 2. If seasonal variation was substantial, a crudely adjusted extrapolation of level was substituted for A_t, namely, $A_t(A_{t-10}/A_{t-12})$—so that the measure of amplitude of employment becomes: $\sum[(A_t/A_{t+2})/(A_{t-12}/A_{t-10}) - 1]$. This is also the seasonally corrected naïve model forecast error presented in Table 2. Corresponding forms were used for carloadings.

Seasonal variation in a series was considered "relatively little" if the relative amplitude of the seasonal index derived for that series by link relatives was less than 10 per cent. This was true of all the employment series except transportation equipment, and of none of the carloading series. For further details, see my *Employer Forecasts of Manpower Requirements* (Studies in Business Expectations and Planning, No. 3, Bureau of Economic and Business Research, University of Illinois, 1958).

CHART 4

Percentage Errors of Railroad Shippers' Forecasts and of Labor Force Anticipations, by Industry, 1951–1957



show little similarity between them (Table 5). None of the percentages are significantly different from 50 per cent at the 0.05 probability level, even if the two types of error are combined for each industry or for all seven industries.

TABLE 5

Correspondence between Direction of Errors of Labor Force Anticipations and of Railroad Shippers' Forecasts, July 1952–December 1955

	ANTICIPATIONS ERRORS		PERCENTAGE OF TIME SHIPPERS' FORECAST ERROR IN SAME DIRECTION	
	Over-estimates	*Under-estimates*	*Over-estimates*	*Under-estimates*
Food, except meat packing	8	6	25	67
Meat packing	7	5	71	20
Iron and steel	8	5	50	60
Fabricated metals	6	4	83	75
Nonelectrical machinery	9	3	67	33
Transportation equipment	4	4	75	0
Automobiles and parts	10	2	40	50

These results were to be expected. For one of the two principal determinants of error in a forecast is the level of the actual magnitude, and the previous analyses showed little correspondence, in the short run, between fluctuations of carloadings and of employment by industry during the period studied.

Structure of the Anticipations

The railroad shippers' forecasts have shown a striking tendency to regress toward the past level of carloadings. In my earlier study it was shown that the shippers' forecasts for the prewar and early postwar years could be closely approximated by two terms: the level of shipments in the corresponding quarter of the preceding year (Q_{t-4}); and the year-to-year change in carloadings for the most recent quarter (Q_{t-1}/Q_{t-5}). It was also found that shippers' expectations were contrary to what one would expect. When carloadings had risen for twelve months, the shippers' expected carloadings in the next quarter to decline more than halfway back to the previous year's level. When carloadings had fallen, they expected a reversal of the movement and a rise more than halfway back again. The phenomenon characterized total national carloadings as well as those of all five industries studied.

The same hypothesis was tested with the labor force anticipations to see whether the regressive tendency is characteristic of other types of anticipations and with the Midwest shippers' forecast data, since only national aggregates had been used in the earlier study. The basic functions to be fitted for testing the hypothesis were, for the railroad shippers' forecasts:

$$(1) \qquad E_t = a + bQ_{t-4} + cQ_{t-4}\left(\frac{Q_{t-1} - Q_{t-5}}{Q_{t-5}}\right)$$

and for the labor force anticipations:

$$E_t = a + bA_{t-12} + cA_{t-12}\left(\frac{A_{t-2} - A_{t-14}}{A_{t-14}}\right) \tag{2}$$

where Q_t represents actual carloadings in quarter t, and A_t represents actual employment in month t.

In the absence of any trend, the discussion makes it evident that if c exceeds one, extrapolation is indicated; if less than one, a reversal. Assuming a straight line trend over the preceding year, if an upward trend is present, a value of c as low as 0.75 in (1) and 0.83 in (2) would be consistent with an extrapolation hypothesis, because extrapolation of just the latest level for the railroad shippers' data would require adjusting Q_{t-4} for the increase in carloadings from Q_{t-4} to Q_{t-1}. By the above assumption this would be three-fourths of the distance from Q_{t-5} to Q_{t-1}, the modifying element in (1). A similar argument holds for the employment anticipations.

The results obtained from fitting (1) and (2) to the two sets of anticipations are shown in Table 6. They may be summarized as follows:

1. On the whole, the hypotheses fit the data well for both sets of anticipations (column 4). More than three-quarters of the variance in the anticipations is explained by one or both of the independent variables for six of the seven industries in each case. The exceptions are the iron and steel carloading forecasts and the nonelectrical machinery employment anticipations, for which the explained variance is no larger than would be expected as a result of chance.

