CAPITAL FORMATION, CAPITAL STOCK, AND CAPITAL OUTPUT RATIOS

(Concepts, Definitions, Data, 1850-1975)

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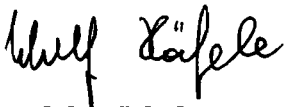
PREFACE

Under a project funded jointly with the United Nations Environment Programme (UNEP), IIASA's Energy Systems Program looks into energy strategies for the transition from today's infrastructure into a future's energy system that permits the supply of very large and practically unlimited amounts of energy. Such supply systems tend to be very capital intensive. By the year 2030 a kilowatt at the end-use side can easily cost $3000.

With IIASA's consideration of global scenarios that envisage an increase from the present eight terawatt society to one of 24 (low) and 40 (high) terawatts, the question of capital required for this expansion becomes important. The amounts of future long-term capital requirements may further be increased by the demands for environmental protection, as well as expansion and changes in the elements of an infrastructure, such as transportation.

The present compilation by Mrs. Doblin is an attempt of the Program to review and compile relevant data on capital. IIASA's Energy Systems Program is primarily science and engineering oriented. Nevertheless, determination of the economic implications is in any event mandatory, which also necessitates consideration and evaluation of the economic data. It is felt that this paper may be of interest also outside the Energy Systems Program for the purposes of which it was prepared.



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ABSTRACT

There is considerable concern about the possible general capital shortage and, more specifically, about the availability of capital to permit the expansion of traditional energy supplies and the transition from conventional to nonconventional fuel sources with appropriate changes in patterns of transportation. Future long-term capital needs may further be increased by the demands for environmental protection.

The study is concerned with the development of capital in the past. It goes back to the mid-nineteenth century for presently developed countries (US, UK, FRG, France, Japan) to look at capital formation and capital stock. A more recent past, 1950 to date, is studied for the growth of capital stock and capital output ratios for the US, the FRG, and the world.

The purpose was to detect from macroeconomic statistical facts any clues on the behavior of capital formation, including the impact of innovation industries which might be of relevance for the future availability of capital stock.

The historical chapter on capital does not attempt to study all aspects of capital formation. No reference is made to the institutional questions, except for long-term series of bank and prime rates, and the capital market has been ignored including the question of how much of the capital requirements could be met through self-financing. Likewise, fiscal policies (redistribution of income, corporate taxation) or monetary theory (i.e. how changes in money supply determine a nation's economic course) that bear on the origin of capital formation are not considered. Yet it is hoped that the many data compiled for the study--which also discusses concepts, definitions, and sources--may help to establish the range, if not the absolute amounts, of some of the variables used in modeling capital demands by the energy sector.

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1. INTRODUCTION

1.1. Capital Growth and Innovation Industries

The greatly increased demand for capital to permit the new technology of future energy supplies brings to mind Schumpeter's classical example of the "railroadization" as a basic innovation industry with large-scale capital requirements surpassing the capacities of individual entrepreneurs and an industry where profitability cannot be achieved within the time horizon that most investors care to envisage.[1] The history of the financing of railroads and other industries in the 19th and early 20th centuries might lend credence to the statement that *the shortage of capital is an optical illusion*, especially at macroeconomic level in the developed countries. The question is whether, towards the end of the 20th century, this statement applies for the developed and developing countries to meet the capital requirements of the innovation industries of the future?

History is full of the examples by which *to illustrate the nature and modis operandi of innovation, in particular the way in which innovation produces prosperity and depression* [1]. The various tables in Appendix A show how population, gross domestic product (GDP), and capital grew, and how prices and interest rates moved in some of our presently developed countries, from the mid-19th century to date. This period was marked by long-term or secular (i.e. 50 years) business cycles overshadowing medium- and short-term cycles; the transition of main sources of energy supplies through the market penetration of coal, oil, and gas, and the beginning of nuclear energy; and a succession of innovation industries, in particular railroadization, electrification, the automobile, etc.

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[1] See Joseph A. Schumpeter, *Business Cycles*, [1], Vol.I., Chapter VII, Historical Outlines.

1.2. Gross Domestic Product

A common way of expressing the economic state of a nation and measuring its growth is by estimation of the gross domestic product (representing the expenditures on all goods and services produced in the country including those for exports and excluding imports) or by the concept of the gross national product favored in recent US statistics (GNP) which measures the output attributed to the factors of production--labor and property--supplied by the residents of the country. See Appendix A, Table I.1, Population, Per Capita GDP and Prices in the Developed Countries, 1850-1977.

Investments are both a determinant for and the outcome of the growth of GDP. For this reason, capital formation and build-up of capital stock depend on the size of the gross product and its rate of growth. Table I.2 in Appendix A shows the growth rates of per capita GDP in constant prices of the UK, US, Germany/FRG from the middle of the 19th century to the present. As the system of national accounts (SNA) was perfected only in the late 1940s, the historical series evolved mostly from estimates made in retrospect.[2] To facilitate presentation, and to eliminate annual fluctuations, we compiled the growth rates as averages *within* five year periods. The only instance where this was not possible for lack of data was in the case of the US, 1869/72 to 1927/31, where the average growth rates are compiled as from one five-year period to the next, i.e. from 1867/71 to 1872/76.

The data in Appendix A, Tables I.1-3 suggest that the road to development was marked by fairly large fluctuations. In fact, the fluctuations, annual and cyclical, become even more evident if one looks at annual growth rates and investment coefficients, discussed more fully below. The data further suggest that during the long climb towards increased industrialization, GDP total and per capita grew at fairly low rates in the UK and Germany. In the UK up to World War I, the average annual growth of total GDP was seldom more, often less than 2%; exceptions were two extraordinary growth periods, 1852/56 (3.7%) and 1867/71 (6.5%). The German

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[2]For publications of historical series of national accounts, see:
Simon Kuznets, *Quantitative Aspects of the Economic Growth of Nations* [2].
US Department of Commerce, *Historical Statistics of the United States* [3].
B.R. Mitchell, *Abstract of British Historical Statistics* [4]; and
B.R. Mitchell, *European Historical Statistics 1750-1970* [5].
G. Hoffmann, et al, *Das Wachstum der Deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts* [6].
FRG, Statistisches Bundesamt, *Bevölkerung und Wirtschaft 1872-1972* [7].
H. Rosowsky, *Capital Formation in Japan, 1868-1940* [8].

performance during the pre-World War I period was not much better, except for the two boom periods, 1892/96 (4.5%) and 1902/06 (4.2%). Compared to these two older industrial countries, the growth rates of total GDP in the USA from 1869/72 to the First World War were higher and constantly above 3%. In the post-World War II period, the picture was reversed, with US average annual GDP growth rates below UK and FRG levels.

1.3. Historical Growth Rates; UN Projection Targets

The review of the GDP growth rates may be useful as a means of checking on the premises on which to build projections. The United Nations in their projections for *the demographic, economic, and environmental states of the world*, in 1980, 1990, and 2000 envisages the following targets for GDP growth rates in developed and developing countries (Table 1):

Table 1. GDP Growth Rates, UN Targets.

	Total		Per Capita	
	Developed	Developing	Developed	Developing
I =	4.5%	6.0%	3.5%	3.5%
C =	3.6%	6.9%	3.0%	4.9%

I = indicates scenario based on extrapolation to the year 2000 of IDS (International Development Strategy) targets for gross product increase in developing countries and extrapolated long-term historical rates in developed countries.

C = indicates scenario based on substantial reduction of gap in gross product per capita between developing and developed countries.

Source: Compiled from UN, *Future of the World Economy* [9, p.3].

Historical and recent observations suggest that the UN rates seem to be on the high side for both developing and developed countries. The achievement of the targets set for the developing countries does not seem to be realistic, in the light of the long history of the developed countries. Moreover, the developing countries' own performance (especially on a per capita level) during the first and second Development Decades (1960's and 1970's) does not warrant the UN optimism. A more realistic approach would be to envisage a growth rate for total GDP in the developed countries of not more than 3.5% per year; and the scaling down of the growth rate in the developed countries could by itself have a depressing effect on the developing countries' growth rate.

2. CAPITAL FORMATION

2.1. Concepts

The compilation of historical series on capital formation was done by working backwards from the most recent statistics published by the United Nations [10, 11]. The advantage of starting out with the UN (instead of national sources) is that data are made internationally comparable by means of a questionnaire of the UN Statistical Office. Thus, gross fixed capital formation as used by the UN and in this study represents for all countries the investments, or annual additions of capital goods in *all* sectors of the economy, government, business and residential or households. This is different from current US practice, where capital formation is mostly discussed as *gross fixed private domestic investments* excluding the government sector, or as *non-residential gross fixed private investments* which exclude government and households, relating to the business sector only. For the numerical difference between US capital formation in all sectors of the economy (16.2% in 1975) and the business sector only (9.8% in 1975) see also Appendix A, Table I.4.

The capital goods, as defined by the UN (and generally the US) consist of: construction (residential and non-residential building); land improvement; transportation equipment (passenger cars and other); machinery and other equipment, and, where appropriate, breeding stock. In principle, all military goods are excluded. For the purpose of this analysis, inventories were eliminated; in current systems of national accounts (SNA) they are considered as capital goods--though not as *fixed* capital goods.

Current SNA do not include under capital formation any services, thus certain activities are automatically excluded, such as research and development (unless embodied in material capital goods), education, training activities, health services. In order to get an idea of the structure of capital formation, reference may be made to this Kuznets quote:

> *...The capital goods that are clearly carriers of technological change--producers' equipment and the construction that serves public utilities, dams, etc.--account for two thirds, at most, of gross domestic capital formation in recent years; and for a smaller proportion in the earlier decades when the share of producers equipment tended to be lower.* [12, p.127]

For the UK the oldest among the industrialized countries, annual capital formation data are available beginning with the year 1830. For Germany, annual data start with the year 1850. French data, for ten year averages, start with 1789. Japanese capital formation and GNP data go back to 1887/96. For the US, capital formation (for the economy as a whole) and GDP (later GNP) estimates begin with 1869/73. Because most of the US

historical data are available only for five year averages, we have presented five-year averages for other countries as well. This has the advantage of eliminating annual fluctuations, besides it renders the presentation more manageable. Certain years, which have a special significance, are shown separately, for example 1912 and 1913 (Germany and the UK); 1937 and 1938; and 1970 to date. The origin and sources of the historical series of GDP or GNP, of which capital formation is part, were indicated on page 4 above, footnote 2. Because of the uncertainties involved in these estimates, any interpretation of the data must proceed with a great deal of caution. This has to be kept in mind for the observations on the investment coefficients, which represent the share of gross fixed capital formation (GFCF) in GDP. In the following they are viewed first in the historical series in developed countries mid 19th century to the present, and subsequently in a cross-section analysis including developed and developing countries in 1960, 1970 and 1975.

2.2. Investment Coefficients in Developed Countries, Historical Series (see Figure 1, based on Appendix A, Table I.4)

2.2.1. Mid-19th century to the end of the 1940's:

United Kingdom. Historical statistics on domestic gross fixed capital formation for residential construction; mercantile shipbuilding; railways; local authorities' loan expenditures; machinery for domestic use and other for the years 1856-1914 in current and constant prices of 1913 are published in the *Abstract of British Historical Statistics*, [4, p.373/374]. Reflecting the country's low level of industrialization, the investment coefficient was below 4% in the early 1830's. In twenty years' time, with progress almost linear (except for a minor setback in 1842/46 that coincided with a period of price decline), the investment coefficient reached 8% in 1847/51. In the nearly 100 years following up to 1942/46, the high point of 1847/51 was surpassed, and this by less than one percentage point, only in a few, short periods: 1862/66 and again 1897/01 and 1902/06. The 1862/66 high level of the investment coefficient coincides or rather reflects a period during which investments in UK railroads were at their highest, £22.3 million in current prices and 29.4% of all domestic capital formation.

It is interesting to note that during the period 1862/66 gross capital expenditures by the British railroads were at their highest when, according to Schumpeter, the *heroic age of genuine railroad innovation that revolutionized the economic system was entirely over by 1860...and English railroad development from about 1860 on was a consequence of growth in our sense and innovation elsewhere in the system, responding at every step to existing conditions, rather than an active factor of innovation* (1, p.342].

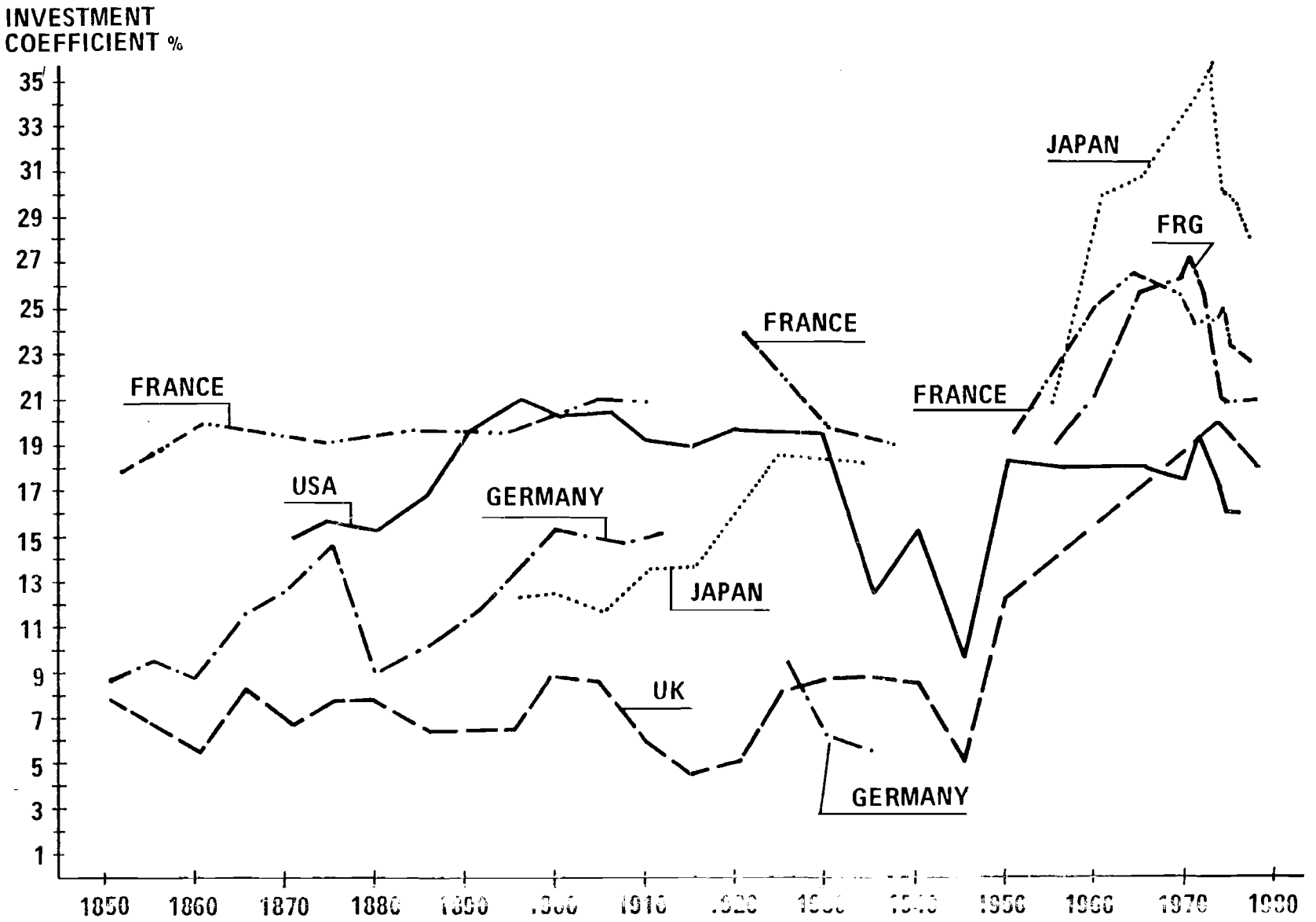

Figure 1. Investment coefficients (share of GFCF in GDP) in selected developed countries 1850-1977.

