Statistical Treatment of the Nonresponse Problem

By Earl E. Houseman

Given a sample—that is, a specified selection of individuals from whom specified information is desired—two questions immediately arise: How much effort should be spent toward getting complete coverage of all individuals in the sample? What methods can be used to adjust for nonresponse, and how successful are such methods? Although only partial answers to the nonresponse problem can be given, this review of techniques and the presentation of a few concepts and results relating to the nonresponse problem should be helpful, particularly to persons who are planning surveys.

IN PRACTICE, the rates of response (percentage of the individuals specified for the sample for whom questionnaires are obtained) vary from as low as 5 percent or less to 100 percent. Response rates of 5 percent or less have occurred in some cases where a mailed questionnaire was used and only one mailing was made and none of the nonrespondents were interviewed, whereas in other cases a response exceeding 80 percent has been obtained from a mailed questionnaire. For interview surveys the rates of response are often less than 90 percent and in some areas they are sometimes as low as 30 to 40 percent if only one call was made at each sample household. To get a rate of response of 90 percent or more usually requires considerable effort.

The response pattern for a Nation-wide interview survey of consumer preferences for citrus products is shown in table 1. In general, the proportion of questionnaires completed on first call, second call, etc. will vary from survey to survey depending upon the time of year, the time of day the calls are made, the ingenuity of the field staff in making the second or later calls successfully, and other factors. But the pattern displayed in table 1 is rather typical. In this survey as many as eight or nine calls were made on some households in the cities and metropolitan areas, whereas in the open country not more than three calls were made at one household. But interviews were obtained with only 83 percent of the sample households in metropolitan areas compared with 91 percent in the open country. The refusal rate in this survey was somewhat higher than the average (2 to 3 percent for most similar surveys) which the Bureau of Agricultural Economics has experienced.

Failure to obtain close to a 100-percent response is not serious unless the respondents differ appreciably from the nonrespondents; in general, they do differ, though sometimes by only a negligible amount. However, it is the writer's belief that bias due to nonresponse is of sufficient general occurrence so that plans to insure a high rate of response (in general about 90 percent or more), or a satisfactory means for adjusting for possible nonresponse bias, should be part of the specifications for any survey, unless past experience with the particular type of survey has demonstrated that such precautions are not needed. Even then, one should be constantly on guard to detect such biases.

Although the nonresponse bias differs from one situation or time to another, a few general patterns commonly appear. With the mailed questionnaire there is usually an "interest" bias that might be revealed in various ways—for instance, through familiarity with the subject, or having the item under study. Nonresponse bias in interview surveys is associated with the factors that are associated with the likelihood of finding a qualified person at home. These factors include family size, education, age, and employment status. In general, there appears to be some tendency for nonresponse bias to be greater for personal characteristics of the individual than for characteristics, for example, of his farm or dwelling.

Definition of Bias Due to Nonresponse

Consider a population of N individuals and a specified system of field operations for contacting a random sample of members of a population. Let p_i, where

$$0 \leq p_i \leq 1 \qquad (1)$$

represent the probability of obtaining a questionnaire from the ith individual in the population, assuming the ith individual has been se-

TABLE 1.—*Number of interviews by call and nonresponse for a national consumer preference survey* [1]

Item	Area								Total	
	Metropolitan [2]		Cities [3]		Towns [4]		Open country			
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Interviews obtained on										
1st call	446	36	593	41	562	50	504	68	2,105	46
2d call	273	22	378	26	275	25	139	19	1,065	24
3d call	186	15	185	13	97	9	29	4	497	11
4 or more calls	118	10	118	8	54	5	----	----	290	6
Not at home	99	8	79	6	77	7	47	6	302	7
Refusals	82	7	62	4	21	2	11	1	176	4
Other	28	2	35	2	26	2	14	2	103	2
Total	1,232	100	1,450	100	1,112	100	744	100	4,538	100

