III

TOTAL PUBLIC AND PRIVATE CONSTRUCTION IN THE UNITED STATES, 1923–1933: DETAILED COMPARISONS OF DIFFERENT ESTIMATES[1]

Estimates of Total Public and Private Construction

Two comprehensive estimates are available of the total volume of public works of all types performed throughout the country during each year of the last decade or so, and three of the total volume of all construction work, public and private. All these estimates are made by widely different methods and to a considerable extent on the basis of different original data. They are all, of necessity, by reason of the nature of the material available, subject to a wide margin of error. The procedure employed for each estimate must therefore be described in some detail both in order that the elements of uncertainty in these figures be fully recognized and to allow intelligent comparison of the various estimates. The estimates are as follows:

Public Construction

a. By the author, on the basis of figures of contracts awarded and, for roadbuilding, of actual expenditures. This estimate was made originally in 1929 for the report of the National Bureau of Economic Research, *Planning*

[1] Readers who are not interested in the details of the methods by which these estimates were made may pass directly to the next chapter.

and Control of Public Works, and has been revised and brought up to date for the present study.

b. By Corrington Gill, for the Federal Employment Stabilization Board, when in the service of the Board in the capacity of Chief Economist. This estimate was made mainly on the basis of actual figures of expenditures. It was made public in a release of the Stabilization Board but without detailed description of the method of estimation employed, and has only very recently appeared in print.[2]

Total Public and Private Construction

a. By the author, on the basis of contracts awarded for public and private construction, and of expenditures for railroads, utilities and roadbuilding. This estimate is made by methods very different in certain important respects from the author's original estimate which first appeared in *Planning and Control of Public Works* and gives results markedly different from the latter.

b. By Corrington Gill, on the basis both of contracts awarded and actual expenditures.

c. By Simon Kuznets, of the National Bureau of Economic Research, on the basis chiefly of figures of the volume of construction materials produced each year.

TOTAL PUBLIC CONSTRUCTION

a. The author's estimates

The respective merits and defects of the available sources of information concerning expenditures on public construction are examined in detail in *Planning and Control of Pub-*

[2] In *Bulletin 52* of the National Bureau of Economic Research, November 15, 1934. A critical discussion of the sources of construction data in general appears in an article by Mr. Gill, Construction Statistics, in the *American Statistical Association Journal,* March 1933. The author wishes to express appreciation of Mr. Gill's helpfulness in making available his material and explaining its sources and composition.

lic Works.[3] The conclusion there reached is that the most satisfactory and inclusive original data available are the Dodge statistics of reported contracts awarded. These are, however, as already pointed out, subject to certain shortcomings for purposes of this study. They do not cover the entire country and, by reason of the difficulty of including low-cost work, they have until recently omitted most new construction and remodeling and alteration projects under a certain minimum value, particularly in rural areas. This minimum valuation of contracts included, which through 1927 was $5,000, was lowered to $2,000 in 1930 and 1931, $1,000 in 1932, and $100–500 in 1933. Thus Dodge data have recently been including contracts for alterations and repairs previously omitted. Officials of the Dodge Corporation state that the broadened base does not seriously affect the comparability of their series over the entire period of years covered by the data. However, in this study, allowance has been made for the change in the estimates of total public construction. Another recent change in the composition of these figures is the inclusion since 1930 of pipe lines, previously omitted. The subtraction of the amounts for this item, however, from figures for 1930 onwards makes the latter comparable with those of earlier years. This has been done in the tables of this study. Estimates of the total volume of construction throughout the entire country, inclusive of the large volume of small items omitted in the reported figures, were made yearly by the Dodge Corporation itself until 1931, but they did not distinguish public from private construction or admit of their separation. Moreover, all Dodge figures, reported and estimated, greatly undervalue the total volume of roadbuilding work through failure to include small reconstruction and maintenance

[3] Pp. 115–22; see also Corrington Gill, *loc. cit.*

expenditures made by means of force accounts on streets and highways, which aggregate a very large amount. The estimates of the total volume of public construction of all varieties throughout the country, presented in Table 7, are therefore based in part on Dodge statistics of contracts awarded and partly on other data which allow these defects to be rectified. Dodge reported construction figures for 37 states are corrected to cover the entire country, to include items omitted, and to give proper weight to highway and bridge construction and maintenance expenditures. The steps taken in reaching the final estimates presented in Table 7 are as follows:

Line 1: the most-inclusive Dodge series of recorded figures for construction contracts awarded.
Line 2: the estimate for the entire country on the basis largely of the figures, in line 1, for 37 states.
Line 3: calculated from the detailed, classified tabulations of the figures of line 1, by the exclusion of all private construction items (see Ch. II, note 12).
Line 4: calculated by raising figures of line 3 by the percentage that figures of line 2 are of figures of line 1 (except in 1932, when the figure is raised by a somewhat larger percentage); the assumption made being that public construction in the 11 unreported states is normally roughly the same proportion of total construction as it is in the 37 states covered by the Dodge figures. (In 1932 the proportion was probably larger in the 11 western states by reason of certain large Federal projects.)
Line 5: as all figures in lines 1–4 omit most new buildings under the minimum valuation mentioned above and practically all remodeling and alteration work in rural districts, an estimate for these items is made in line 5 by the same method as used by the Dodge Corporation until 1930 in making its yearly estimate for total low-cost new and alteration projects.
Line 6: this column would give a satisfactory total public construction estimate did not the Dodge figures greatly undervalue