Subsequently, the high levels of capital formation 1897/01 and 1902/06 may have been due to a boom in residential construction (over £30 million per year) and investments in machinery for domestic use (£30.5 to 30.7 million).

Germany. Investment coefficients becoming available as of mid-19th century were consistently at a higher level than those of the UK, except for the one period during the deep depression in 1932/36 when they fell below the UK rate. The German investment coefficient, which was nearly 9% in 1850/51, rose to a high of 14.6% in 1872/76. This ascent took about 20 years, the progress was straight, except for the decline in 1857/61 (when the UK rate also took a dip). The high point of 14.6% reached in 1872/76 was equaled and slightly surpassed in the last years before the outbreak of the First World War (1897/01 to 1913). It was also during that period that the gap between the investment coefficients of Germany and the UK widened considerably, as the UK coefficient started to decline.

France's investment coefficient rose from 16% in 1825/34 to 20% at mid 19th century and remained at this level for a long time until the outbreak of World War I. Was the investment coefficient really as high as the data suggest, topping by far the UK and Germany, and finally the US? There remains an element of doubt as to the *level* which may result from the fact that gross fixed capital formation could be shown as a share of national income which conceptually is lower than GNP or GDP. More relevant than the level is the observation that the stability of the investment coefficient coincided with population stabilization.

The *United States'* historical series became available with the Kuznets estimates starting with 1869/73. At that period, the total gross private and government investment excluding stocks as percent of gross natural product was nearly 15%. This was considerably higher than the UK coefficients (7%) and Germany's (12%). The US coefficient remained consistently higher than that of the UK and Germany, through boom times and depressions, up until the end of the 1940s. The remarkable feature of the US investment coefficient is that it stopped growing after 1892/96, when the share of capital formation peaked at 21.3% or about one fifth of GNP. The trend from 1892/96 to the end of World War II, except for the depression of the 1930s and the war years, was near stagnation and slowly downward. This trend was to be accelerated in the years following World War II.

2.2.2. 1950-1977.

Reflecting reconstruction and re-equipment of industries, the investment coefficients rose to levels never observed before, and this for a sustained period of growth. On an annual basis, the peak was reached in France (27.9%) in 1969; FRG (26.7%) in 1971, and Japan (34.9%) in 1970. (If inventories were included in capital formation, the coefficients would be 29% France, 28% FRG, and 40% Japan.) In the UK, the investment coefficient

also rose, but it had a later start, and it peaked at 24% in 1974. In all of these countries, the investment coefficients eased under the recent recession.

In contrast to these countries, the United States investment coefficient moved very slowly, showing a small but steady decrease. The decrease from year to year is so small that some analysts view it as the result of statistical discrepancies. Which ever way one might interpret the long-term US trend (stabilization or slight falloff), it has to be considered for the projections of future capital stock expansion. A rather slow move, with yearly changes of less than one percentage point, is also seen in the investment coefficient that relates to the business sector only; it has hovered around 10% since the 1950s. (For details see Appendix A, Table I.4.)

An exaplanation for the comparatively low level of the US investment coefficient vis-a-vis other, developed, countries may be seen in the fact that the US have a high defense budget, whereas in the FRG and Japan this is much lower. A further explanation for the relatively low level of the US investment coefficient may be the fact that in countries where per capita GDP and annual investments are high in absolute amounts, a fairly high share of the investments go into maintenance. Other countries with comparatively high per capita GDP and relatively low investment coefficients are Sweden and Canada (see also below, cross-section analysis on per capita GDP and investment coefficient).

As regards the leveling off of the US investment coefficient or its tendency to slowly decline, this might be exaplained by a look at the marginal productivity of investment. In this connection, the reader may be referred to the development of the US capital/output ratios 1950-1970 (Department of Commerce data), or to the FRG 1950-1970 capital/output ratios, discussed in Section 3 of this paper.

In conclusion, the long-term developments, from the mid-19th century on or earlier, show that the investment coefficients tended to rise with growing industrialization--this was also true for the periods of early growth in the United States. The climb in the 19th century until World War I was rather slow, and countries saved at most 20% of GDP; whereas after World War II, during the period of intense growth in Europe and Japan, the investment coefficients rose rapidly, countries managed to save 25% to 35% of GDP, and this for a number of years.

2.3. Cross Section Analysis, Developed and Developing Countries, in 1960, 1970, 1975.

Generally, the long-term developments show that the investment coefficients tended to rise, at least for a while, as per capita GDP increased and the role of agriculture decreased in the nations' economies. The assumption that the investment coefficient is largely, though not exclusively, determined by the

level of income and economic activity was tested in a cross-section analysis encompassing over 90 countries. For this purpose, the countries were grouped by world regions as used by IIASA's Energy Systems Program global energy modeling exercises, subject of a forthcoming IIASA publication. These regions encompass both market economies and centrally planned economies. They are distinguished by their degree of economic development and the availability of energy resources. The following regions are used for the cross-section analysis of market economy countries:

Region I: North America, highly developed market economies with energy resources
Region III: Western Europe, Japan, and other developed countries with relatively low energy resources
Region IV: Latin America
Region V: Africa, South and East Asia
Region VI: Middle East.

The countries omitted from the following analysis are those in:

Region II: USSR and Eastern Europe, developed centrally planned economies
Region VII: China and other developing centrally planned economies.

The cross-section analysis of the countries in regions I, III, and IV to VI relates to: i) GDP by kind of economic activity in 1970 (see Appendix A, Table I.7); and ii) per capita GDP and investment coefficient 1960; 1970 and 1975 (see Appendix C, Table I.8). All the data were compiled from the United Nations *Yearbook of National Accounts* [10] updated by the United Nations *Monthly Bulletin of Statistics* [11]. It may be noted that per capita GDP is at current prices and converted to US dollars at the official rates of exchange prevailing during the years to which they relate. Therefore, the change in per capita GDP during these three periods (1960; 1970; 1975) is not an indication of real growth; it was used because it was readily available in the UN statistics, and as stated by the UN the GDP data expressed in current US dollars are designed to facilitate international comparisons of levels of economic activity in a given year.

The use of official exchange rates, whether current or fixed, is frequently criticized as an inadequate means for international comparisons of economic development levels. A study by the UN and the World Bank led by Irving B. Kravis attempted to compile an *ideal exchange rate* based on price indices for goods according to the weight they held within the respective countries and the US in 1970. The data reveal considerable undervaluation for the UK, Japan, and FRG, and overvaluation for France, when official exchange rates are used instead of the *ideal exchange rates* [13]. Undervaluation may well have resulted from the use of official exchange rates for the conversion of national currencies of US dollars in the year 1970. With the recent fall of the dollar, a correction for undervaluation of the data converted from

D-Mark or Yen to the dollar by means of current official exchange rates, does not seem to be needed any longer.

2.3.1. GDP by kind of economic activity in 1970.

Because of the paucity of the service sector data, it was thought best to limit the economic activity groups to "agriculture, forestry and fishery", and "industry". In regions I and III, developed countries with high per capita GDP, the share of agriculture in GDP is low. In most of these countries the agricultural sector contributes no more than 3 to 6% of GDP. Industry comprising mining and manufacturing provides about 30% of GDP. Exceptions are due to special circumstances. For instance, the fact that in the FRG 46% of GDP come from industry may have something to do with the fact that since World War II a relatively large share of the industrial areas of Germany has become part of the FRG. The fact that Japan's industry sector is the source of nearly 40% of its GDP may be an indication of that country's intent drive for industrialization, especially in the manufacturing sector (36%)--and a certain lack of underdevelopment of services. On the other hand, in the US and Sweden the share of services in GDP is fairly high, and these are the countries as indicated above with rather low investment coefficients. In the oil exporting countries of the Middle East (Region VI), that now have a per capita GDP as high or well above that of countries in Regions I and III, the share of agriculture in GDP is also very low, not more than 6% in Saudi Arabia, or 2% in Lybia, or 0% in Kuweit. In these countries, the service sector is low, and in 1975 their investment coefficients (not so in earlier years) tend to be among the highest in the world.

In the developing countries of regions IV and V, the share of agriculture in GDP tends to vary. It ranged from 8 to 20% in countries that have already reached a certain level of development (i.e. Argentina, Brazil, Mexico) and/or have a pronounced mining-for-export sector (Bolivia, Chile, Jamaica, Venezuela; also Zaire and Zambia). But in the remaining countries of regions IV and V, it is generally observed that the lack of development is reflected in the high proportion of agriculture in GDP. At the bottom of the scale, or hard-core underdeveloped countries, the agricultural sector accounts for about 50% of GDP, for example Uganda (49%); Malawi; Ethiopia, Afghanistan (51%), Burundi (52%), Bangladesh (59%). These are also the countries where the investment coefficient hovers at very low levels.

The conclusions to be drawn from the above analysis for the capital formation study is that the investment coefficients tend to be low in countries were a high proportion of GDP originates from the agricultural sector. As the structure of any country tends to move slowly, the implication of the above stated conclusion is that there are powerful constraints that should not be overlooked when estimating the developing countries' capacity to generate and to absorb major increases in capital and energy consumption.

2.3.2. Per capita GDP and investment coefficient in 1960, 1970 and 1975.

It is obvious that the investment coefficient is low in countries where GDP is low and where subsistence agriculture dominates. It is therefore not surprising that in 1960 and 1970, many of the developing countries had an investment coefficient that resembled that observed above for the presently developed countries when they were at the threshold of their industrialization. For industrialized countries and others with high export earnings, the relationship between GDP and the propensity for domestic capital formation is not so direct. Figure 2 shows per capita GDPs and investment coefficients in 1970. On the left side of the graph are most of the developing countries, poor and with low investment coefficients; the cluster of countries is thinned out towards the right side of the graph, where higher per capita GDP and higher investment coefficients prevail. The countries which in 1970 had the highest per capita GDP but not very high investment coefficients, are shown on the very right side of the graph; they are Canada, Kuwait, Sweden, and USA. Between 1970 and 1975, there was generally an increase in GDP, even at constant prices, and on a per capita basis. If the data for 1975 were also plotted on a graph, it would compare as follows with the 1970 picture: Countries with low per capita GDP would still be crowded in the lower level at the very left side of the graph. These are Burundi, Chad, Ethiopia, Ghana, Niger, to name a few of the *hard-core* countries. For most of the developing countries, however, there would be a move towards the right. The move to the right and towards the upper level of the graph would indicate that these countries had embarked on a more serious program of industrialization, managing a higher share of domestic capital formation. The countries who seem to have reached this turning point include in region IV Brazil, Bolivia, Mexico, Peru, Ecuador, Paraguay; in region V India and Pakistan; Philippines, Indonesia, Malaysia; and in Africa Morocco and Tunesia, Nigeria, Sudan, Zaire. Fortunately this list of countries includes the most populous among the developing world. For developing oil exporting countries in Region VI, the move to the right and upper level of the graph would be most dramatic, reflecting the sudden rise in GDP that had lately effected a rise in domestic capital formation. Thus, in 1975 the investment coefficient shot up to 28% in Lybia, 30% in Iran, 52% in Iraq, and to as much as 75% in Kuwait.

Most of the developed countries of Western Europe and Japan would also move further to the right, but slightly down towards lower levels of the imaginary graph. The downward move would be the result of the slight falloff in their investment coefficients, whereas the move to the right would reflect the change in the exchange rates of their national currencies towards the dollar.

The conclusion on the cross section analysis tends to indicate that a very rapid increase in GDP (oil exporting countries) and the option for more intensive industrialization (oil exporting countries and a number of developing countries) favor a higher

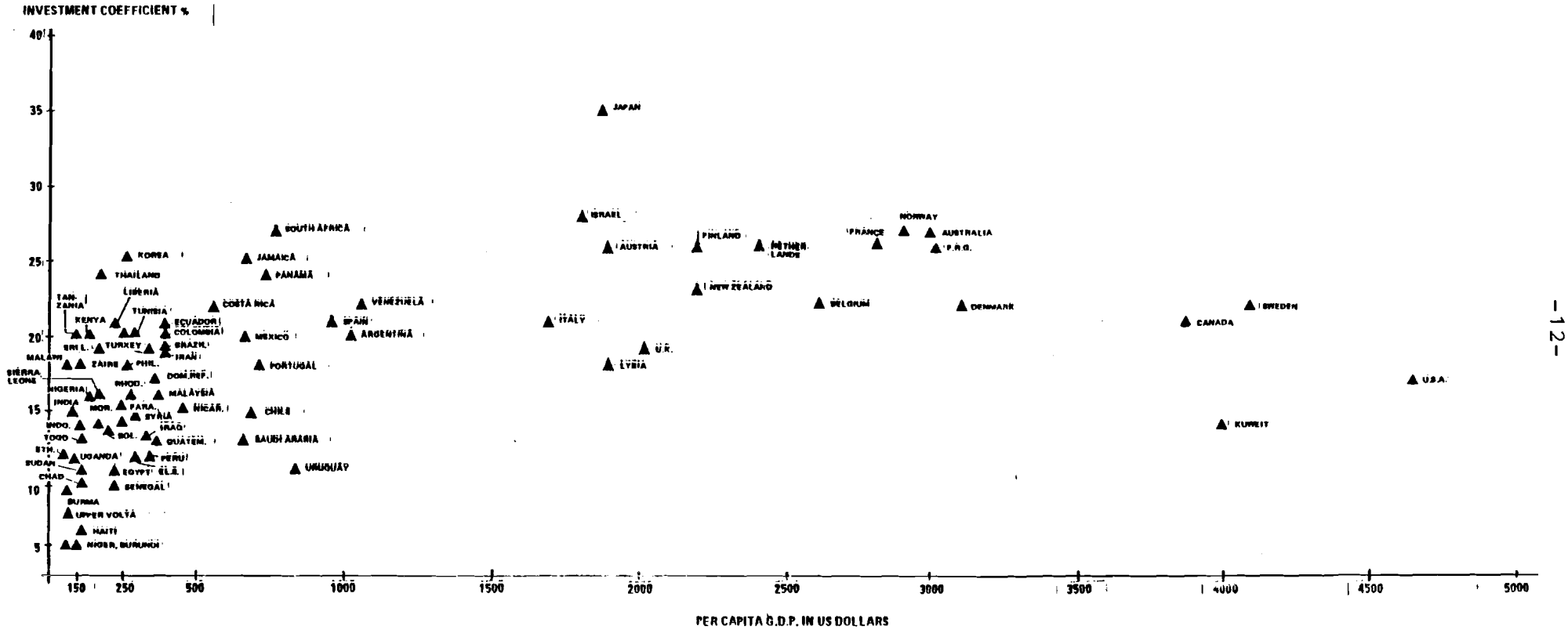

Figure 2. Per capita GDP and investment coefficient (share of GFCF in GDP) 1970.

share of capital formation. On the other hand, among the developed countries, the share of capital formation in GDP need not rise with higher per capita GDP. This was seen in the historical series of the US investment coefficients; there is also a trace of it in the comparison of per capita GDP and investment coefficient between 1970 and 1975 in the developed countries of Western Europe and Japan.