[1] This was a national survey of housewives relating to preference for citrus products, conducted by the Bureau of Agricultural Economics during January and February, 1950.
[2] Metropolitan: This stratum is comprised of the 13 largest metropolitan areas, 9 of which were in the sample.
[3] Cities: Places with a population of more than 10,000 in 1940.
[4] Towns: Incorporated and unincorporated places up to 10,000 population in 1940.

lected for a sample. The specifications for field operations might, for example, include the requirement that as many as three calls be made, but fourth calls should not be made. In this case, p_i is the probability, assuming that the ith individual is in the sample, that he will be contacted on three or fewer calls, and if contacted will cooperate. The p_i for everyone who would refuse is zero. Likewise, p_i would be zero in the situation in which the field work is restricted, for example, the hours 9:00 a.m. to 5:00 p.m. and the ith individual is never home during those hours. Hence, it is clear that a different set of p_i's is postulated for each system of field operations although the system of field work might not be clearly defined.

Suppose that a random sample of k is selected with equal probabilities. The expected response rate, $\bar{p}$, is the average of all p_i's; that is

$$\bar{p} = \frac{1}{N} \sum_{i=1}^{N} p_i$$

Hence the expected number of completed questionnaires is $\bar{p}k$.

Next, let X_i be the value of some item X for the ith individual and let the sample mean of X for the respondents be $\bar{x}_r$.

Thus, $$\bar{x}_r = \frac{1}{k_r} \sum_{i=1}^{k_r} X_i$$

where k_r is the number of respondents.

The nonresponse bias, b, is now defined as the difference between the expected value of $\bar{x}_r$ and the population mean $\bar{u}$, where

$$\bar{u} = \frac{1}{N} \sum_{i=1}^{N} X_i$$

Hence, $$b = E(\bar{x}_r) - \bar{u}$$

However, since k_r is a random variable, the expected value of $\bar{x}_r$ involves the expected value of a ratio or an approximation; namely,

$$E(\bar{x}_r) \doteq \bar{u}_r = \frac{\sum_{i=1}^{N} X_i p_i}{\sum_{i=1}^{N} p_i}$$

It is clear that $\bar{u}_r$ is simply a weighted average of X using the p_i's as weights, which gives a conception of the quantity which $\bar{x}_r$ is an estimate of.

Similarly,

$$E(\bar{x}_n) \doteq \bar{u}_n = \frac{\sum_{i=1}^{N} X_i (1-p_i)}{\sum_{i=1}^{N} (1-p_i)}$$

where $\bar{x}_n$ is the unknown average of X for the nonrespondents in the selected sample. As $\bar{u} = \bar{p}\,\bar{u}_r + \bar{q}\,\bar{u}_n$, where $\bar{q} = 1-\bar{p}$, the bias b can be written in the form

$$b \doteq \bar{u}_r - \bar{u} = \bar{q}\,(\bar{u}_r - \bar{u}_n) \qquad (2)$$

It may also be useful to consider the size of the bias as a percentage of $\bar{u}$. Thus,

$$B = 100 \left[\frac{1}{\bar{p} + \bar{q}d} - 1 \right]$$

where $d = \frac{\bar{u}_n}{\bar{u}_r}$

The relative response bias is plotted in figure 1, which provides a basis for judging the possible extent of bias due to nonresponse if one has some information on response rates and can make reasonably good guesses as to the relative difference between respondents and nonrespondents. Even with a response rate of 0.95, the nonresponse bias is as much as 5 percent when the value of d is equal to 2.0.

In the preceding discussion, a simple arithmetic average has been assumed as a method of estimation. It is recognized that for other types of estimation the nonresponse bias might be different. In a farm survey, for instance, the sample average number of acres per farm in a given crop might be biased because of nonresponse, whereas the ratio of acres in the particular crop to total acres of cropland might be virtually unbiased.

