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## The Size of Construction and Its Components

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The boundaries of the type of final output that is called construction are not clearly marked. There is, however, fairly general agreement with the view of the Departments of Commerce and Labor that it includes "the erection, maintenance, and repair (including replacement of integral parts) of immobile structures and utilities, together with service facilities which become integral parts of structures and are essential to their use for any general purpose."<sup>1</sup> This definition comprehends not only buildings and other structures, but also the clearing and development of land. It also includes structural additions and alterations, such as the conversion of a structure to a use other than its original purpose. Service facilities included in construction cover types of immobile equipment like plumbing, heating, and elevators, but not special-purpose equipment like the steam tables in a restaurant. *Total* construction includes the maintenance and repair of existing structures, while *new* construction does not. It is perhaps worth remembering that gross construction, as it appears in the national product accounts, covers only new construction: the activity of maintaining and repairing buildings is there implicitly treated as an intermediate input which is covered in the value of current output of the service rendered by structures, for example, the rental value of residential buildings.

Not all estimators of aggregate construction activity adopt the Commerce-Labor definition of the physical boundaries of construction, but the differences in concept seem to be small. Simon Kuznets, for example, treats the drilling of oil and gas wells as part of construction,

<sup>1</sup>Depts. of Commerce and Labor, *Construction Volume and Costs, 1915-1956* (44), p. 69.

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while the Departments of Commerce and Labor do not.<sup>2</sup> Some writers consider that the building of very large, durable, and expensive pieces of equipment, like ships, ought to be counted as construction even though they are mobile. These differences, however, cannot change the totals of aggregate construction in any significant degree.

In principle, the value of construction as defined by the Departments of Commerce and Labor is the value of work put in place during a given period. It is the sum of architectural and engineering fees, materials and service facilities installed, labor, overhead costs, and profits. Materials and equipment are charged to the account when put in place, regardless of when they were purchased. To these are added the cost of labor performed during the period and proportionate allowances for overhead costs and profits. Since the cost of any given project is thus spread over time, the value of construction estimated on these lines differs in principle from other familiar kinds of construction estimates, such as the value of permits granted or contracts awarded or the value of houses started, because these figures represent the value of the work currently undertaken or about to be undertaken. The Commerce-Labor figures are, therefore, at least in intention, measures of the value of current activity, while the other figures represent measures of an earlier stage in the process, more akin to the placement of orders for construction work rather than to the pace at which work is done. For some purposes, particularly for the measurement of short-term movements, these differences must be kept in mind, but they are of little importance so long as we are concerned with trends and long waves in construction.

The only long-range estimates from which the importance of construction can be judged are those by Simon Kuznets. These estimates correspond in concept to the Commerce-Labor definition of new construction just set forth. Indeed, apart from including the value of oil and gas wells drilled, Kuznets' figures are essentially those of the Departments of Commerce and Labor for the period since 1915. For the years before that, they depend on the value of construction materials flowing into domestic use raised to allow for value added in the construction industry proper.<sup>3</sup> According to Kuznets' estimates, new con-

<sup>2</sup>*Ibid.*, p. 69.

<sup>3</sup>See Appendix A, Part III, below.

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struction has been a large, but declining, share of gross capital formation and of gross national product during the entire eighty-five-year period. While the share of gross capital formation in gross national product fluctuated around 21 per cent, the share of gross new construction, which was around 14 per cent in the period before 1900, was under 12 per cent in the decade 1946-55 (Table 1). Even this figure may underestimate the long-term decline in the importance of construction, for this activity has been booming since World War II. In the quarter-century from 1929 to 1955, the share of construction was under 11 per cent; but again this figure may be too low because of the influence of the Great Depression and the war. Correspondingly, the share of new construction in gross capital formation, which was between 60 and 65 per cent in the period before World War I, was slightly under 50 per cent in the decade following World War II. In spite of a considerable decline in relative importance, therefore, the productive activity carried on by the construction industry and by those who supply it with materials remains of very great importance whether it is measured against total economic output or against that portion devoted to capital formation.

These figures refer to the more volatile portion of construction, which is concerned with building new structures, alterations, and additions. The part of the industry concerned with the more stable activity of maintenance and repair is another large sector. In the years since 1919, the value of repair and maintenance expenditures has been approximately 40 per cent of the value of expenditures for gross new construction.<sup>4</sup>

To gauge the importance of the various components of total construction, two sets of estimates are used. For the period before the First World War, Kuznets' capital formation studies provide estimates of new construction divided into nonfarm residential, government, and "other" construction; the last is a miscellaneous category dominated by industrial construction broadly conceived (that is, farming, manufacturing, mining, commerce, transportation, and public utilities), but including also private building for eleemosynary purposes. For comparative purposes, this three-fold division has been extended to 1955. The large

<sup>4</sup>Cf. *Construction Volume and Costs, 1915-1956* (44), Table 1. The ratio was 0.393 for 1919-33 and 0.427 for 1946-55.