2.4. Gross Fixed Capital Formation by Sectors of the Economy.

The above notes relate only to total GFCF over very long-term periods. For the more recent past, data are also available by sectors of the economy and individual industries. Investments in public utilities consisting of a combined total for electricity, gas, and water are currently published by the United Nations for all countries that collect these data [10; Vol. I, standard tables 9a and 9b]. In many countries, including developing, electricity represents the major share of energy sector investments; therefore, the UN data provide a rough indicator on the range of energy sector investments in a large part of the globe.

More detailed data and for all branches of the energy sector are compiled by selected developed countries. For instance, in the US, the Department of Labor, BLS Office of Economic Growth, has developed a data base containing gross and net fixed capital formation and gross and net capital stock for 170 industries and various aggregations of these industries, covering the years 1947 to 1974 [14]. The publication of these data is expected by the end of 1978. For a description of the series, see the note on capital stock data in Appendix D. Detailed investment and capital stock data for historical periods and projections are also made by the US Department of Commerce, BEA. In December 1975 they prepared a study for the Council of Economic Advisers on Fixed Capital Requirements of the US Business Economy 1971-1980, with investment data for 80 industries [15]. This study is further discussed in chapters 3 and 4.

In the FRG, investments are compiled for individual industries and sectors, but there is no consolidated account for the economy as a whole. The Ministry of Food and Agriculture (Bundesministerium für Ernährung, Landwirtschaft und Forsten) gives gross and net investments in agriculture, separated into buildings, equipment, and changes in livestock. The German *Industrie-Statistik* gives annual investments for 40 individual mining and manufacturing industries, separated into "built-up land", "land without buildings" and "machinery and equipment". For the construction industries, another service compiles gross fixed capital formation, and yet another service provides investments for electricity (public and industry) and gas utilities. All these data are currently published in various sections of the FRG *Statistisches Jahrbuch* [16]. We have used these sources to compile the investments for various components of the energy sector, namely solid fuels, crude oil and natural gas, petroleum refining, electricity and gas, over

the period 1950 to 1975; see Appendix A, Table I.9.

For the countries belonging to the European Community, with the exception of the FRG, the EC publishes GFCF for energy and other broad sectors of the economy [17; standard table 7]. For 1975 investments by broad sectors of the economy, see Appendix A, Table I.10. For 1970-1976, investments in the energy sector and total economy, see Appendix A, Table I.11.

Work on investments in the energy sector is also in progress at the United Nations Economic Commission for Europe in Geneva. See in particular the reports presented to the 33rd Session of the Commission in Januar 1978 on New Issues Affecting the Energy Economy of the ECE Region in the Medium and Long Term [18]. It may be noted that this "ECE" region, in contrast to the European Community, includes the Eastern European countries. Thus, the UN ECE publications include the USSR and other COMECON countries.

2.5. Prices, Interest Rates, Population, 1850-1975

2.5.1. Prices (GFCF Deflators)

Concepts. One reason for the compilation of the long-term price index numbers is to study the relationship between price movements and the development of the investment coefficient. Another purpose served is the conversion into constant prices of absolute amounts of per capita capital formation and capital stock.

In most cases, the deflators are implicit in the national accounts data, showing GDP and GFCF in current and constant prices. For the pre-World War I period, GFCF and GDP deflators are mostly identical. The long-term series on prices and interest rates in the UK, USA and Germany/FRG are shown in Figures 3, 4 and 5; they are based on Appendix A, Table I.5 and I.12 to I.14.

The compilation method for the long-term price index numbers consisted in shifting the base years of the deflators, if and when the series were overlapping and in linking the price indices of various periods. For example, the UK National Accounts data 1850 to 1913 are given by the source in prices of 1900; next we have National Accounts data 1913 to 1947 in prices of 1938, etc. The German National Accounts data 1850 to 1913 are given in 1913 prices, and the data 1913 to 1938 in 1938 prices, etc. The US used 1929 prices for the historic series 1867/73 to 1947; the basis for the series 1929 to 1974 is 1958; and finally (for capital stock) we have series 1925 to 1975 in terms of 1972 prices. Each price series is based on a different basket of goods; therefore the fact that our GFCF deflators cover a century-long period does not mean that they are based on a single basket of goods which never changed over the entire period. A problem arose only in the case of implicit deflators when the time

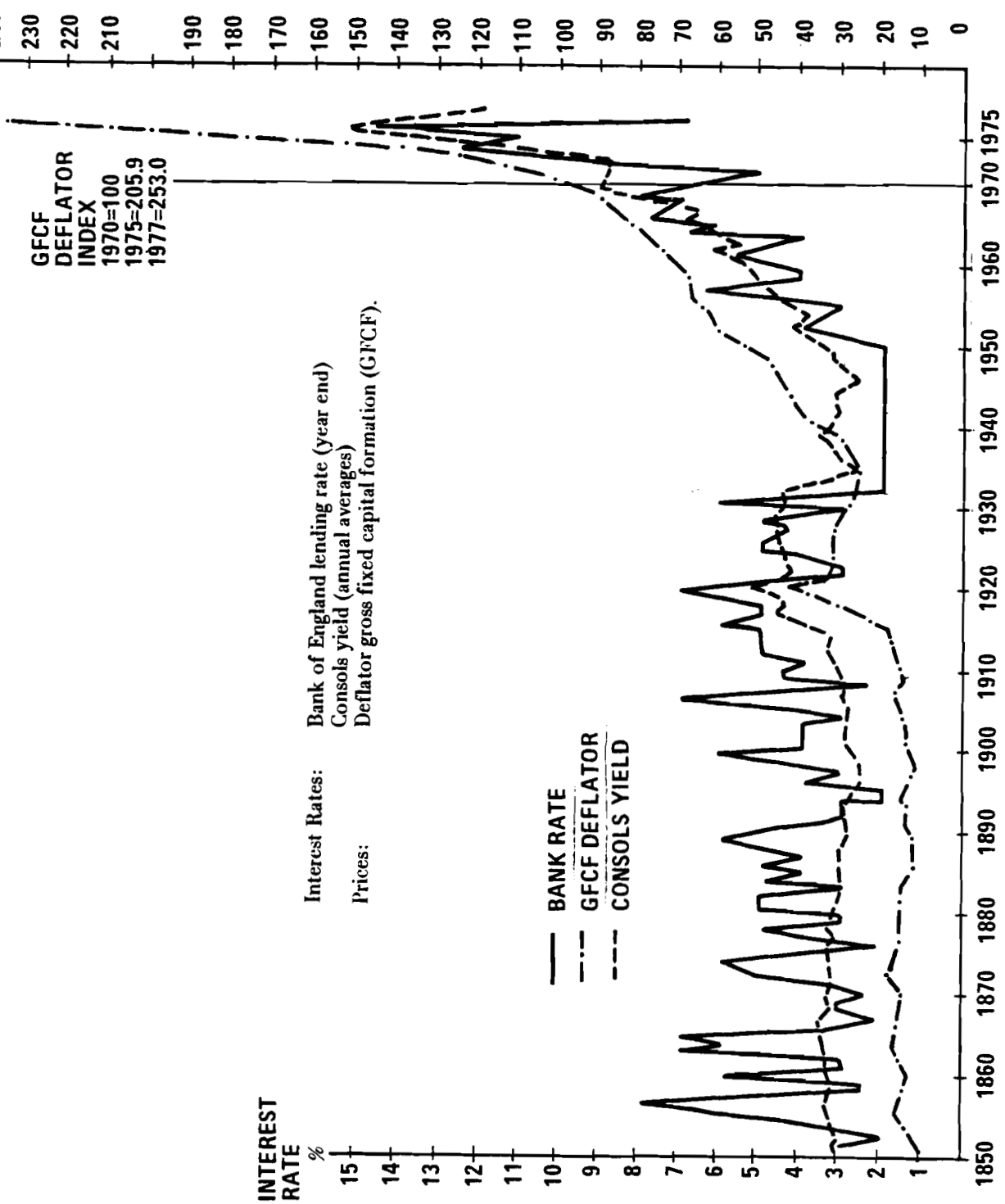

Figure 3. United Kingdom: Interest rates and prices 1850-1977.

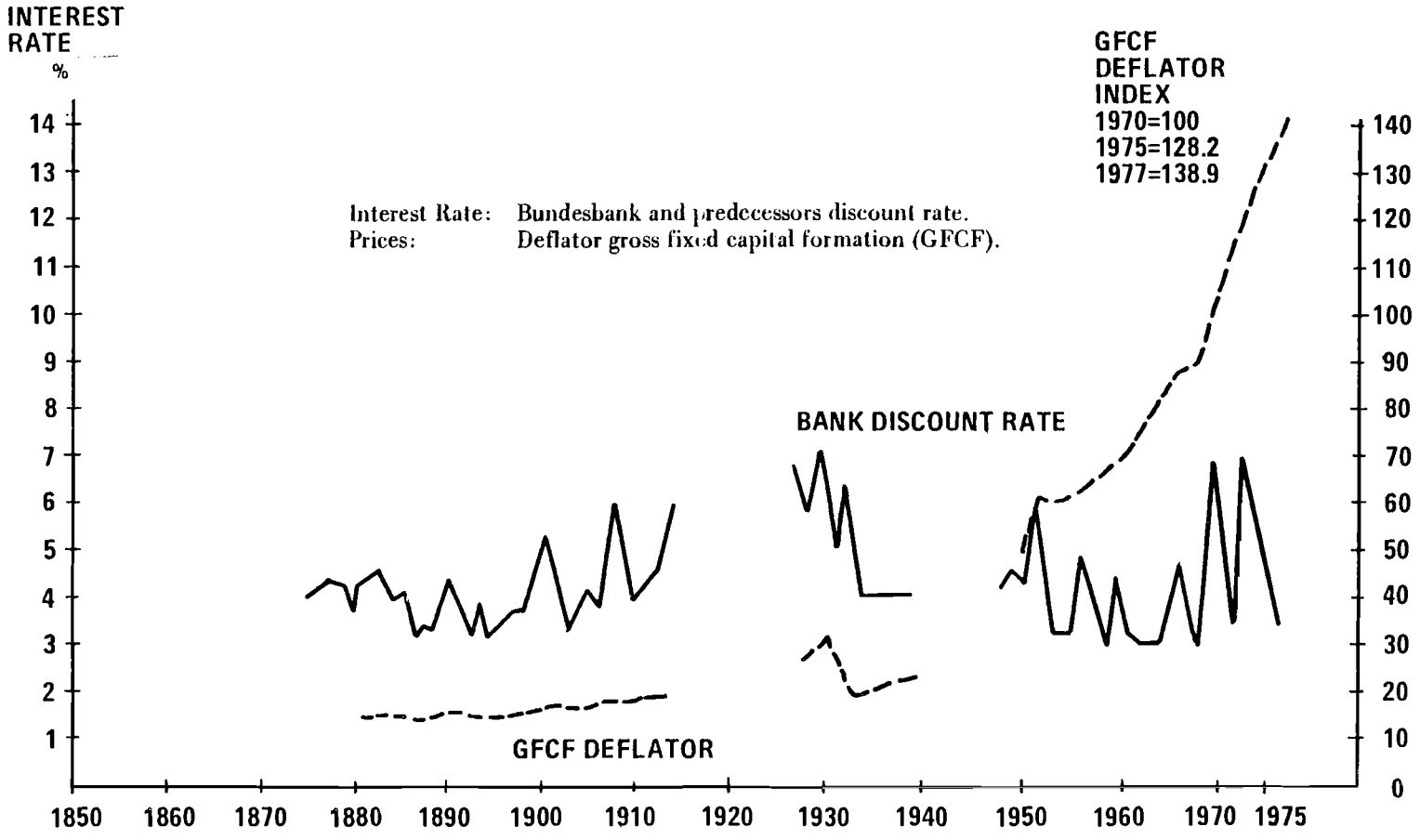

Figure 4. Germany/Federal Republic: Interest rates and prices 1880-1977.

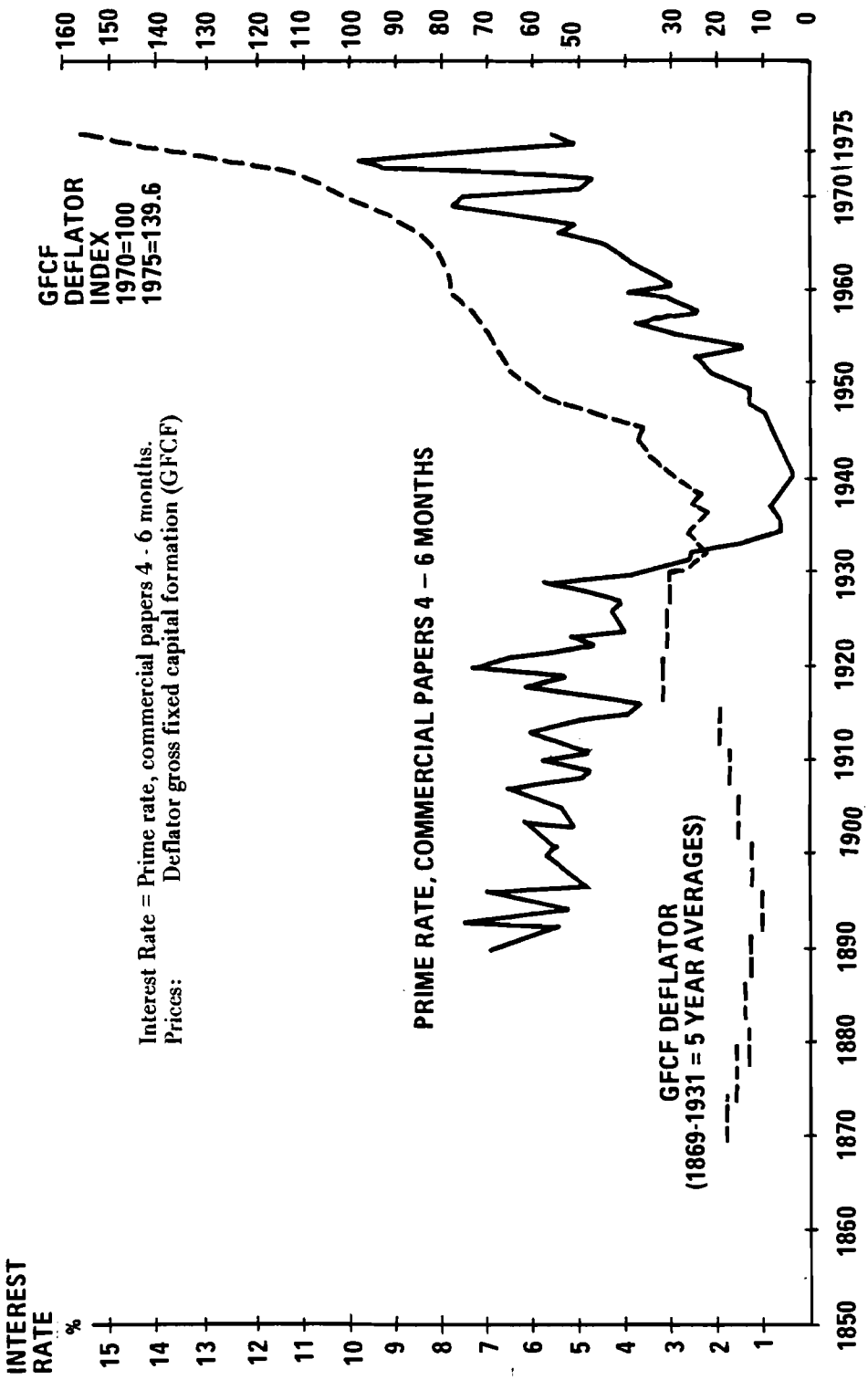

Figure 5. United States: Interest rates and prices 1869-1975.

series did not overlap and when a link had to be found between two price series. How this was done in the cases of the FRG, UK, and France, is indicated in Appendix B, Note on Compilation of Long-Term GFCF Deflators.

