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APPENDIX B
CONSTRUCTION PRICE INDEXES
THE PRESENT INDEXES

The Department of Commerce "composite" construction cost index, now compiled by the Bureau of the Census, is the closest substitute for a comprehensive construction price index now available. It is a very distant substitute, being defective in almost every possible way. This is the inevitable result of the fact that the skimpiest of resources have been devoted to it. It depends entirely on secondary sources (no original data have ever been collected for it), and these are more than ordinarily defective.

Persons working in this field distinguish between construction "prices" and construction "costs." In force-account construction performed by the prospective user the two are synonymous—both represent the amount paid by (or costs to) the buyer or user. A difference arises in the case of houses, stores, and occasionally other structures that are built for sale by speculative builders, and in contract construction. Here, "price" means the price paid by, or cost to, the ultimate buyer, while "cost" means the cost to the speculative builder or prime contractor, exclusive of his profit (but including the profits of subcontractors). In practice there may also be other differences (such as in the treatment of commissions), but these are not differences of principle. Measurement of either "price" or "cost," but especially "price," involves a difficult problem of distinguishing land value from the price (or cost) of structures.

This Committee believes that the objective here, as elsewhere, should be to measure prices rather than costs. If (as some argue) "cost" indexes are also needed, they should be provided as supplementary information. The difference between an index of prices and an index of costs as just defined is minor, however, as compared to the difference between either of the two and the composite index presently available.

The Department of Commerce "composite" is the quotient of total construction activity valued at current costs, seasonally adjusted, and total construction activity valued at 1947-49 cost, seasonally adjusted. Total construction activity at 1947-49 cost is obtained by deflating each type of construction at current cost by a so-called "cost index" for that type of construction, and summing the deflated components.

The gravest deficiency of the index originates in the character of the individual cost indexes used for deflation. With the exception of the Bureau of Public Roads for a "composite mile of highway," and Interstate Commerce Commission series for railways and pipelines, these cost indexes do not approximate cost as defined above. For the most part they are, instead, indexes of wage rates and building ma-

terial prices weighted together in accordance with their importance in the cost of a unit of construction of some specified type in a base period. As such, when used to measure price (or "cost" as earlier defined) they assume that there is no change in productivity in construction. Over any considerable period of time this tends to impart a strong upward bias to the cost indexes. The only reason for any doubt that such an upward bias exists in the "composite" index arises from the many other deficiencies of the component indexes which impart other biases of unknown direction.¹

These other deficiencies are extremely serious. We merely list what seem to be the more important ones. (1) Most of these indexes are compiled by private firms as a byproduct of other activities viewed as far more important. They are not reviewed by any central agency for adequacy of statistical procedures nor for consistency. Information in sufficient detail to permit adequate review, the Committee is informed (although it has not itself attempted to contact the compilers directly), is not generally available. (2) The indexes are not prepared in order to provide appropriate coverage for the categories of construction they are used to deflate. Instead, these categories are deflated by whichever of the available indexes seems to fit most closely (or least distantly) each category of construction activity. In some cases no relevant index is available. (3) The bill of materials priced and included in the indexes is usually incomplete, and in some cases grossly so. (4) Weights by which various indexes of wage rates and materials are combined are usually based on periods in the remarkably remote past, and their accuracy even for the period to which they relate is dubious. (5) It appears that the wage rates and prices used frequently do not represent actual transaction prices but rather some type of quoted or "normal" price. (6) The geographic coverage and weighting of the indexes are rarely suitable and comprehensive. (7) The timing of the cost indexes is not, in general, appropriate for deflation of the construction activity estimates, which represent an allocation over time of contracts or other valuations established at an earlier date.