There is a wide variety of practices and methods of dealing with the nonresponse problem. Some of these methods are discussed here under succeeding headings.

Substitution and Weighting

If no one is at home or the respondent refuses to give information, should a substitute be selected? Should substitution be permitted after the first not-at-home call or only after two or more calls have been made? If substitutions are permitted, how should the substitutes be selected? Such questions are frequently asked. No uniformity of practice is evident except within some agencies.

Substitution is deficient as a solution to the nonresponse problem because the substitutes do not constitute, in a statistical sense, a sample of the nonrespondents. In fact, one might expect, as several studies have shown, that the substitutes tend to be more like the respondents than the nonrespondents. But the making of substitutions may have some advantages. The rate of response can vary considerably from one location to another (table 1), including locations within cities or counties. By making substitutions, the areas are represented in the sample in the intended proportions. Following this idea into more detail, elaborate schemes of substitution such as requiring that the substitute match the nonrespondent on one or more characteristics, could be used; but under such a plan considerable effort might be spent finding substitutes. One alternative, if the necessary information is available, is to introduce weighting into the tabulations to allow for differential response by areas or other factors.

With respect to the removal of nonresponse bias, the making of substitutions in the field is about equivalent, in the writer's opinion, to a corresponding weighting of data in the office. Consider cluster sampling, for example. If an interview is unobtainable with one of the households in a sample cluster, the selection by some objective means of a substitute just outside of the cluster appears to the writer about equivalent, in terms of nonresponse bias, to substitution of the cluster average of the completed questionnaires for the missing household. Either alternative removes only a component of nonresponse bias that can be associated with differential response by areas. Similarly, selecting the nearest household outside of the cluster that matches the nonrespondent household with respect to number of persons, for example, might be about equivalent to weighting the data in the office to adjust for differential response by area and size of household. Although in the majority of cases such weighting of data (or

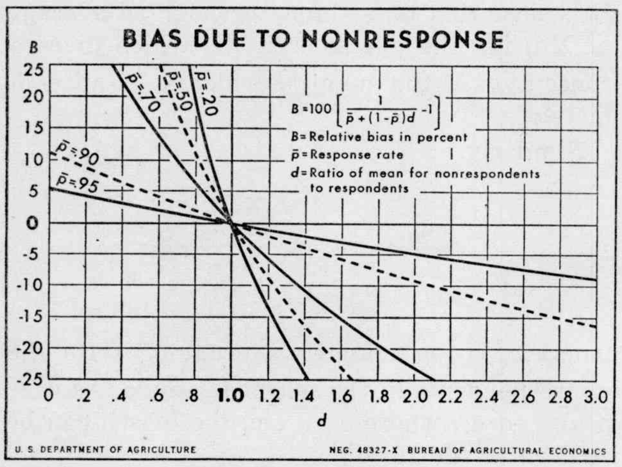

Figure 1

substitution) probably gives some reduction of error, it does not necessarily lead to an improvement—in fact, the error might be increased. There is frequently too much confidence that weighting poor data will give good results.

Analysis of Successive Responses

This section applies to surveys having three or more response waves. With mailed questionnaires this means three or more mailings and classification of the returns by first, second, or third mailing, or perhaps one mailing and classification of the questionnaires by date received. Similarly, for interview surveys the response waves would be defined in terms of the call on which an interview was obtained.

(1) One method of coping with the nonresponse problem is to compute averages or "statistics" for each response wave and then from an inspection of the differences among the waves, to decide subjectively upon an average for the nonresponse group. The estimate is of the form $\overline{x} = p_r\overline{x}_r + p_n\overline{x}_n$ where p_r and p_n are respectively the sample proportions of respondents and nonrespondents, $\overline{x}_r$ is the average for all respondents and $\overline{x}_n$ is an assumed average for the nonrespondents. No matter how the nonresponse problem is treated some assumption is made about the nonresponse group. Making no adjustment for nonrespondents is equivalent to assuming $\overline{x}_r = \overline{x}_n$. Substituting guesses at the smallest and largest values of $\overline{x}_n$ that have any possibility of existing is sometimes helpful in judging the outside limits of the extent of bias due to nonresponse that might exist.

