CALCULATION OF THE COST OF UNEMPLOYMENT BENEFITS
(With Particular Reference to Ohio and Pennsylvania)

BY

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The hardships of the current depression have inevitably revived in this country proposals to apply the principles of insurance or reserves to one of depression's most serious hazards: that of unemployment. In Wisconsin an unemployment reserve law, not yet operative, has been passed. Legislative and other commissions have approved the principle of unemployment indemnity in at least seven other states; and commissioners representing the Governors of the six largest Eastern industrial states have unanimously urged on their chiefs the desirability of uniform legislation on the reserve plan. The following paper, on the calculation of the cost of unemployment benefits, discusses one aspect of the question that—sooner or later—must be decided in any thorough-going investigation. It is an aspect that, particularly in the propagandist stage of argument and discussion, is of small general interest. The vast majority both of opponents and proponents are interested in broad results, not in what both sides consider details of administration. To the present group it is quite unnecessary to present a case for another point of view, nor to elaborate the fact that rate-making is the central and vital feature of any system of true insurance. On its structure of rates or contributions will depend not only the adequacy but the equities of the entire system.

A word of explanation is in order on the definition of the subject and its delimitation to the states of Ohio and Pennsylvania. The expression, unemployment benefits, is taken to include either a plan promising a contractual right (i.e., insurance) or any systematic provision against unemployment without the element of contractual obligation (i.e., reserves). In his capacity first as the Pennsylvania representative of his Governor on the Interstate Commission on Unemployment Insurance and later as

advisor to the Pennsylvania Commission of the same title, the approach of the writer has naturally been in terms of his own state. It is evident, however, that Pennsylvania represents in the present instance not special but general conditions. It is so truly typical of the industrial states of the north and east that its conditions and the deductions one draws from them, may be taken as generally applicable to the entire industrial community. For Pennsylvania it is perfectly legitimate to read the name of any other industrial state, and we shall refer to it from time to time, without further explanation, with that understanding. Direct comparison has also been made with Ohio, for reasons that will presently appear; done originally at the request of the Pennsylvania Commission, this comparison makes still more definite our examination of rate-making for unemployment insurance or reserves.

Any actuarial problem divides itself automatically into two parts. There is first and foremost the question of the underlying data, only second the validity of the calculations based on these data. The computation of the cost of a system of unemployment benefits is not a particularly difficult one, provided the actuary is satisfied of the dependability of his raw materials. It is on this ground of statistical inadequacy that most criticism of cost calculations is based. Obviously if the fundamental data are not reliable, mere refinement or ingenuity of method cannot overcome a basic defect.

1. THE UNDERLYING STATISTICAL MATERIALS

For the calculation of unemployment benefits Pennsylvania provides meager statistical resources. For even the very crudest computations, three series of data are absolutely essential: (1) on the number of persons employed, (2) on the number and quality of persons unemployed, and (3) (if weekly and maximum benefits are related to wages) on payroll classified by the proportion of workers in each wage-group. Where, for example, in 1929 Ohio can produce (through its Department of Industrial Relations) direct data covering 97 per cent. of the total number of workers employed in manufacturing industry in that state, (measured by the Federal Census of Manufactures) Pennsyl-

vania can show direct information for only 30 per cent.[1] The discrepancy between available and complete data on the number of persons employed is even greater if the comparison is made for the entire working population. The Federal population census of April, 1930, reports for Pennsylvania 3,722,104 persons 10 years and over gainfully employed. If we assume that only 53 per cent. of these will be eligible under a scheme of unemployment benefits in Pennsylvania (this is the Ohio percentage) because of the elimination of farmers, professional people, employers and self-employers, 1,972,715 persons are to be accounted for. Yet in April, 1930, the Pennsylvania Department of Labor and Industry could account directly for only 542,141, a sample of 27 per cent.[2]

The unusual completeness of Ohio figures on total employment (as distinguished from employment in manufacturing industry) is due to the fact that the selling of workmen's compensation insurance is a monopoly of the state. A state like Pennsylvania, which permits sale of this insurance by private carriers naturally is less likely to collect complete data on unemployment as a part of its regulation of compensation.

