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Chapter Author: Neal Potter, David Rosenblatt

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PART XI

Method of Estimating the Distribution of Civilian Money Income in 1942

as given in

Civilian Spending and Saving, 1941 and 1942
(OPA Division of Research, March 1, 1943)

Outlined by

NEAL POTTER

and

DAVID ROSENBLATT

from the records of

HILDEGARDE KNEELAND

and

WILLIAM G. MADOW

under whose direction the estimates were prepared
in the

Division of Research
Office of Price Administration

The distribution of civilian money income in 1942, given in *Civilian Spending and Saving, 1941 and 1942,* was based on an inflation to 1942 levels of an adjusted 1935-36 distribution from *Consumer Incomes in the United States.*[1] As a preliminary step, the 1935-36 distribution was corrected in the light of more recent information, and adjusted to the new concept of income.

Changes in the relative distribution were estimated primarily by increasing the income of each quincentile[2] of the population separately, on the basis of (1) the source-composition (by type of payment—wages, dividends, etc.) of the income in each quincentile, and (2) the relative increase between 1935-36 and 1942 in the national aggregates of each type of income as shown by Department of Commerce estimates (Sec. III B). For example, the relatively high percentage of wages in the low income brackets together with the large percentage increase in the wage aggregate yields a relatively large increase in low incomes.

This procedure was applied to the family and single consumer groups separately.[3] Primarily for lack of data, the various economic groups, such as farmers, wage earners, business men, and rentiers, were not treated separately; changes in the relative weights of industrial groups or geographic areas were not allowed for; hence no allowances were made for differences in

[1] National Resources Committee; Washington, D. C., Government Printing Office, 1938. The reader is referred to this publication for the background material.

[2] 'Quincentile' was coined to designate a set of 5 percentiles, i.e., one of the 20 classes containing equal numbers of consumer units ranked according to income.

[3] A single consumer is an unattached person maintaining an independent economic status; i.e., a person maintaining independent living quarters or living by himself as a lodger or servant in a private house, or as a roomer in a lodging house, boarding house, or hotel. Men in labor camps and crews of vessels are also classified as single consumers, though these groups were classified as quasi-institutional in the National Resources Committee study. Most members of the group are 'single', with respect to both marital and economic status, but some married persons not living with their spouses, and persons widowed, divorced, or separated are also included.

A family is a group of two or more persons (usually, but not necessarily, related by blood, marriage, or adoption) living together as one economic unit, having a common or pooled income, and under a common roof. However, sons and daughters living with their parents are considered family members, rather than single consumers, even if they do not pool their incomes in the common family fund. (This is contrary to the treatment by the National Resources Committee, which based its classification on pooling alone.) In addition, sons and daughters away at school, or for other reasons temporarily not living at home (unless they are members of the institutional population), are classified as family members.

the patterns of the average source-composition of income for these different groups at any one income level.

The procedure took into account information on civilian population and its distribution by type of residence (urban, rural nonfarm, rural farm) and aggregate national income and its distribution by type of payment. A final rough adjustment allowed for the effects, on the relative distribution of income, of changes in the number of principal and supplementary family earners, and of increases in individual earnings due to the shifting of workers to more highly paid industries, to increases in hours and weeks of work and in basic wage rates, and to overtime payments. In short, it took account of changes in the relative distribution of wages and salaries classified by income from all sources. No attempt was made to adjust for changes in the relative size distributions of other types of income (farm income, dividends, etc.). The estimates for 1941 prepared by this method check with information for 1941 in the *Survey of Wartime Spending and Saving,* conducted by the Bureau of Labor Statistics and the Bureau of Home Economics.

The method of estimating the 1942 distribution is outlined in order to clarify the structural relation of the various steps. Some items are not explained in detail, partly to avoid obscuring the main framework of assumptions, and partly because it is felt that much of the detail might be treated in various ways with equal justification, and (in most cases, at least) without seriously changing the results.

The method may be divided into four main steps:

I Ascertaining the aggregate population among whom the income is to be distributed, and its composition by type of unit and of community

II Determining the aggregate income to be distributed, together with its composition by type of payment, and the recipient groups to which assigned

III Estimating the relative and absolute distributions of family income

IV Estimating the relative and absolute distributions of single consumer income

I Aggregate Population

A *Total population*

1 The average of quarterly estimates, published by the Bureau of the Census through 1941, projected through 1942 on the basis of current birth and death data

2 Division into:
   a Urban-rural: same proportions of total population as given in the 1940 Census, except for adjustment to allow for estimated military inductions by areas (cf. B 2)
   b Farm-nonfarm: Bureau of Agricultural Economics estimates of rural farm civilian population adjusted for greater military inductions and out-migration than estimated by BAE