Two additional general comments should be made: (1) The "composite" index is an "implicit price deflator" and, as such, measures the combined result of cost changes and of changes in the weights of different types of construction in the current-dollar construction activity aggregate. This is appropriate for deflation but not for the compilation of a price index. When and if the major deficiencies in the index are corrected, a change should be made to a fixed-weight index. We do not recommend this change now lest it contribute to the illusion that a true construction price or construction cost index exists. (2) The present definition of construction with respect to the inclusion or exclusion of various types of equipment, landscaping, commissions, and other items is, to say the least, imprecise. An inter-agency committee of the Federal Government has recently examined the definition from the standpoint of the construction activity estimates, and has recommended definitions with which the construction activity estimates should be brought into conformity. The present Committee has not reviewed this report, but does wish to stress that

¹ A supplementary note to this appendix contains a listing and brief description of the construction cost indexes used to deflate each category of construction activity, and the value of construction in that category in 1959.

the definition of construction in the compilation of price indexes should be consistent with that adopted for value estimates.

SUGGESTIONS FOR NEW WORK

Construction is a particularly difficult field to price because the units built are constantly changing, and the "quality change" problem is acute. At present there evidently is no way to allow for quality change in the form of changes in convenience, efficiency, attractiveness resulting from better (or worse) design, or improvements in building materials. Once this limitation is accepted it appears possible to construct a reasonably adequate price index if the necessary effort is devoted to devise methods of measurement and if funds can be provided for collection of data. The techniques that can be followed to obtain better data are not the same for all categories of construction, but major improvements are possible in nearly all categories.

Whenever possible, the series ought to be based on actual transaction prices. By price we mean the price paid by the buyer in the case of speculative builders, the contract price in the case of contract construction, and the total expenditure in the case of force-account construction. This approach is, in principle, available for all types of buildings, which comprise the great bulk of construction. It seems almost certainly practical for residential and commercial structures, which represent about half the total value of new construction.

In the case of residences, for example, the approach requires the classification of new houses in sample localities by certain broad characteristics which dominate the determination of price per square foot, and the computation for each category of a price per square foot. The characteristics by which houses are classified may include size (by number of dwelling units and floor area), development or nondevelopment, general building material, number of floor levels, and some specification as to equipment, but the classes should be kept as few as possible in order to minimize collection problems. Basement and attic areas can be converted to equivalent square feet on the basis of relative cost in the base period. The index of price per square foot in each category is then treated as a price index, and these can be weighted together by the value of the different categories in the base period. As already noted, the procedure requires the elimination of land values from houses speculatively built. This is an important limitation on the method but it does not loom large in comparison with the difficulties of other approaches.

In a rudimentary way the index of house prices computed by the Bureau of Labor Statistics as a component of the Consumer Price Index (but not separately published) is a start toward the use of this approach. It is based on price per square foot for FHA-insured housing. However, in its present form it is not suitable for use as a construction price index. Cells are too broad (specifications are only for new vs. used, over or under 1,000 square feet, and site value below the FHA median for the city or not); land is not eliminated; and the series is not (and is not intended to be) representative of all housing. As the BLS index is presently compiled, separate indexes for new and used houses do not emerge. The Federal Housing Administration has been trying to develop an improved price index carrying this

approach further by standardizing FHA-insured houses in additional respects. It may also be noted that the Bureau of the Census, in connection with its building permit survey, is now collecting data on cost and expected selling price of new houses. These data have not yet been tabulated, but soon will be. Since the coverage of this sample is not restricted by the method of financing, it may have potential value as a primary source of data for a price index, although there appear to be fairly serious difficulties to be faced. Asking prices (rather than actual prices) are collected and information on important characteristics of the units is not obtained.

For types of construction that vary so much as to preclude direct pricing of complete projects and conversion to a square foot or similar basis, pricing of separate operations entering into them appears to be the best alternative. The Bureau of Public Roads series corresponds broadly to this approach. It is based on average contract unit bid prices for various road-building operations, such as a cubic yard of excavation or a square yard of paving. The bid prices are obtained from actual contract information. The Interstate Commerce Commission follows an essentially similar approach in compiling series for railroad and pipeline construction.