When one looks for appropriate data on the number of persons unemployed, the material available is even more deficient. Aside from the studies made annually for Philadelphia since April, 1929, by the Department of Industrial Research of the University of Pennsylvania, there is no continuous information

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[1] It should be noted that, because of differences in classification, the Pennsylvania official figures are reported as a 42 per cent. sample of manufacturing industry in that state. If on this assumption we step up the 302,259 workers directly accounted for, Pennsylvania data represent 71 per cent. of its manufacturing workers. A revised but as yet unpublished index of employment of the Philadelphia Federal Reserve bank raises the scope of direct employment information to 52 per cent. of the total number of workers; or 93 per cent. if we extend the sample on the assumption above.

[2] Again there is a discrepancy in the size of the sample as measured in this manner and as reported in the Pennsylvania statistics. Even if we step up this figure of 542,141 to include all the workers represented according to the Pennsylvania statement, the total is still only 80 per cent. of the estimated eligibles.

The propriety of this extension of the sample is not beyond question. For example, the sample for retail trade represents only 25 per cent. of the total for its class; for wholesale trade only 12 per cent.; for construction and contracting only 3 per cent. By interpolation on other Federal and State figures an even greater sample is possible, but the results are derived, not direct.

on the rate or duration of unemployment or the number of unemployed. Excellent as these studies are within their scope, they show conditions for a single city, they represent a sample only, and three years of the four covered fall within a singularly malignant depression. Pennsylvania, it may be noted, is by no means alone in this handicap. The actuary for the Ohio Commission on Unemployment Insurance was forced to use data from the Federal population censuses as a base on which to compute the number of the unemployed and the rate of unemployment. For duration of unemployment—information vital in benefit calculations—he has had to use the 1930 Federal population census exclusively.

There are available in Pennsylvania apparently no useful data on payroll as required. The Ohio actuary again has had to adapt and interpolate: in this case his original material apparently was merely classified wage rates.

In summary, it is evident that of three basic series of data needed to compute the cost of a system of unemployment benefits, Pennsylvania is vitally lacking in all three. By comparison, Ohio is comparatively well off. Her most serious lacks are in the number and per cent. of unemployed persons, and in the duration of unemployment. Even for these data (save for duration) it has been possible for the Ohio actuary in some degree to check locally collected against Federal data, and therefore to give to his computations an aspect of reality considerably greater than to any that could be made in Pennsylvania.

2. THE METHOD OF CALCULATION

One cannot of course decide finally on the usefulness of statistical or actuarial materials apart from their specific purpose. Even for the elementary discussion in Part 1 of this paper a number of *a priori* assumptions—though they are reasonable enough—have been introduced. Final decision requires intensive, detailed analysis. The most desirable way to make this analysis would be in terms of a specific plan, preferably one intended for Pennsylvania. There is at this time no such plan, and rather than present a theoretical discussion of the statistical pros and cons of unemployment benefit calculations, the Ohio plan and the calculations supporting it will be used as a tangible

background. This procedure has the immense advantage of definiteness: not only is the Ohio unemployment insurance proposal a definite plan; it applies to conditions very similar to those of Pennsylvania, and most important of all, the calculations of the actuary, Dr. I. M. Rubinow, have been published in considerable detail. Various estimates of the cost of an unemployment benefit scheme have now appeared, but none but Ohio's fits so closely Pennsylvania conditions, no other includes an exhibit of the statistical raw material used by the actuary and a detailed statement of how this material was used.