International Comparisons; Historical Series. The price indicators show considerable agreement as to the trend in the various countries. For the years 1850 till the outbreak of World War I the prices reflect the long-term business cycles or waves suggested by Kondratiev [19; p. 443]. Thus, the data in Appendix A, Table I.5 show prices at a peak in the late 1860s in the USA (Civil War); and 1872-76 in the UK and Germany (after the Franco-Prussian War). French deflators peaked during the decade of 1865-74. This is followed in all four countries by a fall lasting about 20 years and reaching its lowest point in 1892-96. Then comes a slow climb, taking almost another 20 years, and by the outbreak of World War I the deflators are about back to where they stood around the turn of the 1870s. Only the French deflator index, with 1905/13=100, had not regained the earlier peaks of 1855/64 and 1865/74 when it stood at 127 and 125. (French historic data are available for ten-year periods only.) However, while the late 19th and early 20th century may have been periods of generally falling deflators for France, things changed radically with the later instability of the franc.

Next the deflators show the depression (US, UK, Germany with incomplete data,also France), and the subsequent recovery in the US and UK.

Current Series. As indicated above, we have linked the pre-World War I deflators to those of the post-World War II era. All three countries, FRG, UK,and USA were in 1952/56 at similar levels vis-à-vis their 1913, respectively 1912/16 averages. In the ensuing price race, the UK has by far outstripped the US and the FRG (Table 3; summarized from Appendix A, Table I.5).

Table 3. Post World War II GFCF Deflators
Index Numbers, 1913=100

	FRG	UK	USA
1913	100	100	100[a]
1952-56	314.0	373.7	350.8
1967-71	473	558	505
1970	528	584	526
1971	570	635	557
1972	591	695	574
1973	621	807	606
1974	662	969	657
1975	685	1202	734
1976	708	1320	775
1977	733	1478	833

a=1912/16

Comparison of the Movements of Prices and Investment Coefficients. If one were to plot a graph of the GFCF deflators (Appendix A, Table I.5) and the investment coefficients (Appendix A, Table I.4), one could easily see in each country how the investment coefficients tend to rise and fall with increasing and decreasing prices, except for world wars and times of runaway inflation. Thus it seems that the biggest incentive for capital formation are the periods of modest price increases that go with, or lead to, real economic growth.

2.5.2. Interest Rates

The observations on capital formation would be incomplete if there was no reference to the income on capital, or interest and profits. While considerable light is shed on the profits of US corporations 1948 to 1973 in the study by W.D. Nordhaus "The Falling Share of Profits" [15], there are no long-term and internationally comparable data that we found readily available. The following observations are therefore linked to the long-term development of interest rates and bond yields in the UK and Germany/FRG since about 1850 and the US prime rate since 1890.

Concepts, Sources. The compilation of "interest rates and bond yields" may be justified on the basis of a quote from Schumpeter, as "average of interest rates and bond yields" serve as index of business activity [16; Vol. I, p. 23, footnote 1].

Historic statistics of the lending rate charged by the Bank of England start with 1797, giving the year, month, and day of changes [4]; updated in [21] and [22]. In order to simplify compilation and presentation, we show the rates as of the middle and the end of the year (see Appendix A, Table I.14). Long time series exist also for UK government securities (see Appendix A, Table I.12); these are the "yield on consols" (Consolidated Government Obligations) shown annually since 1796 in the UK statistics [4; 22]. It may be noted that in the UN statistical publications, the "consols" appear as Treasury bills [23].

For Germany historical series on interest rates for government obligations are represented by the statistics on "Verzinsung der Öffentlichen Schulden" during the pre-World War I period, 1850-1913 [6; p. 798] (see Appendix A, table I.13). The German central bank's rate or the "Bankdiskontsatz" of the Reichsbank, and subsequently the Bundesbank, go back to 1970 (Appendix A, Table I.14). For 1870 to 1971, the rates are given in terms of annual averages [7; p. 325]; they were updated by compilations from current publications on changes in the *Diskont* of the Bundesbank [24]. Data on the *Diskont* of the Bundesbank at end of the month are also published by the International Monetary Fund (IMF) [24].

For the USA an indicator of historical interest rates are the series, starting with 1890 on the "prime rate on commercial papers for 4 to 6 months" [3; 25; 22]; this is the interest

charged by commercial banks to their prime customers (see Appendix Q, Table I.14).

The bank rates and the "prime rates", while not typical for all lending and borrowing transactions, may be considered as minimum lending rates (for most of the periods under consideration). Moreover, they indicate the trend of the nation's interest rates.

Changes in Interest Rates and GFC Deflators. These tendencies become quite evident with the developments starting about 1900: In the UK, Germany, and the USA, the rise in bank and prime rates 1900 to 1929, was paralelled by rising GFCF deflators. The fall in prices, set off by the 1929 crash, was accompanied by a steep descent of the US prime rate from 5.85% in 1929 (already below a previous peak of 7.5% in 1921) to the all-time low of 0.53% reached in 1941. In the UK the bank rate fell from 6.5% in Septemper 1929 (that was below a previous peak of 7% on 15 April 1920, and still below the previous all-time records of 10% reached on 1 August 1914; 12 May 1866 and 9 November 1857) to a depression level of 2%, which remained in effect throughout World War II until 1950. In Germany, the bank discount fell in 1929 from 7.11% (previous peak 9.15% in 1925) to a low of 4% in 1933, remaining at this level with only little change through 1950, when the annual discount rate stood at 4.3%. Based on these data one could say that all 3 countries (UK, FRG, and USA) entered the 1950s with bank, respectively prime rates, that hovered around depression levels of the 1930s.

By contrast to the bank and prime rates, the price indicators, i.e. deflators of gross fixed capital formation, stood well above their 1929 levels in all the three countries by 1950. During the following unprecedented growth period of GDP and capital formation, prices, and interest rates rose sharply. The increase was the steepest in the UK with the index of GFCF deflators reaching 253 in 1977 (1970=100) and the bank rate set at 15% on 6 October 1976; it has since come down to 7% in 1977, while inflation continued, though at a milder rate. The inflation, measured in terms of GFCF deflators with 1970=100, was "milder" in the US (1977=158) and FRG (1977=139); this was accompanied in the US [25] by a prime rate climbing to an all-time record of 9.8% in 1974; it has since come down to 5.19% in 1976 and moved up to 5.59% in 1977. In the FRG the bank discount rate peaked at 6.91% in 1974 and fell to 3.5% in 1976 and 3.25% in 1977.

2.5.3. Population Growth

The population growth is not seen as natural growth alone. Instead, the data reflect the changes caused also by migrations and territorial changes.

The outstanding feature of the population growth trends shown in Appendix A, Table I.6 is the strong and uninterrupted increase of US population. For the pre-World War I period the index numbers show that by the middle of the 19th century, both Germany and

the UK had already reached over 50% of their 1913 level, while the US had barely reached 30% of its 1912 to 1916 average. In the late 1930s, Germany (frontiers as of the time) had just come back to the 1913 number of the old empire; the UK had surpassed its 1913 level by a good 10%, and in the US a good 30% more people were living than in 1912/16.

In the post-World War II period we see that by 1975 the FRG population was still nearly 10% below the empire level of 1913, while the UK population had grown to 30% above 1913, and the US had more than doubled its population compared to 1912/16.

2.6. Observations on What Made Capital Formation Grow

2.6.1. Prices

Capital formation is part of GDP; it grows when GDP grows and the investment coefficient rises, remains constant, or at least does not fall below a certain level. Prices seem to have exerted a direct influence on capital formation. Investment coefficients and per capita capital formation in constant prices rose with rising prices, except for world wars and times of runaway inflation. By the same token, when prices fall investment coefficients decrease and per capita capital formation drops. This was shown during the deep depression in Germany and the US. On an annual basis we have such examples, as for instance the US recession of 1937.

2.6.2. Population and Technology

While prices were important indicators for the growth of per capita capital formation in the past, it seems that for a look into the future one had better study the role of population and technology, and possibly the finite supply of natural resources. As to the role of population in economic growth and hence capital formation, some clarification is called for. This is found, for instance, in the selected essays by Simon Kuznets on *Population, Capital and Growth* [12].

In the first place, he finds that the association between the growth of per capita product and population is rather loose. As shown in the tables and graphs, high rates of growth of per capita capital formation does not necessarily mean high rates of growth of population (i.e. FRG and US in the post-World War II period).

The present situation in the developed countries is quite different from what they experienced earlier in their history--when rising knowledge and technology permitted greater control over health and production, leading to an accelerated growth of both population and per capita product. *But today and in areas with conditions quite different from those that characterize the presently developed countries in their past, rapid population*

growth may be an obstacle to, rather than a condition of, an adequate rise in per capita product [12, p.3]. The author then asks why is it that (in our times) *a larger number of human being need result in a lower rate of increase in per capita product? More population means more creators and producers,...why should not the larger numbers achieve what the smaller numbers accomplished in the modern past--raise total output to provide not only for the current population increase but also for a rapidly rising supply of per capita?* [12, p.3]. The answer may be found in capital requirements. *Larger population and labor force mean... additional workers who must be equipped with material capital if their productivity is not to fall below that of those already equipped and engaged. Hence...the higher the rate of increase in population and labor force, the greater the requirement for material capital to equip the additonal workers* [12, p.10]. The numerical example for this theory and the illustrative calculation on *effects of rise in rate of population growth on capital requirements and per capita consumption* are given in [12, p.10-18].

3. CAPITAL STOCK

3.1. History, Concepts, Evaluation

3.1.1. History

Formerly capital stock estimates were part of the system of national wealth statistics. In the late 1950s it was found that the methods to estimate national wealth varied more from country to country than the systems of national accounts, or the methods of measuring income flows, of which capital formation is a part. For this reason comparisons between countries and over time were even more hazardous for capital stock than for capital formation

The uncertainties involved in national wealth and capital stock estimates were stated by W.R. Goldsmith:

> *Inter-country comparisons of economic structure derived from the estimates of national wealth, and from the relationships between capital assets and current output, necessarily present many problems. Even when the theoretical concepts and categories, and the methods of estimation, appear to be identical, the resulting estimates may still fail to yield precisely comparable results between one country and another. Differences in valuation methods, in relative prices and in the nature of the basic statistics used can be responsible for wide differences in the resulting estimates--probably even wider differences than those involved in national income estimates* [27].

For this reason we disregarded the historical capital stock data for a number of countries, shown in the *Income and Wealth* series (except for the US series that were taken over by the

Commerce Department). With infinitely better data becoming available from modern industrial censuses, and the subsequent development of input output matrices, computerization of census processing, and the development of the perpetual inventory method, capital stock estimates went through a renaissance. The estimates became based on the gross fixed investment flows that are part of the national accounts systems. This yielded for the more recent periods of history, 1950-1974, estimates of total gross capital stock, i.e. for the US, FRG, and UK that seem to be more reliable.

Better capital stock data may also have been compiled for other countries; they were not included in this paper, because they are currently not available at IIASA.

In our presentation we shall first deal with the period 1850-1974, showing total capital stock (structures and equipment) by sectors of the economy, and per capita capital stock in constant prices, in Germany, the FRG, and the United States. This will be followed by an analysis of the capital stock (business capital in the US) by more narrowly defined activities for the FRG, USA, and UK, plus a distribution of world capital stock by regions.

3.1.2. Concepts

The data on total capital stock are concerned with "domestic, reproducible, tangible, fixed assets". This includes structures (building) and equipment (durable goods) held by the private sector (business and household); and government except military goods. By this definition, the "capital stock" data exclude land (except for improvement) and natural resources; patents and licenses or works of art (which are considered "intangibles"); financial claims on other countries; and military goods. The data on *business capital stock* are limited to the private sector including agriculture, mining, manufacturing, construction, energy sector and services, and excluding government and households.

The relative importance of structures and equipment in the US and German capital stock data may be seen from the estimates for 1960 (Table 4):

Table 4. 1960 Total Capital Stock (All Sectors of the Economy)

	USA (1958 prices)		FRG (Gross, 1962 prices)	
	Billion $	%	Billion D-Mark	%
Structures	892.9	71.4	759	72.5
Equipment			288	27.5
Producer Durables	218.6	17.4	.	.
Consumer Durables	139.6	11.2	.	.
Total	1251.1	100.0	1047	100.0

Source: Compiled from US *Statistical Abstract* [25], 1975, p. 411 and FRG *Statistisches Jahrbuch* [16] p. 21.

Inventories are excluded from our capital stock data, although they are part of the reproducible tangible assets. Inventories, which include livestock and, in some instances, "standing timber", may not be unimportant for the capital/output ratios of the farm sector. However, we attempted to exclude inventories because they were excluded from the capital stock, FRG, 1950-1970, first compiled by H. Lützel [28] and continued in the FRG *Statistisches Jahrbuch 1975* [16]. It was not possible, however, to exclude inventories from the German historical series.

3.1.3. Perputual Inventory Method, Gross and Net Capital Stock

The concept used by the Department of Commerce BEA for estimates of business capital stock is given in an article by John Musgrave in the Survey of Current Business [26], April 1976; also July 1970. Accordingly, the estimates of gross capital stock *are derived by the perpetual inventory method, which starts with investment flows and calculates gross capital stock for any given year by cumulating past investment flows and deducting discards.* The discards, or retirements of assets, are based on assumptions of average service lives.