TABLE 7

ESTIMATED TOTAL PUBLIC CONSTRUCTION, UNITED STATES, 1923–1932 [1]

(in millions)

TYPE	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*
1. Total construction, 37 states [2]	$3,990	$4,479	$6,006	$6,381	$6,303	$6,628	$5,751	$4,336	$3,063	$1,348
2. Total construction, U. S.[3]	4,768	5,237	6,724	7,062	7,022	7,295	6,421	4,838	3,523	1,550
3. Public construction, 37 states [2]	1,029	1,165	1,423	1,517	1,772	1,840	1,770	1,814	1,497	819
4. Public construction contracts above minimum coverage, U. S.[3]	1,225	1,363	1,594	1,684	1,967	2,204	1,982	2,032	1,722	1,023
5. Public construction contracts below minimum coverage plus reconstruction and remodeling, U. S.[4]	404	436	462	438	472	466	456	325	276	123
6. Total public construction, U. S.[5]	1,629	1,799	2,056	2,122	2,439	2,490	2,438	2,357	1,997	1,146
7. Streets, roads and bridges, U. S.[3]	497	493	575	701	856	884	821	885	742	451
8. Total public construction, minus streets, roads and bridges	1,132	1,306	1,481	1,421	1,583	1,606	1,617	1,472	1,255	696
9. Rural roads and bridges, construction and maintenance [6]	784	934	968	956	1,066	1,237	1,248	1,486	1,301	1,015
10. City streets and bridges, construction and maintenance [7]	207	412	363	597	1,057	788	690	674	511	293
11. Estimate of total public construction, U. S.[8]	$2,123	$2,652	$2,812	$2,974	$3,706	$3,631	$3,555	$3,632	$3,067	$2,004

[1] These computations are based on revised figures in many instances. This explains why they differ from those of Table 42 of *Planning and Control of Public Works*. The method of estimating has also been revised at several points.

[2] Source, F. W. Dodge Corporation. In 1923 and 1924 the figures cover 36 states. Pipe lines excluded in 1930, 1931 and 1932 to make figures comparable with previous years.

[3] Estimates of the F. W. Dodge Corporation or on basis of their figures.

[4] Estimated by same method as employed by the F. W. Dodge Corporation.

[5] Sum of items 4 and 5.

[6] Figures of U. S. Dept. of Agriculture, Bureau of Public Roads. Figures for 1931 and 1932 partly estimated. (Expenditures for rights-of-way are included to some extent.)

[7] Estimated on basis of F. W. Dodge Corporation figures for 14 cities (18 cities in 1931 and 1932).

[8] Sum of items 8, 9 and 10. Bureau of Public Roads' figures for rural roads and bridges, construction and maintenance, have been substituted for the Dodge figures of streets, roads and bridges because they are more inclusive.

total road and bridge expenditures by the omission of maintenance work and the huge volume, in the aggregate, of minor repair, reconstruction and construction items in this class.
Line 7: the estimated amounts which represented this type of work (road and bridge expenditures) in the totals of line 6.
Line 8: the road and bridge items (estimated on the basis of Dodge figures) are taken out of the totals for public construction of line 6 (similarly estimated on the basis of Dodge figures). For them are substituted the more comprehensive figures for this class of expenditure presented in lines 9 and 10.
Line 9: Bureau of Public Roads' figures for construction and maintenance of rural roads and bridges.
Line 10: estimates of the expenditures on construction and maintenance of city streets and bridges throughout the country, made on the basis of the sample of such expenditures by 14 cities (18 in 1931 and 1932) covered by the Dodge records. The cities included are those of Tables 43 and 44, Ch. VII. (The estimates allow for maintenance, repair and reconstruction work.)
Line 11: the sum of lines 8–10. This should give a truer estimate of the aggregate volume of public construction of all types throughout the country than has been made hitherto. It is not possible to carry these estimates back before 1923, since comparable Bureau of Public Roads' figures are not available for earlier years, and because only 27 states are covered by the Dodge figures prior to 1923.

b. Corrington Gill's estimates

These estimates, shown in Table 8, are composed of the following items:

1. Federal outlays for new construction, repairs and alterations, including aid to states for cooperative highway construction. Federal expenditures for the District of Columbia are omitted, as expenditures of the Office of the Architect of the Capitol are not available for 1920–28. Figures are readjusted from basis of fiscal to calendar years by taking averages of succeeding years.

TABLE 8

ESTIMATED TOTAL PUBLIC CONSTRUCTION, UNITED STATES, 1925–1933 [1]

Estimates of Federal Employment Stabilization Board

YEAR	AMOUNT IN MILLIONS					PERCENTAGE DISTRIBUTION				
	CITIES	COUNTIES	STATES [2]	FEDERAL [3]	TOTAL	CITIES	COUNTIES	STATES	FEDERAL	TOTAL
1925	$1,283	$778	$411	$245	$2,717	47	29	15	9	100
1926	1,302	676	404	230	2,612	50	26	16	9	100
1927	1,482	885	438	240	3,045	49	29	14	8	100
1928	1,422	829	502	270	3,023	47	27	17	9	100
1929	1,339	556	576	305	2,776	48	20	21	11	100
1930	1,495	709	706	390	3,300	45	22	21	12	100
1931	1,302	329	786	510	2,927	44	11	27	18	100
1932	797	137	551	580	2,065	38	7	27	28	100
1933	400	100	300	500	1,300	31	8	23	38	100

Source: Federal Employment Stabilization Board

[1] Basic figures are those of Table 12. Figures for 1933 partly estimated.