Other approaches, which do not use actual contract prices, should be used only as a last resort. One is to specify a particular type of structure and obtain estimates from builders of their contract price to build it. If used, the specifications should be changed frequently so that they always correspond as nearly as is practicable to structures that are in fact being commonly built. (The new indexes would, of course, be introduced by linking, not by assuming the new specifications to be equivalent to the old.) This procedure has the distinct disadvantage, especially for short-term price comparisons, that it is not based on actual transactions. This appears especially serious because actual bids on actual projects are known to vary widely and the same contractors are not consistently high or low, and because a hypothetical quotation may well differ from what the same contractor would bid on an actual contract under competitive conditions. However, the long-term bias in most of the existing indexes arising from productivity change would be reduced or eliminated by this procedure.

Another approach is to continue the existing procedures but adjust periodically to benchmark data for changes in direct labor requirements in construction so as to correct for changing productivity. The Bureau of Labor Statistics, for example, is currently studying direct and indirect labor requirements for hospitals and schools. If repeated periodically, such surveys would provide information needed for such an adjustment. However, reliance on contract prices for these types of structures would be much preferred.

DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
CONSTRUCTION STATISTICS OFFICE

September 9, 1960.

CONSTRUCTION COST INDEXES CURRENTLY USED FOR DEFLATION OF VALUE OF
CONSTRUCTION PUT IN PLACE

The following statement relates to the individual construction cost indexes which are now being used to convert the monthly values of new construction to 1947-49 prices, and to the so-called Commerce Composite Construction Cost Index.

INDIVIDUAL COST INDEXES USED FOR DEFLATION

The selection of the cost indexes which are now being used to deflate the current value of construction activity, by major types of construction as indicated in the attached table, was made about 1946. The object of the study which resulted in this selection was to obtain construction cost indexes for each of the primary categories of construction for which activity estimates were computed.

With the exception of the Bureau of Public Roads Composite Mile index, which was designed to measure changes in construction costs for highways, none of the available indexes was found to be completely representative of any one specific primary classification of construction. For example, the Boeckh residential index (item 1 on the attached table) does not include apartment buildings or non-housekeeping residential facilities. Nevertheless, a number of single indexes or combinations of indexes were found, each of which was judged to be reasonably representative of one specific primary category. However, for several of the primary categories—those included in items 4 and 14 on the attached table—no index was found to be applicable to only one specific category. For each of these groups a single index was selected as being reasonably representative of all of the primary categories in the group.

In addition to the question whether any particular index is designed to measure changes in construction corresponding to our system of project classification, the indexes pose several other problems. Among these are:

- (a) Some of the indexes measure cost changes for fixed quantities of material and labor which were typical of structures or facilities constructed 25-30 years ago but which are no longer representative.
- (b) Few of the indexes make any allowance for changes in productivity.
- (c) At least one of the indexes excludes major items of construction cost, such as: plumbing, heating, electrical work, air conditioning and elevators.
- (d) Very little detailed information is available concerning the sources of data for these indexes or the methods used in their construction.

COMMERCE COMPOSITE COST INDEX

The composite index is a variably weighted, seasonally adjusted index which is computed monthly. The cost indexes are weighted by the seasonally adjusted values of the categories to which they apply; these categories are listed in the attached table. The seasonally adjusted values are used to minimize the influence of the differential seasonal fluctuations of activity for the individual types of construction.

Construction Cost Indexes Used To Adjust the Value of New Construction to 1917-49 Prices