Likewise the FRG gross capital stock (Bruttoanlagevermögen) is estimated from cumulative additions (Zugänge) minus retirements (Abgänge) which are goods effectively leaving the process of production. This concept involves only actual retirements, without consideration of depreciations [16]; 1976, p. 596.

Cumulation of past net investment flows (gross investment minus depreciation) yields net capital stock. *The value of net capital stocks equals the difference between the cumulative value of gross investment and cumulative depreciation. The methods of depreciation used for US compilations of net capital stock is usually the straight-line formula, which assumes equal dollar depreciation each year over the life of the asset* [26], April 1976.

Price basis for computation of Capital Stock. As stated in the abovementioned *Survey of Current Business: ...capital stock measures are computed on three bases of valuation--historical cost, constant cost, and current cost. Historical cost measures are derived by valuing each item in the stock at the price at which it was purchased new...*

Constant cost measures are derived by valuing all assets at the prices of a given period. For these calculations, the gross investment flows must be expressed in constant prices. This is done by applying appropriate price indexes to the current-dollar investment flows. The constant cost stock is a measure of the physical volume of capital.

Current cost measures are derived by valuing all assets in the stock at any specific period at the prices of that period. This is done by applying price indices to the constant cost stock estimates to convert them to current cost measures. In effect,

the current cost stock is a measure of the replacement value of capital [26], April 1976.

For an evaluation of the capital stock data presented below, one has to keep in mind that these can only be approximations because the application of the perpetual inventory method (though preferable to the "Balance Sheet Method") requires:

Long-term series of capital expenditures, capital goods deflators, and estimates of the length of life of capital goods. All three elements, but especially long-term price series and life time estimates of capital goods, involve considerable statistical uncertainties. Moreover, the quality of the world estimates is affected by the conversion of data from national currencies to US dollars, not to mention the difficulties that evolve from differences in national structures of the economy.

Another, minor, source of discrepancies between various estimates is whether they relate to the beginning, end, or middle of the years under consideration.

In the following, we are concerned only with *gross capital stock*, just as in the previous chapter we were concerned only with *gross capital formation*.

3.2. The Historical Sweep, 1850-1974 (Germany, the FRG, and the US)

3.2.1. Sources and Linkage of Series

Germany, FRG. Gross capital stock data were compiled from two sources: The data 1850 to 1938 are from W.G. Hoffmann, et al. [6]. This source shows capital stock by economic sectors in prices of 1913 and in current prices, for the years 1850 to 1959 [6; p. 253-256, Table 39-40]. The second source are the current series on gross capital stock (Bruttoanlagevermögen) at prices of acquisition (Neuwert) of 1962, for the period 1950 to 1971 from H. Lützel [28], updated in the *Statistisches Jahrbuch* [16].

The linkage of the two series was possible because it seems that *grosso modo* a similar methodology was followed for both the historical and the *Statistisches Jahrbuch* series. Moreover, the data from the historical and current series overlap for the years 1950 to 1959. This permitted us to make a number of checks, establishing the continuity and comparability of the series.

United States. Data on gross capital stock for 1850 to 1968 for all sectors of the economy (business, government, household) were compiled from two series: national wealth by type of assets, in current and constant prices, 1850 to 1956, published for selected years in the *Historical Statistics of the United States* [3] and national wealth by type of assets, 1952 to 1968 (selected years), in current and constant prices of 1958, given in the US *Statistical Abstract* [25].

At present, for lack of data on the government sector there are no series of total capital stock after 1968. Such data may become available again with the compilation of work by the Commerce Department on stocks of nonresidential government-owned capital that was reported in April 1976 to have been initiated [26; p. 47]. For the private sector, gross and net capital stock 1925 to 1970, by type of capital good (structures, equipment and since 1928 inventories) in current and constant prices of 1958 are given in the *Historical Statistics of the United States* [25]. For the business sector, gross and net capital stock (fixed non-residential business capital) by major industry group and legal form of organization, in current and constant prices of 1972 for the years 1925-1975 are given in the *Survey of Current Business* [26] April and July 1976. Reference may also be made to the forthcoming publication of the US Department of Labor [14], see Appendix D.

3.2.2. Growth of Capital Stock, 1850 to 1974

The compilation of the growth of capital stock, in the FRG and the US was based on the above-mentioned sources and methods. For details of the compilations see Appendix A, Table II.3, Germany, FRG Gross Capital Stock, Population and Prices, 1850-1974; Appendix A, Table II.6, US Gross Capital Stock, Population and Prices, 1850-1968; and Appendix A, Table II.7, US Gross Capital Stock (Business, Governments and Households) by type of asset, 1850-1968. These tables have been summarized in Appendix A, Table II.1, Capital Stock, Total and Per Capita in Constant Prices of 1912/13, in Germany, the FRG, and the USA, 1850-1974 (selected years).

Total Capital Stock. Appendix A, Table II.1 indicates that in terms of constant prices of 1913, and at 1913 exchange rates, the 1850 level of total capital stock may have been higher in Germany ($11.7 billion) than in the US ($4.6 billion, incomplete data). At that time, the German population of 35.3 million was also more numerous than that of the US of 23.3 million. In 1880, the US population of 50.3 million had risen above Germany's 45.1 million, and total capital stock reached the same level, little over $23 billion in either country. By 1890, the US total capital stock of $45.6 billion had risen above that of Germany's $30.7 billion. The US *total* capital stock remained at a higher level above Germany's ever since--although on a *per capita* basis, the development was different.

Per Capita Capital Stock. From 1850 to 1913, the growth of per capita capital stock was quite similar in the two countries (see Figure 6). Not so much attention has to be devoted to the fact that at certain times in history the per capita capital stock of Germany topped that of the US (US 1850 data may be incomplete) or, vice versa, that the US topped Germany (i.e. in 1890)--in the last decades before World War I the gap was closed.

In 1952 the FRG per capita capital stock at 1913 prices and 1913 exchange rates was $775 (little higher than what it had been

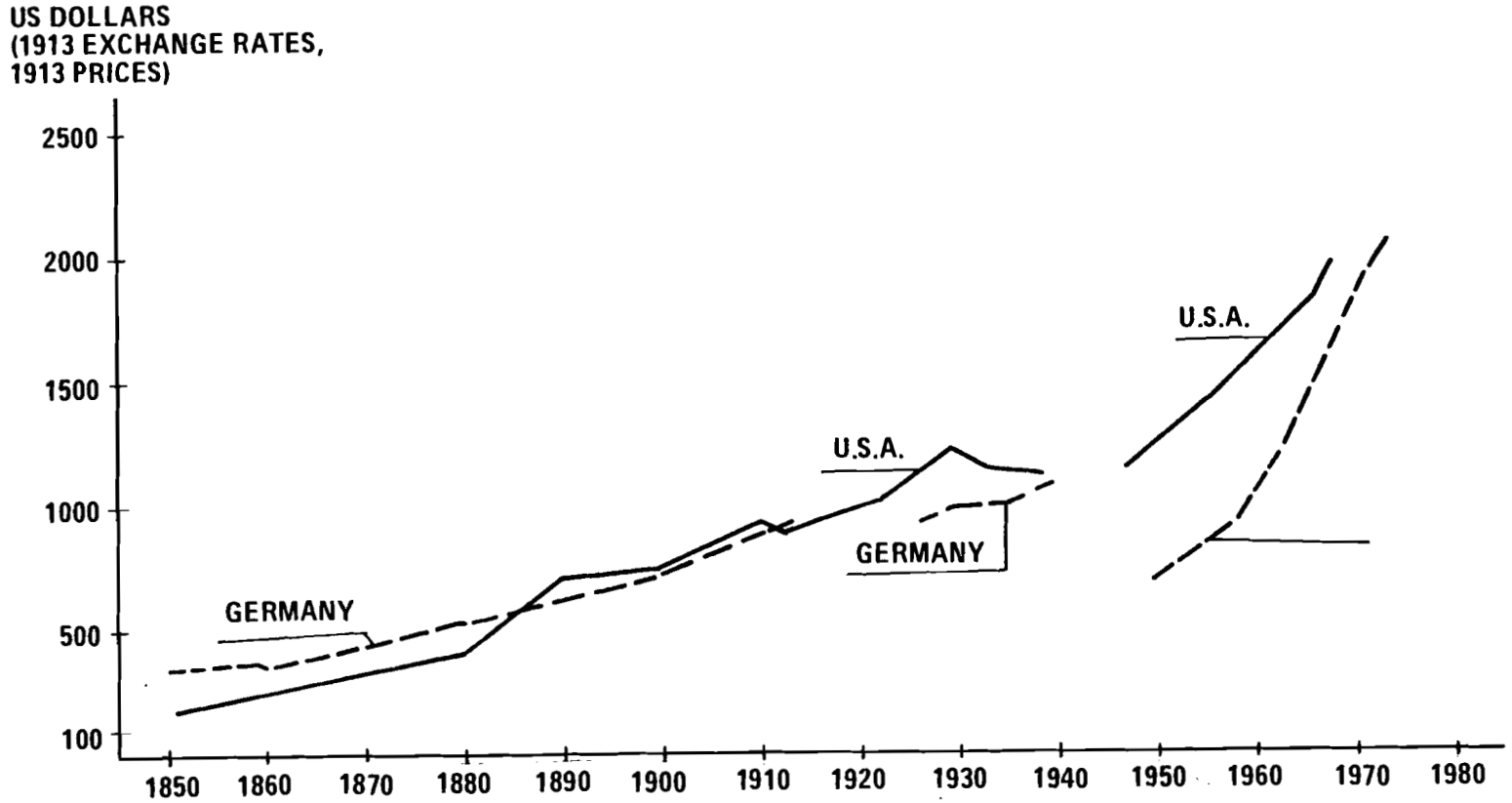

Figure 6. USA and Germany/FRG per capita capital stock 1850-1974 (selected years) in constant prices and dollars of 1913.

for Germany in 1900), while the US per capita capital stock was $1369 against $747 in 1900. As was to be expected, shortly after the War the FRG per capita capital stock was considerably lower than that of the US. But by 1968, the gap had considerably narrowed, with US per capita capital stock at $1989 and the FRG's at $1730. Here we are not quite sure whether the data based on 1913 prices can accurately reflect current situations. A comparison in 1968 prices, with FRG data converted to US dollars on the basis of 4 D-Mark = 1 US-Dollar (official 1968 rate) shows more of a difference in level.

1968 per capita capital stock in 1968 prices:
US = $10,702
FRG = $7,849.

However, if we were to use the "ideal dollar exchange rate" which tends to adjust for different prices and weights (see notes on p. 9 above) the difference in level would be less acute. Whatever price basis is used, the 1952 gap had definitely narrowed by 1986, and this reflects the FRG's rapidly rising investment coefficient, coinciding with a US investment coefficient that remained nearly constant. At the same time, the GDP growth rates (total and per capita) were higher in the FRG than in the US. Official US estimates for *total* capital stock after 1968 are not available at present.

3.2.3. Capital Stock by Broad Economic Sectors, 1850-1974

Limits to Comparability. The historical capital stock data by economic sectors lack a certain amount of comparability. First of all, for US historical data starting with 1850, the breakdown relates only to structures. The equipment is broken down into "producers goods" and "consumers durables", with no further allocation as to the sector.

Secondly, the groupings within the sectors differ between historical and more current series. For example, in Germany's capital stock data 1850 to 1938 the agricultural sector is overstated because capital stock includes inventories and rural dwellings. The dwelling sector is understated because it excludes rural dwellings. In the FRG 1950 to 1974 capital stock, farm inventories have been eliminated, and rural dwellings were moved out of the farm sector into "dwellings".

Apart from these discrepancies within national capital stock data, we do not know whether the categories are comparable from one country to the other. For instance, would "dwelling" (German statistics) fully correspond to the US "residential, business and non-business?" More uncertainty exists about the comparability of "government" between the two countries.

Interpretation of Data. Notwithstanding the obstacles to comparability mentioned above, the data in Appendix A, Table II.3 show changes in the capital stock brought on by progressive industrialization. In 1850 more than half of the entire capital stock

of the German empire consisted of agricultural structures, equipment, and inventories. The share of the agricultural sector may have been somewhat overstated because of the inclusion of inventories and rural housing. Whatever minor distortions due to matters of classification, the historical series show very clearly the relative decrease of agriculture's capital stock to about one fifth of the total in 1913. There was a further, slight increase in the period between the wars, as the share of agricultural capital stock came down to 18% of total capital stock in 1938. With territorial changes brought on by the establishment of the FRG, agriculture's capital stock fell to 9% of total in 1950, and further to 5% in 1974. In the US, the percentage share of agricultural structures decreased steadily from 25.9% of total structures in 1850 to 9.2% in 1922, and a mere 3.6% in 1968. The shares of business farm structures and equipment in total business structures and equipment fell from 9.6% in 1925 to 8.6% in 1939, were again 9.6% in 1952, but have fallen since to 7.5% in 1968 and 7.3% in 1975 (current prices). In the US, the general decrease of the importance of the farm sector coincided with a considerable increase of the share of government structures from under 4% in 1850 to nearly 30% of all structures in 1968. These data seem to underline the well known fact that government has become the biggest business in the US. Unfortunately, at the time of this writing, there are no up-to-date official US estimates available to show the share of government in total capital stock, comprising structures and equipment. However, such work is now in progress. The data on business capital stock have recently been supplemented by estimates on "residential, non-business capital stock, 1925-1975", and further additions on government capital stock have been planned [26] April 1976, p. 47.

By contrast to the US, and keeping in mind the above-stated obstacles to comparability, Appendix A, Table II.2 shows that in Germany and the FRG the share of the government sector in total capital stock (structures and equipment) has rather diminished. The share of the government sector in total capital stock fell from 24% in 1880 to only 17% in 1974 (FRG). This does not mean that there is less government capital stock now, it simply means that the capital stock created by industry, trade, and commercial services has expanded so much faster.

Finally, it should be noted that "dwelling" and, respectively, "residential" are of considerable importance in both US (capital structures) and FRG (capital structures and equipment) data. This importance has increased over the historical sweep in both countries--it might signify an increase in the standard of living. Whatever the reason, in 1970 in the FRG, one third of the entire capital stock was dwellings (it has since dwindled a bit); in the US residential structures amounted to over 40% of total structures in 1968.

