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Part V

Size Distribution of Farm

The statistical procedures for adjusting the distributions were developed by

Hyman Kaitz

NATIONAL INCOME DIVISION

DEPARTMENT OF COMMERCE

Operators' Income in 1946

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IN THIS PAPER we try to distribute farm operators' incomes in 1946 by size from data collected in a nationwide field survey conducted by the Bureau of Agricultural Economics in January 1947, covering farm income, production expenses, and income from nonfarm sources of farm operators. The survey results are subject to the limitations characteristic of other income surveys. Farm receipts are generally understated in income surveys, partly because respondents do not remember the numerous transactions involved in operating the farm during the year and partly because they are reluctant to disclose figures.

It is harder for the farm operator to remember each item of his income than it is for most other occupational groups. Wage

earners, for example, usually have fixed rates of earnings, easy to remember and report, and also relatively easy to check upon. In the Census-BAE survey of income in 1946, more than 90 percent of urban wages and salaries was reported but apparently only about half of net cash farm income. The marked understatement of farm operators' income in comparison with both the actual farm income and the reported income of other groups led us to try to show what its size distribution would be if it had been fully reported. The adjustments were facilitated by the high proportion of gross cash farm income and production expenses reported in the survey as compared with the estimate of the BAE for 1946.

A   CONCEPTS OF FARM FAMILY INCOME

The uses for which distributions are wanted determine the concepts of income. For most purposes of demand analyses, the money income concept has considerable merit. The objective of the recent surveys by the Bureau of the Census and the Federal Reserve Board was the size distribution of the money income of farm families after farm production expenses had been deducted. The BAE Enumerative Survey was limited to ascertaining the money income, although data on farm income and production expense were gathered in more detail than in the other surveys. The value of changes in inventory, nonmoney income in the form of farm products used in the household, and the occupancy value of the dwelling were not ascertained, mainly because of time and cost factors. However, materials from other sources are used to distribute total income (nonmoney plus money) for comparison with the money income distribution constructed from the Enumerative Survey.

Unfortunately, the value of changes in inventories was not ascertained. Theoretically, it should be taken into account in computing total income. Practically, it is one of the most difficult items to estimate.

When incomes of farm operator families and of nonfarm groups are compared, all sources obviously should be covered. For instance, the value of farm-furnished food and other products and the occupancy value of the farm dwelling should be added to

the net cash income and value of changes in inventories. This comprehensive definition of income was used in the Study of Consumer Purchases, 1935–36, and Family Spending and Saving in Wartime, 1941.

The evaluation of nonmoney income is largely a price problem. For farm products used in the farm household, two extremes in pricing can be assumed: the level at which similar products are sold by the farmer (the method by which the BAE computes farm income) and the retail price to farm families (used in Family Spending and Saving in Wartime). In comparing farm and nonfarm incomes, differences in the valuations imputed for farm-furnished food can be adjusted by the price deflators used in conjunction with the income data.

The farm dwelling is part of the farm enterprise and a rental value comparable with that of an urban dwelling cannot be computed. Moreover, no appropriate means are available for determining its contribution to the income of the farm family. In the earlier studies where the contribution of housing was estimated, the rental value was determined as a percentage of the value of the dwelling, representing the return on the investment, interest, taxes, insurance, and depreciation. The BAE determines the contribution of housing to aggregate gross farm income by a similar procedure. There is no adequate basis for going beyond this sort of allowance for farm housing.

B THE INCOME UNIT

In the earlier studies, and more recently in the FRB surveys, the income unit was defined as a spending unit, or a group of individuals who pool the major part of their incomes. For the Bureau of the Census it is all persons related by blood, marriage, or adoption who live together. In this report it consists of the farm operator and all members of his family as defined by the Census. However, on the assumption of one farm operator per farm, a partnership or the operation of more than one farm by one operator is not allowed for.[1] To adjust the distributions to a

[1] Data from the Census of Agriculture are compiled and tabulated on the basis of one operator per farm.

family basis, some allowance for these factors should be made. However, this adjustment would modify the distributions only slightly since the percentage of farms affected is small.

C THE BAE SAMPLE AND ITS EXPANSION

It is not proposed to describe fully or appraise the sampling procedure of the BAE Enumerative Survey.[2] In brief, the sample represented 4,021 segments in 816 counties in every state of the union. Sampling rates were varied in order to get information on certain items in 4 major geographic divisions. From 17,704 farms in the sample areas, 14,468 schedules were collected—635 in the 'clean-up' phase of the survey when interviewers were asked to visit the farms in a subsample of one-third of the segments from which records had not been obtained. Of the 4,021 segments, 73 were never visited, chiefly because they were not easily accessible and time did not permit. Because of shortcomings in the sample, 685 duplicate schedules of farms in areas where the noninterview rate was high were included, making a total of 15,153.

Every schedule had a section on cash receipts from farming. Additional information on production expenses and nonfarm income was gathered from a subsample, which in most areas was 25 percent. The schedules containing these additional sections were known as 'long' schedules.[3] Their total, including duplicates, was 4,465.

Schedules, including duplicates, on which all income items were entered totaled 14,079; those with complete information on both income and expense, 3,692. Approximately 7 percent of the schedules reporting income and about 17 percent of those re-

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[2] For details see E. E. Houseman, 'The Sample Design for a National Farm Survey by the Bureau of Agricultural Economics', *Journal of Farm Economics*, XXIX, 1 (Feb. 1947); and for an evaluation of the sample see Catherine Senf, 'The General Enumerative Surveys–II', *Agricultural Economics Research*, Vol. 1, No. 4, Oct. 1949, pp. 109–1.

[3] The long schedule was used on all sample farms in Illinois and half of the sample farms in New York, Pennsylvania, and the Western Region to provide for special studies in these areas.

porting both income and expenditures were not usable because of incompleteness.

Inasmuch as it was not feasible to adjust for income of farms for which data were incomplete, it was assumed that the farms reporting income fully were representative of all farms in the original sample.

The difference between the survey total, 5,366,000 farms in January 1947, and the Census of Agriculture total, 5,859,000 in 1945, was largely in the smaller farms, and there is no conclusive evidence that the total increased or decreased significantly.[4] Consequently, the Census total was taken as the base. In all regions except the West, farms were classified into 3 size groups—under 10 acres, 10–49 acres, and 50 acres and over. The sample was then expanded to equal the Census number for these size of farm groups.

Tenure had evidently changed considerably since the Census report. The rate of ownership rose with farm income: owner and part-owner operated farms as a percentage of all farms increased from 57.2 in early 1935 to 60.7 in 1940, 67.6 in 1945 (all Census of Agriculture estimates), and 71.9 in 1947 (Enumerative Survey). Tenure rates were ascertained in the survey and the gross cash income distribution was expanded by means of 8 tenure groups (Table 1).

Table 1
Number of Farms by Tenure (thousands)

Tenure Group	1945 Census of Agriculture	1947 Enumerative Survey
Owners	3,301	3,396
Part-owners	661	816
Managers	39	42
Cash tenants	402	336
Cash share tenants	138	218
Share tenants	695	660
Croppers	446	344
All others	177	47
Total	5,859	5,859

However, only 2 major tenure groups, 'owners and part-owners combined' and 'all others', were used in expanding the data on

[4] Farm family workers without cash wages averaged about the same in 1946 as in 1944; 9 percent more people lived on farms in January 1947 than in January 1945.

farm production expenses and net cash farm income because the much smaller sample of 'long' schedules did not appear to warrant being expanded by the more detailed classification of tenure.

D Size Distribution of Gross Cash Farm Income

The size distributions of gross farm income from the survey are quite similar to that from the 1945 Census of Agriculture (Table 2). Differences in the definition of income are offsetting in some degree. The Census distribution is based upon the total value of sales, including those of the landlord whose rent was a share of the crop; if landlords' sales were not included, the distribution would be shifted more toward the lower income levels. On the other hand, the Census does not include government payments to farm operators or income from custom work. Furthermore, the distribution shifted upward because of the 20 percent increase in the aggregate cash farm income from 1944 to 1946. In comparison with the BAE estimates, the Census of Agriculture underreported gross cash farm income to approximately the same degree as the Enumerative Survey. The BAE estimates are based in part upon data from the Census of Agriculture, but other sources, such as market receipts and the Bureau's estimates of crop production and livestock, are also used.

Eliminating schedules with incomplete reporting causes little difference in the distributions. Especially in the first two columns of Table 2, large items of income were probably missing from few of the schedules marked incomplete. Consequently, the elimination of incomplete schedules had little effect on this sample as a whole. 'Incompleteness' had somewhat more effect on the distributions based on the 'long' schedules. However, since the distributions based on all schedules and those on the 'long' differ considerably and the major discrepancies are apparently at the lower income levels, the difficulty of determining income and expenses on small farms was probably the reason.

The size distribution of all schedules with no 'incompletes' in the income section appeared to be more trustworthy as a basis

for adjustment than that of schedules reporting both income and expenses. It was derived from more than 14,000 schedules; one-fourth that number underlie the corresponding distribution of farms reporting both income and expenses. The rate of 'incompleteness' was lower and its effect negligible. The close correspondence with the distribution from the 1945 Census of Agriculture is some assurance that the sampling procedure was generally adequate. The number of farms in each gross income interval was multiplied by the average income and expense for that interval on the 'long' schedules (no incompletes) to yield aggregate income and expense. The average income in each income interval in the smaller sample corresponded closely with the averages in the larger sample, even in the open-end interval, $20,000 and over.

Table 2
Number of Farms, Percentage Distribution by Gross Cash Farm Income Classes

Enumerative Survey, 1946

Gross Cash Farm Income Class	All schedules (15,153)	Schedules with no incompletes in gross income (14,079)	All schedules report. income & expenses (4,465)[a]	Schedules with no incompletes in gross inc. or prod. exp. (3,692)[a]	1945 Census of Agriculture [b]
0	7.3	7.4	6.1	5.8	9.0
$1– 249	15.5	15.5	15.1	15.3	14.4
250– 499	9.8	9.8	10.4	10.2	9.5
500– 749	7.7	7.7	7.9	7.6	7.7
750– 999	6.0	6.0	6.1	6.3	6.6
1,000– 1,499	9.4	9.1	9.9	10.0	10.3
1,500– 1,999	6.8	6.7	7.2	6.9	7.4
2,000– 2,499	5.3	5.2	5.3	5.1	5.7
2,500– 2,999	4.5	4.5	3.8	3.9	4.4
3,000– 3,999	6.1	6.2	6.1	6.1	6.7
4,000– 4,999	4.9	5.0	5.1	5.1	4.5
5,000– 5,999	3.6	3.6	3.8	4.0	3.2
6,000– 7,499	4.0	4.1	4.0	4.3	2.9
7,500– 9,999	3.4	3.4	3.2	3.4	3.1
10,000–19,999	4.1	4.2	4.0	4.1	3.2
20,000 & over	1.6	1.6	2.0	1.9	1.4
Total	100.0	100.0	100.0	100.0	100.0

[a] 'Long' schedules only.
[b] Not exactly comparable with Enumerative Survey data. Distributed by value of sales classes 1944, and includes landlords' share of sales but not government payments or income from custom work.