(2) A procedure that has been considered but used very little, if any, is to prepare a chart and visually make an extrapolation. The chart is prepared by plotting on the horizontal axis the accumulated percentage response, and on the vertical axis the corresponding accumulative averages. Thus, the first point has as its abscissa the percentage responding on the first wave and the ordinate is the average for the first wave. The next point is for those responding on the first and second waves combined. The third point would be for those responding on the first, second, and third waves combined, et cetera. The line or trend as established by these points is projected to 100 percent, and the ordinate at 100 percent gives the estimate. The writer has no knowledge of this method having been studied or used. It has the appearance of lacking precision unless the response rate is high.

(3) Hendricks [1] has suggested a more refined approach to the analysis of successive response waves to correct for nonresponse. His approach involves postulating a frequency distribution of resistances to returning the mailed questionnaires, the resistances ranging from zero to infinity. Those responding to the first mailing might be assigned 1 unit of resistance, to the second mailing 2 units of resistance, et cetera. It is assumed that the logarithms of the resistances are normally distributed, which provides a basis for estimating the average resistance of all individuals on the mailing list. An equation is then set up to represent the relationship between the resistance to returning a questionnaire and the item whose average is being estimated. Substitution of the average resistance in this equation gives a result that is the estimate of the population average.

The mathematical form of the models used in this approach need further investigation, and tests using data from several surveys along with good check data are needed to ascertain its utility.

(4) Ferber[2], in 1948, considered the use of tests for random order as a basis for learning the need for follow-ups to mailed questionnaires, the questionnaires being ordered according to the time of the response. This idea is based upon the hypothesis that, if respondents and nonrespondents are alike, the returns would be independent of the time the questionnaires are received. Ferber recognized, however, that nonresponse bias could occur even though the order of receipt was random, and that random order with respect to one question did not assure randomness with respect to another question.

Ford and Zeisel[3] later presented some results that cast considerable doubt on the utility of random order tests to detect nonresponse bias.

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[1] HENDRICKS, W. A. ADJUSTMENT FOR BIAS CAUSED BY NON-RESPONSE. Agricultural Economics Research, 1:52-53, 1949.

[2] FERBER, ROBERT, THE PROBLEM OF BIAS IN MAIL SURVEYS: A SOLUTION. Public Opinion Quarterly, 12:669-676, 1948.

[3] FORD, ROBERT N., and ZEISEL, HANS. BIAS IN MAIL SURVEYS. Public Opinion Quarterly, 13:495-501. 1949.

Their findings showed that differences between early and late responses could not be relied upon to indicate the result for the nonresponse group. Moreover, some examples were cited in which there was a substantial nonresponse bias even though the early and late responses were about the same.

Subsampling of Nonrespondents

In 1946, Hansen and Hurwitz[4] reported a technique for combining some of the advantages of the mailed questionnaire and of personal interviews. The technique avoids bias due to nonresponse and takes advantage of the lower costs of the mailed questionnaire. The procedure requires contacting in person a subsample of the nonrespondents to mailed questionnaires. Every effort is then made to obtain questionnaires for the individuals in the subsample. Compared with interviewing everyone in a sample this technique is most advantageous when the response rate to a mailed questionnaire is high and the difference between the cost of the mailed questionnaire and personal interview is large.

The theory is also applicable to interview surveys. After one or more calls have been made, a subsample of the remaining nonrespondents may be selected and an intense effort made to complete a questionnaire for every member of the subsample.