2. In several instances, the hypothesis appears to be unnecessarily complicated inasmuch as the anticipations appear to be based solely on the actual level of operations a year earlier (columns 2 and 3). This is true of the shippers' forecasts in the food, meat packing, and transportation equipment industries.

3. The regression phenomenon remains in evidence for all the carloadings functions for which equation 1 is valid but not for any of the labor force anticipation functions. This is evident from column 3, which shows all the estimates of c of (1) to be well below 0.75, the minimum for extrapolation in the presence of an upward linear trend. Only two estimates of c in (2) are consistent with the corresponding minimum of 0.83 (at the 0.05 probability level). Furthermore, the estimate of $b-c$, which reflects the extent to which the present trend is reversed in preparing the anticipations, significantly exceeds zero (at the 0.05 probability level) for all industries where (1) holds, but not for any instance in which (2) has been fitted.[6] Indeed, the estimates of $b-c$ in (2) are mostly negative, which could indicate a sharp extrapolation of the current trend.

[6] The reflection of extent of the reversal depends on the assumption that b is approximately one, in which case (1) becomes:

$$E_t = a + Q_{t-1}\frac{Q_{t-4}}{Q_{t-5}} - (b-c)(Q_{t-1} - Q_{t-5})\frac{Q_{t-4}}{Q_{t-5}}$$

TABLE 6

Test for Regression Hypothesis on Labor Force Anticipations and Railroad Shippers' Forecasts

	ESTIMATES OF PARAMETERS OF EQUATION 1 OR 2			R^2 USING AS DEPENDENT		ESTIMATES OF REVERSAL COEFFICIENTS
	a (1)	b (2)	c (3)	E_t (4)	A_t (5)	$b-c$ (6)
Food, except meat packing:						
Employment	787	0.90	0.84	0.83	0.69	(0.06)
Carloadings	424	1.00	(0.07)	0.77	0.40	0.93
Meat packing:						
Employment	1,661	0.81	0.88	0.80	0.72	(−0.07)
Carloadings	(636)	1.00	(−0.03)	0.92	0.77	1.03
Iron and steel:						
Employment	99,033	−0.25	0.56	0.83	0.59	−0.81
Carloadings	28,986	0.63	0.20	0.68	(0.25)	0.43
Fabricated metals:						
Employment	1,394	(0.03)	0.42	0.94	0.66	−0.39
Carloadings	(−61)	1.06	0.31	0.89	(0.14)	0.75
Nonelectrical machinery:						
Employment	11,312	(0.36)	(0.33)	(0.21)	(0.04)	(0.02)
Carloadings	2.562	0.77	0.37	0.83	0.65	0.39
Transportation equipment:						
Employment	13,957	0.65	0.87	0.96	0.95	(−0.22)
Carloadings	2,852	0.82	(−0.08)	0.79	0.63	0.90
Automobiles and parts:						
Employment	2,354	0.66	0.77	0.90	0.70	(−0.11)
Carloadings	4.597	0.85	0.37	0.77	(0.22)	0.48

NOTE: The regressions shown are based on somewhat fewer observations than the number noted in Table 2, mainly because earlier data were not available to permit calculation of the change terms for the entire period of observation.

All numbers are significant at 0.01 probability level except those with rules, which are significant at 0.05 probability level; and those in parentheses, which are not significant at the 0.05 probability level.

4. Pronounced differences between the estimates of the parameters of the two functions are evident also for b. For the shippers' forecasts, five of the estimates are not significantly different from 1.0 and one only barely. For the labor force anticipations, only two of the estimates are consistent with a true value of 1.0 for b. In general, deviations of the estimates of b from 1.0, as well as significant estimates of a, may point to the need for modifications in the original formulation of the hypothesis.

5. The hypothesis implicit in (1) and (2) appears a more valid explanation of actual (aggregate) structure of the shippers' forecasts than of the labor force anticipations. In fact, it is doubtful whether (2) provides a really adequate explanation of the formation of the labor force anticipations. It follows both from the preceding observations and from a

comparison of columns 4 and 5, which shows when (1) and (2) are fitted alternately to E_t and to A_t, as dependent, that the closeness of fit varies much more for carloadings. The high correlations obtained with (2) may reflect, for example, primarily extrapolation of current levels. In the same vein, for all the labor force anticipations industry functions, the estimate of a particular parameter based on E_t, as dependent, was similar to that based on A_t, as dependent, whereas this was true of only one of the carloading functions (transportation equipment). Then too, the hypothesis advanced in the next section to explain the regression phenomenon would, if valid, negate (2).