The size distribution of farms by gross income classes and the aggregate gross cash farm income, production expenses, and net cash farm income computed on the above basis are shown in Table 3, which is the basis for the adjustments that follow.

Table 3

Farm Operators, Aggregate Income, and Production Expenses
Unadjusted Distribution by Gross Cash Farm Income Classes, 1946

Gross Cash Farm Income Class	No.[a] of farms (000)	Average, $			Aggregate, $ million		
		Gross cash farm income	Expenses	Net cash farm income	Gross cash farm income	Expenses	Net cash farm income
0	433.0	0	384	−384	0	166	−166
$1– 249	911.5	111	447	−336	101	407	−306
250– 499	574.9	374	556	−182	215	320	−105
500– 749	449.4	621	564	57	279	253	26
750– 999	351.6	867	634	233	305	223	82
1,000– 1,499	534.8	1,221	899	322	653	481	172
1,500– 1,999	393.4	1,719	1,222	497	676	481	195
2,000– 2,499	306.4	2,221	1,482	739	681	454	227
2,500– 2,999	261.1	2,741	1,681	1,060	716	439	277
3,000– 3,999	365.0	3,483	2,262	1,221	1,271	826	445
4,000– 4,999	291.9	4,461	2,967	1,494	1,302	866	436
5,000– 5,999	210.0	5,469	3,331	2,138	1,149	699	450
6,000– 7,499	238.6	6,663	3,867	2,796	1,590	923	667
7,500– 9,999	199.1	8,493	4,911	3,582	1,691	978	713
10,000–19,999	245.4	13,171	8,670	4,501	3,232	2,128	1,104
20,000 & over	93.0	42,478	29,813	12,665	3,950	2,772	1,178
Total	5,859.1	3,040	2,119	921	17,811	12,416	5,395

Enumerative Survey.

[a] Based on all schedules with no 'incompletes' in the farm income section (14,079).

[b] Based on schedules reporting gross cash farm income and production expenses, with no 'incompletes' in the farm income and farm expense sections (3,692).

E   GROSS FARM INCOME AND PRODUCTION EXPENSES

The survey accounted for 72 percent of the gross cash farm income and 91 percent of the production expenses estimated for 1946 by the BAE. Production expenses appear to be a sounder basis for adjusting the survey results to the BAE aggregates than gross cash farm incomes. The relation between gross cash farm income and production expenses is a guide to those adjustments. Some information is available in *Differentials in Productivity and in Farm Income of Agricultural Workers, by Size of Enterprise and by Regions* by L. J. Ducoff and Margaret J. Hagood.[5] Average production expenses corresponding to the average value of products sold were estimated for each value of product class in 1939 (Table 4). The value of products and the major variable

Table 4
Sales and Production Expenses, Averages, by Total Value of Product Classes, 1939

Total value of product class [a]	Sales	Expenses [b]	Total value of product class [a]	Sales	Expenses [b]
$1– 99	$16	$139	$1,000–1,499	$993	$685
100–249	70	151	1,500–1,999	1,484	1,020
250–399	165	195	2,000–2,499	1,977	1,349
400–599	303	252	2,500–3,999	2,847	1,903
600–749 [c]	462	328	4,000–5,999	4,528	3,127
750–999	647	451	6,000–9,999	7,210	4,896
			10,000 & over	22,660	14,299

1940 Census of Agriculture.
[a] Includes value of home consumption obtained from the farm.
[b] Computed by Ducoff and Hagood.
[c] This group contains the median.

production expenses were reported in the 1940 Census of Agriculture; other production expenses were allocated by various means. For example, taxes and farm mortgage interest were distributed in proportion to the estimated value of land and buildings. Aggregate income and expense were adjusted to the BAE estimates. The relation between the average value of products sold and average expense tends to be linear (Chart 1).

[5] (Department of Agriculture, Aug. 1944), Table 5, p. 22.

Chart 1
Value of Sales and Production Expenses, 1939
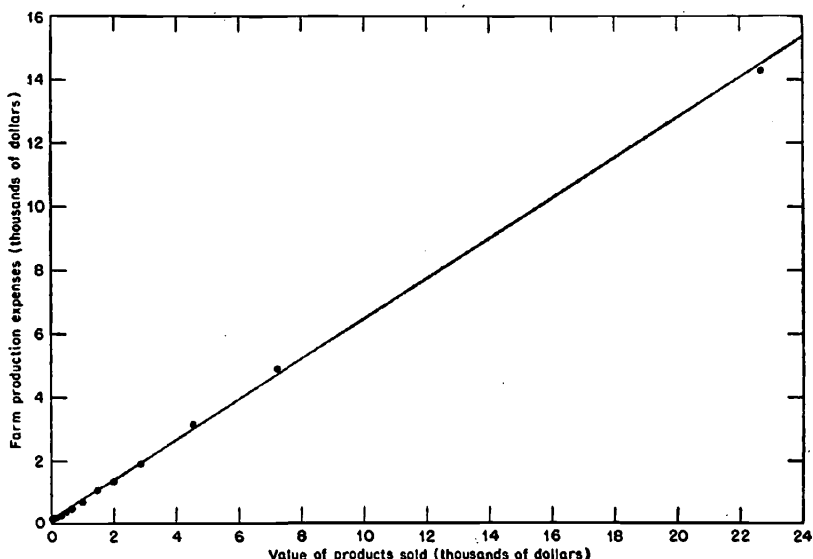
Source: 1940 Census of Agriculture.

Table 5 confirms the tendency. From the 1945 Census of Agriculture, average expenditures for the chief variable items such as cash wages, feed, livestock purchases, fertilizer, lime, and seeds —the 'increasing cost' items commonly assumed for agricultural operations—were compared with the average value of farm products sold by size of farm groups. (In general, the association between size of farm and value of products sold is close.)

Table 5
Sales and Selected Expenses, Averages by Size of Farm, 1944

Size of farm (acres)	Sales	Expenses*	Ratio: expenses to sales	Size of farm (acres)	Sales	Expenses*	Ratio: Expenses to sales
Under 10	$807	$434	.54	140–179	$3,342	$1,257	.38
10– 29	1,139	419	.37	180–219	4,058	1,586	.39
30– 49	1,326	490	.37	220–259	4,821	1,888	.39
50– 69	1,552	620	.40	260–499	5,937	2,294	.39
70– 99	1,952	777	.40	500–999	8,876	3,409	.38
100–139	2,514	1,005	.40	1,000 & over	17,651	6,856	.39

Special Report-Farms and Farm Characteristics by Size of Farm (Census of Agriculture, 1945), Table C, May 1948.
* Selected expenses reported in the 1945 Census of Agriculture included cash wages paid, livestock purchases, feed, fertilizer, lime, and seeds.

An analysis of 2,948 records of farm operators in Illinois for 1946 also suggests that the relation between gross cash farm income and production expenses in 1946 was more like a straight line than like the relation indicated in the Enumerative Survey (Table 6). These data were representative of the higher income farms in the state. Voluntarily submitted for analysis, they were based on more accurate records than are kept by most farmers. Undoubtedly, they were less affected by biases inherent in memory and reluctance to disclose income than the reports of Illinois farmers to the Enumerative Survey.

Table 6
Gross Cash Income and Production Expenses, Averages, by Gross Cash Income Classes, Illinois, 1946

Gross cash income class [a]	Income	Expenses	Ratio: expenses to income	Income	Expenses	Ratio: expenses to income
	Enumerative Survey			*Farm Accounts* [b]		
$4,000– 4,999	$4,546	$2,446	.54	$4,551	$2,454	.54
5,000– 5,999	5,535	2,998	.54	5,494	2,943	.54
6,000– 7,499	6,756	3,787	.56	6,750	3,374	.50
7,500– 9,999	8,562	4,709	.55	8,755	4,347	.50
10,000–19,999	13,137	8,037	.61	14,064	7,276	.52
20,000–29,999	35,918 [c]	25,209 [c]	.70 [c]	23,962	13,299	.56
30,000–39,999				34,805	19,950	.57

[a] Incomes below $4,000 are not compared because very few in the farm account sample were below that level.
[b] *Income Size Distributions for Illinois Farm Operator Families* by Rex F. Daly, to be published jointly by the University of Illinois College of Agriculture and the Bureau of Agricultural Economics.
[c] For $20,000 and over income class.

Finally, the historical relation between aggregate gross cash farm income and production expenses as indicated in the BAE figures is also linear. However, this does not preclude the possibility of a nonlinear relation within the distribution of the income for a particular year.

In short, the relation between gross cash farm income and production expenses can be assumed to be fairly well represented by a straight line. Although agriculture is usually thought to be affected by increasing costs, the evidence does not seem conclusive. From the Enumerative Survey the relation might be assumed to curve upward, largely because of the sharp increases in

expenses relative to income in the higher income groups ($20,000 and over). However, this could be due to a progressively larger understatement of income. The income tax bias undoubtedly operates with more force above than below the $10,000 level. Some reservations still apply to the extreme ends of the distribution, it is true. At the lower income levels the distribution tends to flatten. At the higher levels, increasing unit costs might operate but they might be obscured by the large open-end income class. Evidence of a nonlinear over-all relation between income and expense is insufficient and even if it curves slightly the distribution would not be affected significantly.