B *Single consumer total*

1 Ratios of single consumer population to total population for farm, rural-nonfarm, and urban communities were computed for 1940 on the basis of Census data. Single consumers in 1940 estimated as the sum of:
   a One-person private households
   b Persons 14 years old and over not related to head of private household or not in private household

   Minus:
   c Institutional population 14 years and over and persons in the armed forces included under b

   Minus:
   d Nonrelatives 14 years and over listed as 'married, spouse present', who were assumed to be members of 'subfamilies', defined as families other than the first living in a dwelling unit (see Sec. C)

2 These ratios were applied to total population in farm, rural-nonfarm, and urban areas in 1942; the results were adjusted for estimated rates of military inductions among family members and single consumers, assumed to be proportional to the number of male single consumers and family members 16 years old and over in 1935-36 (National Resources Committee)

3 The adjusted estimates for the three types of area were added to give total single consumers in 1942

C *Family and family member totals*

1 Number of families assumed to be proportional to total population, by area (farm, rural-nonfarm, and urban). The components of the 1940 base for this estimate included:
   a Number of multi-person occupied dwelling units
   b Number of 'subfamilies', defined as families other than the first living in a dwelling unit; estimated as equal to the number of

males 14 years and over unrelated to head of household, listed as 'married, spouse present', minus those living in institutions

2 Number of family members
 a Total population
 Minus:
 b Single consumers (B)
 Minus:
 c Institutional population[4] and armed forces
  1) Armed forces (estimated to be 4,100,000)
   a) Published figures of the Bureau of Labor Statistics through November 1941
   b) Army of 10 million assumed by end of 1943
   c) Interpolation based on various current releases
  2) Civilian Conservation Corps: CCC statistics
  3) Prisons, hospitals, poorhouses, etc., based on 1940 Census
   (2) and (3) together estimated to be 1,400,000

II Aggregate Income

A *By type of payment*

Department of Commerce estimates of income payments adjusted to yield total Civilian Money Income[5]

1 Salaries and wages
 Minus:
 Military and CCC payrolls
 Imputed income[6]
 Plus:
 Odd job earnings

2 Farm entrepreneurial income
 Minus:
 Imputed income[6]

[4] Includes inmates of institutions for the aged, insane, mental or physical defectives, dependents, and for criminals or delinquents. In addition, CCC enrollees in the continental United States in 1942 are considered to be members of the institutional population for the portion of the year during which they were enrolled (the CCC program ended in July 1942).

[5] Civilian Money Income comprises net money earnings of the civilian non-institutional population, including those from work relief and from roomers and boarders and other paid work in the household; net profits from business enterprises operated or owned by the spending unit; net rents from properties, cash interest and dividends from stocks, bonds, and other property; pensions, annuities, and benefits received from the state or federal government or from industrial benefit funds; money received as direct cash relief; and money allotted to a family or single consumer by a son in a CCC camp, as well as money received by family members or single consumers dependent on men in the armed forces, either from the men themselves or from the government by virtue of their dependency. In addition, money income includes net changes in inventories of, and investment in, unincorporated business.

3 Nonfarm entrepreneurial income[6]

4 Interest and dividends

Minus:

Amounts paid to military and institutional recipients and interest not paid out to individual consumers

5 Rents and royalties

Minus:

Amounts paid military and institutional recipients

6 Other income (including Social Security payments)

Minus:

Nonmoney items (relief in kind and food stamps)

Plus:

Income from roomers and boarders

B *By type of recipient unit*

1 New aggregate incomes estimated for families and single consumers in 1935-36

a Aggregate income, all consumer units

1) Reconciliation and adjustment of 1935-36 income estimates to revised Department of Commerce estimates (the previous National Resources Committee estimate was 5 percent less than the Department of Commerce: *Consumer Incomes in the United States,* p. 35)

2) Concept of income shifted to money income base (imputed income eliminated)

b Family and single consumer aggregates estimated by revising National Resources Committee estimates

1) Several important corrections had to be made in the single consumer aggregate:

a) To correct for overestimate of high incomes
Statistics of Income data had not been sufficiently adjusted to allow for the large number of persons reporting as 'not heads of families, single, or married and not living with spouses', but who are members of economic families and who report separate incomes to avoid high surtax rates:

b) To adapt the estimates to the new concept of income (cf. II A)

c) To adapt the estimates to revised population estimates and to the new concept of single consumer, which differs from