Thus the main conclusion emerging from this part of the study is that the regression phenomenon, so typical of the railroad shippers' forecasts, is not present in the labor force anticipations—at least not when the actual level in the corresponding period of the preceding year is used as the base.[7]

EXPLANATION OF THE REGRESSION PHENOMENON

Why should the regression phenomenon appear so strikingly in the railroad shippers' forecasts and yet not be apparent in the labor force anticipations? The available evidence suggests that the answer may well lie in the different phrasing of the questions used in the two surveys.

The traffic managers are asked for two figures: the *actual percentage change in carloadings over the past year*, and the *expected change in carloadings next quarter relative to the same quarter for the preceding year.* Whatever their absolute percentage changes may have been during the past year (Q_{t-1}/Q_{t-5}), most traffic managers are inclined to deflate the change in the belief that carloadings are not likely to rise, or fall, as much at an annual rate in the next quarter as in the preceding quarters. Hence, they predict E_t/Q_{t-4} invariably lower than Q_{t-1}/Q_{t-5}, and seemingly with little awareness of the full extent of the change that has already taken place, Q_{t-2}/Q_{t-4}. Since Q_{t-2}/Q_{t-4} is common to both terms, their prediction of E_t relative to A_{t-1} seasonally adjusted—which is in effect $A_{t-1}(A_{t-4}/A_{t-5})$—tends in the aggregate to run counter to the prevailing trend.

The two figures requested from the employers are very different from those just discussed: the *current level of employment* (A_t) and the *expected level two months hence* (E_{t+2}).[8] When employers prepare their labor force anticipations, they are not confronted with any past actual change as a

[7] One could modify the basic hypothesis to allow for rate-of-change factors and for use of different bases for preparing the anticipations. As shown in the earlier study on the railroad shippers' forecasts, however, such refinements are likely to have negligible effect on the main results, and hence were not attempted here. A detailed exploration of the factors that seem to influence the labor force anticipations will be found in the monograph on the subject published by the Bureau of Economic and Business Research of the University of Illinois.

[8] The same applies to the four-month anticipations.

basis for modification but use solely the current levels, to which they are asked to add or subtract the next expected change in their labor force. As a result, the value of the employers' E_{t+2} is far less likely to be deflated relative to past trends than is the value of the railroad shippers' E_t. In other words, the regression phenomenon appears to be the product largely of a forecast requested (1) for year-to-year changes, (2) in percentage terms, and (3) by comparison with the actual change over the past year, when most of the period of the forecast is already over.

Summary

Comparison of two sets of anticipations for the same industries, area, and time period resulted in the following main findings:

1. The degree of correspondence in direction between the two series of anticipations varies sharply by industry.
2. No correspondence is evident between the errors in the two sets of anticipations for any particular industry.
3. The labor force anticipations, particularly the two-month but also the four-month, are considerably more accurate than the railroad shippers' forecasts. Much if not all, of the difference would be removed if allowance were made for the higher amplitude of fluctuations of carloadings and for the generally positive relationship between amplitude and predictive accuracy.
4. A tendency toward overestimation is apparent in both sets of anticipations. The "permanent optimism" hypothesis, proposed and supported by the earlier study of the railroad shippers' forecasts, receives further support here from the evidence that larger errors are made on the downswings than on upswings.
5. The basic hypothesis on the structure of anticipations, formulated in the earlier study, is more effective for explaining the formation of the shippers' than for the employers' expectations. For the two sets of anticipations, the form of the correlation functions for the same industry differs substantially. Particularly noticeable is the absence in the labor force anticipations of the regression phenomenon so typical of the railroad shippers' forecasts.
6. The regression phenomenon in the railroad shippers' forecasts seems to stem from the request for an expected annual (usually percentage) change relative to the actual annual percentage change during the past year. The question appears to elicit use of some deflated value of the past change in carloadings as the basis for forecasts. The question asked employers, on the other hand, calls for use of the current level of employment as the base for anticipations with little tendency to consider or modify recent percentage changes.

7. Incidentally, for the labor force anticipations little additional information is provided by the four-month figures over that contained in the two-month anticipations, both usually being the same.

