Working Paper

Capital Stock and Capital Output Ratios: A Comparison Between the United States, United Kingdom and the Federal Republic of Germany

Claire P. Doblin

WP-91-29
August 1991

IIASA International Institute for Applied Systems Analysis □ A-2361 Laxenburg □ Austria
Telephone: +43 2236 715210 □ Telex: 079 137 iiasa a □ Telefax: +43 2236 71313

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Foreword

The paper assesses capital stock and capital output ratios for major branches of the economy and selected industries. It is an important part of the research effort to determine historical rates of economic and technological change, especially those related to energy systems and their environmental impacts. The composition of capital stock and its vintage structure are a good measure and determinant of rates of change. Furthermore, the analysis presented in this paper may be useful for estimating the capital input required for production of goods and services at given levels of output. The capital output ratios could also enhance understanding of the selection mechanism operating among industries with varying capital productivity.

The first part of the paper analyzes the composition and distribution of capital stock within the economies of the US, UK, and the FRG. It is not surprising that the share of capital stock in different sectors shows the known development of investment and employment. In the last 25 years the share of fixed assets invested in agriculture decreased and the share of the national capital stock invested in services increased. The development in major branches and industries shows that transport (due to the decreased importance of railroads as a means of transportation) declined, whereas public utilities and construction comprised a stable proportion of the capital stock and finance/insurance/real estate and other services, excluding government, absorbed an increasing part of the national capital stock.

The second part of the study tries to determine common features of capital output ratios economy wide and for major branches and selected industries. It can be concluded that there are some similarities for the US, UK and the FRG. For example, during the 1980s, capital output ratios for the economy as a whole but excluding residential were found to be quite similar for the US, UK and the FRG, in that they varied only between 2.5 and 2.8.

Over a longer time frame, the US capital output ratio was relatively constant whereas the capital output ratio in the FRG increased by 50 percent in less than 30 years (from 1.8 in 1960 to 2.7 in 1987). This trend is consistent with an earlier investigation (Doblin, 1978), that showed growing capital output ratios for the 1960s and 1970s in the FRG (enterprises, excluding residential) as well as the UK (1964–1974).

At the major branch level, a constant figure over the entire time frame was found for the US, UK and FRG capital output ratios for manufacturing, construction, trade, and finance/insurance/real estate. For the other branches, no common trend could be established. Furthermore, the ranking of the capital output ratios shows clearly that public utilities have the highest, and construction the lowest, capital output ratios. The absolute level is similar in all three countries for construction (0.5–0.9) and in the US and the FRG for manufacturing (1.7–2.0).

Another interesting fact is that in the three countries, the deviation from the average was found to be the same for a number of industries. Capital output ratios were above the national average for agriculture, public utilities, transport, and communication; and below the average for manufacturing (with the exception of the UK), construction, trade and finance.

With regard to observations at industry level, motor vehicles and equipment, stone/clay/glass, and radios/televisions showed a deterioration of capital productivity, whereas in chemical and allied industries the reverse happened. Food/drink, non-electric and electric machinery (with the exception of the FRG), and paper are rather constant. As regards the magnitude of the coefficients it could only be said that the railroads had the highest capital output ratio. Capital output ratios above the national average were also found for chemical and allied industries, and radios/televisions; and below average for non-electric and electric machinery.

Nebojša Nakićenović
Project Leader
Environmentally Compatible Energy Strategies

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Capital Stock and Capital Output Ratios: A Comparison Between the United States, United Kingdom and the Federal Republic of Germany

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1 General Introduction

The capital stock data discussed in this paper relate to observations over time in (a) the composition of a country's capital stock by major sectors of the economy and selected industries; and (b) changes in the capital/output ratios that measure the productivity of capital for the economy as a whole, major branches and selected industries.

The capital stock, as used in this analysis, relates to the value of *reproducible tangible fixed assets*, consisting of buildings (structures) and equipment (plant)[1] This excludes all non-reproducible assets, such as land and mineral or other resources in the ground, that are also excluded from GDP.

Structures are divided according to the purpose they serve into "residential" that are for private use, and "non-residential" that serve in the production of goods and services for the market. For comparisons with GDP, we have narrowed our concept of gross fixed capital stock by the exclusion of residential buildings—though the latter constitute an important part of the nations' *total* fixed capital stock. Other exclusions relate to the consumer *durable* goods, because they are not used for market production. They are included, however, in the stock of fixed reproducible *wealth* [see *Gross and Net Stock of Fixed Reproducible Tangible Wealth, 1970 to 1987* in US Department of Commerce (1989); also *Fixed Reproducible Tangible Wealth in the US, Revised Estimates 1947-1984* in US Department of Commerce (1986a)].

The above concept, adjusted to be consistent with GDP, is also consistent with the one on fixed capital formation (annual investments) from which capital stocks are currently derived.

The countries selected for our analysis provide capital stock in terms of "gross" and "net", with the exception of Japan and Norway, for whom data are only given in terms of "net". The reason for our preference of gross capital stock is that they are in line with GDP data on value added that are used for capital output ratios. Moreover, *gross* capital stock was also used for our earlier compilations of long-term series of capital stock in the US, FRG, and UK prepared at IIASA in Summer 1989.

The price basis for capital stock compilations can be "historical", "current", and "constant". Historical means that the annual additions to the capital stock are valued at

*Note: This paper is a continuation and elaboration of the research on capital stock carried out at IIASA in Summer of 1989 under a grant by the *Forschungszentrum Jülich* (formerly Kernforschungsanlage Jülich GmbH) (Doblin, 1989a).

[1]The German terminology is *Reproduzierbares Sachvermögen oder Anlagen, bestehend aus Bauten (structures) and Ausrüstungen (equipment).*

the prices as of the year when additions were made. Current means that the capital stock and annual additions are evaluated at current replacement cost and constant means that the capital stock and annual additions are evaluated at the replacement cost of a given year. Currently, the base year for constant priced capital stock series is still 1980, in the FRG statistics and United Nations publications. But in the US, the data in domestic publications are related to 1982, the year of the last comprehensive manufacturing and other production censuses, carried out at ten-year intervals. Normally, the base year for constant priced capital stock series changes every ten years—except for the UK, which shows detailed capital stock data at base years changing at intervals of five years, with 1985 being the latest base year.

Methodology-Comparability-Reality

Systematic, annual government estimation of capital stock as part of national accounts, is rather new. However, through backdating using the same techniques for all years, there are now fairly comparable long-time series in the US going back to 1947 (all variables) and 1925 (selected variables). Capital stock goes back to 1966 in the UK for all variables, and to earlier periods for selected variables. German statistics (all variables) are backdated to 1960. For all three countries there also exist earlier series (see Doblin, 1989b; also Doblin, 1978).

However, the data become less detailed, less reliable and less comparable, the longer the periods of observation reach into the past. In part, this is due to the lack of adequate price deflators—a deficiency that also affects the quality of contemporary series.

In Western industrialized countries, the compilation of current capital stock estimation is to some extent in agreement with the recommendations and standards of the United Nations (UN, 1979). Here, it should be recalled that capital stock is estimated on the basis of "Gross Fixed Capital Formation" that are part of National Accounts. The latter, when published by the United Nations, must be in fair agreement with UN standards—a matter that should ensure a minimum of international comparability.

The technique of modern capital stock estimation as part of National Accounts may be seen in the example of the US. In the US, the estimates are prepared by the Commerce Department, Bureau of Economic Analysis (BEA). The method is based on the addition of annual expenses for investment (capital formation) minus capital consumption allowances. The latter consists of depreciation, primarily based on tabulations of tax returns and accidental damage to fixed capital, estimated by BEA. The estimates of depreciation that are based on capital consumption allowances with capital consumption adjustments, are derived from "perpetual inventory calculations" provided by BEA (UN, 1989).

Other Western industrialized countries also use the "perpetual inventory method"—though the length of time allotted for depreciation may vary according to national practices. Obviously, there is no way to adjust for these differences. There is, however, a way to enhance international comparability through UN adjustments to national coverage and classifications. Thus, for example, UN publications of US capital stock includes government, whereas US domestic publications of capital stock (and fixed capital formation as well) tend to relate only to the private sector. (More on this in the section on the share of government, discussed below.) The adjustments are obtained by means of a UN prepared questionnaire on capital stock estimates that the OECD sends to and collects from governments of its member countries. Non-government sources, for instance, banks or private associations' estimates are excluded from UN publications and our estimates. The countries whose capital stock estimates appear in the UN 1986 National Accounts Statistics, *op. cit.* are in alphabetical order: FRG, Finland, Japan, Norway, Sweden, UK,

and US. The starting point is the data for the year 1980 on Standard Tables 2.13 to 2.16 in the UN 1986 National Accounts Statistics. This excludes Italy whose capital stock is estimated by private sources (Rosa and Siesto, 1985; Barca and Magnani, 1989).