Item No.	Type of construction	Value of new construction in 1959 (millions of dollars)	Name of cost index used ¹	Comments on indexes
1	Residential (nonfarm).....	25,431	E. H. Boeckh & Associates—Residential.....	A national average construction cost index prepared monthly by E. H. Boeckh & Associates covering residences in 20 major pricing areas.
2	Industrial.....	2,474	Turner Construction Co.....	A construction cost index prepared quarterly by the Turner Construction Co., representing the cost experience of that firm, primarily in eastern cities.
3	Office buildings and warehouses.....	1,954	George A. Fuller Co.....	A national construction cost index prepared quarterly by the George A. Fuller Construction Co., representing a composite of 3 types of buildings—factories, hotels, lots, and other types.
4	Stores, restaurants, and garages..... Educational buildings..... Hospital and institutional buildings..... Other nonresidential buildings.....	1,976 3,181 998 2,790	American Appraisal Co.....	A national average construction cost index prepared monthly by the American Appraisal Co., covering 4 representative types of frames, brick, concrete and steel buildings ² in 22 cities. This index covers only the structural portion of the building and does not cover such items as plumbing, heating, lighting, sprinklers, or elevators.
5	Farm operators, dwellings.....	425	Agricultural Marketing Service—Operators' dwellings.....	A national construction cost index prepared annually by the Agricultural Marketing Service of the U.S. Department of Agriculture based on a weighted average of prices paid by farmers for building materials (78 percent) and farm wage rates (22 percent).
6	Farm service buildings.....	836	Agricultural Marketing Service—Service buildings.....	Same as above except weights of 78 percent and 22 percent are used.
7	Railroad..... Local transit (private).....	251 25	Interstate Commerce Commission—Railroad.....	A national average construction cost index prepared annually by the Interstate Commerce Commission representing a weighted average of 46 expenditure accounts covering capital improvements, other than equipment, by class I railroads.
8	Telephone and telegraph.....	952	Interstate Commerce Commission—Telephone and telegraph.....	A national average construction cost index prepared annually by the Interstate Commerce Commission representing expenditures by class I railroads for communication systems.
9	Highways.....	5,916	Bureau of Public Roads—Composite mile.....	A national construction cost index prepared quarterly by the Bureau of Public Roads measuring cost changes for furnishing and installing fixed quantities of excavation, concrete having structural concrete, reinforcing steel and structural steel as represented in a 1921-29 composite mile.

10	Electric light and power.....	2, 072	Weighted average of: Handy-Whitman—Electric plant (weight 9). Handy-Whitman—Utility buildings (weight 1).	An unweighted average of construction cost indexes compiled semiannually by Whitman, Requardt & Associates for 6 geographical regions representing the cost of constructing and equipping steam electric light and power plants. An unweighted average of construction cost indexes compiled semiannually by Whitman, Requardt & Associates for 6 geographical regions representing, separately, the cost of constructing reinforced concrete buildings and brick buildings.
11	Gas..... Public service enterprises.....	1, 557 551	Weighted average of: Handy-Whitman—Gas plant (weight 9).....	An unweighted average of construction cost indexes compiled semiannually by Whitman, Requardt & Associates for 6 geographical regions representing the cost of constructing and equipping gas manufacturing plants. See item 10.
12	Military facilities.....	1, 488	Handy-Whitman—Utility building (weight 1). American Appraisal Co..... Bureau of Public Roads—Composite mile..... Turner Construction Co..... George A. Fuller Co.....	See item 4. See item 9. See item 2. See item 3.
13	Petroleum pipelines.....	95	Unweighted average of: Handy-Whitman—Electric plant..... Handy-Whitman—Gas plant..... Handy-Whitman—Utility building..... Interstate Commerce Commission—Railroad.	See item 10. See item 11. See item 10. See item 7.
14	Sewer..... Water..... Conservation and development..... All other private..... All other public.....	906 561 1, 130 207 229	Unweighted average of: Associated General Contractors..... Engineering News-Record—Construction.....	A national average construction cost index prepared monthly by the Associated General Contractors of America based on data reported from 12 geographical areas covering wage rates and construction materials prices (weighted 40 and 60). A national average construction cost index prepared monthly by Engineering News-Record based on a weighted average of prices for fixed units of construction materials and common labor in 20 cities.

¹ Where the applicable deflating index is not available on a monthly basis, an appropriate monthly index is used, by linking to the deflating index, to estimate the current monthly values of the deflator.

Source: Bureau of the Census, Department of Commerce, Washington, D. C., Sept. 9, 1960.