[2] Excluding Federal aid.

[3] Including Federal aid, excluding District of Columbia.

2. State, city, county and other local construction expenditures, including costs of land acquisition and excluding expenditures for maintenance, repairs and alterations. Figures are in the main for calendar years but the timing factor introduced by differences in the period of the fiscal year in different localities is not eliminated, nor is allowance made for differences in accounting methods.

The magnitude of the two elements mentioned above which these non-Federal public expenditures respectively include and omit may be judged from the following proportions which were found in a study by Mr. Gill of expenditures in New York City and other cities of New York State over a period of years: cost of land, furniture, movable equipment, etc. comprised 16–18 per cent, repairs and alterations 28–35 per cent, of total capital outlays. The inclusion of land costs and the omission of repairs and alterations probably make the figures obtained for these non-Federal public expenditures somewhat lower than their true amount, and exaggerate their fluctuation. They also somewhat impair their accuracy as measures of expenditures on *construction* in the strict sense.

State outlay figures are obtained from *Financial Statistics of States* (United States Bureau of the Census). Receipts of the states from subventions and grants by the United States government for highway construction are deducted, to avoid duplication.

Estimates of expenditures by cities, towns and villages are based on the figures, secured from *Financial Statistics of Cities,* of expenditures made by cities having a population of 30,000 and over (247 in number in 1925; 250, 1926–29; 310, 1930 and 1931) and on the relationship of net additions to debt for all cities to the increase in fixed or funded indebtedness of the selected cities. Expenditures for New York City Rapid Transit construction, excluding land, obtained from Comptroller's reports, are added.

For 1925–29 inclusive, the outlays for the 250 cities used as the basic sample in the computation are estimated to have been 77 per cent of outlays of all cities, towns and villages through-

TABLE 9

ESTIMATED TOTAL CONSTRUCTION OUTLAYS BY CITIES AND STATES, UNITED STATES, 1925–1932[1]

(in thousands)

YEAR	NUMBER OF CITIES	OUTLAYS OF CITIES OVER 30,000[2]	OUTLAYS OF ALL CITIES, TOWNS AND VILLAGES	TOTAL OUTLAYS INCLUDING N. Y. C. RAPID TRANSIT EXPENDITURES[3]	OUTLAYS OF STATE GOVERNMENTS[4]
1925	247	$973,822	$1,246,704[5]	$1,283,283	$410,939
1926	250	963,443	1,251,225[5]	1,301,999	404,162
1927	250	1,091,960	1,418,130[6]	1,482,485	437,838
1928	250	1,036,635	1,346,2?/9[5]	1,422,269	502,321
1929	250	967,065	1,255,929[6]	1,339,260	575,997
1930	310	1,115,220	1,394,025[6]	1,495,053	705,720
1931	310	966,895	1,208,619[7]	1,302,111	786,496
1932	[8]	593,000[8]	741,250[8]	796,849	551,000

Source: Federal Employment Stabilization Board

[1] Including cost of land, excluding maintenance. No allowance made in respect of timing for differences in accounting methods in different localities, but most figures are for calendar years. Estimates based mainly on figures of *Financial Statistics of Cities* of 30,000 and over (U. S. Bureau of Census).

[2] *Financial Statistics of Cities.*

[3] Expenditures for *all* rapid transit construction, but excluding land (figures obtained from Comptroller's reports).

[4] *Financial Statistics of States;* figures are for state outlays minus receipts from subventions and grants for highways by the Federal government.

[5] For 1925–29 inclusive the outlays for the cities covered are estimated to be 77 per cent of all cities, towns and villages, based on population and estimate of construction work performed in cities *under* 30,000.

[6] In 1930 the outlays for cities over 30,000 are estimated to be 80 per cent of outlays of *all* cities, towns and villages.

[7] In 1931 estimates of outlays are based on the decline from 1930 as determined from a sample study based on 81 cities.

[8] In 1932 minimum estimate of $400,000,000 for cities over 30,000 is based on net bond sales (municipal bond sales for cities, towns and villages plus 20 urban counties minus New York City). Maximum estimate of $575,000,000 is based on weighted average of bond sales (55 per cent) and tax collections (45 per cent) based on a study of 51 cities from the *National Municipal Review.* Average of these two methods would be $485,000,000, plus $108,000,000 for New York City (sum of monthly reports to Federal Employment Stabilization Board from New York City Comptroller's office) equalling $593,000,000.

out the country on the basis of population and the estimated construction work performed in cities *under* 30,000. In 1930, outlays for cities over 30,000 are estimated to have been 80 per cent of the outlays of all cities, towns and villages. Estimates of outlays in 1931 are based on the decline from 1930 as determined by a sample study based on 81 cities. In 1932 a minimum estimate of $400,000,000 for cities over 30,000 is based on net bond sales (municipal bond sales for cities, towns and

villages, plus 20 urban counties minus New York City). A maximum estimate of $575,000,000 is based on a weighted average of bond sales (weight, 55 per cent) and tax collections (45 per cent) based on a study of 51 cities from the *National Municipal Review*. The average of these two methods would be $485,000,000. Adding $108,000,000 for New York City (the sum of monthly reports to the Stabilization Board from New York City Comptroller's office) $593,000,000 is obtained. The detailed figures for state and city construction outlays since 1925 are presented in Table 9.