The above notes indicate the efforts made by national and international agencies to ensure a minimum of international comparability for a given year and over time. Still, questions remain whether the various national estimates are representative, and internationally comparable. For example, do all countries follow the "capital consumption allowances" as practised, for instance, by the US? Most certainly not, and how realistic can a capital stock estimate be, when it excludes the plant and equipment, that by bookkeeping standards is fully depreciated and no longer in use, while in reality it may still be operating and producing? What about the inadequacy of price deflators for investment goods which affects the quality of the estimates?

Here, it should be recalled that we are not so much looking at actual amounts of the various capital stock—but rather at changes over time that may permit comparisons as long as the methodology is not radically changed. For it is the *trend* rather than absolute values that interest us.

Another flaw in the present concept of capital stock are the omissions of R&D, software, and environmental considerations which are also absent from national, accepted estimates of GDP and annual investments. However, until national statistical agencies take care of these omissions, we will have to accept the present capital stock data that are worth to be analyzed despite their shortcomings.

2 Observations on Capital Stock

2.1 Share of residential and non-residential in gross fixed capital stock

Residential buildings are included in the following analysis, merely for the sake of establishing the percentage share they hold in the total (residential and non-residential) gross fixed capital stock. While residential is excluded from other computations because of their incompatibility with GDP value added. This exclusion is especially important for capital/output ratios that measure productivity. Moreover, for long-term series, the inclusion of residential buildings would further distort capital output ratios because residential as other structures have a longer lifetime than equipment (also discussed under capital output ratios, subsection 3.1.)

The impact of the inclusion of residential in capital stock can be seen on hand of the US example for 1986, taken from United Nations tabulations (see *Table 1*).

Table 1. US: 1986 gross fixed capital stock and GNP in current and constant prices.

	Current prices	*1980* prices*
Gross Fixed Capital Stock:[a]	Billion Dollars	
including residential	15,922	12,609
excluding residential	10,048	8,033
GNP	4,185	3,180
Capital Output Ratios:		
including residential buildings	3.8	4.0
excluding residential buildings	2.4	2.5

* In UN tabulations, constant prices relate to 1980 (not 1982).

a Including government.

Source: Table on Reproducible Fixed Assets in United Nations 1986 National Accounts Statistics, Main Aggregates and Detailed Tables, New York, 1989. Sales Number E-89.XVII.7, Part II.

The figures show very clearly the difference between the higher capital output ratios that are compiled with residential building included, and those that are more realistic when residential buildings are excluded. Unfortunately, in historic capital stock data, one did not always know whether or not they included residential buildings. Most likely, they did.

The share of residential in total gross fixed capital stock is not only substantial in the US, but in other countries as well (see *Appendix Table 1a*—Share of Residential Buildings in Total Gross Fixed Capital Stock, 1980–1987.) The data have been compiled from the UN statistics so as to offer comparability in terms of classification and coverage. In addition, where feasible, data were also used from national publications, starting with pre-1980.

Appendix Table 1a shows that the share of residential in total gross fixed capital stock is fairly high (ranging from 30% to 45%), remained fairly stable in the 1980s, and that there is considerable agreement between UN and national publications.

The share of residential is the highest in the FRG, around 44% in the 1980s. Here it may be recalled that total gross fixed capital relates to "Private Enterprises" and "government", which excludes households and non-profit organizations. Were the latter included (a rather small amount), the percentage of residential in the gross fixed capital stock of all spheres would be somewhat smaller.

The FRG is followed by Sweden (38%), the US (36%), the UK (33%), and Finland (also 33%).

For Japan and Norway, data are available only in terms of *net* capital stock. Over the 1980 to 1986 period, the share of residential in total *net* fixed capital stock decreased from 25% to 22% in Japan, and rose from 23% to 25% in Norway.

2.2 Share of government in non-residential gross fixed capital stock

Note: For the following analysis, the statistical universe consists of *non-residential* gross fixed capital stock only, held by private enterprises and government (services), excluding military.

Government capital stock shown in *Appendix Table 2a* and as discussed below relates only to services, excluding enterprises. In the UK, government services exclude road paving; and in the FRG government services exclude *Tiefbau*.

Appendix Table 2a shows the percentage share of government in total non-residential gross fixed capital stock during the 1980s and at 1980 constant prices, compiled from UN publications. Data are also compiled from national publications for the US (at 1982 prices) going back to 1950; the FRG (at 1980 prices) going back to 1960; and for the UK (at 1980 and 1985 prices) going back to 1970.

The data shown in *Appendix Table 2a* indicate that according to UN publications, the share of government in total non-residential gross fixed capital stock is the highest in the US (24% to 23%, 1980 to 1986). This is followed closely by Sweden (23% to 24%, 1980 to 1983). While in the FRG, government-owned capital stock amounts to no more than 14% (1980 to 1986), and to even less than that in the UK (8% to 9%, 1980 to 1986).

A comparison of UN data with those found in national publications indicates that the shares of government in total gross fixed capital stock excluding residential and military are:

- about the same for the FRG—roughly 14% at either source. (Data exclude government operated *Tiefbau*.)
- possibly somewhat higher at the UK national source—which indicates 13% to 14% for 1964 and 1970, whereas the percentage is only a little over 8% in the revised data picked up by the UN for 1980–1986. UK government service excludes road paving.
- but very much higher for the US: where the national sources indicate 30% for the 1980s, whereas the comparable share in UN publications was only 24%. For earlier periods, the US national publications indicate that the government's share had been rising from 1950 to 1970 (31.4% to 34.8%); decreasing in 1980 (31.8%), with a further drop through 1988 (29.3%).

This leads us to the question: what accounts for the disproportionately high share of government compiled from US publications, and why is the share much lower in the (adjusted) UN publications? To begin with, we shall compare the composition (equipment and structures) of the government-owned capital stock in US national and UN publications (see *Table 2*). This shows that in either publications the government-owned capital stock consists 92% of structures and only 8% of equipment. This very high share of structures may have had an impact on the value of government capital stock—if we keep in mind the longer lifetime of "structures" (even non-residential) versus equipment, as mentioned earlier. However, not only in the US, but in other countries as well, does capital stock owned for government-services consist mostly of structures (non-residential buildings) (see *Table 3*). A comparison of US gross fixed capital stock total and by major branches in US national and UN publications shows that the UN has scaled down the government capital stock by spreading the excess amount over two branches that are non-existent in the US

publications: "other services, excluding government"(!) and "statistical discrepancy" (see *Table 4*). With this adjustment, all other branches and the grand totals come out to be the same in either publications. By UN rules, this adjustment was accepted by the US, or else it could not be published.

Table 2. US: Composition of government-owned gross fixed capital stock, in US and UN publications.

	1986	
	US Publications[1]	*UN Publications*[2]
	Billion US Dollars, Current Prices	
Government gross fixed capital stock excluding residential and military		
Equipment	250 (8%)	157 (7%)
Structures	2893 (92%)	2030 (93%)
Total (Federal State and Local)	3143 (100%)	2187 (100%)
Private gross fixed capital stock excluding residential		
Equipment	3511 (50%)	...
Structures	3545 (50%)	...
Total	7056 (100%)	...
Government and private gross fixed capital stock excluding residential and military		
Equipment	3761 (37%)	3730 (37%)
Structures	6438 (63%)	6316 (63%)
Total (Private and Government)	10199 (100%)	10046 (100%)

Sources:
1 See: US Commerce Department, *Survey of Current Business*, August 1989, pp. 89–92.
2 See: United Nations, *National Accounts Statistics: Main Aggregates, 1986 Part II*, New York, 1989, pp. 1576–1578, Table 2.15.

Table 3. Share of structures in gross fixed capital stock, excluding residential (1986 at 1980 prices).

	Government-owned	*Total*
US	92%	63%
UK	93%	56%
FRG	87%	61%
Sweden	91%	66%
Finland	95%	68%

Source: See Appendix Table 1a.

Table 4. US: Comparison of US and UN data.