Whether the instances of lack of correspondence between the two sets of anticipations can be explained by differences in outlook of the people who prepare them remains open. Replies to the two questionnaires by the same firm are probably prepared independently. Within the same firm short-run changes in employment are not necessarily related to short-run changes in carloadings. They occur in different divisions of the firm's operations, and often may be partly caused by inventory changes in handling storable goods. On the other hand, the differences do not rule out the possibility of a similarity in outlook.

COMMENT

DOUGLAS G. HARTLE, University of Toronto

By applying the same statistical technique to anticipations and to actual data for the same period and for roughly the same plants, Robert Ferber has made an interesting contribution to the discussion of the nature and significance of anticipations data. Although a substantial body of particular findings has resulted from earlier studies, too many employed differing variables, periods, and techniques; and thus it has been extremely difficult to draw general conclusions.

I am pleased to be able to add to the generality of some of Ferber's findings by noting similar results secured in a study I made of the Employment Forecast Survey (EFS) conducted by the Canadian Department of Labour.[1] After examining the individual establishment forecasts and the predictions derived from them, I came to the following conclusions:

1. For 1952-56 the "permanent optimism" hypothesis proposed by Ferber was borne out quite conclusively by the six-month but not the three-month forecasts.

2. A close relationship existed between the average absolute percentage errors of an industry's predictions and the amplitude of the year-to-year changes in its actual employment. Like Foss and Natrella, I found an inverse relationship between size of firm (employment) and the relative errors of their forecasts.

3. Like Ferber, I gained little information from the six-month forecasts not provided by the three-month ones (or vice versa), because so many were identical for both periods.

4. Although the predictions derived from the establishment forecasts tended to lag the nonseasonal changes in the aggregate actual employment

[1] The EFS is a quarterly mail-interview survey of a fixed sample of seven hundred establishments asked to forecast their employment three and six months ahead and to report their actual employment during each of the three preceding months.

of an industry and of the sample, I found no consistent evidence of the regressive tendency Ferber found in his analysis of the shippers' forecasts.

The reason for the presence of the regressive phenomenon in the shippers' forecasts but not in the labor force anticipations (or in the EFS predictions) was suggested by Ferber in an earlier paper. He proposed that the regression phenomena, observed in his original study of the shippers' forecasts "might conceivably have resulted from the extrapolation of the level of the corresponding quarter of the previous year by a large group of respondents and the extrapolation of trend by another large group."[2] Because the shippers' data were available only in aggregate form Ferber was unable to test this hypothesis, but I believe his explanation is substantially correct.

Following his line of reasoning, we know also that if a large proportion of respondents forecast "no change" in the current level of a variable for the next two to four months, we will not find the consistent regression phenomena which his analysis of the shippers' anticipations unearthed. Rather the results will be consistent with Ferber's for the labor force anticipations. I believe that the difference in structure between the two sets of anticipations can be attributed to a strong tendency on the part of the shippers to forecast no change from the same quarter last year, and an equally strong tendency among the establishments to forecast no change from the current level (i.e. from two or three months earlier).

This view is strongly supported by Ferber's results, and by mine in both the investigation of the EFS establishment forecasts and an earlier study of the labor force anticipations of firms in the broadwoven textile industry in North Carolina, as reported to the state employment security agency there. In all of these, approximately half the labor force anticipations were for no change from the current level.

Why do so many shippers forecast no change in the level of shipments from that same quarter of the previous year at the very time many employers are forecasting no change from the current level of employment? Partly, I believe, because the greater seasonality of the shipments series makes a no-change forecast from the current level obviously wrong, partly because the shippers and employers are asked to use different sorts of base figures. The shippers are specifically asked to look at the year-to-year level, the employers to report their latest actual employment.

Other probable explanations of the many no-change forecasts, regardless of the base of the comparison, are:

[2] Robert Ferber, "Measuring the Accuracy and Structure of Businessmen's Expectations," *Journal of the American Statistical Association*, September 1953. This hypothesis was also expounded in Report of Consultant Committee on General Business Expectations, *An Appraisal of Data and Research on Businessmen's Expectations about Outlook and Operating Variables*, Board of Governors of the Federal Reserve System, September 1955.

1. Some respondents really expect no change.
2. Some think a no-change answer the best one when they are uncertain.
3. Some think a no-change answer is the easiest way to get rid of a questionnaire while appearing to cooperate.