County and school district expenditures are estimated on a similar basis to those of states and cities described above.

COMPARISON OF THE ESTIMATES OF TOTAL PUBLIC CONSTRUCTION

In view of the great differences in both the basic data and the methods of procedure employed in reaching the two estimates of total public construction described above, the discrepancy between them is not as large as might perhaps be expected. Except in the last year covered by both series, the author's estimates run consistently higher, and the difference in individual years ranges from 22 to 3 per cent. For the period 1925–32 as a whole it is 11 or 12 per cent. This suggests that the margin of error to which both estimates are subject is not so great as fatally to impair their value. Brief enumeration of their relative merits and defects should be useful.

a. The author's estimate is subject to the following shortcomings: (1) The uncertain accuracy of the estimates by means of which the Dodge data for 37 states are extended to cover the entire country and to include low-cost projects under the minimum valuation recorded in these data. (2) The combination, without allowance for time-lag, of expenditures for road-building work with contracts awarded for all other types of construction. No sufficiently reliable figure of the average time-lag between contracts awarded and actual expenditures for public construction as a whole is obtainable for application as a correction factor.

Conceptually the best solution of the timing difficulty in measures of construction would be to take into account only the actual volume of work accomplished during the period that the project in question is under construction, regardless of degree of completion. Figures showing volume as of the time of completion obviously have a lag in reflecting current activity. On the other hand, a lead is present in figures of contracts awarded, when used for this purpose. To the extent that these estimates are based on Dodge figures of contracts awarded they contain some lead as measures of the current rate of construction activity. This factor is unlikely to affect seriously the value of the estimates as revealing the general trend but introduces an element of uncertainty as to the exact timing of peaks and troughs. This factor applies equally to the author's and to Corrington Gill's estimates of total construction, but not to the latter's estimate of public construction, nor to Simon Kuznets' estimate of total construction. Were reliable figures available both of the average time-lag between the award of contracts and the initiation of projects and also of the average period during which projects are under construction, this defect could be remedied by the use of monthly data recomputed to allow for the lead present in contract data, but no such figures exist which could be used as a correction factor for public construction as a whole with any degree of assurance in their accuracy.

b. A major weakness of Corrington Gill's estimates is their reliance for local expenditures upon the figures of outlays given in *Financial Statistics of States and Cities.* These include land-acquisition costs and expenditures on such items as furniture and movable equipment. Conversely, they exclude most maintenance expenditures and sometimes omit construction expenditures financed from bond issues.[4] These two factors may roughly offset each other over a period of years but are unlikely to do so regularly each year. Another element of uncertainty is the accuracy of the estimates by means of which the expenditures of

[4] For a detailed examination of these and other defects of the figures when used as a measure of the volume of construction of local agencies, see *Planning and Control of Public Works,* pp. 116–8.

cities having a population of over 30,000 are extended to cover all city, town and village expenditures throughout the country. A merit of the estimate is the breakdown by governmental agencies which it makes possible.

Allocation of Public Construction Expenditures by Governmental Agency

Table 8 also gives the percentage distribution by type of governmental agency of the estimated total public construction expenditures there shown. During the normal years 1925–30 almost half the total is represented by city outlays, between 20 and 29 per cent by county, and between 14 and 21 per cent by the state governments, while the Federal government accounted for only between 9 and 12 per cent. During the depression, however, both because of the decline in local expenditures and the concurrent increase in Federal outlays, these relative proportions are greatly changed. The percentage share of the state governments between 1930 and 1933 declines somewhat, that of the cities by about one-third, and that of the counties by about two-thirds, while the percentage represented by Federal expenditures is more than trebled, constituting little short of two-fifths of the total.

For the single year 1932 another computation of the distribution of total public construction by type of governmental agency is available. The tabulation shows the publicly-financed construction contracts awarded in the 37 eastern states covered by Dodge figures classified in this way.[5]

AGENCY	AMOUNT *(in thousands)*	PERCENTAGE OF TOTAL
Federal	$207,879	27.1
State	354,752	46.2
County and township	60,901	7.9
Municipal	144,135	18.8
Total publicly financed	$767,667	100.0

Source: F. W. Dodge Corporation, Statistical Division

[5] The discrepancy between this figure and the one given in Table 7, line 3, is due to the fact that the coverage of the two compilations is not identical; see Dodge Statistical Research Service, Special Bulletin, March 31, 1933.