	1986 Gross fixed capital stock Billion Dollars, Current prices	
	US Publications[1]	*UN Publications*[2]
Non-residential		
Private Capital		
Agriculture, forestry, fishery	385	381
Mining	421	428
Construction	112	110
Manufacturing	1581	1556
Transportation	588	} 1175
Communication	595	
Public utilities	847	838
Wholesale trade	275	} 1705
Retail trade	438	
Finance, insurance, real estate	1197	939
Other producers	617	459
Other services, excl. government	...	453
Statistical discrepancy	...	769
Total private, excl. government	7056	7813
Government, excl. military	3143	2235
Total Non-residential	10199	10048
Residential	5700	5874
Total Gross Fixed Capital Stock	15899	15922

Sources:
1 Fixed Reproducible Tangible Wealth, in US Commerce Department, *Survey of Current Business*, Vol. 69, No. 8, pp. 89.
2 United Nations, *1986 National Accounts Statistics: Main Aggregates, Part II*, New York, 1989, pp. 1576–1578, Table 2.15.

2.3 Major branches and selected industries

Note: Percentage shares in non-residential gross fixed capital stock owned by major branches of the economy are shown for the:

- US 1950–1988 in *Appendix Table 3a*;
- UK 1964–1986 in *Appendix Table 4a*;
- FRG 1960–1986 in *Appendix Table 5a*;
- Finland and Sweden 1980–1986 in *Appendix Table 6a.*

Percentage shares in non-residential gross fixed capital stock by selected industries are shown for the:

- US 1950–1988 in *Appendix Table 7a*;
- UK 1970–1987 in *Appendix Table 8a*;
- FRG 1960–1986 in *Appendix Table 9a.*

The percentage structure derives from absolute values of gross fixed capital stock excluding residential at constant prices of:

- US 1982;
- FRG, Finland and Sweden 1980;
- UK 1970,1980, and 1985.

The data sources are:

- national statistical publications US, UK, FRG (with adjustments, where necessary, from UN National Accounts, i.e., for government in the US);
- United Nations national accounts for Finland and Sweden.

The data bank extends over a fairly long time span—nearly 40 years in the US, 26 years in the FRG, and 20 years in the UK. What can these figures tell us on the structural changes in gross fixed capital stock held by those three highly developed countries that underwent further growth and industrialization in what we now refer to as the cold-war period?

First of all, there are the primary industries: agriculture and mining. Agriculture's share in holdings of total non-residential gross fixed capital stock has been declining in all three countries. The US data seem to indicate that the flight from the farms and the mechanization of agriculture had largely run its course by the time the US data bank started (1950). Though the decrease continued through 1988, the drop was minor, and from an already rather low level, from 5.2% of total non-residential capital stock in 1950 to 3.2% in 1988. The decrease was somewhat similar in the UK, from 2.9% in 1964 to 2.6% in 1986. This is different from the FRG, where the share of capital stock held by agriculture was still fairly high in 1960 with 14.0% of total non-residential—a level from which it fell uninterruptedly through the 1970s and 1980s, landing at less than 7% in 1986.

In the *mining* sector, the trend is a reflection not only on the country's stage of industrialization; it is also a reflection on resource endowment and demand for mineral products. Thus, in the FRG, the share of mining in the country's total non-residential capital stock as 3.5% in 1960 was already low. It has since fallen uninterruptedly to an insignificant 1.3% in 1986. In the US, with its comparatively richer mineral resources, the share of mining in total non-residential capital stock amounted to 5.4% in 1950, rising to 6.7% in 1960. By 1970 and 1975 the share had slightly dropped, and this decrease could have continued, had it not been for the oil boom that lifted the share to a high of 6% in 1985. With the slump in oil prospecting, brought by the acute drop in oil prices in the early 1980s, the share of mining in total US capital stock has since fallen to 5.1% in 1988.

Obviously, it was the oil boom that coincided with the development of the North Sea oil which lifted UK's capital stock in the mining sector (excluding petroleum refining) from a mere 2% of total non-residential capital stock in the 1964 to 1975 period, to a level of over 4% in the early 1980s, with the latest figure available for 1986 as 4.9%.

Manufacturing now holds the largest share in the three countries' non-residential capital stock. In the US, this was not always the case. For example, in 1950, manufacturing held less than 14% of total non-residential gross fixed capital stock, while the share of transportation was over 19%, and that of the railroads alone amounted to nearly 15% (higher than total manufacturing!). But with the rapid dismantling of the railroads,

things changed radically. In 1960, railroad's share had tumbled to under 8%; that of transportation to under 13%; while that of manufacturing rose to over 14%, thus becoming the largest major branch. The share has since slightly risen to 15% in 1970, and 15.5% in 1980. Since that time, it fell to below 15% in 1988 (crowded out by services).

This development is in sharp contrast to the UK and the FRG, where manufacturing still holds a much larger share in non-residential capital stock. In the UK, manufacturing was continuously decreasing, though at a moderate pace, from 32.8% in 1964 to 24.8% in 1986. In the FRG, the share of manufacturing increased from 33.1% in 1960 to 36.0% in 1970; subsequently it has steadily decreased to 29.6% in 1986.

We now come to a few major branches whose share of capital stock remained fairly stable. These are:

1. *Public utilities.*
   - In the US, the share oscillated around 8% over the long 1950 to 1986 period;
   - in the UK, the share decreased slightly from 13% in 1964 to little over 11% in 1986;
   - and in the FRG, it moved up from 9.0% in 1960 to 11.0% in 1986 (a consequence of district heating?).
2. *Construction.* This is not really a major branch, but rather an industry. Their share in the country's total capital stock was:
   - in the US, it moved up from 1.3% from 1950 to 1970 to 1.4% in 1980 but has since dropped to 1.0% in 1988.
   - in the UK, it moved up from 1.4% in 1984 to 1.9% in 1970, but has since fallen to 1.5% in 1986.
   - in the FRG, it moved up from 1.7% in 1960 to 2.6% in 1970, but this declined to 1.6% in 1986.
3. *Trade* (*wholesale and retail*). The share in total capital stock:
   - was rising in the US from 4.3% in 1950 to 7.6% in 1988.
   - remained virtually unchanged in the FRG from 7.0% in 1960 to 7.5% in 1980, with a subsequent drop to 7.1% in 1986. (It may be noted that FRG trade includes communication).
   - with inconclusive data for the UK, the shares rose from under 8% in 1980 to under 9% in 1986.

Whatever caused the rise in trade's shares of total capital stock was obviously connected with the growth of service industries to which trade is classified in some countries.

Far more exciting, and with better data than some of the major branches discussed above are the developments in:

- Transportation;
- Communication;
- Finance, insurance, real estate.

Transportation, a major branch, was the biggest loser. Their share in non-residential gross fixed capital stock plummeted in:

- US from 19.1% in 1950 to 5.3% in 1988;
- UK from 14.9% in 1964 to 6.8% in 1986;
- FRG from 9.9% in 1960 to 8.6% in 1986.

The fall was the hardest and occurred the earliest in the US. As mentioned above, the reason for this development is intimately connected with the fate of the railroads (see *Appendix Table 7a*). During World War II, US railroads had their last fling. In 1950, railroads' share in total non-residential gross fixed capital stock amounted to as much as 14.8%. Thus, the share of railroads alone was more than that of all manufacturing, 12.9%. However, by 1988, railroads share had fallen to a mere 2.2%, while that of manufacturing held at nearly 14%.

Air transportation, which really took off at the beginning of the 1950s, requires only a minor share of the nation's capital stock. In the US, their share rose from 0.2% in 1950 to 0.9% in 1980, with a subsequent fall to 0.7% in 1988. There are no data for bus lines' capital stock. Whatever, it has to be kept in mind that one reason for the infinitely lower capital requirements of air and bus lines as compared to the railroads resides in the fact that airlines unlike railroads can operate without a costly infrastructure. Bus lines cannot operate without a costly infrastructure—but most of construction and maintenance of roads, bridges, and tunnels is paid by government and does not appear in the nation's estimates of capital stock. This has to be kept in mind for time comparisons of capital stock productivity (capital output ratios) that will be discussed later in this analysis.

As mentioned above, the fall in the share of transportation in total capital stock started later in the UK and the FRG. Also, for geographical reasons and sheer size of the country, the transportation sector's capital requirements in the UK or Germany were always much lower than in the US, remaining at all times much below those of these countries' manufacturing sectors.