[6] Deductions of imputed income include: (a) wage and salary payments in kind to domestic servants, hotel and restaurant employees, clergymen, agricultural laborers, etc., and value of subsistence supplied to members of the armed forces and CCC enrollees; and (b) value of food and other products produced by farm operators for home consumption. Data were not available to deduct value of withdrawals in kind included in Department of Commerce estimates of nonfarm entrepreneurial income.

the National Resources Committee concept by including men in labor camps and crews of vessels, and excluding sons and daughters living at home, even when they do not pool their incomes

d) To correct for other discrepancies (cf. IV)

2) Because of the major corrections needed, the ratio of aggregate single consumer income to aggregate family income was re-estimated on the basis of:

a) Ratios of average money incomes of single men and women in five occupational groups to family incomes and to earnings of principal family earners in corresponding occupational groups (from National Resources Committee worksheets) with downward adjustment of single consumer averages for some groups

b) Revised estimates of the occupational distribution of families and single men and women, giving a weighted ratio of average incomes of families and single consumers for all occupations combined

c) New ratio of average incomes of families and single consumers, weighted by revised population estimates, used to divide revised estimate of aggregate consumer income between the two types of consumer unit

2 Revised 1935-36 aggregates inflated to 1942 levels

a Average 1935-36 incomes by source for families and single consumers separately were based on National Resources Committee worksheets for families; estimates for single consumers made by adjusting family source data.

b For each type of consumer unit, each source of income was increased (or decreased) proportionately to the change in Department of Commerce aggregates from 1935-36 to 1942. The increases for each group were adjusted to allow for the increased number and earnings of supplementary earners in families, and for the decline in the proportion of men in the single consumer group.

c The resulting averages[7] for each income source (for families and single consumers separately) for 1942 were added to obtain over-all average incomes for each type of consumer unit in 1942

d These averages were multiplied by appropriate population figures to get aggregates for families and single consumers separately

[7] After small proportional corrections had been made to each average to yield the correct aggregates for the two types of consumer unit together, as estimated in II A.

III DISTRIBUTION OF INCOME, FAMILIES

A *Revision of 1935-36 National Resources Committee distribution*

1 Revised distribution of higher incomes ($5,000 and over) on the basis of the *Statistics of Income Supplement, 1936,* which gives the true pairing of separate returns by husband and wife, and classifies incomes on the basis of an income concept excluding capital gains and losses.

2 Elimination of imputed income for income levels under $5,000 on the basis of Tables 110-12 in *Family Expenditures in the United States* (National Resources Planning Board, June 1941), by reducing the average of each consumer income class by the percentages indicated in the table, to obtain money income class averages. New class limits were calculated in the same manner, except that the percentage reductions are interpolations on a smooth curve relating imputed income to consumer income level.

3 Adjustment for revisions in estimates of population (30,210,000 families, as against 29,400,000 estimated by the National Resources Committee), by adding the additional families proportionately at the lower levels of income (the higher levels estimated as indicated in 1)

4 The discrepancy remaining between the aggregate obtained by the use of revisions indicated in 1-3 and that estimated in II B 1b was distributed by proportional adjustments to all the class limits and averages for levels up to $5,000. The tail of the distribution was then attached to the distribution for the lower levels, and the results smoothed somewhat at the point of attachment, down to the $3,000 level.

B *Inflating 1935-36 to 1942*

1 The 1935-36 average percentage distribution of sources of income for each quincentile was calculated

- a Primary source, National Resources Committee worksheets
  - 1) The worksheets showed nonfarm earned income as a single category, and farm income, rent, dividends and interest, and other income, separately
  - 2) Nonfarm 'earnings' (from these worksheets) were separated into wage and salary income and nonfarm entrepreneurial earnings on the basis of statistics from the Minnesota Income Study (Minnesota Resources Commission, *Minnesota Incomes, 1938-1939,* Table 52)
- b *Statistics of Income* used as the basis for the source distribution of higher incomes (cf. III A)
- c Ratio of each money source (omitting imputed income) to total money income for each twentieth of the consumer income distribution based on:
  - 1) Income limits for each quincentile were calculated by interpolation. These interpolations were made on a cumulative

curve of frequencies of the NRC family consumer income distribution, showing frequencies by deciles and by conventional dollar classes. As a preliminary step, the class limits were adjusted for the new concept of income

2) The average source-composition of money income for each twentieth of the *money* income distribution was assumed to be the same as the source-composition for each corresponding twentieth of the *consumer* income distribution

d These patterns were adjusted to yield correct aggregates for each income source as estimated in II. The ratios of certain sources to total income required adjustment:

1) Nonfarm entrepreneurial income derived from the Minnesota Income Study was quite high
2) The National Resources Committee rent component was somewhat low
3) Farm entrepreneurial income was high
4) National Resources Committee sample data on dividends and interest were too low

The adjustments were arbitrary and minimum except for dividends and interest, which were reestimated, primarily on the basis of tax data, extrapolated for the lower income levels by a straight line connecting with the National Resources Committee data at the lowest income level.