3.3. The More Recent Past, 1950-1974

3.3.1. US, FRG, and UK Capital Stock by Industries, 1950-1974

US Business Capital Stock. Definitions, Sources. The preceding section dealt with the capital stock (structures and equipment) held by the economy as a whole including business (farm and nonfarm), government, and household (part of residential). The following observations are limited to the capital stock (structures and equipment) held by the business sector. The "Fixed Nonresidential Business Capital" as it is known in official US statistics, broken down by "farm", "manufacturing" and "nonfarm nonmanufacturing industries", in current and constant prices of 1958 for the years 1950-1975 are shown in the *US Statistical Abstract* [25], 1975, p. 411/412, Tables 675 and 676. These estimates were backdated to 1925 in an article published in the *Survey of Current Business*, with the constant price basis shifted to 1972 [26], April 1976. See Appendix A, Table II.9, which is a reproduction of the 1925-1975 Business Capital Stock Data by Major Industry Groups. We have checked the business capital stock against the total capital stock, on the basis of data contained in the *Statistical Abstract* [25]. For details see Appendix A, Table II.8: US Gross Capital Stock, Total and Business Economy, 1960 and 1968. Accordingly, the capital stock (current prices) held by the business economy represented 53.2% of the total capital stock in 1960, and 51.7% in 1968.

US Business Capital Stock by Industries. The 1970 business capital stock, in 1958 prices, at 80 industry level for input output aggregation are shown in Appendix A, Table III.6. These are the data that were compiled by the US Department of Commerce BEA, for the Council of Economic Advisers [15]. Appendix A, Table II.12 shows these data summarized for 20 industry groups. This table shows the relative importance of certain industrial sectors in total business capital stock. Thus, the energy sector including mining, refining and utilities, accounts for nearly 20% of total business capital in 1970 (at 1958 prices). In fact, the share of the capital stock held by the energy sector would be somewhat higher, if the federally operated power plants had been included in the US Department of Commerce BEA study [15]. The manufacturing sector (excluding petroleum refining] accounted for "only" 22.9%. The table also shows that the US economy is highly service-oriented, as nearly half (47.4%) of all business capital is held by the services sector, excluding government. Reference may also be made to the capital stock data, for the period 1947-1974, prepared by the US Department of Labor [14], and soon to be published. See Appendix D for a description of the series.

FRG Capital Stock by 19 Groups of Activities. Appendix A, Table II.5 shows the FRG capital stock at 1962 prices for 19 groups of activities, for the years 1950-1972; these data were compiled in May 1976 by the team who prepared the study, led by

Eduard Pestel on the German model[3]. These data are consistently lower than the "gross" (Brutto) capital stock (structures and equipment) in 1962 acquisition (Neuwert) prices and consistently higher than the net capital stock (structures and equipment) at 1962 replacement values (Wiederbeschaffungspreis), shown in *Wirtschaft und Statistik* or the 1975 *Statistisches Jahrbuch* [18].

Notwithstanding these differences, the capital stock data compiled by the Pestel team are of great interest for the study of capital requirements, because they are broken down into 19 groups of activity. Of particular interest for the Energy Systems Program are the energy capital stock data. In constant prices of 1962, they increased from 41.2 billion D-Mark in 1950 to 170.4 billion D-Mark in 1972. During the same period the share of the energy sector in the total capital stock of the FRG hardly moved--it was 9.8% of the total in 1950, slipping to 9.4% in 1972.

The sector "dwellings" fell from 33% in 1950 to 27.2% in 1972, this decrease was similar to what we had observed in the capital structures by sectors in the official FRG statistics of the *Statistisches Jahrbuch*.

The sector "government" in the Pestel capital stock data shows an increase from 7.7% of total capital stock in 1950 to 15.8% in 1972. This development is quite different from what we observed in the official government statistics. Unfortunately, we do not have sufficient information on what exactly is included under government capital stock in either set of statistics, Pestel and official FRG.

Comparison of 1970 US Business Capital and FRG Capital Stock (see Appendix A, Table II.12). A comparison of the capital stock by industries between the two countries should be limited to "total capital stock excluding residential and government". This shows the relative importance of various sectors. Of relevance for the capital requirements' study may be the fact that in the US the total capital stock of the energy sector alone is almost as large as that of the total manufacturing sector (excluding petroleum refining). In the FRG, the capital stock held by the energy sector is also important, but it amounts to only little more than half of the manufacturing sector.

UK Gross Capital Stock of Industries. Data on Gross Capital Stock at 1970 Replacement Cost by Industries, 1964 to 1974, are shown in the UK *Annual Abstract of Statistics* [21]. We have reproduced these data in Appendix A, Table II.11. In Appendix A, Table II.12, we have tried to summarize the 1970 capital stock by categories similar to those used for the USA and FRG. There

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[3]Pestel, E. et al., *Das Deutschlandmodell* [30].

are difficulties of classification as, for instance, the UK coal and petroleum products capital stock is lumped with the capital stock of chemical industries; also, we do not know for sure whether coal mining is included with "Mining and Quarrying" or whether it is included in the group "Coal, Petroleum Products, and Chemicals".

Despite these handicaps, certain characteristics emerge from the data in Appendix A, Table II.12. First of all, the share of agriculture in total capital stock is very low, 3.4% of total stock excluding government and residential. In the US and FRG the corresponding shares were 7.5 and 11.4%, respectively. The share of the energy sector was 19.7% in the US and 16.4% in the FRG. The share of the UK energy sector's capital stock would probably lie somewhere between these two values; it must be less than 19.5% because of the inclusion of chemicals in the group of coal and petroleum products.

3.3.2. World Capital Stock by Regions, 1950-1970.

Evaluation of Estimates. Global estimates of capital stock that include Western industrialized countries, developing countries, and Eastern European countries and China must be considered with a great deal of caution. This is due to the paucity of data, i.e. in the developing countries, and the fact that conceptual differences in the national accounts and pricing systems between East and West make a summation of the data from these groups highly problematic, not to mention the uncertainties involved in the conversion of data from national currencies to US dollars. We know of two attempts to estimate global capital stock by regions. There are the W. Ströbele estimates, used for a doctoral dissertation [31], and the United Nations' global estimates made available in a study on the Future of the World Economy [9]. The two sources, as regards 1970 GDP and gross capital stock total and by regions, in US dollar values (Ströbele at 1963 prices; UN at 1970 prices), are reviewed in Appendix C. According to this review it seems that the Ströbele data for the world gross capital stock were too high. If the Ströbele 1970 total world capital stock ($7.5 billion in 1963 prices) are converted to 1970 prices, one obtains a total of $9.4 billion, against the UN total of $5.7 billion (1970 at 1970 prices). The UN gross capital stock for the world, although limited to the private sector, seems to be more realistic. We were able to check this out, by comparing the UN and Ströbele data for the North American region.

Extrapolation of the UN data to 1975. As stated above, the UN estimate for the world's gross capital stock, in 1970 amounted to $5.7 billion in 1970 prices. We could assume a growth of 15% between 1970 and 1975; this is a conservative estimate, considering that the US business capital stock (in constant prices) grew by 20% in 1970-1975 (see Appendix A, Table II.10). We could further assume that the deflator rose from 100 in 1970 to 130 in 1975. Thus a conservative estimate would put the world's total gross capital stock in 1975, at 1975 prices, to $8.5 billion.

Growth of Global Capital Stock by Regions. A comparison of the regional percentage distribution of the 1970 capital stock between the UN and the Ströbele data shows remarkable agreement between the two sources. In both estimates for 1970 the developed countries' share in total capital stock amounted to over 70% of world total; North America, i.e. USA and Canada, held about 40%, Western Europe 26%, Japan 5%, etc. (see Appendix A, Table II.14). Developing countries held less than 10% with the remainder, about 20%, held by centrally planned economies. More significant than the percentage structure in a given year may be the development over time. For this purpose, we have reproduced the Ströbele data in Appendix A, Table II.13, although, as stated above, the level of the capital stock is too high. The changes in the percentage structure of world capital stock by regions between 1950 and 1970 reflect to some extent the observations on capital formation and capital stock made in the preceding sections of this chapter, namely the unprecedented growth of capital formation and stock, by Western European countries and Japan, which coincided with relatively slower growth in the US. At the same time, Eastern European countries rapidly built up their capital stock. Consequently, the share of North America in global capital stock decreased from 58.7% of total in 1950 to 40.6% in 1970 (although in absolute values it nearly doubled). The implications of the shift in the percentage distribution of global capital stock for North America versus Western Europe and Japan could become even more thought-provoking, if one considered the fact that Western Europe and Japan's capital stock are much newer (only a minor portion of their present capital stock predates 1950) than that of North America.

Another conclusion to be drawn relates to the slow growth of capital stock in the various regions of developing countries. Progress achieved between 1960 and 1970, during the much heralded First UN Development Decade, suggest that projections on the developing countries' energy demand should proceed with a great deal of caution. Perhaps greater attention should be devoted to the question of what is the developing countries' capacity to absorb increased energy consumption than to the question of wishful targets on industrial development reached by "consensus", e.g. at the Sixth Special Session of the UN General Assembly (1974), UN Conference on Industrialization (Lima, Peru, 1975), and UNCTAD IV (Nairobi, April 1976).

4. CAPITAL/OUTPUT RATIOS

4.1. Concepts

Capital output ratios are compiled with the capital stock as numerator and output, represented by value added, as denominator. The ratio simply indicates the number of capital units needed to produce one unit of output, during a given time period, for instance, in the course of a year. When compiling capital/output ratios for the nation as a whole, one uses total capital

stock (all sectors of the economy) divided by GDP (or GNP, as the case may be). For the compilation of sectors of the economy (i.e. private sector, business sector) it is necessary to relate the appropriate capital stock to the particular share of GDP it serves to generate.

The capital/output ratio can be used to measure the efficiency of the use of capital stock in production. With no changes in capacity utilization, a declining capital output ratio over the years (or in space, country to country) means increased efficiency in the use of capital; conversely, if the capital/output ratio rises the productivity of capital declines.

The fact that capacity utilization is not constant was considered by the US Department of Commerce, Bureau of Economic Analysis (BEA) [15]. Their computations of capital/output ratios for the business sector 1947-1974, adjusted and unadjusted for capacity utilization, as well as their estimates of capacity utilization rates are reproduced in Appendix A, Table III.3. If not specifically stated otherwise, the capital/output ratios used in this paper are unadjusted for capacity utilization.

4.1.1. Gross and Net Capital/Output Ratios

For the purpose of estimating additional capital stock required to generate additional GDP, capital/output ratios may be compiled as net capital stock over GDP. On the other hand, if the purpose is to estimate *total* capital requirements for a given output, it is useful to compile the ratio from gross capital stock over GDP. The US Department of Commerce (BEA) in their projections of 1980 capital requirements used 1970 capital output ratios (for the business sectors) derived from *gross* capital stock (adjusted and nonadjusted for capacity utilization). Throughout this paper, unless specifically stated otherwise, the capital/output ratios derive from *gross* capital stock.

In order to get an idea of the order of magnitudes involved, see the following examples which show the difference in US capital/output ratios, whether derived from gross or net capital stock and for the various sectors of the economy (Table 5).

Table 5. US Capital Output Ratios

		Total Economy	Private* Economy	Business Sector
1963	$\frac{\text{Gross Capital Stock}}{\text{GNP}}$	2.735	2.77	1.447
	$\frac{\text{Net Capital Stock}}{\text{GNP}}$	1.799[a]	1.77	.
1970	$\frac{\text{Gross Capital Stock}}{\text{GNP}}$	.	2.92	1.536
	$\frac{\text{Net Capital Stock}}{\text{GNP}}$	1.883[a]	1.86	.

[a] IIASA estimates of 1976 [32]. *Total economy excl. government

4.2. Estimates of Capital/Output Ratios

4.2.1. World Average Capital/Output Ratios by Regions, 1950-1970.

Capital output ratios, derived from broad aggregates of national accounts data, were compiled by W. Ströbele for the world (including China) and by regions, for the period of 1950 to 1970 [31]. As stated above, we found the Ströbele capital stock data to be too high; consequently his capital/output ratios are also too high. We tested this in the case of the US 1968 capital/output ratio as 2.7, against the Ströbele 1968 capital output ratio for North America as 3.45. Still, we have reproduced the Ströbele capital output ratios for the world and by regions 1950-1970 (Appendix C, Table III.1) to show the trend.

Between 1950 and 1970, capital/output ratios showed rising trends, though at different intensity, in the various regions. The strongest increases were observed in the capital/output ratios in Western Europe, Japan, and the developing countries. The slowest increases occurred in the Latin American region, where the coefficient remained almost constant. In the North American region, the trend was mixed. An upward swing, 1951 to 1958, was followed by a downward swing, 1959-1969, with some increase again in 1970. Most of the North American region consists of the US, and the above described movement is reflected in the US business capital/output ratios discussed below.

4.2.2. United States Capital/Output Ratios

Total capital/output ratios for the economy as a whole can easily be compiled from the series on gross capital stock and GDP (see Appendix A, Table III.2) and Figure 7.

The US Department of Commerce, Bureau of Economic Analysis [15] has compiled capital/output ratios for the business economy 1947-1974 (see Appendix A, Table III.3), as well as capital/output ratios at 80 industry level for input/output aggregation, for 1963 and 1967-1970, based on unscaled capital stock data (see Appendix A, Table III.4), and based on capital stock data scaled by capacity utilization (see Appendix A, Table III.5). For an interpretation of these data, reference may be made to the following two paragraphs, taken from the Commerce Department study:

> *"...capital/output ratios for the total private economy indicate a mixed picture as regards trends during the post-war period. Moreover, this picture is somewhat different for the adjusted vs the unadjusted ratios. During the period 1947-1961, there was a clear-cut downward trend in the adjusted ratios, while the period 1962-1969 showed a reversal in the direction of this trend. Data for the more recent time period indicate no clear-cut trend with the 1973 ratio about equal to the 1969 ratio. However, given the impact of shifting industrial*

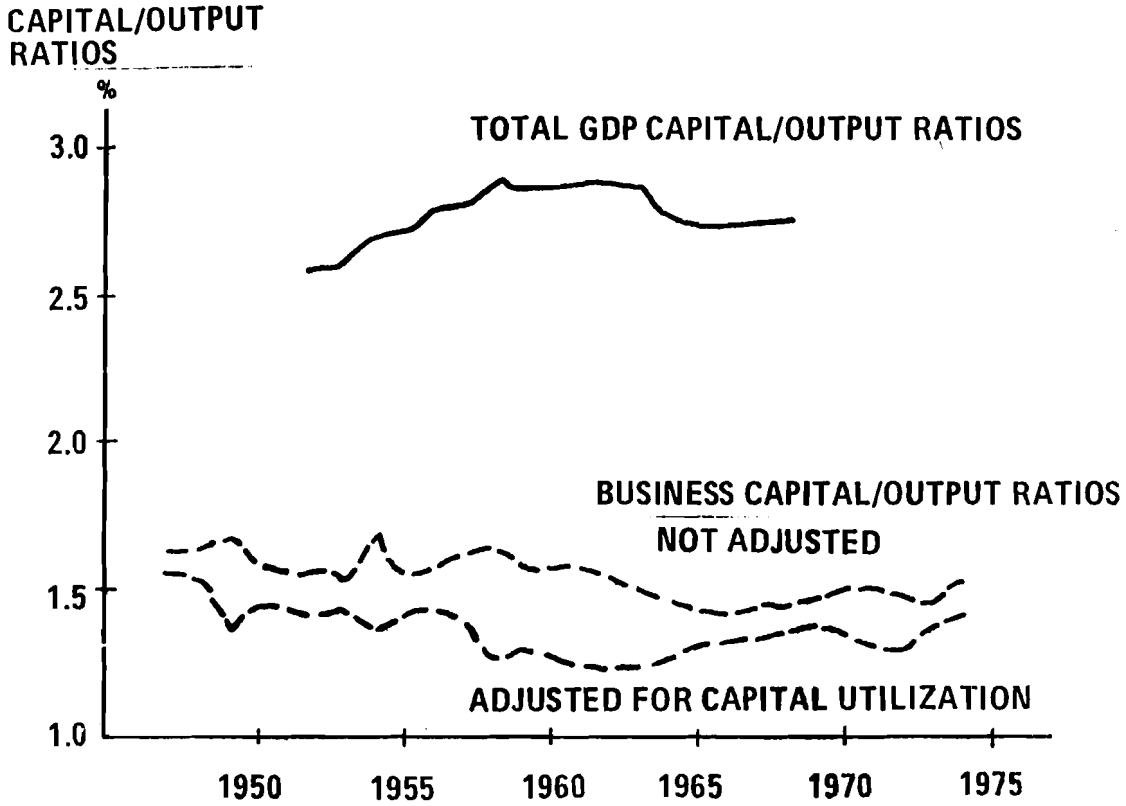

Figure 7. US capital/output ratios, selected concepts.

mix (due to both cyclical and more long-run factors) on the observed overall capital/output ratio for the total private economy, it would be inadvisable to assume the absense of clear-cut trends for the recent period in the capital/output ratios for individual industries.