Whether the European countries' comparatively low capital stock requirements of the government operated railroads and other subsidized transportation is "real" or whether it results from a shift of the financial burden to other accounts not included in the estimation of gross fixed capital stock cannot be ascertained at this time.

For completeness sake we should mention that in the UK, railroad's share in non-residential gross fixed capital stock dropped from 7.4% in 1966 to 4.4% in 1980. At the same time, sea shipping fell from 2.9% to 1.1%; while the share of airlines, though rising, remained under one percent.

In the FRG, the abandoning of the railroads had a slower start and slower going. Their 1970 share in non-residential capital stock was 6.5%; and in 1987, it was still 4.8%—indicating a much softer fall than that which occurred in the US.

Another losing industry that may be mentioned at this point, though it has nothing to do with transportation, is textiles. In fact, their decrease started long ago. In the post World War II period, textiles' share in non-residential gross fixed capital stock continued their descent:

- in the US, from 1.0% in 1950 to 0.4% in 1988.
- in the UK, from 1.5% in 1980 to 1.1% in 1986.
- in the FRG, from 1.7% in 1970 to 0.9% in 1987.

2.4 Service Industries

(Trade and Communication, Finance, Real Estate, Insurance, and others). See *Appendix Tables 3a to 5a* and *Table 5* below.

The growth of the service industries can be seen in the increase of their shares in non-residential gross fixed capital stock. The increase was most dramatic in the US where the transition from secondary to service industries had started earlier than in Europe. In 1950, nearly one-half of all non-residential gross fixed capital stock was already owned by service industries; this share exceeded 50% in 1960, and rose to 60% in 1986. While in the UK, the respective shares were still little over one-third (32.8%) in 1964; and still below one-half (48%) in 1986. The data for the FRG tend to indicate an even slower rise of service industries. Their shares in gross fixed capital stock excluding residential rose from a relatively low of 18.3% in 1960 to 37.9% in 1986 (see *Table 5*).

Table 5. US, UK, FRG: share of service industries in total gross fixed capital stock, excluding residential (in percent).

	US			*UK*		*FRG*	
	1950	1960	1986	1964	1986	1960	1986
Trade	4.3	4.0	7.0	[b]	8.7	8.1	8.4
Communication	2.2	2.9	5.6	3.5	4.0	[b]	[b]
Finance, real estate	7.0	7.7	11.9	16.4	11.9	10.2	29.5
Others, excl. gov't	33.9	36.8	12.5		14.5		
Government			23.1	12.9	8.9		
Total	47.4	51.4	60.1	32.8[a]	48.0	18.3[b]	37.9[b]

a) UK, trade included with other services.

b) FRG, communication (postal services) is excluded from services; it is part of transportation.

Source: General Tables 3–5.

2.5 Energy

The Energy sector consists of these industries:

- Coal mining;
- Oil and gas extraction;
- Oil refining and coal processing;
- Electricity;
- Gas supply.

Comparative data for these industries' capital stock, 1950 to 1988, are available for the US (see *Appendix Table 7a*). For the UK, a complete set of data is available only for 1970 to 1982 (see *Appendix Table 8a*). For the FRG, a complete set of energy industries' gross fixed capital stock is available for only one year, 1984 (Schmidt, 1986). For other years, incomplete, sporadic data are available which are difficult to use because electricity and gas supply are lumped with water services (see *Appendix Table 9a*).

The detailed and long-term capital stock data for the energy sector in the US (see *Appendix Table 7a*) show that the energy sector's share in non-residential gross fixed capital stock decreased from a high of 16.8% in 1950 to a low of 13.6% in 1988. A

comparison with manufacturing shows that in 1950, the energy sector held a higher share of the nation's non-residential gross fixed capital stock (16.8%) than all of manufacturing (13.9%). In 1988, the situation was somewhat reversed, the energy sector's share had dropped to 13.6%, that of total manufacturing had risen to 14.8% (*Table 6*).

Table 6. US: Share of non-residential gross fixed capital stock.

	1950	1980
Energy sector	16.8%	13.6%
Manufacturing	13.9%	14.8%

The drop in the energy sector's share in non-residential gross fixed capital stock is largely explained by the slump in coal mining. One of the reasons for this decrease may be seen in the fact that in the immediate post-war years, coal mining was at a high, because of the much-needed shipments of US coal to Europe (this required the construction of special facilities at an East Coast Harbor). With the end of these exports, and with the displacement of coal by oil and gas, coal mining's share of total non-residential gross fixed capital stock fell from 4.2% in 1950 to only 0.1% in 1980, coal by oil and gas, coal mining's share of total non-residential gross fixed capital stock fell from 4.2% in 1950 to 0.1% in 1980, with only a slight upturn to 0.4% in 1988.

In other US energy industries, the swings were less pronounced, though there were some ups and downs. Shares in non-residential gross fixed capital stock moved for:

- Oil and gas extraction from 4.4% in 1950 to 4.2% in 1988.
- Oil refining (including coal processing) from 1.0% in 1950 to 0.9% in 1988.
- Electricity supply from 5.3% in 1950 to 6.5% in 1988.
- Gas supply from 1.9% in 1950 to 1.6% in 1988.

In the UK (*Appendix Table 8a*) it appears from the few data at our disposal that the share of Energy in gross fixed capital stock excluding residential moved as follows:

- Coal mining continued to decrease from a low of 2.0% in 1966 to 1.2% in 1980.
- Oil and gas extraction, insignificant until the North Sea finds, rose rapidly from 1.0% in 1975 to 3.4% in 1986.
- Electricity supply displaced by North Sea gas, fell from 9.1% in 1966 to 7.0% in 1980.
- Gas supply moved up from 1.8% in 1966 to 2.0% in 1980.

Finally, it may be worth noting that presently the energy sector as a whole, in both US and UK assumes almost similar shares in total non-residential gross fixed capital stock (about 14%). For the FRG, we have complete energy sector data for only one year. This indicates that the share of energy in total gross fixed non-residential capital stock is lower than in the US and the UK (*Table 7*).

Table 7. Total Energy Sector: Shares in non-residential gross fixed capital stock.

	US	UK	FRG
1975	14.5%	13.5%	...
1980	14.0%	14.0%	...
1984	...	...	9.4%

The above data may be considered as "bench-mark" statistics, for whatever this is worth.

2.6 Summary observations on capital stock

The above survey of capital stock held by major branches and selected industries in the US, UK, and the FRG has shown that:

> With due consideration of geographical differences (size, resource endowment) and time lags in these countries' transition from secondary to service industries, it was found that the structure of capital stock held by major branches and selected industries was not too different between the three countries. More importantly, the trends were mostly pointing in the same directions. Altogether, the structural changes shown in the capital stock holdings reflected a good deal on recent economic history in Western industrialized countries.

3 Capital Output Ratios

3.1 Data availability

The capital output ratios are derived from capital stock and value added. For our exercise, we selected non-residential gross fixed capital stock at constant prices (i.e., 1982 for the US; 1985 for the UK; and 1980 for the FRG).

Gross value added for the country as a whole, major branches and selected industries were compiled from these sources:

- US: GNP by industries, 1947–1982; updated with the US Statistical abstract (US Department of Commerce, 1986b).
- UK: GDP at constant prices and by industries was not found in national publications. For this reason, use was made of the United Nations data on the UK GDP by kind of activities (UN, 1986).
- FRG: GDP (Brutto Sozial Produkt) by industries of 1980 prices (see *Statistisches Jahrbuch*, various issues; see also Statistisches Bundesamt).

Classification was found to be the same for major branches and selected industries of both value added and capital stock—this made it possible to compile capital output ratios at detailed industry level. The matter is not quite so simple when it comes to the capital output ratio for the economy as a whole. This is so because the statistical universe of *total* capital stock and *total* GNP (or GDP as the case may be) are not identical. In addition to value added by industries, the GDP is adjusted through the addition of indirect taxes, and deduction of statistical discrepancies. However, it was found that these are only minor amounts and therefore comparability of total GDP and total capital stock may not be materially affected.

Another problem is whether "residential" should be really excluded from total gross fixed capital stock. The argument for including it is that if the nation changes from "self-owned" to "rental dwellings"—and residential is excluded—the capital output ratio tends to be biased. On the other hand, we felt that the inclusion of residential would be inconsistent with the GDP concept, and therefore omitted it. Be that as it may the

residential can easily be reinstated, if necessary. The essential thing is to provide adequate identification as to inclusion or exclusion.