F   ADJUSTMENT OF GROSS AND NET CASH FARM INCOME DISTRIBUTIONS

Under the assumption of a linear relation between average gross cash receipts and expenses, the survey results were adjusted to the BAE aggregates as described in Appendix B. Gross cash income turned out to be substantially more unequally distributed than the original survey results (Table 7), reflecting the situation

Chart 2
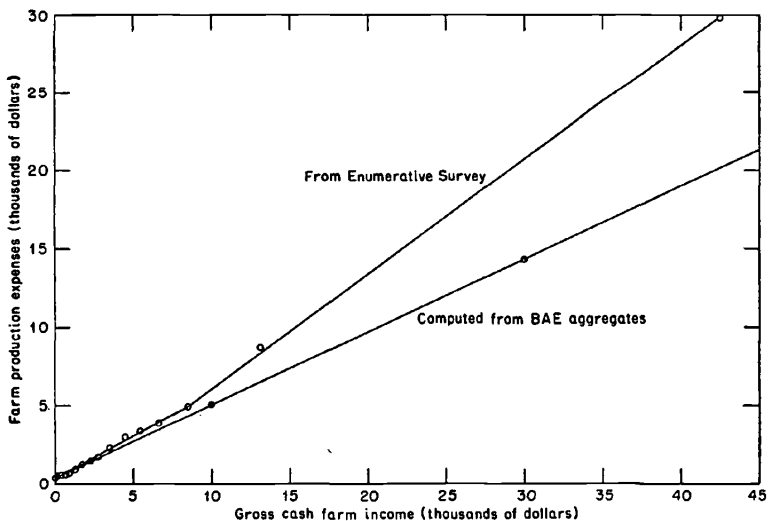Gross Cash Farm Income and Production Expenses

Table 7

Gross Cash Farm Income, Adjusted and Unadjusted Distributions by Gross Income Classes, 1946

| Gross Income Class | Adjusted | | | |
| | Percentage | | Cumulative % | |
	No. of farms	Income	No. of farms	Income
0	7.4	.0	7.4	.0
$1– 249	10.5	.3	17.9	.3
250– 499	11.4	1.0	29.3	1.3
500– 749	9.7	1.4	39.0	2.7
750– 999	5.2	1.1	44.2	3.8
1,000– 1,499	8.1	2.3	52.3	6.1
1,500– 1,999	6.2	2.6	58.5	8.7
2,000– 2,499	4.9	2.6	63.4	11.3
2,500– 2,999	5.1	3.3	68.5	14.6
3,000– 3,999	5.0	4.1	73.5	18.7
4,000– 4,999	3.7	3.9	77.2	22.6
5,000– 5,999	3.3	4.3	80.5	26.9
6,000– 7,499	6.3	10.0	86.8	36.9
7,500– 9,999	5.0	10.1	91.8	47.0
10,000–19,999	4.7	15.1	96.5	62.1
20,000 & over	3.5	37.9	100.0	100.0
Total	100.0	100.0		

| Gross Income Class | Unadjusted | | | |
| | Percentage | | Cumulative % | |
	No. of farms	Income	No. of farms	Income
0	7.4	.0	7.4	.0
$1– 249	15.5	.6	22.9	.6
250– 499	9.8	1.2	32.7	1.8
500– 749	7.7	1.6	40.4	3.4
750– 999	6.0	1.7	46.4	5.1
1,000– 1,499	9.1	3.7	55.5	8.8
1,500– 1,999	6.7	3.8	62.2	12.6
2,000– 2,499	5.2	3.8	67.4	16.4
2,500– 2,999	4.5	4.0	71.9	20.4
3,000– 3,999	6.2	7.1	78.1	27.5
4,000– 4,999	5.0	7.3	83.1	34.8
5,000– 5,999	3.6	6.5	86.7	41.3
6,000– 7,499	4.1	8.9	90.8	50.2
7,500– 9,999	3.4	9.5	94.2	59.7
10,000–19,999	4.2	18.1	98.4	77.8
20,000 & over	1.6	22.2	100.0	100.0
Total	100.0	100.0		

Enumerative Survey.

shown in Chart 2 where apparently the higher the income the more it was underreported. Another point of interest is the large percentage of farms reporting zero cash receipts. The number of farms in this group was not adjusted. The 1945 Census of Agriculture reported 523,000 farms with zero sales in 1944; the

Enumerative Survey yielded 433,000, which seemed fairly well in line.

The original distribution of net cash farm income (Table 8), adjusted as outlined in Appendix B, yielded the desired distribution (Table 9). Even after the adjustment about 30 percent of the farms, 1,753,000, were still in the negative net income class. This large negative group should be appraised in the light of the Census of Agriculture definition of a farm, necessarily that adopted in the survey. In addition, as noted above, net cash farm income does not include the value of changes in inventory. Had changes in inventories been included, many of the negative incomes reported by large farms would probably have been positive. The large negative group appears to be reasonable because approximately two-thirds of the farms reporting losses had gross cash incomes of less than $500, and as we saw above, at this income level, average expenses were almost $400. Few of these farms are commercial; some are primarily country residences; others supplement income from nonfarm sources by raising noncash farm items such as food for home consumption.

Table 8
Number of Farms and Net Cash Farm Income
Unadjusted Distribution by Net Cash Farm Income Classes, 1946

Net cash farm income class	No. of farms (000)	Av. income ($)	Aggregate income ($ mil.)
Negative	1,953.3	−775	−1,514
0	53.7	...	...
$1– 249	704.2	119	84
250– 499	601.5	372	224
500– 749	429.7	620	266
750– 999	362.8	861	312
1,000– 1,499	469.2	1,243	583
1,500– 1,999	311.9	1,762	550
2,000– 2,499	209.0	2,221	464
2,500– 2,999	155.3	2,754	428
3,000– 3,999	203.6	3,471	707
4,000– 4,999	140.0	4,453	623
5,000– 5,999	73.2	5,519	404
6,000– 7,499	58.1	6,691	389
7,500– 9,999	57.1	8,457	483
10,000–19,999	52.2	13,827	722
20,000 & over	24.3	35,475	862
Total	5,859.1	954	5,587

Farms in all gross income classes up to the $20,000 and over contributed to the number of farms in the negative net cash farm group (Table 10).

Table 9

Net Cash Farm Income, Adjusted and Unadjusted Distributions by Net Cash Farm Income Classes, 1946

	Adjusted			
	Percentage		Cumulative %	
Net Cash Farm Income Class	No. of farms	Income	No. of farms	Income
Negative	29.9	−11.9	29.9	−11.9
0	1.0	.0	30.9	−11.9
$1– 249	11.7	.7	42.6	−11.2
250– 499	8.7	1.7	51.3	−9.5
500– 749	5.9	1.9	57.2	−7.6
750– 999	4.7	2.2	61.9	−5.4
1,000– 1,499	7.9	5.1	69.8	−.3
1,500– 1,999	5.3	4.8	75.1	4.5
2,000– 2,499	3.8	4.5	78.9	9.0
2,500– 2,999	3.1	4.4	82.0	13.4
3,000– 3,999	4.7	8.7	86.7	22.1
4,000– 4,999	3.6	8.5	90.3	30.6
5,000– 5,999	2.4	7.1	92.7	37.7
6,000– 7,499	1.9	6.7	94.6	44.4
7,500– 9,999	1.4	6.3	96.0	50.7
10,000–19,999	2.5	18.3	98.5	69.0
20,000 & over	1.5	31.0	100.0	100.0
Total	100.0	100.0		

	Unadjusted			
	Percentage		Cumulative %	
Net Cash Farm Income Class	No. of farms	Income	No. of farms	Income
Negative	33.3	−27.1	33.3	−27.1
0	.9	0.0	34.2	−27.1
$1– 249	12.0	1.5	46.2	−25.6
250– 499	10.3	4.0	56.5	−21.6
500– 749	7.3	4.8	63.8	−16.8
750– 999	6.2	5.6	70.0	−11.2
1,000– 1,499	8.0	10.4	78.0	−.8
1,500– 1,999	5.3	9.8	83.3	9.0
2,000– 2,499	3.6	8.3	86.9	17.3
2,500– 2,999	2.7	7.7	89.6	25.0
3,000– 3,999	3.5	12.7	93.1	37.7
4,000– 4,999	2.4	11.2	95.5	48.9
5,000– 5,999	1.2	7.2	96.7	56.1
6,000– 7,499	1.0	7.0	97.7	63.1
7,500– 9,999	1.0	8.6	98.7	71.7
10,000–19,999	.9	12.9	99.6	84.6
20,000 & over	.4	15.4	100.0	100.0
Total	100.0	100.0		

Enumerative Survey.

Table 10

Percentage of Farms with Negative Net Cash Farm Income (after adjustment) in Each Gross Income Class, 1946

Gross farm income class	%	Gross farm income class	%
0	86.6	$2,500– 2,999	7.9
$1– 249	63.3	3,000– 3,999	7.4
250– 499	42.4	4,000– 4,999	3.6
500– 749	36.7	5,000– 5,999	4.2
750– 999	31.9	6,000– 7,499	3.9
1,000–1,499	18.9	7,500– 9,999	2.6
1,500–1,999	14.8	10,000–19,999	.7
2,000–2,499	12.4	20,000 & over	...

G   ADJUSTMENT OF NET CASH TOTAL INCOME

Of the BAE estimate of nonfarm income received by persons on farms in 1946, $4.3 billion, farm operator families were estimated to have received about $4.0 billion. The chief bases for these BAE estimates were the number of days worked off the farm at non-farm jobs reported by farm operators in the Census of Agriculture and various surveys of the amount and sources of nonfarm income of farm families in 1934–36.

According to the Enumerative Survey the nonfarm income of farm operator families totaled about $5.5 billion. Most of the difference can be accounted for by the exclusion from the BAE estimate of income received from work on other farms, rental income from other farms, armed service pay, veterans' payments, family dependency allotments, and social security payments. The first two items represent income from agriculture, although not from the farm itself. If income from these sources were included, the BAE estimate would be approximately the same as the survey aggregate.

For the adjustment of the distribution of net cash total income (farm plus nonfarm), it was considered advisable to use the survey data on nonfarm income without further adjustment. For major components of nonfarm income, the survey and the BAE estimates are more or less the same. The lower level of the latter is due primarily to a smaller coverage of sources. Moreover, the survey yields the only information available on the distribution

of nonfarm income and its effect on the size distribution of farm income in recent years.

At all levels of net farm income, nonfarm income is a substantial addition (Table 11). In particular, the average nonfarm income in the negative net cash farm income class was one of the largest throughout the range, confirming our observation that these farm families are predominately rural residents with nonfarm occupations.

Table 11
Average Net Cash Farm and Net Nonfarm Income in Each Net Cash Farm Income Class, Unadjusted, 1946

Net cash farm income class	Cash farm income	Nonfarm income	Net cash farm income class	Cash farm income	Nonfarm income
Negative	$-775	$1,711	$3,000–3,999	$3,471	$647
0	0	2,042	4,000–4,999	4,453	455
$1– 499	236	658	5,000–5,999	5,519	453
500– 999	729	511	6,000–7,499	6,691	584
1,000–1,499	1,243	535	7,500–9,999	8,457	1,074
1,500–1,999	1,762	391	10,000 & over	20,706	1,381
2,000–2,499	2,221	414			
2,500–2,999	2,754	331	Average	954*	946

* After adjustment, average net farm income was $1,885.