Comparison with the figures of Table 8 for the same year shows virtually the same proportion for the Federal government and for counties and townships. On the other hand it shows a much smaller percentage for municipalities and a much larger percentage for state governments. The discrepancy is probably explained by the following factors: the difference in the coverage of the figures, since the proportion of publicly-financed local projects is likely to have been substantially larger in the 11 western states during recent years than in the 37 eastern states included; the difference in the nature of the figures, which in one case are for actual expenditures, in the other for contracts awarded; a possible difference in the composition of the figures, owing to the necessity of making a somewhat arbitrary decision concerning the proper assignment of 'townships'; the inclusion in the contract figures of highway construction performed by states with Federal-aid funds, which are excluded from the expenditure figures; the omission from the contract figures of the large volume of small road construction expenditures made through force accounts; and finally, the inclusion in the expenditure figures of land-acquisition costs excluded in those of contracts. Though the last two factors mentioned would affect the figures of both municipalities and states, they might do so in different degree.

Estimated Construction Expenditures of Railroads and Public Utilities

It is interesting to know how the construction expenditures of privately-financed public utilities compare with the capital outlays of governmental agencies. Table 10 presents the estimated total construction and maintenance expenditures of railroads and public utilities, 1923–32. In contrast to the private construction estimates, these estimates are open to no criticism on the score of timing or incompleteness. They include expenditures on new construction and maintenance by railroads, electric power companies, telephone companies and electric railroads, for all years covered.

TABLE 10

ESTIMATED TOTAL CONSTRUCTION AND MAINTENANCE EXPENDITURES FOR RAILROADS AND PUBLIC UTILITIES, 1923–1932

(in millions)

NEW CONSTRUCTION	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*
Railroads	$364	$367	$397	$495	$465	$435	$510	$523	$255	$124
Electric power companies	737	845	786	720	735	700	795	851	554	222
Telephone companies	310	381	381	398	394	445	600	610	412	260
Electric R. R. companies	102	73	58	59	81	97	89	91	75	37
Sub-total	1,513	1,664	1,622	1,672	1,675	1,677	1,994	2,075	1,296	643
Pipe line companies								475	426	125
Gas companies				*(data*				197	140	70
Telegraph companies				*not*				57	24	14
Water works companies				*available)*				38	20	10
Total								2,842	1,906	862
MAINTENANCE										
Railroads	825	802	826	876	874	845	860	707	533	354
Electric power companies	85	91	98	103	109	113	111	117	100	100
Telephone companies	99	110	121	136	151	168	195	207	192	174
Electric R. R. companies	135	178	184	148	124	97	105	98	80	61
Sub-total	1,144	1,181	1,229	1,263	1,258	1,223	1,271	1,129	905	689
Pipe line companies								40	43	40
Gas companies				*(data*				29	27	26
Telegraph companies				*not*				16	13	7
Water works companies				*available)*				6	5	5
Total								1,220	993	767
TOTAL										
Capital expenditures								2,842	1,906	862
Maintenance								1,220	993	767
Grand total	$2,657	$2,845	$2,851	$2,935	$2,933	$2,900	$3,265	$4,062	$2,899	$1,629

Source: Federal Employment Stabilization Board

Alterations and repairs are included, and land-acquisition costs are excluded for the most part. Expenditures on pipe lines, gas works, telegraph lines, water works, aviation fields and cotton warehouses are included only from 1930, as data are not available for previous years. Reference to Table 8 shows that until 1930 the capital outlays of railroads and utilities were in excess of those of governmental agencies, but that during the subsequent depression years they declined much more sharply. Throughout, expenditures for maintenance have been not much less than for new construction.

Total Construction, Public and Private

a. The author's estimates

The procedure followed in making these estimates, presented in Table 11, differs in important respects from that used in the similar estimates of *Planning and Control of Public Works*. As an absolute measure of the aggregate volume of all construction the latter estimates were subject to a serious defect. By reason of their being based on contracts awarded, except for roadbuilding, they underestimated the true volume of total construction of all types by the omission of the large amount of privately-financed construction work which is undertaken by means of force accounts, without the competitive award of contracts, especially by railroads and public utilities. The chief value of these estimates was the direct comparison which they made possible with the similarly calculated estimates of public construction, but as a result of the omissions noted the figures given as indicating the percentage that public works constituted of total construction each year overestimated the relative magnitude of the former.

TABLE 11

ESTIMATED TOTAL PUBLIC AND PRIVATE CONSTRUCTION, UNITED STATES, 1923–1932

(in millions)

	1923	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*
1. Construction contracts awarded, 37 states [1]	$3,990[8]	$4,479[8]	$6,006	$6,381	$6,303	$6,628	$5,751	$4,336[9]	$3,063[8]	$1,348[8]
2. Construction contracts, 37 states, minus roads, railroads and utilities [2]	3,333[8]	3,799[8]	5,122	5,259	5,184	5,446	4,544	3,102	2,179	890
3. Total construction contracts, U. S., excluding roads, railroads and utilities [3]	5,275	5,867	7,400	7,356	7,135	7,369	6,260	4,030	2,907	1,146
4. Railroads and utilities, U. S., construction and maintenance [4]	3,321	3,556	3,564	3,669	3,666	3,625	4,081	4,018	2,873	1,614
5. Highways, streets and bridges, U. S., construction and maintenance [5]	991	1,346	1,331	1,553	2,123	2,025	1,938	2,160	1,812	1,308
6. Estimated total public and private construction, U. S.[6]	9,587	10,769	12,295	12,578	12,924	13,019	12,279	10,208	7,592	4,068
7. Estimated total public construction, U. S.[7]	2,123	2,652	2,812	2,974	3,706	3,631	3,555	3,632	3,067	2,004
8. Percentage public is of total construction, U. S.	22.1	24.6	22.9	23.6	28.7	27.9	29.0	35.6	40.4	49.3

Source: Based on figures of the F. W. Dodge Corporation, the Federal Employment Stabilization Board and the U. S. Bureau of Public Roads

[1] Dodge figures of total contracts above minimum valuation recorded.