Capital output ratios for the total economy engaged in the production of goods and services for the market and by major branches are shown in *Appendix Table 10a* for the US, UK, and the FRG. For selected industries, see *Appendix Table 11a*. For GDP gross value added and non-residential capital stock (total, major branches, and selected industries) in US Dollars, UK Pound Sterling, and German Mark, see *Appendix Tables 10a* and *11a* (not reproduced, available upon request).

3.2 Total economy

The data show first of all that the capital output ratios for the economy as a whole in the three countries are very close. The almost identical capital output ratios (excluding residential) amounted in 1987 to:

- 2.5 in the US;
- 2.7 in the FRG; and
- 2.8 in the UK.

Secondly, capital output ratios for the economy as a whole change very slowly. Between 1980 and 1987, the ratios remained:

- Constant in the US (2.5).
- Almost constant in the UK (2.9 in 1980–1986; followed by a minor drop in 1987 to 2.8).
- But rose slightly in the FRG (2.5 in 1980 to 2.7 in 1987).

This means that between 1980 and 1987, the productivity of capital did not change in the US, increased slightly in the UK, and fell off slightly in the FRG.

What was the long-term development? In the US, the capital output ratio held steady at 2.4 in 1950, 1960 and 1970. But after 1970, a slight deterioration of the productivity of capital set in. The capital output ratio moved up to 2.5 in 1980. In the FRG, the long-term decrease of capital productivity for the economy as a whole was more pronounced. The capital output ratio rose from 1.8 in 1960; to 2.1 in 1970; 2.5 in 1980; and 2.7 in 1987. Long-term data were not found to be available for the UK at least not those capital stock and GDP value added consistent with prices and definitions used in this analysis for the short-term variables.

3.3 Major branches and selected industries

Major branches' capital output ratios differ considerably from those observed for the economy as a whole. In the first place, the *level* of capital output ratios for major branches and selected industries is much higher for some, and much lower for others than the "national average" presented by the economy as a whole. Secondly, their movements— up or down— are faster than those of the economy as a whole. The interesting part of the capital output ratios is that they indicate clearly what may be considered as "expensive business" where the capital input per value added output is relatively high, and what can

be considered as "less expensive business" where the reverse is true. On this score, there is much similarity in all three countries.

The worst in the so-defined "expensive business" is found in the public utilities. Their capital output ratios are much higher than those of any other major branch. The highest capital output ratio for public utilities amounted to as much as 18.4 in the UK in 1980; it has since come down (rapidly) to 15.8 in 1987. In the US, public utilities capital output ratios amounted to 14.0 in 1950; they have since come down to 7.2 in 1985 with a light upswing to 7.6 in 1987. In the FRG, the ratio fell from 9.2 in 1960 to 8.0 in 1980; and after some ups and downs, reached 9.7 in 1987. There are no data for the individual industries that are lumped in the public utilities—electricity, gas and water supply. But judging from the sparse information on the energy sector, it may be surmised that electricity and gas supply are the ones with very high capital output ratios.

Transportation is the major branch with the second highest capital output ratios. In the US, the ratios fell from 8.0 in 1950 to 3.9 in 1987. This is of course a reflection on the substitution of railroads by bus and airlines as discussed above. Moreover, one wonders whether the narrowing of the capital output ratios does not also give a hint of the neglect of infrastructure in US transportation. Within the transportation branch, the capital output ratio of US railroads decreased from 16.5 in 1950 to 13.1 in 1987, during the same time period the capital output ratio for air transport fell from 4.1 to 2.5 *Appendix Table 11a.*

In the FRG, the capital output ratio for transportation moved up from 5.2 in 1970 to 6.1 in 1986. This was a movement in the opposite direction from that observed for the US; at the same time, the German ratio for railroads moved up from 9.3 in 1970 to 14.9 in 1986 (may be they enjoyed better maintenance). Transportation capital output ratios were not found for the UK.

Communication capital output ratios fell in the United States, from 6.3 in 1950 to 5.0 in 1987; and in the FRG, they rose from 3.3 in 1970 to 4.2 in 1986; no data for the UK. The relatively high levels of the communication branch capital output ratios, and their slow movements, may be explained by the fact that this branch consists mostly of postal services, including telegraph and telephone, plus radio and television that in Europe are government operated.

What about the primary industries, agriculture and mining? As regards agriculture, the capital output ratios seem to indicate that capital is used with more efficiency in the US—where the capital output ratios are significantly lower than in the FRG and the UK. This is notwithstanding the fact that in the US, the efficiency with which capital is used in agriculture has slowly diminished between 1950 and 1987—as capital output ratios rose from 2.3 in 1950 to 3.4 in 1987. In the FRG, the corresponding ratios rose from 6.6 in 1960 to 8.6 in 1980, reaching 7.9 in 1987. In the UK, these ratios moved from 6.0 in 1980 to 5.1 in 1987. This may signify that the efficiency with which capital is used in European countries has in recent times improved, while there is a long time deterioration in the US. However, the efficiency of capital use in the US agriculture (3.4 capital output ratio in 1987) is still better than that of the FRG (7.9 in 1987) and the UK (5.1 in 1987).

In the 1950 to 1970 years, for both the US and the FRG, mining capital output ratios were rather low though slowly rising: in the US from 2.1 in 1950 to 2.5 in 1970; and in the FRG, from 1.8 in 1960 to 2.2 in 1970. Since 1970, a faster deterioration of capital productivity in mining began, as the growth of capital output ratios accelerated in both countries. In 1987, the ratios reached 4.5 in the US, and 4.8 in the FRG. For the UK, mining capital output ratios are available only from 1980 to 1987. This was a period of uninterrupted decrease—from 6.0 to 5.1 (as the North Sea finds of oil paid off).

Now come the "less expensive" businesses, the major branches and selected industries with capital output ratios lower than the ones observed above.

The analysis starts with total manufacturing. The capital output ratio for the major branch of total manufacturing is lower than that of the economy as a whole in the US and the FRG. However, similarly to what happened to the economy as a whole, the productivity of capital in manufacturing has been deteriorating though at a somewhat slower pace and for different reasons. In the US, the capital output ratios for manufacturing grew from 1.6 in 1950 to 1.9 in 1980; this was followed by a slight improvement as the capital output ratio stood at 1.7 in 1987. In the FRG, the ratio rose uninterruptedly from 1.5 in 1960 to 2.0 in 1987. This also shows heavy capital investment to speed up mechanization of industry.

For the UK, manufacturing capital output ratios fell from 3.5 in 1980 to 3.3 in 1987 which signifies some increase in the productivity of capital. Comparable long-term series were not found.

The manufacturing branch contains a multitude of individual industries, each having their own capital output ratios—though not all are readily available. And some that are available, for example, primary metals in the UK may not be comparable to those for the US and the FRG, for reasons of classification. Comparability seems to be better for industries in the US and the FRG (see again *Appendix Table 11a*). This shows, for instance, for primary metals, the productivity of capital has deteriorated in these two countries, with the movement of capital output ratios from:

- 1.4 in 1950 to 4.7 in 1987 in the US; and
- 3.5 in 1970 to 4.0 in 1987 in the FRG.

Mechanical engineering (non-electric machinery) capital output ratios remained fairly stable in the US, but deteriorated slightly in the FRG. The capital output ratios moved from:

- 1.0 in 1950 to 1.2 in 1980; and 0.9 in 1987 in the US;
- 1.1 in 1970 to 1.6 in 1986 in the FRG.

Motor vehicles and equipment's development merits special attention. Their capital productivity decreased, as the capital output ratios moved from:

- 1.1 in 1950 to 2.2 in 1987 in the US; and
- 1.4 in 1970 to 2.0 in 1986 in the FRG.

Chemical and allied's capital productivity increased, as the capital output ratios moved from:

- 4.1 in 1950 to 2.5 in 1987 in the US; and
- 3.1 in 1970 to 2.8 in 1986 in the FRG.

Also of interest is the textiles industry, which as we saw above, lost a lot of ground. But in the process, they improved their capital output ratio in the US while it deteriorated in the FRG. Their capital output ratios moved from:

- 5.5 in 1950 to 2.0 in 1987 in the US; and
- 2.7 in 1970 to 3.0 in 1986 in the FRG.

Finally, a look at the major branches with comparatively low capital output ratios: finance, real estate, trade, construction.