Determination of the Optimum Number of Call-Backs

The problem of determining the optimum number of call-backs to be made has been attacked mathematically by Birnbaum and Sirken[5] for questions that can be answered as Yes or No, and assuming that only one question is asked. Their procedure was to determine sample size (in terms of number of individuals selected for the sample rather than the number of completed questionnaires) and the number of call-backs that would minimize the expected cost of the survey. This procedure was subject to the conditions that the total error (that is, sampling error plus nonresponse bias) has a probability greater than some specified level of being within a specified range on either side of the population value. To define nonresponse bias, Birnbaum and Sirken assumed that the individuals in the population were either available or not available.

That is, with reference to expression (1), earlier in this discussion, the p_i's were assumed to be either 0 or 1. This gave, however, an expression for the nonresponse bias that was similar to equation (2) ; namely,

$$b = q(p_r - p_n)$$

where q is the percentage of the individuals in the population who are not available, p_r is the percentage of the available individuals in the population who would answer yes, and p_n is the percentage of the nonavailable individuals in the population who would answer yes. To solve the problem it was necessary to make assumptions about the size of the nonresponse bias b. This is an important aspect of the solution, because the value of b can be reduced only by making additional call-backs; and assuming a maximum value of b (to be on the "safe" side) overemphasizes the need for call-backs. The particular results given by Birnbaum and Sirken showed that, up through five calls, each added call-back reduced the expected total cost for specified precision. The constants used in the cost equations were estimated from available data and were thought to be rather typical.

Weighting by the Reciprocals of the p_i's

In 1949, Politz and Simmons developed a plan which was an attempt to obtain unbiased estimates without the necessity of making call-backs.[6] The essentials of this plan can be described by making reference to the earlier discussion on the definition of bias due to nonresponse. It can be shown that, if none of the p_i's are zero, an unbiased estimate of the popu-

[4] HANSEN, MORRIS H., and HURWITZ, WILLIAM N. THE PROBLEM OF NON-RESPONSE IN SAMPLE SURVEYS. Amer. Statis. Assoc. Jour. 41:517-528. 1946.

[5] BIRNBAUM, Z. W., and SIRKEN, MONROE G. BIAS DUE TO NON-AVAILABILITY IN SAMPLING SURVEYS. Amer. Statis. Assoc. Jour. 45:98-110. 1950.

[6] POLITZ, ALFRED, and SIMMONS, WILLARD. AN ATTEMPT TO GET 'NOT AT HOMES' INTO THE SAMPLE WITHOUT CALLBACKS. Amer. Statis. Assoc. Jour. 44:9-31, 1949. This idea was suggested earlier by H. O. Hartley in the discussion of a paper by F. YATES, A REVIEW OF RECENT STATISTICAL DEVELOPMENTS IN SAMPLING AND SAMPLING SURVEYS. Royal Statis. Soc. Jour. Vol. CIX, Part I, 1946.

lation mean, u, from a random sample of k selected with equal probabilities is

$$\bar{x} = \frac{1}{k} \sum_{i=1}^{k_r} \frac{X_i}{p_i}.$$

Hence, if there is a practical system of field operations and a means of determining the p_i's for the k_r respondents, an unbiased estimate would be possible provided none of the p_i's are zero (or for practical purposes that a negligible proportion of the p_i's are zero). Apparently it is impossible to define a practical system of field operations which, at the same time, would permit a precise determination of the p_i for every individual contacted. Perhaps the best that can be done is to estimate the p_i's.

Politz and Simmons considered dividing the respondents into six groups according to the estimated proportion of time at home during the interviewing hours. The plan was to make only one call at each sample dwelling and to ask each respondent whether or not he was home at six specific times determined at random; hence, the estimated proportions of time at home were in sixths. One of the six was the instance of the interview, which was a random time during interviewing hours. The estimate would then be made by sorting the questionnaires into six groups on the basis of the amount of time at home and weighting each group by the reciprocal of the proportion of the time the respondents in the group were at home. Two important aspects of this plan to keep in mind are:

(1) Although, for practical purposes, this plan might be satisfactory for eliminating nonresponse bias, there could be a residual nonresponse bias remaining if part of the individuals in the population have $p_i = 0$, that is, do not have a chance of being in the sample. Under a call-back plan and a noncall-back plan for which the same individuals have $p_i = 0$, the nonresponse bias should be the same, assuming that call-backs, under the call-back plan, are made to the extent of getting interviews with all persons in the sample other than those with $p_i = 0$. But, in practice it might not be practical to make call-backs to such an extent.