[2] Excluding highways, bridges, railroad construction, transportation terminals, pipe lines, lighting systems, and electric power plants, but not water works.

[3] Including allowance for low-cost work below minimum Dodge coverage and for 11 western states.

[4] Figures of Federal Employment Stabilization Board. Include construction and maintenance expenditures of railroads, electric power companies, telephone companies, electric railroads, gas companies, telegraph companies and for pipe lines (amounts for last three classes before 1930 are estimated).

[5] Estimates based on figures of the Bureau of Public Roads, and of the Dodge Corporation (see Table 7).

[6] Sum of items 3, 4 and 5.

[7] See Table 7.

[8] In these two years amounts given are for 36 states.

[9] Pipe lines excluded in these three years to make figures comparable with previous years.

The steps taken in reaching the final estimates presented in line 6 of Table 11 were as follows:

Line 1 gives Dodge figures of the total volume of construction contracts awarded in the 37 eastern states above the minimum valuations recorded in this series: $5,000, 1923–29; $2,000, 1930 and 1931; $1,000 in 1932.

Line 2 excludes from these figures the following classes of construction because their real volume is much underrepresented by contract award figures by reason of the large amount of force-account work performed without contracts: highways and bridges; railroad construction and transportation terminals; lighting systems and electric power plants. Though the same is probably true of water works, a small item, they are not excluded because no better figures are available prior to 1930 which could be substituted. Pipe lines are excluded in 1930–32 to make the figures comparable with preceding years, which omitted them. No Dodge figures for this item are available before 1930.

Line 3 gives the estimate for the whole country made on the basis of the figures of line 2. It makes allowance both for low-cost work below the minimum Dodge coverage and for the 11 western states. From 1923 to 1930 the percentages applied in each case were those used by the Dodge Corporation in estimating these two items. In 1931 and 1932 these estimates were discontinued by the Dodge Corporation, but estimates along similar lines were made for this study. The percentage allowance both for low-cost work and the 11 western states naturally varies from year to year.

Line 4. Figures of Federal Employment Stabilization Board. They include construction and maintenance expenditures of railroads, electric-power companies, telephone companies and electric railroads; also those of gas companies, telegraph companies and those for pipe lines. As no original figures for these last three classes are available prior to 1930, allowance was made for them in earlier years by raising the figures of the other classes by the average percentage ratio (25 per cent) which these three classes bore to the latter during 1930–32.

Line 5. Estimates of highway, street and bridge construction and maintenance expenditures throughout the country based on figures of Bureau of Public Roads (rural roads and bridges) and estimates of Dodge Corporation (city streets and bridges); (see Table 7).

Line 6 shows the sum of lines 3, 4 and 5 for each year. As estimates of the aggregate volume of all types of construction throughout the country, these figures are subject to two defects, neither of which, fortunately, is likely to be serious: the combination of contract figures and expenditures; and the uncertain accuracy of some of the utility figures.

These estimates run well over three billion dollars more each year, except one, throughout the period covered than the estimates of *Planning and Control of Public Works.* Consequently, the figures in line 8, showing the percentages public works constituted of total construction, are markedly lower than the corresponding figures of the earlier estimate, ranging for the years covered in both (1923–1928) between 22 and 29 per cent as compared with 29 and 37 per cent.

b. Corrington Gill's estimates

These estimates, presented in Table 12, comprise separate estimates of private construction, railroad and public utility construction, and public construction. The data and methods employed in estimating the two last-mentioned categories, construction undertaken by railroads and utilities and by governmental agencies, have already been fully described. The private construction estimate includes:

1. Contracts awarded for most of the private projects in the 37 eastern states, as reported by the Dodge Corporation.

2. Estimates of the corresponding volume of contract work in the 11 western states.

3. Estimates of expenditures on farm construction in the United States.

The contract figures mentioned above are used as representing

TABLE 12

ESTIMATED TOTAL CONSTRUCTION, UNITED STATES, 1925–1933[1]

Estimates of Federal Employment Stabilization Board

(in millions)