Whereas in the unadjusted distribution of net cash farm income 33 percent of all farm operator families had negative net farm incomes, only 10 percent reported negative total cash incomes (Table 12). When the distribution in Table 12 was adjusted to reflect total money income of $16.6 billion (App. B), the cumulative percentages showed that it was somewhat more unequal than that based on the raw data from the survey (Table 13).

The effect of the foregoing adjustments on the farm and total income distributions is illustrated by the median and quartile incomes for the adjusted and unadjusted distributions. As will be recalled, the major adjustments were in the higher income farms.

	Unadjusted			*Adjusted*		
	1st quartile	Median	3d quartile	1st quartile	Median	3d quartile
Gross cash farm income	$304	$1,198	$3,500	$406	$1,358	$4,405
Net cash farm income	*	342	1,312	*	463	1,990
Net cash total income	477	1,210	2,572	538	1,464	3,141

* Negative

Table 12

Number of Farms and Net Cash Total Income

Unadjusted Distribution by Net Cash Total Income Classes, 1946

Net Cash Total Income Class	No. of Farms (000)	Net Cash Total Income	
		Average ($)	Aggregate ($ mil.)
Negative	559.8	−1,217	−681
0	4.4	0	0
$1– 249	378.1	141	53
250– 499	568.1	376	214
500– 749	576.1	624	359
750– 999	559.2	861	481
1,000– 1,499	669.2	1,241	830
1,500– 1,999	580.2	1,755	1,018
2,000– 2,499	442.0	2,235	988
2,500– 2,999	402.9	2,737	1,103
3,000– 3,999	377.8	3,444	1,301
4,000– 4,999	299.2	4,466	1,336
5,000– 5,999	131.7	5,500 [a]	724
6,000– 7,499	119.8	6,700 [a]	803
7,500– 9,999	95.1	8,500 [a]	808
10,000–19,999	71.3	14,000 [a]	998
20,000 & over	24.2	34,223 [a]	828
Total	5,859.1	1,905	11,163 [b]

[a] Only average income for farms with incomes of $5,000 and over was available from the machine run. The averages within these classes were estimated from that average.

[b] The net cash farm income implicit in this total is different from that of the original unadjusted net cash farm income distribution because fewer schedules (only those with all items complete in the farm income, expense, and nonfarm income sections) were used as the base for expanding the distribution of net cash total income.

The adjustment of net cash total income is the final adjustment that can be made from the data compiled by the Enumerative Survey. The major components still lacking in the distribution are the value of changes in farm inventories and the nonmoney income in the form of food, fuel, and housing furnished as part of the operation of the farm. For the present, the lack of inventory data leaves a gap in the construction of adjusted income distributions for farm operators.

Materials from the 1942 study of Rural Family Spending and Saving provide a clue to how the inclusion of nonmoney income affects the distribution of money income.

Table 13

Net Cash Total Income, Adjusted and Unadjusted Distributions by Net Cash Total Income Classes, 1946

Net Cash Total Income Class	Adjusted				Unadjusted			
	Percentage		Cumulative %		Percentage		Cumulative %	
	No. of farms	Income	No. of farms	Income	No. of farms	Income	No. of farms	Income
Negative	9.1	-3.2	9.1	-3.2	9.6	-6.1	9.6	-6.1
0	.1	...	9.2	-3.2	.1	...	9.7	-6.1
$1– 249	6.0	.3	15.2	-2.9	6.5	.5	16.2	-5.6
250– 499	8.5	1.2	23.7	-1.7	9.7	1.9	25.9	-3.7
500– 749	8.5	1.9	32.2	.2	9.8	3.2	35.7	-.5
750– 999	7.6	2.3	39.8	2.5	9.5	4.3	45.2	3.8
1,000– 1,499	11.0	4.8	50.8	7.3	11.4	7.4	56.6	11.2
1,500– 1,999	9.4	5.8	60.2	13.1	9.9	9.1	66.5	20.3
2,000– 2,499	7.1	5.6	67.3	18.7	7.5	8.9	74.0	29.2
2,500– 2,999	6.7	6.4	74.0	25.1	6.9	9.9	80.9	39.1
3,000– 3,999	7.1	8.7	81.1	33.8	6.5	11.7	87.4	50.8
4,000– 4,999	6.0	9.5	87.1	43.3	5.1	12.0	92.5	62.8
5,000– 5,999	3.2	6.3	90.3	49.6	2.3	6.5	94.8	69.3
6,000– 7,499	2.9	6.8	93.2	56.4	2.0	7.2	96.8	76.5
7,500– 9,999	2.5	7.7	95.7	64.1	1.6	7.2	98.4	83.7
10,000– 19,999	2.8	13.9	98.5	78.0	1.2	8.9	99.6	92.6
20,000 & over	1.5	22.0	100.0	100.0	.4	7.4	100.0	100.0
Total	100.0	100.0			100.0	100.0		

Enumerative Survey.

H   EFFECT OF INCLUDING THE VALUE OF INVENTORY CHANGES
ON THE DISTRIBUTION OF NET FARM INCOME, ILLINOIS

In computing net income from agriculture the BAE adjusts for
the change in inventories of farm products held for sale or for
home consumption. Year end prices are applied to the physical
changes. In 1946 the value of the change in inventories was nega-
tive, −$126 million.[6] For total inventories, including changes in
the value of farm products not held for sale such as feed crops,
the estimated inventory adjustment would be −$271 million. Al-
though even the larger figure is only about 2 percent of net cash
farm income, it is likely to have affected the distribution signifi-
cantly. While the net reduction in inventories is relatively small
for the United States as a whole, net increases occurred in the
Northeast and South and net decreases in the North and West.
Even in the latter, the inventories on many farms undoubtedly
increased.

Some light on the effect of including the value of changes in
inventories can be obtained from the study of Illinois farm
records. The BAE estimated the total change in inventories on
Illinois farms, including farm products held for use in farm
operations, to be $290 million; net cash farm income $506 mil-
lion. But Illinois is probably not representative of the nation and
the change in the distribution (Table 14) is undoubtedly much
larger than is likely to have been the case for the United States as
a whole.

When changes in inventory were included, the distribution of
net farm income shifted sharply upward at the lower income
levels (Table 15). However, the small proportion, one-eighth,
remaining in the negative income class after inventory adjust-
ment is probably too high for the state as a whole, because farms
under 50 acres were excluded. Many smaller farms would un-
doubtedly have been in the negative cash farm income class and
their inventories probably would not have changed substantially.

Generalizing for the country as a whole, it is unlikely that more

6 *The Farm Income Situation*, August–September 1948, p. 15, Table 2.

Table 14
Net Value of Changes in Inventories: Percentage Distribution by Net Cash Farm Income Classes, Illinois, 1946

Net Cash Farm Income Class	Inventory Change as % of Total	Net Cash Farm Income Class	Inventory Change as % of Total
Negative	34.3	3,000– 3,999	4.2
0– $249	6.0	4,000– 4,999	4.6
250– 499	11.6	5,000– 5,999	2.8
500– 749	5.0	6,000– 7,499	3.3
750– 999	4.0	7,500– 9,999	3.6
1,000–1,499	6.8	10,000–19,999	1.2
1,500–1,999	5.4	20,000 & over	–1.8
2,000–2,499	5.1		
2,500–2,999	3.9	Total	100.0

Based on data from 2,948 Illinois farm record accounts. These farms were substantially above the average for the state and relatively few had gross cash farm incomes of less than $4,000.

Table 15
Effect of Inventory Adjustment on the Distribution of Farms in Illinois, 1946

Income Class	Percentage of Farms		Income Class	Percentage of Farms	
	Net cash farm income class	Net cash farm income plus value of inventory change class		Net cash farm income class	Net cash farm income plus value of inventory change class
Negative	16.8	2.3	$3,000– 3,999	8.7	14.2
0– $249	7.2	1.0	4,000– 4,999	7.1	11.4
250– 499	6.7	1.9	5,000– 5,999	4.5	8.5
500– 749	5.3	1.5	6,000– 7,499	4.9	8.0
750– 999	4.5	3.7	7,500– 9,999	4.1	6.5
1,000–1,499	7.7	7.7	10,000–19,999	2.3	3.9
1,500–1,999	7.4	9.1	20,000 & over	.9	.9
2,000–2,499	6.4	10.4			
2,500–2,999	5.5	9.0	Total	100.0	100.0

See Table 14, note.

than a third of the 30 percent of farms in the negative net cash farm income class would have moved into positive income classes. The *Special Report on the 1945 Sample Census of Agriculture* classified almost 1 million farms as 'nominal' units. Most of them were residences and/or places of retirement with enough acreage (3 acres or more) to meet the Census definition of a farm. More than a quarter million farm operators in this category were 65 years or older. Country estates also were included in this group.

Adjusting for a net over-all decrease of $271 million in inventories would probably reduce the representation at the higher income levels. On the whole, the inclusion of an inventory adjustment would apparently have tended to equalize the distribution of farm income by reducing the number in both the very low and the very high income classes.

I ADJUSTMENT FOR NONMONEY INCOME

The BAE estimates of nonmoney income from farming in 1946 include $995 million gross rental value of farm dwellings and $2,624 million value of home consumption of farm products. Gross rental value was computed by applying the interest rate on farm mortgages to the value of the dwelling and adding other expenses, such as maintenance and depreciation, insurance and taxes. In adjusting the survey expenditure data to the BAE estimate of aggregate expense (App. Table 3), all expenses pertaining to the farm dwelling, $394 million, were deducted. Consequently, the net rental value to be included in the nonmoney income adjustment is $601 million.

Family Spending and Saving in Wartime, which evaluated products raised and consumed on the farm at the retail price level, indicated that in spring 1942 the retail level was approximately twice that of the prices received by farmers; the ratio varied little by income levels.[7] From 1942 to 1946 prices of farm products increased more than retail prices of foods. According to BAE estimates, the farmers' share of the retail cost of the family 'market basket' increased from 48 percent in 1942 to 54 percent in 1946.[8] On this basis, the ratio of the retail price level to the farm level would be reduced from 2.00 in 1942 to 1.78 in 1946. The value of farm food in 1946 at the retail level would total $4.7 billion. The final adjustment to account for nonmoney income, including the rental value of the dwelling, is $3.2 billion (with food valued at the farm price level) or $5.3

[7] Family Food Consumption in the United States, Department of Agriculture, *Miscellaneous Publication 550*, 1944, p. 43.