Finance and real estate. Though the capital output ratio is still at a rather low level, it has:

- Increased in the US from 1.7 in 1950 to 2.1 in 1987.
- Decreased in the FRG from 1.8 in 1970 to 1.6 in 1986.
- Remained stable in the UK at 1.7 to 1.8 between 1980 and 1987.

Trade (*wholesale and retail*) seems to be a good business, from the point of view of capital requirements. Although their capital output ratios have risen from:

- 0.7 in 1950 to 1.0 in 1987 in the US; and
- 1.2 in 1970 to 1.8 in 1987 in the FRG.

Construction seems to be the best industry to select from the point of view of capital productivity, as indicated by the very low level of the capital output ratios that remained under 1 in all three countries. The capital output ratios moved from:

- 0.7 in 1950 to 0.5 in 1987 in the US;
- 0.3 in 1970 to 0.7 in 1987 in the FRG; and
- 0.9 in 1980 to 0.8 in 1987 in the UK.

These very low capital output ratios may be explained by the fact that the share of "Structures" is extremely low in the construction industry's gross fixed capital stock. Moreover, the practice of leasing instead of purchasing of equipment may have reduced the industry's capital stock requirements as well.

4 Summary Observations

The capital output ratios compiled for the US, UK, and the FRG, for their economies as a whole; major branches and selected industries were found to bear considerable resemblance as to levels and directions of trend. This may enhance the users' confidence in the application of these ratios as a tool for the establishment of economic scenarios for these countries.

In addition, these ratios might also fill a gap in the projections on industrial development in other countries, which do not dispose of detailed statistical information. Specifically, one thinks of countries where these capital output ratios might be useful as one of the criteria deciding on the selection of industries for reconstruction and development, i.e., in Eastern Europe where capital output ratios moreover are important for the estimation of total capital requirements.

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Appendix Table 1a. Selected countries: share of residential building in grand total gross fixed capital stock (residential and non-residential) (in percent).

	At 1980 Constant Prices											
	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
USA–UN statistics				36.6	36.4	36.2	36.2	36.2	36.2	36.3		
National Publications[a)]	37.5		36.2	35.6	35.3	35.1	35.1	35.2	34.4	35.2	35.3	
United Kingdom–UN statistics		[a)]		30.8	30.8	30.8	30.8	30.8	30.7	30.8		
National Publications		30.0	28.6	31.4	31.4	32.8	32.9	32.9	32.9	32.9	32.9	32.8
Germany, F.R.–UN statistics				43.6	43.6	43.6	43.6	43.7	43.7	43.6		
National Publications		47.8	45.7	44.5			44.5	44.5	44.6	44.6		
Sweden–UN statistics				38.8	38.4	38.2	37.9					
Finland–UN statistics				32.5	32.6	32.8	33.0	33.2	33.2	33.2		
Norway–UN statistics (*Net* Fixed Capital Stock)				(23.5)	(23.6)	(24.0)	(24.3)	(24.3)	(24.8)	(25.1)		
Japan–UN statistics (*Net* Fixed Capital Stock)				(25.4)	(24.9)	(24.4)	(24.0)	(23.4)	(22.7)	(22.3)		

Sources: United Nations statistics, at 1980 constant prices (see National Accounts Statistics. Main aggregates and detailed tables, 1986 Parts I and II, New York, 1989).

National publications:

USA (1982 constant prices) (see Commerce Department, Survey of Current Business, August 1989 and earlier issues).

United Kingdom (1985 constant prices), see Central Statistical Office, 1990 Annual Abstract of Statistics, Table 14.15 and earlier issues. Also, National Amounts, 1984 edition.

Germany, F.R. (1980 constant prices), Statistiches Bundesamt: Volkswirtschaftliche Gesamtrechnungen, Fachserie 18, Lange Reihen 1960–1984, S 8, Updated with Statistiches Jahrbuch.

a) 1964

Appendix Table 2a. Selected countries: share of government services in non-residential gross fixed capital stock (in percent).

	At 1980 Constant Prices											
	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
USA–UN statistics				24.0	24.5	24.3	24.1	23.7	23.4	23.1		
National Publications[a)]	31.4	33.6	34.8	31.8	31.4	31.1	30.9	30.5	30.0	29.8	29.6	29.3
United Kingdom–UN statistics[b)]				8.3	8.4	8.5	8.5	9.6	8.7	8.9		
UK National Publications		12.9 [a)]	14.2									
Germany, F.R.												
– UN statistics				13.8	13.8	13.9	13.8	13.8	13.7	13.7		
– National Publications[a)]	16.1	14.0	13.5	14.4	14.4	14.4	14.4	14.4	14.3			
Norway–UN statistics												
Net Fixed Capital Stock				(11.6)	(11.8)	(12.0)	(12.2)	(12.1)	(12.4)	(12.6)		
Sweden–UN statistics				23.3	23.3	23.5	23.8					
Finland–UN statistics							16.3	16.3	16.4	16.4		
Japan–UN statistics												
Net Fixed Capital Stock	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Sources: see Appendix Table 1a.

a) 1964

Appendix Table 3a. USA: Share of major branches in non-residential gross fixed capital stock, 1950–1988 (in percent).

Activity of owner	Based on 1982 Constant Priced Capital Stock								
	1950	1960	1970	1975	1980	1985	1986	1987	1988
Agriculture	5.2	4.9	4.2	4.3	4.5	3.8	3.6	3.4	3.2
Mining	5.4	6.7	5.8	5.2	5.5	6.0	5.8	5.5	5.1
Manufacturing	13.9	14.4	15.0	15.0	15.5	15.1	15.2	15.0	14.8
Public utilities	7.7	8.5	8.4	8.8	8.5	8.3	8.4	8.4	8.3
Construction	1.3	1.3	1.3	1.4	1.4	1.1	1.1	1.0	1.0
Trade, wholesale and retail	4.3	4.0	4.8	5.3	6.9	6.6	7.0	7.3	7.6
Transport	19.1	12.8	8.8	7.6	5.7	6.1	5.8	5.5	5.3
Communication	2.2	2.9	3.8	4.3	4.9	5.5	5.6	5.6	5.7
Finance, insurance real estate	7.0	7.7	8.9	9.5	8.9	11.4	11.9	12.5	13.1
Other services, excl. government					14.2	12.7	12.5		
Government					24.0[a)]	23.4[a)]	23.1[a)]		
Other services, incl. government	33.9	36.8	39.0	38.6				35.8	35.9
Total, excluding residential	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(Billions of 1982 Dollars)	2905	3955	5725	6808	7950	9075	9319	9557	9829

a) UN data (see Appendix Table 2a).

Source: USA. Commerce Department, Survey of Current Business 1986, January, Vol. 66, No. 1, pp. 56–57; and Commerce Department, Survey of Current Business 1989, August, Vol. 69, No. 8, pp. 90–92.

Appendix Table 4a. United Kingdom: Share of major branches in non-residential gross fixed capital stock, 1964–1986 (in percent).

Activity of owner	Based on 1970, 1980, and 1985 Constant Priced Capital Stock							
	1964	1965	1970	1975	1980	1985	1986	1987
Agriculture	2.9	2.9	2.7	3.5	3.1	2.8	2.6	
Mining	2.1	2.0	2.2	2.2[c]	4.2[d]	4.2	4.9	
Manufacturing	32.8[a]	32.7[a]	29.8[a]	28.6[c]	27.0[d]	25.1[d]	24.8[d]	
Public utilities	13.1	13.2	12.3	12.7	12.2	11.5	11.4	
Construction	1.4	1.6	1.9	1.7	1.7	1.5	1.5	
Trade, wholesale and retail	[b]	[b]	[b]	[b]	7.9	8.6	8.7	
Transport	14.9	14.5	10.7	10.7	9.0	7.2	6.8	
Communication	3.5	3.5	4.5	3.4	3.9	4.0	4.0	
Finance, insurance, other services, excl. government	16.4	16.7	21.7	37.2	8.3 14.4	11.2 15.2	11.9 14.5	
Government	12.9	12.9	14.2*		8.3	8.7	8.9	
Total, excluding residential	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
£Billions at 1970 Prices	98.7	103.0	128.1					
£Billions at 1980 Prices				638.5				
£Billions at 1985 Prices					927.1	1023.1	1044.0	1068.6

a) Manufacturing includes oil refining.
b) Trade included with other services, excluding government.
c) Oil refining excluded from manufacturing, included with mining.
d) Oil refining included with manufacturing unknown.
* This was double checked. In the early 1970s, UK share of government had risen much above the level of the 1980s.
Notes and Sources:
1964–1970 based on 1970 constant prices. Source: UK 1979 Statistical Abstract; Table 14.19 and earlier ones.
1975 based on 1980 constant prices. Source: UK 1989 Statistical Abstract, Table 14.16.
1980–1985 based on 1985 constant prices. Source: UK National Accounts; 1989 edition, Table 14.8.
Note: 1980–1986 structures adjusted with data in United Nations. *National Accounts*, Part II.