(2) The statistical efficiency of the noncall-back plan needs to be considered, as well as differences in costs, since the loss of statistical efficiency due to weighting can be appreciable.

Costs

One of the missing links in the solution to the call-back problem is information on costs; that is, marginal costs of making call-backs. Some information from two different surveys on cost of call-backs is given below which would indicate that perhaps the cost of call-backs is less than generally presumed. In table 2, the number of interviews as a percentage of number of calls is presented by call number for the national consumer preference survey, discussed earlier. Without any factors tending to make second or later calls successful, one would expect the yield (number of interviews) per call to decrease with each additional call because the households remaining after each call would tend to be home a smaller portion of the time.

TABLE 2.—*Number of interviews by call as a percentage of number of calls*

Area	1st call		2d call		3d call		4th call		5th call	
	Number of calls	Interviews per call	Number of calls	Interviews per call	Number of calls	Interviews per call	Number of calls	Interviews per call	Number of calls	Interviews per call
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Metropolitan	1,232	36	744	37	437	43	199	33	109	26
Cities	1,450	41	823	46	413	45	188	35	96	30
Towns	1,112	50	516	53	186	52	74	53	----	----
Open country	744	68	218	64	46	63	----	----	----	----
Total	4,538	46	2,301	46	1,082	46	461	37	205	34

However, the interviewers on the citrus preference survey were expected to exercise judgment in making calls, after the first, successful by use of such techniques as arranging to make a return visit at a different time of the day or ascertaining from a neighbor when the eligible respondent is likely to be home. They could make appointments but were not instructed to attempt to arrange for appointments generally. This is evidently why in table 2 the yields per call for the second and third calls are as high as for the first. It is likely that ways can be found to further increase the yields per call after the first.

If the yield per call for the first 3 calls is the same, 100 calls would be expected to yield the same number of completed questionnaires under a call-back plan requiring 3 calls, as under a noncall-back plan. In this case the choice between the two is dependent, among other things, upon the difference in statistical efficiency and the difference in the over-all cost per call.

Unfortunately, appropriate costs per interview by call number are not available, and the direction of the differences in cost per interview by call is not obvious, for some of the factors contributing to cost are compensating. For example, the average distance among noncontacted individuals tends to increase with call number. But steps can be taken to increase the likelihood that calls after the first shall be successful. The interviewer can usually locate a house more easily the second time and many of the second or later calls, when they are worked in along with first calls, can be made with the expenditure of little extra time.

On some occasions the Bureau of Agricultural Economics has followed the practice of making as many call-backs as necessary to obtain at least a predetermined rate of response. This principle was applied by county or city, which means that a greater number of call-backs was made in the larger cities or metropolitan areas, for example, than in the open country. This practice not only had the advantage of assuring a minimum over-all rate of response but it also led to a more uniform rate by areas. Space will not permit a discussion of the details of the plan. It worked satisfactorily but might give trouble if the required response rate is too high. In application of the plan, if it was decided that fourth calls, for example, should be made in a particular area, fourth calls were made on all nonrespondent households, not just a part of them. A disadvantage is the difficulty of estimating what the field costs will be.