	1925	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*	*1933*[2]
Residential	$3,050	$2,965	$2,856	$3,095	$2,127	$1,222	$900	$311	$232
Commercial	968	1,022	1,036	982	1,031	684	345	136	103
Factories	363	523	417	565	606	285	129	48	140
Theatres, clubs, lodges, religious and memorial	386	385	393	311	224	188	129	47	25
Farm construction	470	470	473	463	463	367	258	125	75
Total Private	5,237	5,365	5,175	5,416	4,451	2,746	1,761	667	575
Railroads	1,223	1,371	1,339	1,280	1,370	1,230	787	478	395
Electric power companies	884	823	844	813	906	968	654	322	75
Telephone companies	502	534	545	613	795	817	604	434	352
Electric R. R. companies	242	207	205	194	194	189	155	98	80
Sub-totals	2,851	2,935	2,933	2,900	3,265	3,204	2,200	1,332	902
Pipe line companies						515	469	165	35
Gas companies			*(data*			226	167	96	35
Telegraph companies			*not*			73	37	21	9
Water works companies			*available)*			44	25	15	8
Total R. R. and Public Utilities						4,062	2,898	1,629	989
Cities	1,283	1,302	1,482	1,422	1,339	1,495	1,302	797	400
Counties	778	676	885	829	556	709	329	137	600
States (Excluding Federal aid)	411	404	438	502	576	706	786	551	300
Federal (Including Federal aid, excluding D. C.)	245	230	240	270	305	390	510	580	500
Total Public	2,717	2,612	3,045	3,023	2,776	3,300	2,927	2,065	1,300
Sub-totals	10,805	10,912	11,153	11,339	10,492	9,250	6,888	4,064	2,777
Grand total						$10,108	$7,586	$4,361	$2,864

Source: Federal Employment Stabilization Board

[1]Based on reports to the F. W. Dodge Corporation, to the Department of Agriculture, the Bureau of the Census and the Federal Employment Stabilization Board.

[2]Partly estimated. Estimates made from same sources as above by the Division of Economic Research and Planning of the National Recovery Administration in October 1933.

expenditures without any allowance for the time-lag between the award of contracts and actual expenditures. Construction work performed without the award of a contract, except on farm buildings, is not included in these estimates.

Figures thus tend to be minima, as a result of the exclusion of (a) work done without contract, except on farms; (b) contracts below the minimum valuation included in the Dodge reports; (c) privately-constructed educational projects, hospitals and institutions. Ordinarily these are not relatively large items and are offset in part by the public contracts contained in the classes of construction included in full as private in these estimates.

The estimates for the 11 western states are based upon the ratio of construction performed in them to that done in the 37 eastern states by contractors having a volume of business over $25,000 as shown by the United States Census of Construction for 1929.

Farm construction estimates are based on a variety of items: the 1924 census of expenditures for building materials; reports each year to the Bureau of Agricultural Economics, United States Department of Agriculture, of a small number of farmers relating to the costs of farm operation; reports to the same Bureau showing changes in the prices paid for building materials by farmers. Expenditures on dwellings are estimated as 40 per cent of the total.

c. Simon Kuznets' estimates

These are presented in Table 13. The following citation from a published preliminary report describes the method of estimation.[6] "The basic data employed in arriving at the total volume of construction were those on the output and flow of construction materials. From these data we arrived, by successive steps,

[6] Gross Capital Formation, 1919–1933, by Simon Kuznets, National Bureau of Economic Research, *Bulletin 52*, November 15, 1934. The estimates "are presented as first approximations, to be used jointly with other data in the field, and subject to possible revision in the final report of the study" for which they were made.

at the estimates of the volume of construction materials consumed, and on the basis of the latter, at the estimates of the volume of construction. The steps may be outlined as follows:

(1) Total output of construction materials, at producers' current values, was estimated from the data in the biennial

TABLE 13

ESTIMATED TOTAL CONSTRUCTION, UNITED STATES, AS DETERMINED FROM THE COST OF CONSTRUCTION MATERIALS, 1919–1933

(in millions)

1919	$8,638	*1924*	$13,308	*1929*	$14,381
1920	10,200	*1925*	14,032	*1930*	11,921
1921	9,224	*1926*	14,343	*1931*	8,920
1922	11,033	*1927*	14,876	*1932*	5,458
1923	13,315	*1928*	15,919	*1933*[1]	5,253

Source: National Bureau of Economic Research, *Bulletin 52* (November 15, 1934), Gross Capital Formation, 1919–1933

[1] Preliminary.

Census of Manufactures, data of the Bureau of Mines on nonmanufactured construction materials, and state and other data for intercensal years. This annual volume of output of construction materials was corrected for price changes with the help of the Bureau of Labor Statistics index of wholesale prices of building materials, thus providing an estimate of output in 1929 prices.

(2) To pass from the output of construction materials to actual consumption in the process of construction, adjustments were needed for exports and imports; for changes in stocks held by the various agencies in the field, beginning with the producers and ending with the construction enterprises themselves; and for successive additions for transportation charges and distributive margins. The first correction was based on the data on exports and imports published by the Bureau of Foreign and Domestic Commerce. The correction for distributive and transportation charges was made on the basis of a comparison of the *Census of Manufactures* and *Mines and Quarries* in 1929 with the *Census of Distribution;* while the adjustment for changes in

stocks was based on a specially-compiled stock index. The adjustments were made from stage to stage: from manufacturers to wholesalers; from wholesalers to retailers; from retailers to construction units. While the detailed figures at these successive stages are possibly subject to an appreciable error, it was felt that only such a successive correction would yield the best estimate of the volume of construction materials actually consumed in the process of construction.

(3) To pass from the value of construction materials consumed to the value of total construction, we needed an estimate of the ratio of the cost of construction materials to the value of the finished product. Such a ratio is provided for various types of construction by the Census of Construction for 1929. The available evidence, scanty as it is, indicates that within each type of construction work, and in terms of constant prices, the ratio of cost of construction materials to the final value of the product tends to vary but little. Therefore, the ratio was allowed to vary only with the shift in importance of various types of construction work, shifts which may be gathered approximately from other available estimates of the volume of construction. These estimates are restricted in area of coverage but show construction by type. The application of the resulting ratio yielded the estimate of the total volume of construction in 1929 prices.