The industry data on capital/output ratios for 1963 and 1967-70 were examined to determine if there were any clear-cut trends evident for recent years. For industries where such trends were evident, a continuation of these trends to 1980 was assumed. For other industries, the 1970 ratio or an average of the ratios for the 1967-70 period was used for 1980.

Since the historical capital/output ratios only extend to 1970, both their levels and trends do not reflect, to any considerable extent, the impact of recent developments related to energy and environmental concerns. This is fortunate since for the present study, as far as possible, we wish to examine separately the capital requirements of production and those of environment and energy." [15; p. 4]

We have looked into the capital/output ratios of the industries comprising the energy sector, in 1963 and 1967-1970 (see Table 6 below).

Table 6. USA Capital/Output Ratios Energy Sector, 1963-1970 (data not adjusted for capacity utilization)

	Industry Classification	1963	1967	1968	1969	1970
7.	Coal Mining	.934	1.224	1.266	1.251	1.295
8.	Crude Petroleum and Natural Gas	5.630	5.002	4.947	4.882	4.732
31.	Petroleum Refining	.585	.541	.522	.522	.511
68a	Electr.Utilities*	4.846	4.659	4.642	4.709	4.714
68b	Gas Utilities	2.083	1.974	2.016	2.023	1.994

*excluding Federal power plants

Source: Compiled from Appendix C, Table III.4.

The table shows that capital/output ratios increased markedly in coal mining, whereas in other industries of the energy sector the ratios decreased mildly. However, it would seem that the period of observation is too short for meaningful interpretation of data.

4.2.3. FRG Capital/Output Ratios

Capital Stock/GDP Output Ratios, Major Sectors of the Economy, 1950-1974 (see Figure 8). Capital stock/GDP output ratios are compiled by the Statistisches Bundesamt for the total economy and various economic sectors (see Appendix A, Table III.8). The estimates shown in the 1975 *Statistisches Jahrbuch* where initially prepared by H. Lützel [28], see Appendix A, Table III.8. In his analysis of the data, he points to the development in three stages: From 1950 to 1956, the capital coefficients fell from 4.3 to 3.3. This was due to the availability of additional labor and the fact that the rehabilitation and expansion of capital stock required rather low investments. From 1956 to about 1961, the capital coefficient remained constant, while from 1962 onwards the capital coefficient started to rise slowly.

Capital Stock/Output Ratios (Capital Coefficient), 19 activities, 1950-1972. The capital coefficients, calculated by the Pestel team (see Appendix A, Table III.9) show a diversity of trends for the various activities. Significant for the energy capital requirements study may be the fact that in the energy sector, the capital coefficient was rising from 4.22 in 1950 to 5.21 in 1972. Rising capital coefficients are shown also for agriculture, and a few individual industries, i.e. metal processing, as well as construction, trade, and total activities.

4.2.4. UK Capital/Output Ratios, 1964-1974.

Capital/output ratios for the total economy (all sectors) can be compiled from the "Gross Capital Stock at 1970 Replacement Cost" (discussed above) and the "Gross Domestic Product" at 1970 prices (see Appendix A, Table III.10). There is a considerable difference in the level of GDP at 1970 prices, whether estimated at factor cost (Ь 10^{9}·47.8 in 1974) or at market price (Ь 10^{9}·56.7). We compiled capital/output ratios for both GDP concepts. (For the other GDP series shown in this paper, we have used "GDP at factor cost", this is the concept selected by the UN for compilations of total and per capita GNP in US dollars, shown in the UN *Yearbook of National Account Statistics* [10; 1975, Vol. III]).

The level of the UK capital/output ratios (Appendix A, Table III.10) is amazingly close to the level observed for all economic sectors in the FRG.

For example, in 1974 the FRG capital/output ratio was 4.0, while that of the UK ranged between 3.66 and 4.35. In 1968, the ratios were FRG 4.8, UK 3.38 and 3.96. Both FRG and UK capital output ratios are considerably higher than the US capital output ratio 1968 = 2.7 (see Appendix A, Table III.2).

UK capital/output ratios for sectors of the economy could be compiled from the detailed national accounts statistics that show GDP by industries (*Annual Abstract of Statistics* [21], 1975, p. 319) and the gross capital stock by industries (see Appendix A, Table II.8a).

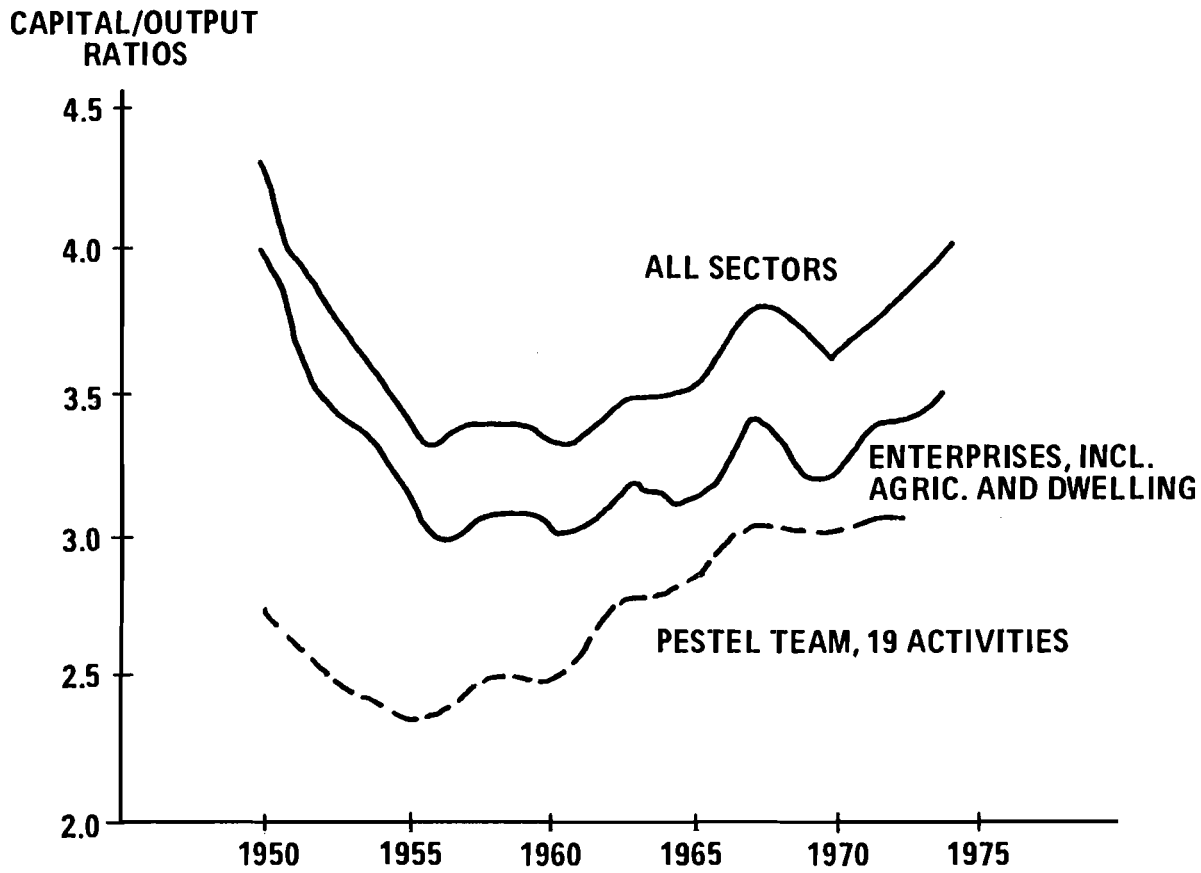

Figure 8. FRG capital/outout ratios, by sectors.

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Appendix A.I.

CAPITAL FORMATION AND GDP

The sources and methods of compilation, if not specifically stated, are indicated in the text to which they relate.

Appendix A, Table I.1.
Population, Per Capita GDP, and Prices in the Developed Countries, 1850-1977
(GDP in Constant Prices and Dollars of 1970*)

	United Kingdom			Germany/FRG			USA		
	Population	Per Capita GDP	GDP Deflators 1970=100	Population	Per Capita GDP	GDP Deflators 1970=100	Population	Per Capita GNP	GNP Deflators 1970=100
	10^6	$	%	10^6	$	%	10^6	$	%
1852/56	21.4	500	15.2	36.2	362	16.5	.	.	.
1867/71	25.2	572	16.0	40.5	461	18.5	40.9+	404	18.2
1887/91	32.1	780	14.4	48.6	825	14.9	61.8	547	14.1
1907/11	41.3	883	15.4	63.7	1087	17.7	90.7	947	16.8
1927/31	44.6	850	30.5	64.6	1176	27.0	121.7	2347	30.6
1932/36	45.5	891	27.8	66.0	1203	22.3	126.4	.	24.3
1952/56	50.8	1302**	58.1	51.9	1402	61.9	163.1	3466	66.2
1962/66	53.5	2076**	82.4	58.0	2424	82.2	191.7	4158	80.8
1967/71	55.2	1848**	95.4	60.2	2910	96.0	202.8	4767	95.4
1970	55.4	1870**	100.0	60.7	3095	100.0	204.9	4769	100.0
1975	55.9	2004**	198.5	61.8	3364	138.5	213.6	5137	139.2
1976	55.9	2069**	226.0	61.5	3467	142.9	215.1	5411	146.5
1977	55.9	2075**	253.0	61.4	3559	148.4	216.8	5632	154.7

*Exchange rate: 1$ = DM 3.648 **GDP at factor cost + = 1869/73
1£ = $ 2.394

Appendix A, Table I.2.
Average Annual Growth Rates of Per Capita GDP in Constant Prices, Developed Countries, 1847/51-1977.

	United Kingdom	Germany/ FRG	USA
Y e a r s	%	%	%
1847/51	0.0	.	.
1852/56	2.5	1.6	.
1857/61	1.4	1.6	.
1862/66	-0.2	2.2	.
1867/71	4.3	1.0	.
1872/76	0.7	2.9	3.0*
1877/81	-0.2	-1.3	5.6*
1882/86	0.5	2.5	2.9*
1887/91	1.2	1.1	0.7*
1892/96	1.0	3.3	1.3
1897/01	0.8	0.2	2.9*
1902/06	-0.1	2.7	3.1*
1907/11	0.4	1.0	1.2*
1912	.	.	.
1913	.	.	.
1912/16	.	.	0.8*
1917/21	.	.	1.3*
1922/26	1.8	.	3.0*
1927/31	0.7	.	0.7*
1932/36	2.8	.	2.3
1937	.	.	.
1938	.	.	.
1937/41	5.2	.	.
1942/46	.	.	.
1947/51	.	FRG .	2.9
1952/56	-0.3	7.7	1.3
1957/61	4.4	6.3	0.5
1962/66	2.4	3.5	4.4
1967/71	1.9	4.1	1.7
1970	-0.8	4.7	-1.5
1971	1.9	2.0	2.2
1972	1.4	2.7	4.7
1973	4.8	4.4	6.6
1974	-1.3	0.2	-3.1
1975	-2.1	-2.1	-2.6
1976	3.3	4.1	5.3
1977	0.2	2.6	3.9

*Represents the average growth from one five year period to the other (not average growth for each year within the five year period).

Appendix A, Table I.3.
Gross Domestic Product, Total, in Constant Prices, Developed Countries, 1847/51-1977; Data in National Currencies.

Years	United Kingdom 10^6 £ Prices of 1900	Germany/FRG 10^9 Mark Prices of 1913	USA 10^9 Dollars Prices of 1929
1847/51	599	.	.
1852/56	680	10.9	.
1857/61	784	12.5	.
1862/66	855	14.6	.
1867/71	993	16.3	9.1a)
1872/76	1234	20.4	11.2
1877/81	1328	21.0	16.1
1882/86	1445	22.5	20.7
1887/91	1595	26.3	24.0
1892/96	1728	30.9	28.3
1897/01	2013	36.2	35.4
1902/06	2163	41.4	45.0
1907/11	2278	47.4	52.5
1912	2388	51.9	.
1913	2514	52.4	.
	In Prices of 1938		
1912/16	.	.	59.7
1917/21	4619	.	67.7
1922/26	4342	47.0b)	84.4
1927/31	4796	50.4	97.0
1932/36	5010	53.5	84.7
1937/41	6233	.	116.6
1942/46	.	.	171.2
	In Prices of 1970		
1947/51	24700	FRG .	446.8
1952/56	27400	265.9	567.6
1957/61	31600	382.8	638.3
1962/66	37100	513.2	792.7
1967/71	42700	639.4	967.0
1970	43300*	678.8	977.1
1971	44500*	760.7	1009.1
1972	45100*	726.3	1066.1
1973	48400*	761.8	1144.9
1974	47800*	766.0	1117.5
1975	46800*	746.2	1097.3
1976	48300*	777.8	1164.0
1977	48400*	797.2	1221.1

a) = 1869/73 b) = 1925/26 * = GDP at factor cost

Appendix A, Table I.4.
Investment Coefficients (Share of GFCF in GDP), Developed Countries 1830-1977; Compiled from Data in Current Prices.