In 1950, the Statistical Laboratory at Iowa State College conducted a retail-store survey in Iowa. Detailed records of field work were analyzed [7] to estimate costs per interview by call number. This survey, like most others, had several components of field cost which exist regardless of whether call-backs are made. One such component was the cost of moving an itinerant field staff from one assigned county to another. A second was the cost of visiting some stores which turned out to be not eligible for the survey. The eligibility was ascertainable on the first call, irrespective of whether an appropriate person was available to interview. Such costs are appropriately allocated to the cost of first-call interviews.

In table 3, the average cost of collection per interview by call number is given for the retail-store survey in Iowa. It is estimated that, if only one call had been made at each of the sample stores, the cost per schedule would have been $4.12. The estimated additional cost of making second calls is $2.12 per schedule. For the survey as a whole, the average cost was $3.60 per schedule, which is less than the estimated cost per schedule if no call-backs had been made. Incidentally, the rate of response exceeded 99 percent, whereas if no call-backs had been made the rate would have been about 73 percent. The above does not provide sufficient evidence to conclude that a noncall-back plan

TABLE 3.—*Average cost per interview by call for a retail store survey in Iowa*

Call number	Number of interviews	Average cost per interview
1	1,456	$ 4.12
2	417	2.12
3	104	2.36
4, 5, & 6	31	3.19
Total	2,008	$ 3.60

[7] The data were analyzed as part of a cooperative program of research on statistical methods. The results have not been published.

would have been inferior, because $4.12 is not the appropriate estimate of cost for the same number of schedules under a noncall-back plan.

Conclusions

Many articles on the nonresponse problem have appeared in the literature but the problem is far from solved. However, with respect to interview surveys, consideration of available evidence and experience has led the writer to conclude, until such time as further research indicates otherwise, that: (1) A good general practice is to require as many as three calls and ask that fourth calls be made whenever convenient during the course of making other calls. Some variation in the required number of calls could be effected depending upon the nature of the population sampled and the nature of the study. (2) For the purposes of most surveys, a 90-percent response is adequate without attempting to make adjustments for nonresponse, but one should always be on guard for nonresponse biases of appreciable magnitudes. Much depends upon the level of precision required. When high precision is important, perhaps a rate of response of more than 90 percent is requisite.

Book Reviews

Mobilizing Resources for War. By TIBOR SCITOVSKY, EDWARD SHAW, and LORIE TARSHIS. McGraw-Hill Book Company, New York. 284 pages. 1951. $4.50.

Defense, Controls, and Inflation. Edited by AARON DIRECTOR. The University of Chicago Press, Chicago. 342 pages. 1952. $3.50.

War and Defense Economics. By JULES BACKMAN, ANTONIN BASCH, SOLOMON FABRICANT, MARTIN R. GAINSBRUGH, and EMANUEL STEIN. Rinehart & Company, Inc., New York. 458 pages. 1952. $4.50.

AS INDICATED in their titles, each of these books is concerned with mobilizing our resources for war and with the economic problems which arise when a large part of our productive capacity must be diverted to defense production. Apparently most economists and businessmen today are concerned with the problems that may arise as the defense program peaks out and possibly declines in the near future. In fact, several studies of these problems have been published.

Although these three books may appear somewhat outdated, they should not be dismissed as untimely. It is possible that the new studies in process relating to economic policies for the post-defense period may seem equally untimely when they are published. Each represents a contribution to the study of economic aspects of defense mobilization.

Mobilizing Resources for War sets out to present an integrated scheme for mobilizing our resources in a defense economy so as to prevent inflation, inequity, and other excesses that usually accompany a defense build-up. The first essay, written by Lorie Tarshis, sets up models to indicate the nature and approximate extent of strains and tensions that the economy must face if compelled to mobilize its resources for war within a short period. Mr. Tarshis sets up an austere program for civilians, one that leads naturally to his assertion that the main task of policy "... would be to dam back a flood of spending power ..." generated by the high level of economic activity. High taxes alone, according to Mr. Tarshis, would not effect an equitable distribution of goods; and restraints on consumption directed at a fair distribution of goods might bring about an extremely unequal dis-