[8] *The Marketing and Transportation Situation*, Nov. 1948, p. 2.

billion (with food valued at the retail price level). Total income, including net cash farm income of over $11.0 billion and non-farm income of over $5.5 billion, is either $19.8 or $21.9 billion, according to the method of evaluating food.[9]

The most recent source of information on the distribution of nonmoney income is Rural Family Spending and Saving in Wartime (Table 16), which adjusted net money income for changes in inventories whereas we did not make this adjustment in net cash total income.

Table 16
Money and Nonmoney Income, Percentage Distribution, 1941

% of Farms by Money Income Class	Money Income*	Value of Home Produced Food*	Rental Value of Dwelling*
Lowest 10	1.2	8.6	5.1
2nd 10	2.2	8.7	5.6
3rd 10	3.3	8.8	6.1
4th 10	4.8	10.1	7.3
5th 10	6.1	10.5	8.8
6th 10	8.2	10.0	10:7
7th 10	10.6	10.7	9.9
8th 10	13.9	10.9	13.0
9th 10	19.2	9.7	16.3
Highest 10	30.5	12.0	17.2 .
Total	100.0	100.0	100.0

Department of Agriculture, *Miscellaneous Publication 520*, Table 5.

* Approximate distribution. Data were not available for a precise distribution.

Nonmoney income from food is substantially more evenly distributed than income from the rental value of the farm dwelling. Total nonmoney income is much more evenly distributed than total money income.

The adjusted distribution of net cash total income was further adjusted to include nonmoney income. The BAE estimates of nonmoney income were distributed by money income classes according to the percentages in Table 16. Ratios of average total income (money plus nonmoney) to average money income were applied to the class limits in each income interval. From the new distribution the number of farms in each original income in-

[9] The adequacy of the BAE estimates of nonmoney income is not judged here. Margaret Reid suggests methods of valuation in Part III.

Table 17

Farms and Total Income, Distribution by Total Income Classes, 1946

| TOTAL INCOME CLASS | Prices Received by Farmers | | | | FARM FOOD VALUED AT Retail Prices | | | |
| | Percentage | | Cumulative % | | Percentage | | Cumulative % | |
	Farms	Income	Farms	Income	Farms	Income	Farms	Income
Negative	5.0	-2.2	5.0	-2.2	2.2	-1.2	2.2	-1.2
0– $249	2.9	.1	7.9	-2.1	2.4	.1	4.6	-1.1
250– 499	3.6	.4	11.5	-1.7	2.9	.3	7.5	-.8
500– 749	4.7	.9	16.2	-.8	3.5	.6	11.0	-.2
750– 999	7.7	2.0	23.9	1.2	4.4	1.0	15.4	.8
1,000– 1,499	14.5	5.4	38.4	6.6	13.1	4.4	28.5	5.2
1,500– 1,999	10.5	5.4	48.9	12.0	14.2	6.6	42.7	11.8
2,000– 2,499	9.2	6.1	58.1	18.1	10.3	6.2	53.0	18.0
2,500– 2,999	7.4	6.0	65.5	24.1	8.1	6.0	61.1	24.0
3,000– 3,999	11.1	11.4	76.6	35.5	12.7	11.8	73.8	35.8
4,000– 4,999	6.8	8.9	83.4	44.4	7.3	8.7	81.1	44.5
5,000– 5,999	4.9	7.9	88.3	52.3	6.1	9.0	87.2	53.5
6,000– 7,499	3.4	6.8	91.7	59.1	3.9	7.0	91.1	60.5
7,500– 9,999	3.2	8.1	94.9	67.2	3.5	8.0	94.6	68.5
10,000–19,999	3.3	13.1	98.2	80.3	3.5	12.8	98.1	81.3
20,000 & over	1.8	19.7	100.0	100.0	1.9	18.7	100.0	100.0
Total	100.0	100.0			100.0	100.0		

terval was computed. The average income in each interval was estimated by means of a straight line fit at the lower levels and a Pareto fit at the upper levels of the distribution. Table 17 shows the percentage distribution of the number of farms and total income, by total income levels, according to whether farm food was valued at prices received by farmers or at retail prices to farmers.

J SUMMARY OF COMPARISONS

The close correspondence of the curves representing the unadjusted survey and the Census of Agriculture value of sales in 1944 (Chart 3) is not surprising, inasmuch as the Census of Agriculture underreported income in relation to the BAE estimate by approximately the same proportion as the Enumerative Survey. The adjusted distribution reveals that the distribution of gross cash receipts was more unequal than the original survey data.

Chart 3
Lorenz Curves for the Distribution of Cash Receipts from Farming
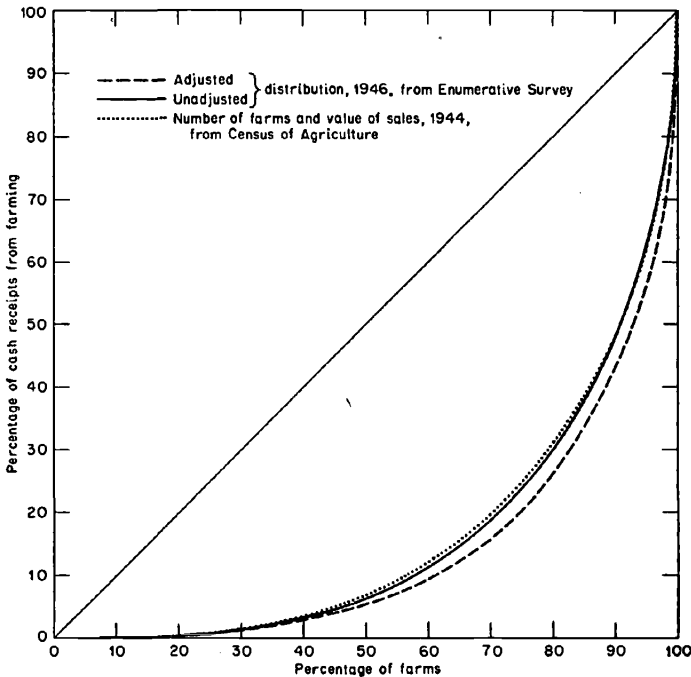
Chart 4
Lorenz Curves for the Distribution of Net Cash Farm Income

Percentage of net cash farm income

— — — Adjusted
———— Unadjusted

Percentage of farms having $1 or more of net cash farm income
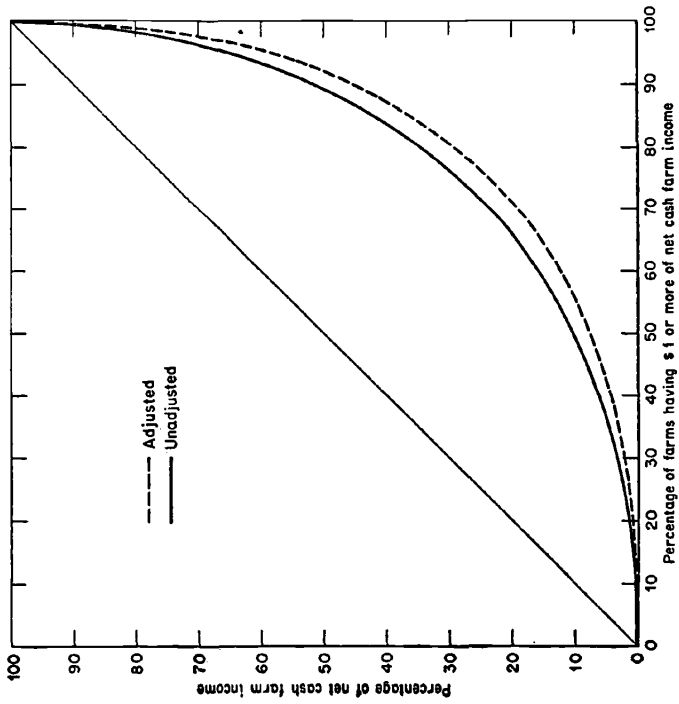
Source: Enumerative Survey.

Chart 5
Lorenz Curves for the Distribution of Net Cash Total Income

Percentage of net cash total income

— — — Adjusted
———— Unadjusted

Percentage of farms having $1 or more of net cash total income
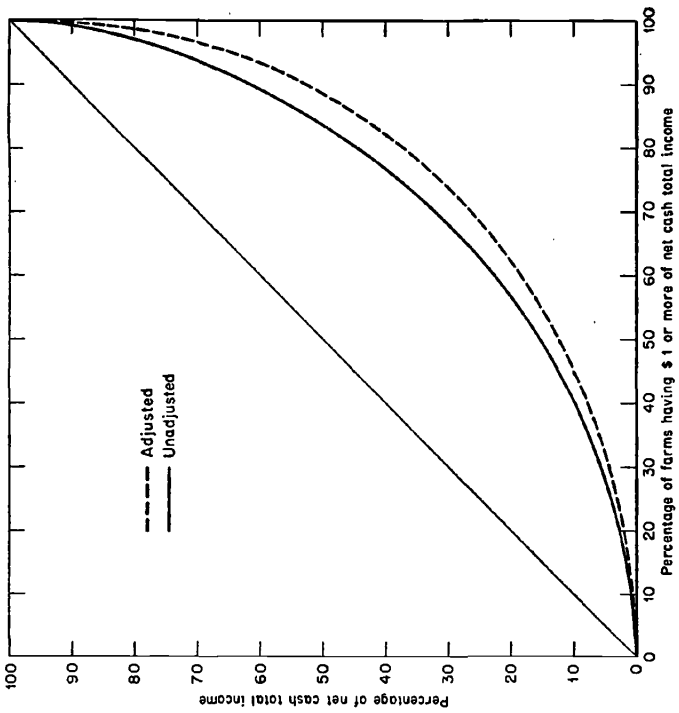
Source: Enumerative Survey.