2 The distribution of 1942 total income was estimated by applying increases in aggregates of each type of income from 1935-36 to 1942 to base period patterns of income sources, and adjusting

a For each quincentile the average percentage contribution of each source to total income was inflated (or deflated) by the 1935-36 to 1942 change in that receipt (as estimated by the Department of Commerce in its income payments series). The resulting raised patterns of income were added by quincentiles to obtain ratios of 1942 to 1935-36 average income for each twentieth of families. These twenty ratios were then used to draw a smooth or multiplier curve relating the 1935-36 to 1942 income increase to the base period level of money income.

b The differential effect of increased employment and earnings of supplementary and principal family earners was taken into account by arbitrary adjustment of the ratio curve obtained in step a, to give greater increases to the lowest four quincentiles of families, smaller increases to the top four, with some smoothing of the intermediate groups. These adjustments were relatively minor, affecting the total income of the lowest quincentile (involving the maximum change) by an amount approximately equal to 12 percent of the change derived from the increase in aggregate incomes in step a.

c Family money income was distributed first by twentieths by applying the appropriate multipliers from the ratio curve (a-b) to the 1935-36 quincentile averages and class limits to yield 1942 averages and class limits for corresponding quincentiles. Aggregate family income is then the sum of the products of 1942 average income for each quincentile and 5 percent of the aggregate number of families (I).

d The multiplier factors were then adjusted proportionately to yield the aggregate income of all families estimated in II.

3 The absolute distribution (i.e., by conventional class limits) of family income was derived from the proportionate distribution (2d) by using derivative Lorenz curves, which relate income-level-to-average-income ratios to cumulative percentage frequencies.[8]

a Ratios of the 1942 quincentile limits to (over-all) average 1942 income were plotted against corresponding cumulative percentage frequencies and a smooth curve (derivative Lorenz curve) drawn through the 20 points.

b Ratios of the desired absolute income class limits to average 1942 income were computed so as to determine the corresponding cumulative percentage frequencies from the derivative Lorenz curve (a).

c Cumulative percentage frequencies associated with the absolute income groups were decumulated and the decumulated percentages of families multiplied by the total number of families (I) to yield absolute frequencies by money income level.

d Average incomes for the absolute income classes were derived by means of a formula similar to that used in *Consumer Incomes in the United States* (p. 88, note 1). Slight discrepancies in aggregate income due to this formula were eliminated by the arbitrary adjustment of the means of certain income intervals.

IV DISTRIBUTION OF INCOME, SINGLE CONSUMERS

The National Resources Committee 1935-36 distributions were not used as a basis for extrapolation to a 1942 distribution (as in the case of families), partly because of inadequacies described in *Consumer Incomes in the United States* (pp. 30-1 and 67-70) and partly because of errors in adjusting tax data to get a single-consumer distribution. Those filing income tax returns as 'single, not head of family' were assumed to correspond to the 'unattached individual' or 'single consumer' category (p. 87). There are indications, however, that many rich men's offspring report property income assigned to them separately. The *Statistics of Income Supplement, 1936* (tables on sources of income by

[8] The properties of the derivative Lorenz curve are discussed by Edward Ames, A Method for Estimating the Size Distribution of a Given Aggregate Income, *Review of Economic Statistics*, XXIV: 4 (Nov. 1942), pp. 184-9. However, the estimates were prepared by a similar procedure independently developed by Maurice Liebenberg of the OPA staff.

'family status') shows higher average incomes and higher proportions of unearned income in the '$10,000 and over' class for 'singles, not heads' than for 'joint returns').

A Ratios of single consumer to family frequencies by money income level were based on:
   1 Revised estimates for single-consumer distribution, 1935-36, made to take account of new tax data (*Statistics of Income Supplement*) and to allow for the new concept of single consumer, revision to a money income basis, and to effect miscellaneous other adjustments
   2 Ratio of single consumer to family frequencies by income level computed from Minnesota Income Study

B The number of single consumers by income level in 1942 estimated by applying these ratios to the 1942 family distribution, as estimated in III

C Resulting estimate adjusted proportionately to yield correct population total, as estimated in I B

D Average income by income class estimated by formula similar to that used in *Consumer Incomes in the United States* (p. 88, note 1), and for '$10,000 and over' group by means of Pareto curve

E Resulting estimate of aggregate used as basis for small arbitrary adjustments of frequencies to yield aggregate income, as estimated in II B 2