The Ohio formula for computation of the cost of unemployment benefits follows. In the formula as such, as its author Dr. Rubinow observes, there is nothing actuarially new or radical. Whatever the questions or the criticisms that may be raised, they turn without exception on the materials that are used to fill in the formula. (P. 224) [3]

$$\frac{U \times B \times (I - W - L) \times (I - M)}{E}$$

in which:

$U =$ Rate of unemployment (per cent. unemployed workers of total working force)

$B =$ Rate of benefit (per cent. of wage loss covered by the benefit schedule)

$I =$ Total quantity of unemployment, or unity

$W =$ Discount for reduction in cost due to the waiting period

$L =$ Discount for reduction in cost due to the limitation in the number of benefit-weeks per year

$M =$ Discount for reduction in cost due to the limitation in dollar benefits per week.

Comments on the application of this formula to Ohio statistics may be considered under three heads: (1) those bearing on sections of the formula about which there is no question or at least no important question; (2) those bearing on questionable sections in which the result of inaccuracy is toward redundancy or safety; finally (3) those on sections not only questionable but producing deficient premiums.

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[3] All page references are in Part II. Report of the Ohio Commission on Unemployment Insurance, January, 1933.

(1) *Sections of the Ohio Formula which appear satisfactory.*— We can raise no serious question about these components of the Ohio formula:[4]

(a) *Number of Unemployed and Rate of Unemployment.* Dr. Rubinow has taken as his average rate of unemployment 13.5 per cent., based on Ohio and Federal data for the years 1923-1931. This includes a full business swing, and while no one may predict even the near future of this changing world, this estimate appears to be a fair one. (The Paul Douglas data, running from 1897 to 1926, show an average of only 8 per cent. for the entire country and there is apparently no up-trend against which the actuary must guard.) It may be noted in passing that while the materials out of which the rate of unemployment has been calculated are partly of Federal origin, and are also to a considerable degree derived by interpolation, the relatively high level of unemployment assumed would appear to meet any reasonable criticism of this part of the calculation.[5]

(b) *Rate of Benefit.* No question; 50 per cent. maximum is fixed in the plan.

(c) I. No question.

(d) M. Ohio is very fortunate in having available exceptionally complete payroll data, arranged by the number of

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[4] The allowance for expense loading, though it is not strictly a part of the rate-formula, is a part of the question of cost. The Ohio allowance of approximately 4 per cent. of premium income is apparently reasonable. As Dr. Rubinow points out, Ohio's conditions will determine Ohio's cost; in the meantime the German and British Unemployment Insurance Funds and the Ohio Workmen's Compensation Fund must serve as bases by analogy.

[5] The estimate of the average number of unemployed is made by deducting from the estimated number of persons eligible for benefit the number of persons employed. This method is indirect, and of course much less satisfactory than a direct count. Even to arrive at this result, the actuary has had to insert no less than three interpolations in his computations. The steps are: (1) The base is taken as the annual population 10 years and over (interpolated between 1920 and 1930) ; (2) application of the annual percentages of the population 10 years and over gainfully employed (interpolated between 1920 and 1930) ; (3) the result equals the number of workers gainfully employed; (4) application of the percentage of eligible workers to workers gainfully employed (the 1930 Federal Census average assumed constant for all years) ; (5) the result equals the number of workers eligible for benefit; (6) deduction of the annual number of workers employed (Ohio data) ; (7) the result equals the estimated annual number of workers unemployed. (7) divided by (5) equals the annual rate of unemployment. (See Table IV, p. 211.)

workers in 11 wage-groups. Even so it appears that inter-
polations have been made since the basic data are "tabula-
tions . . . showing the distribution of persons by *classified
rates of wages."* (p. 220, italics mine.)   Given total pay-
roll for the state, it is a simple operation to check the per-
centage relation between full benefits at ½ of wages and
benefits paid at ½ of wages but subject to a $15 or $17.50
weekly maximum.

(2) *Sections of the Formula which appear to produce re-
dundant results.*—The method of calculating the effect on cost
of the waiting period and of the limitation on number of benefit-
weeks may be questioned; as will appear this is not a serious
question because the net effect of the calculations is apparently
toward redundancy or excess premiums.   The entire calculation
of $(I - W - L)$ is based on Table VI in the Ohio Commission's
Report, that classifying unemployed persons by duration of
unemployment in number of weeks.   Passing over entirely the
fact that these duration figures are for a single point in time
(April, 1930) and do not represent a running record of Ohio's
experience; that extensive interpolation has been necessary to
convert the broad duration classes of the Federal census into
weekly duration classes; and finally that the table includes dura-
tion data for occupations excluded from Ohio benefits, we note
three considerable inaccuracies in calculation.