Chart 6

Percentage of Farm Families with Income Below Designated Amounts, 1935-36 and 1946

Percentage of families below designated amounts

Total income (thousands of dollars)
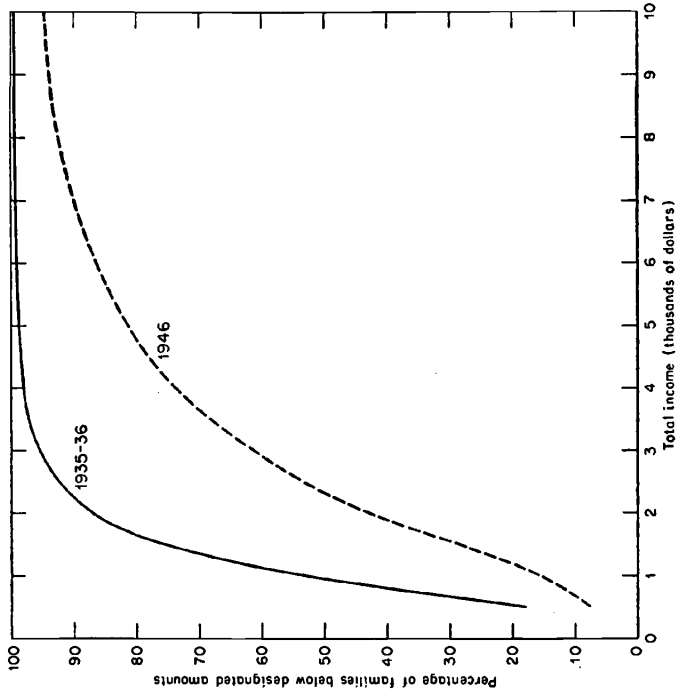
1935-36

1946

Sources: 1935-36 from Consumer Purchases Study – nonrelief families.
1946 from Enumerative Survey – includes nonmoney income (food valued at retail prices).

Chart 7

Percentage of Farm Operators and Nonfarm Families with Incomes Below Designated Amounts

Percentage of families below designated amounts

Total income (thousands of dollars)

Nonfarm Families
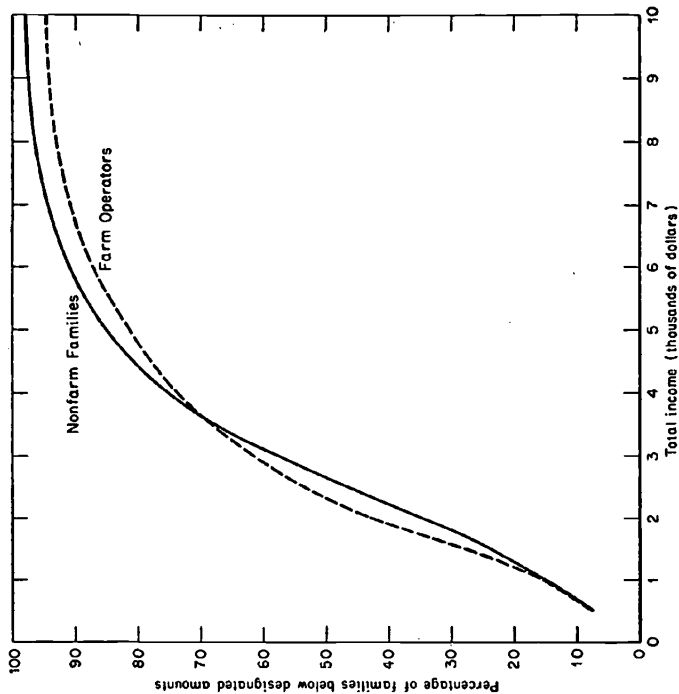
Farm Operators

Sources: Nonfarm families from Bureau of the Census – unadjusted distribution.
Farm operators from Enumerative Survey – total income (farm food valued at retail prices).

The adjusted distributions of farms having $1 or more of net cash farm income and of net cash total income are also substantially more unequal than the original survey data (Charts 4 and 5).

While the income distribution derived from the Consumer Purchases Study for 1935–36 is not strictly comparable with the adjusted distribution of total income for 1946, the two are plotted in Chart 6 to show the big changes that have occurred.[10] In the earlier period almost half of nonrelief families had incomes below $1,000; in 1946, about 15 percent of all farm operator families.

The adjusted distribution of farm operators and the distribution of nonfarm families as published by the Bureau of the Census were quite similar for 1946 (Chart 7).[11] However, income of nonfarm families, too, was underreported in the Census survey for 1946, although not as much as farm operators' income. It is not known how the distribution would be modified if the adjustment to reflect income of nonfarm families in full were made.

K CONCLUDING REMARKS

Any adjustment of an income distribution, such as the one for net cash farm income which requires the injection of as much income as is represented in the original distribution, is extremely vulnerable. Nevertheless, it must be remembered that the distribution of net cash farm income is a residual—the difference between gross cash farm income and farm production expenses. Although not conclusive, the evidence suggests that this relationship is reasonably well described as linear.

The large proportion of farms reporting negative cash farm income, 33 percent, may also be questioned. Even after adjustment, about 30 percent remained in the negative class. As mentioned above, in view of the exclusion of nonmoney income and the Census of Agriculture definition of a farm, this does not appear

[10] *Consumer Incomes in the United States* (National Resources Committee, 1938), p. 25.

[11] *Income of Nonfarm Families and Individuals 1946,* Population Reports, Jan. 28, 1948, Table 1.

unreasonable. The percentage of farms in the negative net cash farm income class in California, according to a study there, would be reduced only from 31 to 24 after adjusting individual farm cash receipts to account for the income missing for individual commodities. (A similar adjustment to production expenses would cause a smaller decline in the number of farms in the negative class.)

The adjustment to include nonmoney income is relatively insecure as it was made from data outside the survey which did not provide information on the distribution of nonmoney income within each net cash income class. However, as noted, nonmoney income was relatively equally distributed by net cash income levels, and probably the assumption that it was fairly evenly distributed also within each cash income class did not cause a large error.

Appendix

A Reconciliation of Survey Income Data with BAE Official Estimates

Gross cash income as defined in the survey includes cash receipts from the sale of crops, livestock and livestock products, government agricultural payments, and income from custom work performed on other farms. Though work on other farms cannot strictly be construed as part of the income from the reporting farm, it is done with the farm's machinery, and the problem of allocating costs makes it more convenient to include the income under farm income. Income from work off the farm not done with machinery or equipment is included in nonfarm income. Production expenses comprise all expenses chargeable to the operation of the farm, including feed purchased, fertilizer, repairs to machinery, interest, taxes, etc; also, 40 percent of automobile expenses and all charges for electricity beyond an estimated normal household consumption.[1]

[1] The BAE too charged 40 percent of automobile expense to the farm business in 1946. The Department of Agriculture *Miscellaneous Publication 520*, Table 40, shows 47 percent for 1941. Whether the assignment of a constant percentage of automobile expense to farm production does not lower unrealistically the net farm income of the smaller low income farms may be questioned. However, the differences in this percentage by income levels, reported in the 1941 survey, are relatively small, suggesting that perhaps a higher percentage might be charged at the lower income levels than at the higher levels.

The Enumerative Survey and the BAE differ in two respects in deriving receipts and production expenses for individual items (App. Tables 1 and 2). First, the BAE estimates include landlords' receipts and expenditures whereas the survey does not show the landlords' shares of receipts and expenditures for individual items but includes them in its totals. Second, the BAE estimates of sales and purchases of livestock cover only interstate transactions whereas the survey includes also sales from one farmer to another within a state. Hence, the percentages for cash receipts from some crops, particularly grain, cotton, and tobacco, are understated; and those for most livestock items, particularly cattle, sheep, and lambs, overstated. If the value of intrastate livestock sales is deducted from the survey total income from livestock and livestock products, the latter represents 76 percent of the comparable BAE aggregate; for crops the survey total income is 71 percent of the BAE. Cash receipts are substantially understated relative to the BAE estimates for practically all commodities; moreover, the proportion of understatement was almost the same for all crops combined and for all livestock items combined.

Most production expenses were better represented than the receipts from individual farm products. The survey figures for expenditures on cash wages and food purchased, the two main cost items, were close to the BAE estimates. Expenditures for livestock were about twice as large because the survey included intrastate shipments. (Expenditures for livestock purchased in 1944, as reported in the Census of Agriculture, were also about double the BAE aggregate.) On many items where the percentage reported in the survey was low, such as interest, taxes, and repairs, much of the expenditure was made by the landlord, whose expenses are shown only as a total. For certain items—electricity and irrigation, spray materials and veterinary services—the considerably larger aggregates reported in the survey lead us to suspect that the BAE estimates, which are not based on very adequate data, may be too low. All in all, the survey and the BAE estimates are fairly close.

To render the income aggregates for farm operators from the survey comparable with the official BAE estimates, adjustments in addition to those mentioned above are required (App. Table 3). The BAE estimates of cash receipts from farm marketings and government payments cover those by landlords, who received rent in the form of a share of the crop and government payments, as well as by farm operators. To get total gross cash income of farm operators both items

Appendix Table 1

Gross Cash Receipts from Farming, 1946

Commodity Group	Enumerative Survey			Official Estimates [a]	Survey as % of Official Est. [b]
	Operators' share	Landlords' share	Total		
			(millions of dollars)		
Corn	581			827	70.2
Wheat	878			1,659	52.9
Other grain	367			746	49.2
Hay, straw, etc.	177			222	79.6
Tobacco	579			955	60.6
Cotton & cottonseed	980			1,462	67.1
Soybeans, peanuts	493			621	79.3
Dry beans & peas, potatoes, etc.	617			1,071	57.6
Truck crops	502			1,217	41.2
Apples	123			299	41.0
Citrus, berries, & other fruit & tree nuts	891			1,503	59.3
Nursery, greenhouse, & forest products	379			582	65.1
Total crops	6,567	1,388	7,955	11,165	71.2
Cattle	3,129			3,722	84.1
Sheep & lambs	384			362	106.0
Hogs	1,946			2,961	65.7
Chickens	730			909	80.3
Other poultry	175			305	57.4
Other livestock & livestock products	312			225	138.8
Dairy products	3,152			3,736	84.4
Eggs	896			1,479	60.6
Total livestock & products	10,723	753	11,476	13,699	83.8
Total crops & livestock & products	17,290	2,141	19,431	24,864	78.2
Government payments	429	49	478	772	61.9
Total farm cash receipts	17,719	2,190	19,909	25,636	77.7
Custom work	297				
Other income	27				
Total cash receipts [c]	18,043				

The occasional minor discrepancies in totals and percentages are due to rounding figures to the nearest million dollars.

[a] Includes landlords' share.

[b] As the landlords' share is not included for individual commodities, those percentages are understated partly because of that omission.

[c] The aggregate of commodities differs slightly from the aggregate gross cash farm income obtained from the size distribution because it was based on all farms reporting income from the specified commodity. The aggregate from the size distribution was based only on farms reporting all income items completely.