Appendix Table 5a. Germany, F.R.: Share of major branches in non-residential gross fixed capital stock, 1950–1988 (in percent).

Activity of owner	Based on 1980 Constant Priced Capital Stock [a]								
	1950	1960	1970	1980	1984	1985	1986	1987	1988
Agriculture, For. Fisheries	17.6	14.0	10.7	8.0		7.0	6.8	6.6	
Mining		3.5	2.0	6.4		1.3	1.3	1.3	
Manufacturing		28.5	30.4	28.0		25.6	25.2	25.1	
Public utilities		7.8	7.7	8.9		9.3	9.4	9.5	
Construction		1.7	2.6	2.1		1.8	1.7	1.6	
Trade, wholesale & retail		7.0	7.7	7.5		7.2	7.2	7.1	
Transport		14.8	9.9	9.4		8.8	8.6	8.6	
Communication			2.6	3.9		4.5	4.7	4.9	
Finance, real estate, insurance		2.5	2.7	3.2		3.4	3.5	3.6	
Other services, excl. government		6.2	8.3	12.8		16.4	17.0	17.4	
Government, excl. road service	16.1	14.0	15.4	14.8[b]		14.7[b]	14.6[b]	14.3 *E*	
Total, excl. residential	100.0	100.0	100.0	100.0		100.0	100.0	100.0	
Billions of 1980 D.Mark		1185	2181	3282	3695	3785	3885	3981	
Billions of 1976 D.Mark	564.1[a]								

a) 1950 based on constant prices of 1976

b) United Nations data

E = Estimated

Notes and Sources:

The Statistical Universe consists of: Private non-residential enterprises plus Government, excluding "Tiefbau" (roads).

1950 = See Volkswirtschaftliche Gesamtrechnungen, Lange Reihen 1950–1984, Fachserie 18, Reihe S7.

1960–1987 = See Statistisches Jahrbuch, 1989, Table 24.21.

1950 at 1976 prices = See Volkswirtschaftliche Gesamtrechnungen, Lange Reihen 1950–1984, Fachserie 18, Reihe 7.

Note: A breakdown of the Energy sector became available in: Wirtschaft und Statistik, 7/1986, p. 199 for 1984.

Data for 1985, 1986, 1987 = See Statistisches Jahrbuch 1989.

Appendix Table 6a. Finland and Sweden: Share of major branches in non-residential gross fixed capital stock (1980 constant prices) (in percent).

Activity of owner	1980	1985	1986
Finland			
Agriculture	12.5	11.8	11.6
Mining	0.5	0.5	0.5
Manufacturing	19.7	19.7	19.7
Construction	1.8	1.5	1.5
Public utilities	9.1	8.7	8.6
Trade	8.9	9.5	8.4
Transport & communication	[a]	[a]	10.5
Government	[a]	24.5	24.6
Others	47.5[a]	23.8[a]	14.6[a]
Total, excl. residential	100.0	100.0	100.0
(Billions Fin. Marks, 1985 prices)	(653)	(1118)	(1150)
Sweden			
Agriculture	6.9		
Mining	1.2		
Manufacturing	25.3		
Construction	1.7		
Public utilities	12.3		
Trade	5.8		
Tranport & communication	11.9		
Government	23.3		
Others	11.6		
Total, excl. residential	100.0		
(Billions of Swedish Kroner, 1980 prices)	1565		

a) Includes "all others".

Source: United Nations, 1986 National Accounts Statistics, Parts I and II.

Appendix Table 7a. USA: Selected industries' share in non-residential gross fixed capital stock, 1950–1988 (in percent).

Activity of owner	Based on 1982 Constant Priced Capital Stock [a]								
	1950	1960	1970	1975	1980	1985	1986	1987	1988
Selected industries									
Energy									
Coal mining	4.2	0.2	0.2	0.3	0.1	0.5	0.5	0.4	0.4
Oil & gas extraction	4.4	6.0	5.1	4.4	4.5	5.0	4.6	4.5	4.2
Oil refining, coal proc.	1.0	1.1	1.0	1.0	1.0	1.0	1.0	0.9	0.9
Electricity	5.3	5.9	6.0	6.8	6.6	6.5	6.6	6.6	6.5
Gas supply	1.9	2.3	2.2	2.0	1.8	1.6	1.6	1.6	1.6
Total Energy	16.8	15.5	14.5	14.5	14.0	14.6	14.3	14.0	13.6
Manufacturing									
Food	2.4	1.8	1.5	1.4	1.4	1.3	1.3	1.3	1.3
Primary metals	1.9	2.1	2.2	2.1	2.0	1.8	1.7	1.7	1.6
Machinery (non-electric)	0.8	1.1	1.2	1.2	1.3	1.5	1.5	1.5	1.5
Machinery (electric)	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.3	1.4
Motor vehicles & equip.	0.7	0.9	1.0	1.0	1.0	0.9	0.9	0.9	0.9
Chemical & allied	1.4	1.6	1.8	1.9	2.0	1.9	1.8	1.8	1.7
Paper & allied	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0
Stone, clay, glass	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.5
Textile mills	1.0	0.7	0.5	0.5	0.5	0.4	0.4	0.4	0.4
Others	2.7	2.9	3.4	3.4	3.6	3.5	3.7	3.7	3.6
Total manufacturing, excl. oil refining	12.9	13.3	14.0	14.0	14.5	14.1	14.2	14.1	13.9
Transportation									
Railroad	14.8	7.7	5.3	4.1	3.2	2.6	2.4	2.3	2.2
Air	0.2	0.4	0.8	0.8	0.9	0.8	0.8	0.7	0.7
Communication									
Telephone & telegraph	2.0	2.7	3.5	4.0	4.7	5.2	5.3	5.3	5.3
Radio, T.V.	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Total industries, excl. residential									
Billions of 1982 US$	2905	3955	5725	6808	7950	9075	9319	9557	9829

Source: See Appendix Table 3.

Appendix Table 8a. United Kingdom: Selected industries' share in non-residential gross fixed capital stock, 1966–1987 (in percent).

Activity of owner	1966	1970	1975	1980	1985	1986	1987
Selected industries							
Energy							
Coal mining	2.0		1.2	1.2			
Oil & gas extraction			1.0	2.7	3.4	3.4	
Oil refining (incl. coal proc.)			1.1	1.1			
Electricity	9.1		8.1	7.0			
Gas supply	1.8		2.1	2.0			
			13.5	14.0			
Manufacturing							
Food, drink (+ tobacco)			2.2	1.3	2.3	2.3	2.2
Primary metals			3.4	3.2	2.7	2.6	2.5
Machinery (non-electric)			2.3	2.5	2.3	2.3	2.2
Machinery (electric)			1.8	1.8	1.8	1.9	1.9
Motor vehicles & equip.			1.8	1.8	1.8	1.8	1.7
Chemical & allied			4.2	4.3	4.1	4.1	4.0
Stone and clay							
Textile mills			1.8	1.5	1.2	1.2	1.1
Paper & allied			1.8	1.9	1.8	1.9	1.2
Transportation							
Railroad	7.4	6.1	5.4	4.4			
Sea	2.9	2.7		1.1			
Air		0.8	0.5				
Communication							
Postal services (incl. radio & TV)		4.0	3.4				
Total							
Billion £at 1970 prices		128.1					
Billion £at 1980 prices			638.5				
Billion £at 1985 prices				927.1	1023.1	1044.0	1068.6

Source: See Appendix Table 4.

Appendix Table 9a. Germany, F.R.: Selected industries' share in non-residential gross fixed capital stock, 1970–1987 (in percent).