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TABLE 1  
RELATIVE IMPORTANCE OF GROSS NEW CONSTRUCTION, GROSS CAPITAL FORMATION,  
AND GROSS NATIONAL PRODUCT, 1869-1955  
(per cent)

	Ratios of		
	Gross Capital Formation to GNP (1)	Gross New Construction to GNP (2)	Gross New Construction to Gross Capital Formation (3)
1869-98	21.6	13.8	63.9
1879-1908	22.4	14.4	64.4
1889-1918	22.4	12.8	57.0
1899-1928	22.3	11.9	53.2
1909-38	19.9	10.6	52.9
1919-48	20.6	9.4	45.6
1929-55	22.3	10.6	47.6
1946-55	23.6	11.4	48.3

### Source

Col. 1, 1869-98 through 1929-55: Calculated from Simon Kuznets, Capital in the American Economy (27). Ratios are based on three-decade moving totals in current prices, with the period 1949-55 given the weight of a decade. The gross capital formation series is from Tables R-14 and R-4; that for gross national product, from Tables R-11 and R-1.

Col. 1, 1946-55: Ibid., Table 9.

Col. 2: Col. 1 multiplied by col. 3. (The slight discrepancy is due to rounding.)

Col. 3: Ibid., Table 14.

category of "other" construction has been further subdivided in the pre-World War I period into the major components important for the present study by making use of Kuznets' estimates of wealth in the form of real estate improvements.<sup>5</sup> Increments to wealth in this form, after allowing for changes in valuation, approximate net construction. Estimates of gross construction are obtained by adding allowances for depreciation.<sup>6</sup> The results of these calculations are presented in Table 2.

<sup>5</sup>Simon Kuznets, *National Product since 1869* (30), Part IV.

<sup>6</sup>See Appendix A, Part III, below, for details of our procedures. Cf. also the notes to Table 2.

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TABLE 2  
COMPOSITION OF GROSS NEW CONSTRUCTION IN 1929 PRICES, 1880-1955  
(per cent)

	1880- 1899	1890 1913	1919 -48	1929 -55	1946 -55
1. Nonfarm residential	41.0	32.0	30.0	28.8	33.3
2. Government	6.5	9.2	32.7	36.0	28.3
3. Other	52.5	58.8	37.3	35.2	38.4
4. Agriculture	9.1	10.7			
5. Nonresidential (mining, manufacturing, and other nonresidential)	16.7	18.2			
6. Public utility	26.7	29.9			
7. Railroad	19.4	17.0			
8. Other	7.3	12.9			

Source

Lines 1 - 3: Kuznets, Capital in the American Economy (27). For 1880-1913, calculated from annual data underlying App. C, Table R-30; percentages are based on totals for the years 1879-98 and 1889-1913. For 1919-55, from Table 18, ibid.

Lines 4 - 8: Based on increments to reproducible capital for the intervals between 1880 and 1900, and between 1890 and 1912, as estimated from Kuznets, National Product since 1869 (30). We adjusted Kuznets' figures to allow for depreciation in each category. See Appendix A, Part III, below, for further details about sources and methods. For 1880-1900, the "other" components as estimated from the wealth data added up to 58.9 per cent, compared with 52.5 per cent from capital formation sources. We therefore adjusted the former by multiplying each component by the fraction 52.5/58.9.

For the period after World War I, use is made of the detailed breakdowns provided by the Departments of Commerce and Labor.<sup>7</sup> Computations based on them are shown in Table 3. The shares in Table 2 are based on figures in constant prices because the estimates made from wealth data necessarily emerge in this form. The shares in Table 3 are based on estimates in current prices. The share of nonfarm residential building in 1929 prices in the pre-World War I periods was

<sup>7</sup>*Construction Volume and Costs, 1915-1956* (44), Tables 2 and 3.

TABLE 3  
COMPOSITION OF GROSS NEW CONSTRUCTION IN CURRENT PRICES,  
1919-55  
(per cent)