Appendix Table 2
Farm Production Expenses, 1946

Expense item	Enumerative survey	Official estimates	Survey as % of official estimate
	(millions of dollars)		
Cash wages to hired labor [a]	2,070	2,165	95.6
Feed purchases [a]	3,022	2,964	101.9
Fertilizer & lime	551	620	88.9
Seed	428	373	114.6
Livestock purchased [b]	2,380	1,261	188.8
Operation of motor vehicles	1,274	1,293	98.5
Repairs to service buildings [c]	172	462	37.2
Repairs to machinery & equipment [c]	603	1,198	50.3
Cash rent	325	352	92.5
Other expenses			
Electricity & irrigation	233	179	129.8
Veterinary & spray materials	167	105	158.9
Containers	81	164	49.5
Ginning, twine, etc.	100	107	93.7
Taxes	397	617	64.3
Interest on mortgage	168	216	77.7
Short term interest	120	209	57.5
Miscellaneous [d]	570	400	142.5
Landlords' expenses [e]	718		
Total expenses [f]	13,378		
Total expenses, with livestock sales on comparable basis	12,259	12,685	96.6

The occasional minor discrepancies in totals and percentages are due to rounding figures to the nearest million dollars.
[a] BAE official estimate adjusted to 1945 Census of Agriculture for hired labor and feed purchased.
[b] BAE official estimate represents only livestock purchased from outside the state, whereas the survey estimate includes intrastate purchases.
[c] BAE official estimates represent maintenance or depreciation.
[d] Includes expenses for machinery for hire, breeding fees, hardware, insurance, and other expenses.
[e] Landlords' production expenses were not itemized in the survey tabulation. In the official estimates they are included in the expense for each item, which probably accounts for many of the discrepancies in repairs to buildings and machinery, interest, and taxes.
[f] The aggregate of individual expense items of farm operators is slightly higher than the aggregate expense obtained from the size distribution because it is based on all farms reporting specified expenditures, whereas the size distribution is based on all farms reporting all expense items completely.

must be deducted. In computing net farm income the BAE assumes that income from custom work is offset by a comparable expense, so that for agriculture as a whole they cancel. In the survey it was found that nonfarmers do some custom work and consequently there is a substantial net expense to farm operators as a group. Moreover, offsets of this nature, when they exist, do not mean that the distribution of income is unaffected.

Appendix Table 3

Adjusting BAE Aggregates to Agree with the Survey Concepts, 1946

Gross receipts of farm operators	(millions)
Cash receipts and government payments	$25,636
Plus: Custom work	297 *
Livestock adjustment for intrastate sales	1,120 *
Minus: Share rent	2,304
Landlords' government payments	131
Total	24,618
Production expenses of farm operators	
Current operating expense (except wages)	7,631
Cash wages	2,165
Maintenance & depreciation on buildings & machinery	2,215
Taxes	614
Interest on farm mortgage	216
Cash rent	351
Plus: Livestock adjustment for intrastate purchases	1,120 *
Custom work	487 *
Minus: Expenses for operator's dwelling	394
Landlords' share of expense	833
Total	13,572
Net cash farm income of farm operators	11,046

Most of these data are published in *The Farm Income Situation*, August–September 1948, or are revisions made subsequently.
* Determined from the Enumerative Survey.

The adjusted BAE aggregate comparable in definition with that of the survey was $24.6 billion for 1946. The survey estimate was $17.8 billion, 28 percent less. The 1945 Census of Agriculture, which ascertained the value of sales by all farms in 1944, underestimated income by approximately the same percentage after similar adjustments. This might be taken as evidence that the sample used in the survey was representative of all farms in the United States despite the high rates of nonreporting and incomplete reporting mentioned above. Some further evidence on this score is yielded by comparing the distributions from the survey and from the Census of Agriculture.

To make the BAE and the survey estimates of farm production expenses comparable, the following adjustments were necessary: the landlords' share of production expenses and expenses pertaining to the farm dwelling were deducted (the BAE does not deduct expenses on the dwelling from total expenditures but adds the imputed income from occupancy of the dwelling to gross income), and intrastate purchases of livestock and custom work added. After all these adjustments, the BAE estimate of production expenses of farm opera-

tors was $13.6 billion; the survey reported $12.4 billion, about 9 percent less.

Since the discrepancy in gross receipts was larger than that in production expenses, only $5.4 billion of the net cash farm income of farm operators was covered in the survey; 51 percent less than the BAE estimate, $11.0 billion.

The percentages of income and expenses reported in the several regions are about the same (App. Table 4). The variation is no more than 5 percentage points in gross cash income and 9 percentage points in production expenses. However, production expenses were better reported in all regions.

Appendix Table 4

Percentage of BAE Estimates of Farm Operators' Income and Production Expenses Reported in Enumerative Survey, by Regions, 1946

	Northeast	North	South	West	U.S.
Percentage of					
Gross cash farm income	74	75	70	71	72
Production expenses	89	96	90	87	91
Net cash farm income	38	53	45	49	49

All adjustments to the 'raw data' were on a national basis. Some further degree of refinement would have been possible if the adjustments had been on a regional basis. However, the relative stability in the proportions of income and expense and the nature of the large adjustments that would be necessary to bring the survey results up to the official estimates indicated that this would not be worth while.

Though the BAE estimates of some income and expense items are relatively weak they are the best available now. The aggregates, especially for certain minor expense items, will doubtless be improved by the Enumerative Survey. Moreover, the survey provides the first complete estimate of the sources and amounts of nonfarm income to farm operator families, a notable improvement.

To follow the usual practice and judge the reliability of income surveys by the proportion of total income represented is not justified in the case of farm income. The number of farm operators represented must be considered also. A higher proportion of income may have been represented because farms with characteristically low incomes were omitted. The 'raw data' of the Enumerative Survey, if expanded without regard to the number of farms in each size of farm class, would have yielded a considerably higher total of income and

expense. The under- or overenumeration of farm operators cannot be offset by multiplying the average income obtained in a survey by the correct number of farm operators.

B STATISTICAL PROCEDURES FOR ADJUSTING THE DISTRIBUTIONS

1 *Adjusting Gross and Net Cash Farm Income Distributions*

In adjusting the distributions of gross and net cash farm income obtained from the survey, these two distributions were cross-tabulated. As the amounts of gross and net income implicit in this tabulation were too low (see Sec. E), BAE official estimates for 1946, adjusted to the survey concepts, were used as controls in inflating the distributions.

The relation between the two variables, gross and net cash farm income, played an integral part in the inflation. The following symbols were used in the computations:

P: production expenses of an individual farm as given in the cross-tabulation

N: net farm income of an individual farm as given in the cross-tabulation

G: gross farm income of an individual farm as given in the cross-tabulation

$\bar{P}_G$: average production expenses at a given level of gross income

The values of these variables, after inflation of the various distributions to the correct aggregates, were written with primes: P', N', G', $\bar{P}'_{G'}$. From the cross-tabulation an average production expense, $\bar{P}_G$, at each level of gross income was computed.[1] The trend line of average production expenses by level of gross income at this point was *not* a straight line. The goal was to inflate all components of farm income, G, N, and P, to their correct totals simultaneously while obtaining a trend line of average production expenses against gross income that would be a straight line.

The trend function in the cross-tabulation is

(1) $\bar{P}_G = f(G)$,

[1] We cannot account for the flattening tendency between expense and income in the original data for the United States as a whole in the lower income groups, $500–1,000 gross income. Neither the regional data nor those from the other studies considered had this tendency. Therefore, the trend of average production expenses by gross income level was smoothed in these groups. This necessitated shifting frequencies down the net income scale somewhat. It was assumed that production expenses were changed proportionately and that the distribution of frequencies in each cell was uniform.

whereas the desired trend line is

(2) $\overline{P}'_{G'} = a + bG'$.

Two conditions must be imposed to determine the values of the constants in (2). The two selected were: equation (2) must have the same intercept as equation (1); and the final trend line (2) must pass through the point of corrected averages. The first condition yielded $a = \$384$, since the survey farms having no gross income reported an average production expense of $\$384$.[2] The second condition was given by

(3) $\overline{P}' = a + b\,\overline{G}'$.

In (3) b is the only unknown. It was assumed that farms with zero gross income would not be affected by the inflation procedure. The further explanation below applies to all other farms.

For each farm, production expense was inflated by the ratio of the increase of aggregate production expenses for all farms having some gross farm income. Thus for each farm

(4) $P' = (1 + r)P$,

where $(1 + r)$ is the ratio of increase.
Equation (2) was rewritten with G' as a linear function of $\overline{P}'_{G'}$:

(5) $G' = -\dfrac{a}{b} + \dfrac{1}{b}\,\overline{P}'_{G'}$, or with (4),

(6) $G' = -\dfrac{a}{b} + \dfrac{(1 + r)}{b}\,\overline{P}_G$

At this point (1) was used in substituting for $\overline{P}_G$ its functional value in terms of the original gross income, G, in (1):

(7) $G' = -\dfrac{a}{b} + \dfrac{(1 + r)}{b}\,[f\,(G)]$.

Equation (4) expresses the change in the production expenses of each farm with the exception listed above, and equation (6) or (7) shows how the new gross income of each farm was obtained in terms of

2 The average expense, $\$384$, reported in the survey at zero gross income does not seem unreasonable. Ducoff and Hagood estimate an average expense of about $\$150$ at the low income level in 1939. Between 1939 and 1946 prices of many production items more than doubled.
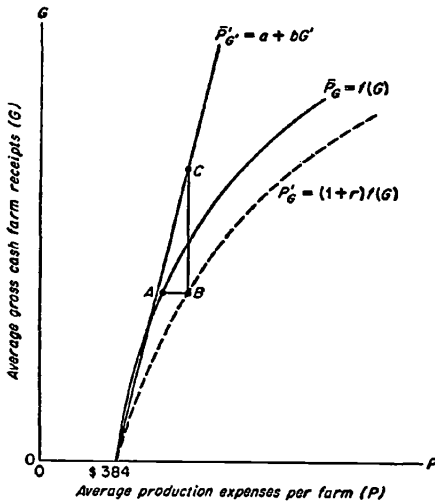
old production expenses or old gross income. Finally, as net income for a given farm is the difference between gross income and production expenses, both before and after inflation,

(8) $N = G - P$; $N' = G' - P'$.