The first two (and the least important) arise from the fact that
the duration statistics employed are from a census, an observa-
tion of the statistical scene *at a given time,* and do not show
duration frequencies *over a period.*   To take a snapshot on a
given day in April, 1930, is useful but the picture lacks its third
dimension: that of breadth.   What is needed is an annual exhibit
showing (1) the number of weeks lost over a year, by duration-
groups, (2) the ratio between the number of persons out of work
on any given day and the total number of persons claiming bene-
fits during a year, and (3) the ratio between the number of per-
sons out of work on any given day and the total number of dif-
ferent persons claiming such benefits.

To illustrate, Table VI (whose duration data are for a single
day in 1930) when interpolated by the writer produces a total
of only 2,985,443 weeks lost from unemployment.   Even if we

assume the low average of 40 weeks employment for 1930, this gives over 55,000,000 weeks for which Ohio's workers were employed. That is, a true duration table should produce (for 1930, with 1,390,400 eligibles and a 17.3 per cent. unemployment rate) a total loss of 9,621,568 weeks. The duration-table made from a census has quite evidently left out over two-thirds of the weeks lost. What will be the average ratio between the number of claimants on a given day and the total number of claims for a year cannot be predicted. British experience shows as high as 6 times the number of claims on the annual as compared with the census basis; and an average of 2.3 to 3.4 annual spells of unemployment per insured person.

The net effect of this use of census data on duration is to render cost estimates deficient. The effect of introducing the additional claimants which Dr. Rubinow leaves out (as tested by sample checks), is almost certainly to make his estimates too low. This is because most of the remainder of the claims if included would fall comfortably within the shorter durations and would be covered by the plan. On the other hand, the effect of introducing the multiple claimants which also are left out is in the opposite direction. This is because Dr. Rubinow assumes no reductions in cost due to the annual limit on benefits per beneficiary. In the absence of annual data such as we have described, one cannot state precisely the net effect of using census data deficient in these opposite directions. The net result would appear to be a deficiency of unknown quantity. In any event, before coming to a final decision on the adequacy of the value $(I - W - L)$, one other very important factor must be weighed.

The calculations based on Table VI include a third factor, one more important than either we have discussed above, which tends greatly toward redundancy. Not forgetting the true nature of Table VI (no rationalizing can change the fact that it represents a simple count on a single day), and assuming for the moment that it is an annual record, its use in the Ohio calculations subjects it to another criticism. As we have seen, the heart of the Ohio formula is $(I - W - L)$, which represents that part of unemployment remaining to be compensated after the important factors of waiting period and the limitation on benefit-weeks have been deducted. It is precisely in this value that there

occurs a curious shift in reasoning from a concept of unemployment as a number of weeks (I) to one as the number of men unemployed (W, L). *The computations of W and L values are all made on the number of persons unemployed, not on the number of weeks lost.* The result is a considerable overstatement of compensable unemployment, because *from the total of all unemployment in weeks are deducted W and L values which are in number of workers.* Because most unemployment falls within the lesser durations, almost without exception the percentage of unemployed persons in a benefit period is greater than the percentage of total unemployment in weeks that falls within the same period. Taking this cause of redundancy alone, sample tests by the writer based on a computation of weeks lost instead of men unemployed indicate that Dr. Rubinow's calculations on W and L values are redundant by quantities ranging from zero to 21 per cent. This redundancy, it should be noted, is quite apart from his use of census data.

Precisely what the net effect of these three causes of inaccuracy will be it is not possible to say. It would appear safe to assume that the marked over-estimate in the W and L values resulting from the confusion of compensable men and compensable weeks will be more than ample to offset whatever underestimate will develop in these same values due to the use of census instead of annual duration data.