Activity of owner	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
				At 1980 Constant Prices								
Selected industries												
Energy												
Coal mining								1.0				
Oil & gas extraction												
Oil refining (incl. coal proc.)			1.1	0.9				0.6	0.7	0.7	0.6	
Electricity (incl. district heating)								7.2				
Gas supply								0.6				
Manufacturing												
Food			2.7	2.2				2.0	1.9	1.9	1.8	
Drink			1.3	1.1				1.0	1.0	1.0	0.9	
Primary metals			2.5	2.1				1.7	1.5	1.5	1.4	
Machinery (non-electric)			2.7	2.5				2.3	2.3	2.3	2.3	
Machinery (electric)			0.3	0.4				0.5	0.5	0.5	0.5	
(Motor) vehicles and repair (Strassenfahrzeug incl. bicycles)			2.5	2.6				3.0	3.0	3.0	3.1	
Chemical & allied			4.2	3.9				3.5	3.4	3.3	3.3	
Paper & allied			0.3	0.4				0.3	0.3	0.3	0.3	
Stone & clay (no glass)			1.4	1.3				1.1	1.1	1.0	1.0	
Textile mills			1.7	1.2				1.0	0.9	0.9	0.9	
Transportation												
Railroad			6.5	5.4				5.0	4.9	4.9	4.8	
Air												
Communication												
Postal services (incl. radio, TV)			2.6	3.9				4.4	4.5	4.7	4.5	
Total private non-residential Enterprises (+ government) Billion DM at 1980 prices		1184.6	2180.6	3282.0				3694.6	3784.8	3885.0	3981.3	

Source: See Appendix Table 5a.

Appendix Table 10a. Capital/Output Ratios: Total and major branches in the United States, United Kingdom and Germany, F.R.

Total and major branches	1950	1960	1970	1980	1985	1986	1987
United States							
Total	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Major branches:							
Agriculture, For., Fish.	2.3	2.8	3.5	4.7	3.7	3.4	3.4
Mining	2.1	2.8	2.5	3.3	4.2	4.7	4.5
Manufacturing	1.6	1.7	1.7	1.9	1.8	1.8	1.7
Public utilities	14.0	9.7	8.0	7.9	7.2	7.5	7.6
Construction	0.7	0.3	0.4	0.7	0.6	0.6	0.5
Trade	0.7	0.6	0.7	0.9	1.0	1.0	1.0
Transport	8.0	6.9	4.9	4.3	4.3	4.2	3.9
Communication	6.3	5.8	5.3	5.0	5.2	5.2	5.0
Finance, real estate	1.7	1.5	1.6	1.6	2.0	2.1	2.1
United Kingdom							
Total				2.9	2.9	2.9	2.8
Major branches:							
Agriculture, For., Fish.				6.0	5.0	5.2	5.1
Mining				2.6	2.2	2.2	2.4
Manufacturing				3.5	3.5	3.4	3.3
Public utilities				18.4	17.7	16.3	15.8
Construction				0.9	0.9	0.8	0.8
Trade							
Transport							
Communication							
Finance, real estate				1.7	1.8	1.8	1.7
Germany, F.R.							
Total		1.8[a)]	2.1[a)]	2.5[a)]	2.7[a)]	2.7[a)]	2.7[a)]
Major branches:							
Agriculture, For., Fish.		6.6	8.2	8.6	7.8	7.1	7.9
Mining		1.8	2.2	3.2	4.2	4.8	4.8
Manufacturing		1.5	1.7	1.9	1.9	2.0	2.0
Public utilities		9.2	8.3	8.0	9.9	9.5	9.7
Construction		0.3	0.6	0.7	0.8	0.7	0.7
Trade		1.2	1.5	1.8	1.8	1.8	1.8
Transport			5.2	5.9	5.9	6.1	
Communication			3.3	3.9	4.2	4.2	
Finance, real estate		1.8	1.5	1.6	1.7	1.6	1.6

a) Germany, F.R. Capital stock of total private enterpriese, excluding residential (and government).

Note: Capital output ratios result from: (1) gross fixed capital stock, excluding residential and (2) GDP gross value added. The capital output ratios are compiled from capital stock and value added at 1982 prices (USA); 1985 prices (United Kingdom) and 1980 prices (Germany, F.R.).

Sources: For gross fixed capital stock, see Appendix Tables 3a–5a. GNP–Gross Value Added, see for *United States*, Commerce Department, The National Income and Product Accounts of the United States 1929–1984. Statistical Tables, Washington, D.C., 1986. Updated with US

Statistical Abstract 1989.

For *United Kingdom*, Gross value added at 1985 prices was not available in national or international publications. For that reason, the United Nations data for 1985 value added was used, at current prices in billion £, and extrapolated back to 1980 and forwarded to 1987 with index numbers of constant priced value added (see United Nations, National Accounts, Part II, Standard Tables 1.10 and 1.11 for the United Kingdom).

For *Germany, F.R.*, GDP Gross Value Added represents "BruttoWertschöpfung" of total non-residential, private enterprises. See Statistisches Bundesamt, 1989 Statistisches Jahrbuch, Table 24.5, pp. 546–548.

Appendix Table 11a. Capital/Output Ratios: Selected industries in the United States, United Kingdom and Germany, F.R.

Selected industries	1950	1960	1970	1980	1985	1986	1987
United States							
Coal mining	1.1	1.2	1.2	2.4			
Oil & gas extraction	2.2	3.0	2.5	3.2			
Oil refining	2.4	2.7	2.3	2.9	3.6		
Electricity							
Gas supply							
Food and drink	2.7	2.2	2.0	2.0	1.9	2.0	2.0
Food							
Drink							
Primary metals	1.4	2.2	2.7	3.4	4.7	4.7	4.7
Machinery, non-electric	1.0	1.0	1.2	1.2	1.0	0.9	0.9
Machinery, electric	1.5	1.3	1.3	1.3	1.4	1.5	1.5
Motor vehicles & equipt.	1.1	2.0	2.2	2.4	1.7	2.0	2.2
Chemical & allied	4.1	3.5	3.0	3.2	2.9	2.1	2.5
Paper & allied^{P}	2.2	2.8	2.8	3.1	2.9	2.9	2.8
Stone, clay, glass	1.8	2.1	2.2	2.5	2.3	2.3	2.2
Textile	5.5	4.5	2.6	2.4	2.3	2.1	2.0
Railroad	16.5	12.9	10.5	9.5	12.0	12.4	13.1
Air transport	4.1	3.0	3.2	3.0	2.9	2.7	2.5
Telephone, telegraph	6.9	6.8	5.5	5.2	5.5	5.5	5.8
Radio, television^{R}	2.6	1.8	3.2	3.0	2.9	2.9	2.9
United Kingdom							
Coal mining							
Oil & gas extraction				1.9	1.8	1.8	
Oil refining							
Electricity							
Gas supply							
Food and drink							
Food				3.3	3.4	3.4	3.4
Drink				4.0	4.6	4.7	4.5
Primary metals							
Machinery, non-electric				2.4	2.6	2.8	2.7
Machinery, electric				2.1	1.9	1.9	1.8
Motor vehicles & equipt.				3.7	4.5	4.7	4.4
Chemical & allied				6.4	5.7	5.4	5.3
Paper & allied^{P}				2.3	2.6	2.6	2.4
Stone, clay, glass							
Textile							
Railroad							
Air transport							
Telephone, telegraph							
Radio, television^{R}							

Selected industries	1960	1970	1980	1984	1985	1986	1987
Germany, F.R.							
Coal mining				3.7[A]			
Oil & gas extraction							
Oil refining				1.2[A]			
Electricity				9.0[A]			
Gas supply				7.3[A]			
Food and drink							
Food		2.3	2.1		2.3	2.4	
Drink		2.8	3.2		3.3	3.4	
Primary metals		3.5	4.1		4.3	4.0	
Machinery, non-electric		1.1	1.5		1.5	1.6	
Machinery, electric		2.1	2.2		1.4	1.4	
Motor vehicles & equipt.		1.4	1.7		2.0	2.0	
Chemical & allied		3.1	3.0		2.7	2.8	
Paper & allied[P]		1.4	2.1		2.1	2.2	
Stone, clay, glass		2.6	2.9		3.3	3.4	
Textile		2.7	3.0		3.0	3.0	
Railroad		9.3	13.9		13.6	14.9	
Air transport							
Telephone, telegraph							
Radio, television[R]		3.3	3.9		4.2	4.2	

A = See Energy sector gross fixed capital stock for 1984 in *Wirtschaft und Statistik* 1986, pp. 499.
P = Excludes printing in the USA; includes printing in the United Kingdom.
R = Radio and television are included in postal services in Germany, F.R.
All other notes and sources, see Appendix Table 10a.