	1919-28	1929-38	1939-48	1946-55
<b>Distribution of Kuznets' gross new construction</b>				
Nonfarm residential	37.6	22.8	29.2	37.8
Government	19.9	40.7	37.8	25.2
Other	42.5	36.5	33.1	37.0
<b>Distribution of Commerce- Labor estimates of gross new construction</b>				
Private, total	79.4	57.3	60.5	73.6
Nonfarm residential	40.0	23.9	30.5	39.7
Nonfarm nonresidential, total	20.3	16.8	13.7	16.1
Industrial	7.0	5.4	6.6	6.1
Commercial <sup>a</sup>	9.0 <sup>b</sup>	6.9	4.3	5.4
All other	4.3	4.5	2.8	4.6
Farm	3.9	2.3	4.9	5.3
Public utility, total	11.7	12.0	10.3	11.6
Railroad	3.5	3.7	2.0	1.2
All other	8.1	8.3	8.3	10.4
Other	3.6	2.3	1.1	1.0
Public, total	20.6	42.7	39.5	26.4
Highway	9.9 <sup>b</sup>	19.4	8.1	7.9
Education	3.6 <sup>b</sup>	4.0	1.8	4.2
Sewer and water	2.5	4.1	2.1	2.3
Military	1.5	0.6	10.1	2.3
All other	3.1	14.6	17.3	9.6
Addendum:				
Federal	2.4	8.6	23.9	7.9
State and local	18.2	34.2	15.6	18.4

Source: Simon Kuznets, Capital in the American Economy (27): annual series underlying Table R-30 revised for 1945-55 on the basis of Value of New Construction Put in Place, 1945-58 (44) and U.S. Income and Output (43), Table V-3. The Commerce-Labor estimates are from Construction Volume and Costs, 1915-1956 and Value of New Construction Put in Place, 1945-58 (44).

<sup>a</sup> Office buildings and warehouses, plus stores, restaurants, and garages.

<sup>b</sup> Based on average of nine years in numerator and ten years in denominator.

Note: Because of rounding, detail will not necessarily add to total. The absolutes underlying these distributions differ only in that the Kuznets series include expenditures for crude petroleum and natural gas well drilling, and for 1919 and 1920, utilize Grebler's estimate of nonfarm residential construction, which shows a different movement from that shown by the Commerce-Labor estimate.

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between two and four percentage points higher than it appears to have been in current prices, and the share of "other" construction correspondingly lower.

In broad terms—the figures do not permit precision—the two tables together suggest that over the entire period, there was a dramatic rise in the share of government construction. In the last fifth of the nineteenth century, this share was barely 7 per cent of the total, but it rose steadily. In the years just before 1914—here I depend on more detailed figures than the tables display—it had reached about 12 per cent, and in the twenties it was about 20 per cent. The very high level during 1929-55 reflects the depression of private construction in the thirties and the wartime bulge in government construction. But even in the postwar decade, the share of governments remains close to 30 per cent. The postwar importance of public construction is founded only in part on defense activity. Even if we add industrial building by public authorities to military construction proper to produce a broad category concerned with defense, the latter would account for no more than 25 per cent of government construction.<sup>8</sup> The great bulk of public construction is devoted to highways, education, sewer and water and other municipal facilities, conservation and development works, and hospitals and other institutions.

The great rise in the share of public construction was matched by declines in the other two categories, residential and "other." Before World War I, the share of residential building fell from about two-fifths of the total to about one-third. In this period, the big residual category, representing chiefly building going into the capital stock of private industry and commerce, actually increased in relative importance—from about one-half to nearly three-fifths of the total. After World War I, the reverse was true. Residential construction has held its own, while the "other" category has fallen to under 40 per cent.

The three great divisions of the "other" category, namely agriculture, nonresidential (that is, mining, manufacturing, and commerce), and public utility, all contributed to its rising share before 1914. Within public utilities, however, a transformation was in progress. In the eighties, the share of steam railroads was perhaps six times that of all

<sup>8</sup>The figure for 1954 was 21 per cent. Cf. *Construction Volume and Costs, 1915-1956* (44), Table 11.



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other public utilities. By the first decade of the present century, the two divisions appear to be of equal importance, a change which is displayed in muted fashion by the overlapping double decade figures in Table 2.

Since World War I, as stated, Kuznets' "other" category (that is, all construction other than government and nonfarm residential) has been a smaller part of the total. Even if the years of depression and war are disregarded, its share has been around 40, instead of 60, per cent. So far as the total of this category is concerned, the decline seems to have taken place chiefly in the form of an abrupt drop between the first decade of the century and the twenties. The share is a little lower in recent years than it was in the twenties. About two-thirds of the drop is attributable to the great decline in the relative share of railroad construction, which for many decades was a very large part of the total but since World War II accounts for less than 2 per cent. Farm building is also less important now than it was before World War I.

These changes in the composition of construction manifestly bear on the character of general construction waves in different periods. The long cycles in construction were, as we shall see, most clearly defined in residential and railroad building; they were less clearly marked in other categories. The great decline in railroad expansion removes an important sector which in the past tended to form long waves in construction. The great rise in the share of governments, particularly that of the federal government, enlarges the importance of a sector less directly influenced by market forces than is private building. The shifting importance of the other sectors also warns us that the nature of general waves in construction is unlikely to have remained unchanged during the era since the Civil War. We conclude, therefore, that while construction activity remains of major importance as a part of both gross national product and of capital formation, its internal composition has altered in ways which cannot but influence the character of long swings in total construction.