Relating the new net income to the old gross and net incomes,

(9) $N' = -\dfrac{a}{b} + (1 + r)\left[\dfrac{f(G)}{b} - G\right] + (1 + r)N.$

The change in the position of a single farm in the cross-tabulation of gross by net income is illustrated in the diagram. For the sake of simplicity gross farm income is cross-classified by production expenses and the selected farm starts at position *A*, which is on the original trend line. The proportionate increase in production expenses moves the original trend line to the dotted position and the farm to point *B*. The straight line is the final trend line, and the movement of the farm from *B* to *C* adds the necessary gross income and at the same time straightens the dotted trend line.

Average production expenses per farm (P)

In brief, the assumptions are:
1) Farms with zero gross income have the correct distribution of production expenses and consequently of net income. The intercept

of the trend line of average production expenses on gross income remains the same.

For all other farms:

2) The missing production expenses are distributed among farms in proportion to the production expenses already reported.

3) The final trend line of average production expenses on gross income is linear, passing through the point having the corrected average production expenses and the corrected average gross income.

4) All farms having the same original gross farm income are shifted so as to have the same final gross farm income, the amount of shift determined in such a way that their average production expense remains the same (subsequent to the procedure of assumption 2).

2 *New Gross and Net Cash Farm Income Distributions*

At least 105 of the 300 cells in the cross-tabulation of net by gross income are unoccupied. By interpolation, the two margins of the cross-tabulation were subdivided into roughly 5 times as many intervals as they had previously (the gross distribution had 15, the net distribution, 20). With the new marginal frequencies as controls, each occupied cell was divided approximately into 25 cells under the assumption of independence of net and gross income in the cell (*not* uniformity of distribution). Each new cell was then assigned an average gross and net income and all frequencies in the cell were given these same two averages.

A smooth curve was then drawn through the observed trend of production expenses by gross income level, and corresponding values of $\bar{P}_G$ and G were read off. For each cell, G, N, and $\bar{P}_G$ were known from the smooth curve and, finally, by computation with formulas (7) and (9), G' and N' were obtained.

3 *Net Cash Total Income Distribution*

The net income distribution derived above was placed on the net farm income margin of a cross-tabulation of net farm income with net cash total income. Upon the assumption that the percentage distribution of net cash total income for fixed levels of net farm income was correct, a new marginal distribution was readily obtained by running the new net farm income distribution through the cross-tabulation.

Comments

HAROLD BARGER, *National Bureau of Economic Research*

The results Mr. Koffsky and Miss Lear have placed before us strikingly exemplify the distinction, often overlooked, between an occupational group's income from its occupation and its total income. In any occupational group some income is received from extraneous sources, e.g., the ownership of property not connected with the exercise of the occupation. For farm operators such extraneous income constitutes an especially large fraction of total income. Our interest in distinguishing between income from the occupation, in this case farming, and income from sources not connected with the occupation stems from the quite different, though not necessarily independent, size distributions the two types of income exhibit.

According to the authors, farm operators received from farming only about two-thirds of their cash income, and less than three-quarters of their total (money and nonmoney) income (derived from Sections G and I of their paper). Not only does nonfarm income form a sizeable slab of farm operators' total income but, as the authors show, the farm and nonfarm components are quite differently distributed. For instance, nearly one-third of all operators reported negative net cash *farm* income, but only some 8 or 9 percent reported negative net cash *total* income. Since nonmoney income from farming is rather evenly distributed, a similar contrast exists between farm income (money and non-money) and total income (money and nonmoney), the former being much more unequally distributed than the latter. Apparently the operators who are least successful agriculturally receive the largest amounts of extraneous income, and vice versa.

The extent to which part-time and gentlemen farmers, and retired members of other occupations now living chiefly on pensions are included in the distributions is undoubtedly a matter for consideration. It seems obvious that, if confined to full-time professional farmers, all the distributions would show less inequality. The authors themselves suggest that inequality

would be reduced also if proper allowance were made to exclude changes in inventory. Yet the contrast between the distribution of two sources of income received by the same individuals is too marked to be altogether obscured by any such adjustments.

These results and some remarks in Mrs. Brady's paper tempt me to offer the Conference a few reflections of a methodological nature. To judge from the discussion to this point, I think I may safely claim to be the only person in the room who has never constructed an income distribution! For what they are worth, I give you an outsider's reactions to the papers and the discussion. Despite any and all complaints that data are deficient, it is obvious that facts about the distribution of income among recipients are piling up and are being compared and summarized at a staggering rate. The contrast in this respect with the poverty of information 20, not to say 10, years ago is striking indeed. Yet it does not appear that the study of the theoretical distributions, which must underlie the observed data, has made any comparable advance. When we talk about the 'laws' governing size distributions the reference is still to such purely empirical generalizations as that which Pareto advanced many decades ago. Theorizing, I suggest, has seriously lagged behind the accumulation of facts. It is accordingly my purpose to enter a plea for more theoretical speculation about these matters.

I can indicate very briefly the type of theory I think we need. To account for the observed distribution of income among a given group of recipients, we would obviously have to start from the various primary distributions that may be supposed to influence the total. We might begin, for instance, with assumptions about the distributions of property and of earning capacity in an economy with a fairly simple institutional framework. Our present distribution of property would have to be explained on historical grounds as the cumulated result of preceding income distributions. (In such a cumulation the incidence of death taxes is an obviously relevant aspect of the institutional framework.) Our present distribution of earning capacity may be supposed, as a first approximation, to rest upon the distribution of some type

of innate 'intelligence'. It would of course not make sense to assume that the distributions of property and of earning capacity are independent. In combining them we would have to make suitable allowance for the superior opportunity to develop earning capacity that is associated with the possession of property, and for the ability to accumulate property this earning capacity confers.

It seems unlikely that either distribution, of property or of earning capacity, could be given any simple form. Each would have to be built up from simpler distributions. One obvious possibility would be to make and test hypotheses concerning the distribution of earning capacity within and among individual occupations. The earnings of farm operators (perhaps partly composed of property income) are unequal, but I would suppose that the earnings of lawyers or film actors are more so. In contrast, the incomes of some other groups—locomotive engineers or college teachers, let us say—are less unequally distributed than those of farm operators. Such differences require explanation. And here we should notice the limited applicability of theoretical distributions based purely upon probability. The distribution of legal talent, and hence the earning capacity of lawyers, may indeed be accidental. On the other hand, we must reckon with the fact that the apportionment of earned income among large groups of workers is apparently settled by institutional factors. The current distribution among federal employees, for example, is pretty nearly uniquely determined by the Classification Act and the Bureau of the Budget. I suppose it could be argued that federal salaries are ultimately fixed elsewhere—in the market for comparable talent hired by private industry—yet this contention appears to be true only within limits so broad as to minimize its helpfulness.

A theoretical distribution of earned income for the entire population, then, would have to be built up in numerous steps. The result would of course have to allow for the length of the accounting period. For a span as brief as a year the transitory component, as Friedman and Kuznets have called it, would be im-

portant in many occupations. The remaining, or permanent, component might be referred to the distributions of income recipients by life earnings as well as by age or by length of occupational history. The average life earnings in a given occupation, and the number attached to it, are presumably not accidental but depend upon familiar circumstances—the relative availability of natural resources, the character of consumer preferences, and, above all, the prevailing technology. Yet here, too, the institutional framework is a factor: let us not forget the obstacles, legal and other, to free choice of occupation. Finally, within any occupational group, the distribution of life earnings about the mean will be governed, as has been hinted, partly by the accidental distribution of talent and partly by institutional factors.

I have said enough to show that the problem is complex. Yet the speed with which empirical data are currently accumulating convinces me of the need to push theoretical investigation in the general direction I have indicated. I suspect that we now have the data to test a much wider range of theoretical assumptions than anyone has yet troubled to formulate.

A. Ross Eckler, *Bureau of the Census*

Mr. Koffsky's paper is the only one that compares census with other data in which the former are the higher. Lest someone read any significance into this relation, I would like to point out that the large differences may be primarily due to a division of effort which was predicted in advance as likely to produce widely varying results. The technical staffs of both agencies generally opposed the method of dividing the field work on farm and non-farm income in 1946.

The comparisons in Mr. Koffsky's paper pertain to a marginal group of farmers covered by both agencies. From experience we know that the size and characteristics of this fringe group are subject to extremely wide differences from survey to survey even if definitions and staff are identical. When two organizations undertake to cover this marginal group, it should not surprise anyone that their figures diverge widely.

CLARK WARBURTON, *Federal Deposit Insurance Corporation*

I would like to comment on the remarks of Mr. Koffsky and Miss Lear about farms that are primarily country residences of persons with nonfarm occupations.

In 1930 the Census of Agriculture reported 6.3 million farms, and the Census of Occupations 6.0 million farmers, a difference of less than one-third of a million, or about 5 percent of the farm operators. In 1940 the Census of Agriculture reported 6.1 million farms and farm operators, and the Census of Occupations only 5.1 million farmers and farm managers, a difference of 1.0 million, or 16 percent of the farm operators.

It seems incredible that in 1946 any significant number of genuine farms would show a negative net cash income. Consequently, it seems reasonable to assume that most of the farms in the negative income class, together with a substantial proportion of the farms with small net cash incomes, are operated by persons receiving the major part of their income from other sources. The 1946 data, if I understand Mr. Koffsky's tables correctly, suggest that the Census of 1950 is likely to show that over 2 million, perhaps 3 million, farm operators, or from 30 to 50 percent of the total number, are not farmers.

The statistics published by the Department of Agriculture for the purpose of computing the income parity ratio, as specified in the Agricultural Adjustment Act of 1938, show for 1946 an income of $620 per person on farms from farming and an income of $1,326 per person not on farms. These figures, I believe, are frequently cited to suggest, though not to measure precisely, how the income of farmers compares with that of the rest of the population. I have attempted to adjust the Department of Agriculture figures: (a) by shifting two and a quarter million farm operators from the class of farmers to the rest of the population, where they appear to belong for this kind of a comparison; (b) by assuming an average of 4 persons per farm for those shifted (in the Department of Agriculture computations the average is 4.6 persons per farm); and (c) by making the appropriate adjustments in income

received by farmers and the rest of the population on the basis of the data presented by Mr. Koffsky and Miss Lear.

The adjusted distribution data in their paper are not in a form to render this computation very precise, and the results are obviously rough approximations only. However, they indicate that the average income of the real farming class in 1946 was about $1,200, and the average income of the rest of the population about $1,000 per person. Is the difference between these figures and those published by the Department of Agriculture a statistical scandal? Seriously, I would like to suggest that the Census of Agriculture for 1950 give us separate tabulations of the farms whose operators do and do not consider farming as their principal occupation.