I do not wish to give the impression that I think the difference in base of the no-change anticipations is the only source of differences between the shippers' and the labor force anticipations. As Don Daly suggested at the conference, the greater seasonality of the industry may itself be a cause of a higher rate of error in the shipments series. My point is simply that, if one could apply Ferber's analysis to the data after excluding establishments reporting no-change anticipations from both the actual and anticipations series, the gross difference between the structures of the two sets of anticipations would probably disappear. If my views are correct, I think one can draw certain conclusions about predictions derived as the sum of reported anticipated shipments or employment that include many no-change answers:

1. The predictions will lag the actual changes they purport to predict except in the unlikely event that the anticipations of change always compensated for the no-change anticipations.
2. If the weight of the no-change responses remained fairly constant, the average error of the predictions probably could be reduced by use of corrective factors. But whether the corrected predictions would catch turning points is doubtful.
3. Elimination of firms that consistently forecast no change, or adoption of an aggregation technique to give less weight to no-change forecasts might improve the reliability of predictions.

The possibility of improvement in reliability by use of the elimination procedure gained only little encouragement from my work with the EFS. In several tests I found that the number and size of the eliminated establishments created sampling errors that usually more than offset the reductions in forecast errors. The net effect of the elimination was a deterioration in reliability.

In an experiment with different aggregation procedures, I converted the quantitative EFS establishment forecasts into forecasts of the direction of year-to-year change and computed an index based on the percentage of firms expecting year-to-year employment gains as a percentage of all reporting establishments.[3] The diffusion approach has its own problems, and my findings are far from complete. But I can report that the method seemed to reduce the lag of the predictions in virtually all instances and

[3] In this I followed a lead suggested by Millard Hastay ("The Dun and Bradstreet Surveys of Businessmen's Expectations," *Proceedings of the Business and Economic Statistics Section*, 114th Annual Meeting of the American Statistical Association, 1955, pp. 93-123).

eliminated it altogether in some although no establishment forecasts (no change or other) were eliminated. These results suggest the trial of other aggregation procedures as means of circumventing the difficulties posed by the prevalent no-change anticipation.

Ferber left open the question whether predictions of different variables secured from the same firm can be explained by "differences in outlook of the people who prepare them. Replies to the two questionnaires by the same firm are probably prepared independently." But he thinks similarity in outlook is not ruled out. Because I am not convinced about the significance of the difference between the structures of the two sets of anticipations, although I agree there is a difference, I must also bring in the Scottish verdict of "not proven." In the EFS interviewing program we encounter so much response variation on employment anticipations within the same firm that inconsistent anticipations of other variables reported to different surveys by the same firm would not be surprising.

I wish that Ferber had dealt more fully with another aspect of his study—the correspondence between the two sets of anticipations compared with the correspondence between the two actual series. I have the impression that he thinks that there was a closer relationship between the anticipations than the actual series, although I am not entirely convinced of this by an examination of Charts 1 and 2. It would have been useful if he had given us the coefficient of determination between the actual year-to-year changes in carloadings and in aggregate actual employment.

Also it is to be hoped that further work by Ferber and others will consider in greater detail the relationship between the anticipations and the actual data of different variables derived from the same firms. Such an investigation should throw light on the sources and character of business anticipations. It would be extremely interesting to know, for example, which anticipations lead and which anticipations lag, and which anticipations are dominant.

I conclude with a plea for more work on anticipations data at the establishment or firm level. If we find, as I believe we will, that much of the anticipations data gathered from business firms have little predictive value, we will be forced to give more consideration to the problem of how firms make predictions, and how they use them in the decision-making process.

I think the inadequacy of much of our anticipations data stems from asking the wrong questions of the wrong people at the wrong time. For example, after interviewing about fifty of the respondents in the EFS survey to learn how they made their forecasts, who made them, and why they were as good or as bad as they were, we had the outstanding impression that a firm rarely forecast its own future employment for its own purposes, presumably making current employment decisions without regard to future requirements or the cost of labor turnover. Whatever the reason,

firms clearly only thought about employment needs three and six months ahead because we asked them to! It is hardly surprising that the answers were often of doubtful value. Perhaps we should have asked for forecasts of other variables about which the firm held anticipations of operational significance and derived from them our employment predictions. Also the dating of our questionnaires may have been entirely out of phase with the planning periods of the firms; and the three- and six-month target dates may have undershot or overshot their time horizons for employment.

To secure better anticipations data I think we must begin to look for answers to questions of the kind I have raised. The developments in decision theory, ably represented by Charles Holt's interesting paper in this volume, may provide a fruitful approach. Although an expensive, roundabout way to improve our predictions, it will increase our knowledge of the firm and the cycle—possibly of more significance in the long run.