3. *Sections of the Formula which appear to produce deficient results.*—The single point at which the Ohio formula might be questioned as deficient is in the treatment of the cost of part-time unemployment. No separate calculations are made; it is simply stated (p. 214) that all partial unemployment figures are included in the basic calculations. As we have seen, the process of estimating the number of unemployed consists of deducting from eligible workers persons reported employed to the Ohio Department of Industrial Relations. If all persons on Ohio payrolls are reported as employed from time to time, even though actually on part-time, the inevitable result is an understatement of the number of unemployed entitled to benefit, and of the true rate of unemployment. Just what the relation will be between the rates for full-time and part-time unemployment is another part of benefit calculations that must wait upon actual experi-

ence. Sample tests made by the writer on other data indicate that part-time unemployment, depending on the degree of business depression, ranges (in percentage equivalents of full-time unemployment) from less than one-fifth of the full-time rate to actually more than the full-time rate itself. Omission of calculation of part-time unemployment will thus introduce a noticeable element of deficiency into the rate structure.

SUMMARY

Even he who has run through this paper has, we hope, been able to notice quite clearly the obstacles to a sound computation of a system of unemployment benefits for Pennsylvania or any other state. The difficulty is not one of technique, but of material; and the actuarial-statistical field is distinctly not one in which all obstacles may be triumphantly borne down by brilliant improvisation. The very first step in the Ohio cost computation is the comparison of a known and direct quantity (Ohio's employed) with an inferred quantity (Federal census data on Ohio's total labor force, interpolated and improvised). This is not an ideal situation certainly, yet in Pennsylvania we are still more badly off: we could devise the second factor but the first simply is not. (Pennsylvania's workmen's compensation records are not complete; annual reports from the Pennsylvania Department of Internal Affairs pertain principally to manufacturing industries.) To compare a guess with an inference is not permissible. Still more important is the required information on duration, so vital and so universally unavailable. Even the required data on payroll are not available.

Given these hindrances one must conclude that an unqualified calculation of the cost of unemployment benefits in Pennsylvania is at present not feasible. It is significant to note that while the Ohio plan has been titled "insurance" (and perhaps is insurance, depending on definition), it lacks that quality of certainty that is the first characteristic of the modern insurance institution. The Ohio Commission recognizes this lack of certainty: it leaves open in its plan the possibility both of emergency borrowing and of downward revision of benefits. This gesture of discretion has for other states at least one important implication. It is quite evidently not possible to give a promise of contractual unemploy-

ment benefits even in the state in which the statistical background is most favorable.

It has been argued in certain quarters that in this lack of certainty unemployment insurance is not different from any other; that no risk, including that underwritten by the life companies, is an absolute certainty; that all insurance plans are subject to revision; that when costs are too high for current premiums to bear, premiums are increased. But this is to argue that all risks are equally uncertain. Even with the statistics and experience of 20 years of operation to guide their calculations, the making of rates for workmen's compensation remains the great unsolved problem of casualty actuaries. Even allowing for the competitive and political reasons that cause some of their troubles (the latter at least would be a part also of unemployment rate-making), how much greater would be the difficulties of rate-making for an insurance with neither precedent nor experience to guide it?

One final comment. To make a statement of obstacles is not at all to decide permanently against insurance, nor against the collection of adequate statistical facilities, cooperative action of various kinds against unemployment, or even compulsory reserves. Actuarially, the ideal approach to the problem would consist of a system of compulsory unemployment reserves, providing standard premiums, benefits and administration, and stopping short of insurance only by the omission of contractual obligation. Such a system would serve as the perfect basis for the collection of data under actual administration, and could, whenever and if ever it were considered desirable, be converted gradually or en bloc into a system of insurance. If there is ever to be a sound actuarial basis for unemployment benefits, these three factors, statistics, cooperation and reserves, particularly the last, are best calculated to produce it.