(4) A composite construction cost index was prepared from various indexes of cost of construction, such as the Bureau of Public Roads index of highway construction costs, the Richey electric light and power index, the American Appraisal Company index of cost of construction, the Tuttle factory construction cost index, and others. The indexes were weighted by the approximate weights of the corresponding types of construction, as revealed by the currently-available indexes of volume of construction by type. The application of this composite cost index to the volume of construction in 1929 prices yielded the final estimate of the volume of total construction in current prices.

It is obvious from this brief description of our procedure that the resulting estimates of total volume of construction may be subject to error. The critical steps in the estimates are the evalu-

ation of the volume of construction materials and the establishment of the ratio of the cost of construction materials to the total volume of construction. An error in either will be reflected in the final totals."

COMPARISON OF THE ESTIMATES OF TOTAL CONSTRUCTION

a. The defects of the author's estimate have been noted above —the combination of contract figures for private and most public construction with expenditure figures for railroad, highway and utility construction.

b. Corrington Gill's estimate is subject to the following defects: (1) those already noted in the component category of public works; (2) in private construction, the omission of work performed without contract awards, except on farms, of contract projects below a certain minimum valuation for years prior to 1932, and of privately-constructed educational structures and hospitals and institutions; (3) in public utility construction, the omission of expenditures on pipe lines, gas works, telegraph lines, waterworks, aviation fields and cotton warehouses prior to 1930; (4) the combination of contract figures for private construction with expenditure figures for public and public utility construction without allowance for the time-lag between the award of contracts and actual expenditures. The merits of the estimate are its comprehensiveness and the breakdown of the totals which it presents into the different component classes of construction.

c. The chief elements of uncertainty in Simon Kuznets' estimates have been noted above. A shortcoming of the estimates for our purposes is the impossibility of segregating public construction.

The three estimates are compared below for the period of years which they all cover. The differences, both in volume and year-to-year movement, are explained by the factors noted above. To make possible better comparison in the case of Gill's figures for years prior to 1930 his estimates have been made all-inclusive for 1925–29 by raising his subtotals for these years to the level

of the grand totals for 1930–32. (The raise is by 8.91 per cent, the average ratio to the subtotal of the construction estimates for pipe lines and other public utilities, available only since 1930.)

(in millions)

YEAR	GILL	GAYER	KUZNETS
1925	$11,768	$12,295	$14,032
1926	11,884	12,578	14,343
1927	12,147	12,924	14,876
1928	12,349	13,019	15,919
1929	11,427	12,279	14,381
1930	10,108	10,208	11,921
1931	7,586	7,592	8,920
1932	4,361	4,068	5,458

The Distribution of Total Construction Expenditures

Table 14 presents the percentage distribution as between private, railroad and utility, and public construction respectively, of the total volume of all construction expenditures as shown in Table 12 above. Until 1929 private construction constitutes approximately between 40 and 50 per cent of the total, railroads and public utilities between 25 and 30 per cent, and public works the balance. During the depression years which followed, railroads and public utilities well maintained their normal percentage, declining in absolute volume only in proportion to the fall in total expenditures. Private construction, however, falls very much more rapidly, the percentage it constitutes of the total being more than cut in half between 1928–29 and 1932–33, while public works decline in volume much less than the average, the proportion they constitute of total construction rising sharply to almost twice its pre-depression amount. Comparison of the figures of this table for the percentages that public constitutes of total construction with the altogether differently-derived figures of Table 11 reveals a remarkably close correspondence each year.

TABLE 14

ESTIMATED TOTAL CONSTRUCTION, UNITED STATES, 1925–1933[1]
DISTRIBUTION BETWEEN PUBLIC, PRIVATE AND UTILITY CONSTRUCTION

YEAR	AMOUNT IN MILLIONS				PERCENTAGE DISTRIBUTION			
	PRIVATE CONSTRUCTION	RAILROADS AND PUBLIC UTILITIES	PUBLIC CONSTRUCTION	TOTAL[2]	PRIVATE CONSTRUCTION	RAILROADS AND PUBLIC UTILITIES	PUBLIC CONSTRUCTION	TOTAL
1925	$5,237	$2,851	$2,717	$10,805	48	27	25	100
1926	5,365	2,935	2,612	10,912	49	27	24	100
1927	5,175	2,933	3,045	11,153	47	26	27	100
1928	5,416	2,900	3,023	11,339	48	25	27	100
1929	4,451	3,265	2,776	10,492	42	31	27	100
1930	2,746	3,204	3,300	9,250	30	35	35	100
1931	1,761	2,200	2,927	6,888	26	32	42	100
1932	667	1,332	2,065	4,064	16	33	51	100
1933	575	902	1,300	2,777	21	32	47	100

Source: Federal Employment Stabilization Board

[1] Basic figures are those of Table 12. Figures for 1933 partly estimated by Division of Economic Research and Planning of the NRA.

[2] Excluding pipe line, gas, telegraph and water works companies, 1930–33, to make figures comparable with earlier years.