Year	Germany, FRG	UK	USA		France	Japan
			Government Business Residential	Business Only		
1832/36	.	3.9	.	.	16.2e)	.
1837/41	.	5.9	.	.	.	.
1842/46	.	5.5	.	.	17.7f)	.
1847/51	8.6a)	8.0	.	.	.	.
1852/56	9.5	6.4	.	.	17.5g)	.
1857/61	8.8	5.6	.	.	.	.
1862/66	11.9	8.3	.	.	20.5h)	.
1867/71	12.2	6.8	14.8d)	.	.	.
1872/76	14.6	7.8	15.9	.	19.2i)	.
1877/81	9.0	7.7	15.5	.	.	.
1882/86	10.1	6.3	16.6	.	19.8j)	.
1887/91	11.9	5.4	19.9	.	.	12.3r)
1892/96	12.0	6.2	21.3	.	19.3k)	.
1897/01	15.3	8.9	20.4	.	.	12.4s)
1902/06	14.5	8.7	20.5	.	21.3l)	11.9t)
1907/11	14.6	5.8	19.4	.	21.0m)	13.6u)
1913	15.6	5.6	.	.	.	.
1912/16	.	4.8	19.0	.		13.8v)
1917/21	.	5.3	19.7	.	.	16.7w)
1922/26	9.7b)	8.1	19.8	.	24.1n)	18.5x)
1927/31	6.8	8.8	18.7	8.7	19.6o)	18.4y)
1932/36	5.7	8.9	12.1	5.4	19.2p)	18.1z)
1937/41	.	8.4	15.9	7.3	.	.
1942/46	.	4.7	9.8	4.6	.	.
1947/51	.	12.2	18.6	10.2	.	.
	FRG					
1952/56	19.1c)	14.4	18.1	9.6	19.4c)	20.1q)
1957/61	21.8	15.9	18.1	9.5	22.7	30.2
1962/66	26.0	17.5	18.1	9.9	25.7	31.8
1967/71	24.7	18.5	17.5	10.3	26.4	34.4
1970	26.4	18.8	17.1	10.3	25.6	34.9
1971	26.7	18.6	17.5	9.9	24.3	34.2
1972	26.2	18.9	18.3	10.2	24.4	34.4
1973	24.7	19.3	18.5	11.4	24.4	36.6
1974	21.9	20.0	17.8	10.5	24.5	34.3
1975	20.8	19.8	16.3	9.8	23.3	30.9
1976	20.7	19.2	16.2	9.5	23.1	29.6
1977	20.8	18.0	.	9.8	22.6	28.9

a) = 1850/51
b) = 1925/26
c) = 1950/51
d) = 1869/72
e) = 1825/34
f) = 1839/44
g) = 1845/54
h) = 1855/64
i) = 1865/74
j) = 1875/84
k) = 1885/94
l) = 1895/04
m) = 1905/13
n) = 1920/24
o) = 1925/34
p) = 1935/38
q) = 1955
r)=1887-1896
s)=1892-1901
t)=1897-1906
u)=1902-1911
v)=1907-1916
w)=1912-1921
x)=1917-1926
y)=1922-1931
z)=1927-1936

Appendix A, Table I.5.
Deflators, Gross Fixed Capital Formation, 1830-1977;
Index Numbers, 1970=100.

Year	Germany, FRG	UK	USA	France 1905/13=100	France 1970=100
1832/36	.	14.6	.	114 e)	.
1837/41	.	15.3	.	.	.
1842/46	.	14.4	.	115 f)	.
1847/51	14.1 a)	14.0	.		
1852/56	16.5	15.2	.	119 g)	.
1857/61	15.7	15.1	.		
1862/66	14.3	15.6	.	127 h)	.
1867/71	18.5	16.0	18.3 d)		
1872/76	19.1	18.5	17.7	125 i)	.
1877/81	14.2	16.2	14.8		
1882/86	13.6	15.2	14.9	116 j)	.
1887/91	14.9	14.4	14.1		
1892/96	13.8	13.9	12.6	99 k)	.
1897/01	16.3	15.4	13.8		
1902/06	16.8	15.0	15.1	95 l)	.
1907/11	17.7	15.4	16.8	100 m)	.
1912	18.9	16.6	.	.	
1913	18.9	17.1	.	.	.
1912/16	.	19.7	19.0	.	.
1917/21	.	38.9	32.9	.	.
1922/26	28.1 b)	32.1	31.2	441 n)	.
1927/31	27.0	27.9	30.6	525 o)	.
1932/36	22.3	26.0	24.3	514 p)	.
1937	23.0	29.1	.	.	.
1938	22.3	29.6	.	.	.
1937/41	.	32.1	27.8	.	.
1942/46	.	44.0	37.2	.	.
1947/51	51.6 c)	51.6	56.8		39.0 c)
1952/56	59.5	64.0	66.7		51.2
1957/61	66.9	72.1	77.0		64.4
1962/66	79.2	80.2	81.7		79.3
1967/71	89.6	95.4	95.7		95.0
1970	100.0	100.0	100.0		100.0
1971	108.0	108.6	105.8	.	104.7
1972	112.1	118.9	109.1	.	109.6
1973	117.6	138.1	115.1	.	117.2
1974	125.4	166.0	124.9	.	135.2
1975	129.7	205.9	139.6	.	149.5
1976	134.0	226.0	147.4	.	159.2
1977	138.9	253.0	158.4	.	169.1

a) = 1850/51
b) = 1925/26
c) = 1950/51
d) = 1869/72
e) = 1825/34
f) = 1839/44
g) = 1845/54
h) = 1855/64
i) = 1865/74
j) = 1875/84
k) = 1885/94
l) = 1895/04
m) = 1905/13
n) = 1920/24
o) = 1925/34
p) = 1935/38

Appendix A, Table I.6.
Population Growth, Developed Countries, 1830-1977.

Year	Germany, FRG	UK	USA	France
	Index Numbers			
	1913=100	1913=100	1912/16=100	1905/13=100
1832/36	45.7	39.3	12.7	83 e)
1837/41	47.2	42.1	16.9	
1842/46	50.7	44.5	19.8	87 f)
1847/51	53.6 a)	47.8	22.9	
1852/56	54.1	50.4	26.9	91 g)
1857/61	55.6	53.6	31.1	
1862/66	58.4	55.8	35.3	95 h)
1867/71	60.5	59.3	41.5 d)	
1872/76	62.8	63.1	44.6	92 i)
1877/81	66.6	67.3	49.8	
1882/86	69.8	71.5	56.0	95 j)
1887/91	72.6	75.5	62.5	
1892/96	76.8	80.5	69.1	97 k)
1897/01	82.5	86.8	75.7	
1902/06	88.8	92.7	83.2	98 l)
1907/11	95.1	97.2	91.6	100 m)
1912	98.8	99.5	.	.
1913	100.0	100.0	.	.
1912/16	.	100.2	100.0	.
1917/21	.	102.8	106.4	.
1922/26	93.5 b)	104.9	115.2	99 n)
1927/31	95.5	107.1	123.1	103 o)
1932/36	98.5	109.9	127.9	105 p)
1937	101.3	111.3	.	.
1938	102.2	111.8	.	.
1937/41	.	112.5	132.5	.
1942/46	.	115.1	136.3	.
1947/51	75.2 c)	117.9	151.5	106 c)
1952/56	77.5	119.5	165.0	109
1957/61	82.0	122.5	179.9	115
1962/66	86.6	126.8	194.0	122
1967/71	89.9	129.9	205.2	128
1970	90.6	130.4	207.3	129
1971	91.5	130.8	209.5	130
1972	92.1	131.4	211.3	131
1973	92.4	131.5	212.9	132
1974	92.6	131.5	214.4	133
1975	92.3	131.6	216.1	134
1976	91.7	131.5	217.7	134
1977	91.6	131.4	219.4	135
		In Millions		
1975	61.8	55.4	213.6	52.8

a) = 1850/51 e) = 1825/34 i) = 1865/74 m) = 1905/13
b) = 1925/26 f) = 1839/44 j) = 1875/84 n) = 1920/24
c) = 1950/51 g) = 1845/54 k) = 1885/94 o) = 1925/34
d) = 1869/72 h) = 1855/64 l) = 1895/04 p) = 1935/38

Appendix A, Table I.7.
The Share of Agriculture and Industry in GDP, 1975
Cross Section Analysis

Countries*	Agriculture, Forestry and Fisheries	Industry:Mining, Manufacturing, Electricity, Gas and Water Supply	(Manufacturing)	Construction
	Percentage Distribution			
Region I				
USA	3	30	(26)	5
Canada	4	26	(20)	5
Region III				
ECE				
Belgium	4	35	(32)	7
Denmark	7	29	(27)	9
France	6	31	.	8
Germany, F.R.	3	46	(43)	8
Ireland	14	30	.	8
Italy	9	34	(32)	8
Luxembourg	4	45	(41)	7
Netherlands	6	32	(29)	7
United Kingdom	2	32	(28)	6
Japan	6	38	(35)	8
Other West.Europe				
Austria	7	38	.	9
Cyprus	21	20	(12)	7
Finland	12	30	(27)	8
Greece	16	19	(16)	8
Iceland	.	.	.	.
Norway	6	26	(22)	8
Portugal	16	33	(30)	5
Spain	11	29	(25)	8
Sweden	4	30	(27)	9
Switzerland	.	.	.	.
Turkey	27	22	(19)	7
Yugoslavia	19	38	.	.
Other:				
Australia	6	30	(24)	8
New Zealand	.	.	.	.
South Africa	9	37	(24)	4
Israel	5	20	.	10

Appendix A, Table I.7 (continued)

Countries*	Agriculture, Forestry and Fisheries	Industry:Mining, Manufacturing, Electricity,Gas and Water Supply	(Manufac-turing)	Construc-tion
	Percentage Distribution			
Region IV Latin America				
Argentina	12	37	(33)	5
Bolivia	16	30	(14)	4
Brazil	12	21	(19)	5
Chile	7	39	(27)	4
Colombia	26	22	(19)	5
Costa Rica	23	20	(18)	4
Dominican Rep.	23	21	(19)	5
Ecuador	27	19	(17)	4
El Salvador	28	21	(19)	3
Guatemala	.	.	.	.
Haiti	49	13	(10)	2
Honduras	31	16	(13)	5
Jamaica	7	29	(15)	16
Mexico	11	29	(23)	5
Nicaragua	25	23	(20)	3
Panama	19	17	(15)	6
Paraguay	32	18	(17)	3
Peru	18	33	(24)	4
Puerto Rico	3	27	(24)	9
Uruguay	11	22	(20)	3
Venezuela	7	37	(16)	4

Appendix A, Table I.7 (continued)

Countries*	Agriculture, Forestry and Fisheries	Industry:Mining, Manufacturing, Electricity,Gas and Water Supply	(Manufac-turing)	Construc-tion
	Percentage Distribution			
Region V				
Africa				
Burundi	.	.	.	.
Cameroon	33	13	(11)	6
Centr.Afr.Empire	31	18	(13)	4
Chad	50	8	(7)	1
Congo	.	.	.	.
Ethiopia	52	9	(8)	4
Gabon	.	.	.	.
Ghana	48	14	(11)	4
Ivory Coast	27	15	(13)	7
Kenya	31	13	(11)	5
Liberia	23	33	(4)	5
Malawi	52	11	(9)	3
Mali	.	.	.	.
Morocco	31	22	(14)	6
Niger	51	7	(6)	3
Nigeria	45	17	(7)	5
Rhodesia	14	29	(20)	5
Senegal	.	.	.	.
Sudan	39	11	(9)	3
Tanzania	37	11	(9)	4
Tunisia	17	15	(8)	6
Uganda	49	11	(8)	2
Upper Volta	44	12	(10)	4
Zaire	17	31	(8)	5
Zambia	11	48	(10)	7
Asia				
Afghanistan	51	12	(11)	2
Bangladesh	59	7	(7)	3
Burma	38	12	(10)	2
India	42	15	(13)	5
Indonesia	47	15	(9)	3
Korea, Republic	28	25	(22)	6
Malaysia	30	24	(15)	4
Nepal	67	9	(9)	2

Appendix A, Table I.7 (continued)

Countries*	Agriculture, Forestry and Fisheries	Industry:Mining, Manufacturing, Electricity,Gas and Water Supply	(Manufac-turing)	Construc-tion
	Percentage Distribution			
Region V Asia continued				
Pakistan	32	17	(15)	4
Philippines	29	18	(16)	2
Singapore	2	23	(20)	7
Sri Lanka	33	10	(9)	6
Taiwan	.	.	.	.
Region VI Middle East and North Africa				
Algeria	.	.	.	.
Egypt	25	21	.	4
Iran	18	35	(13)	5
Iraq	16	39	(9)	3
Kuwait	0	67	(4)	3
Lebanon	9	16	.	4
Lybian Arab Rep.	2	63	(2)	7
Oman	16	69	(0)	8
Quatar	.	.	.	.
Saudi Arabia	6	58	(10)	5
Syria	21	20	(16)	3
Yemen	71	3	(2)	3
Yemen Dem.Rep.	19	27	(25)	1

Source: Compiled from United Nations Yearbook of National Accounts Statistics 1976 [10] Vol.II, Table 3.

Data for the percentage distribution of GDP by kind of economic activity are based on estimates of GDP in current prices. As stated by the UN [10, Vol.II, general note to table 3], the estimates are not fully comparable from country to country in coverage and classification used. In addition, for some countries, the components cannot be adequately estimated for lack of information on import duties. For these reasons, data for additional activity groups were eliminated from the above table.

*Countries grouped by IIASA Energy Modeling Regions.

Appendix A, Table I.8.
Per Capita GDP and Investment Coefficients (Share of GFCF in GDP) in 1960, 1970 and 1975; Cross Section Analysis.

Countries*	GDP per capita			Share of GFCF in GDP		
	1975 $	1970 $	1960 $	1975 %	1970 %	1960 %
Region I						
USA	7120	4769	2817	16	17	17
Canada	6930	3885	2229	24	21	22
Region III						
ECE:						
Belgium	6270	2604	1232	22	22	19
Denmark	6810	3159	1299	20	22	19
France	5950	2851	1336	23	26	20
Germany, F.R.	6670	4015	1323	21	26	24
Ireland	2390	1325	635	22	23	14
Italy	2810	1727	690	21	21	22
Luxembourg	6020	3136	1629	29	24	21
Netherlands	5750	2431	971	21	26	24
United Kingdom	3780	2163	1368	20	19	16
Japan	4450	1895	458	31	35	30
Other:						
Austria	4870	1932	891	27	26	25
Finland	5420	2251	1116	30	26	27
Greece	2340	1134	424	21	24	19
Norway	6760	2880	1277	35	27	28
Portugal	1669	711	306	19	18	18
Spain	2750	1089	341	24	23	19
Sweden	8150	4094	1861	21	22	21
Switzerland	8463	3349	1560	24	28	24
Turkey	900	269	.	18	19	16
Australia	5700	2947	1586	24	27	25
New Zealand	4280	2235	1576	26	23	23
South Africa	1270	773	449	29	27	20
Israel	3790	1867	939	26	26	25

Appendix A, Table I.8 (continued)

Countries*	GDP per capita			Share of GFCF in GDP		
	1975 $	1970 $	1960 $	1975 %	1970 %	1960 %
Region IV						
Argentina	1550	1078	623	21	20	21
Bolivia	360	206	99	15	14	14
Brazil	1030	400	208	23	19	17
Chile	990	689	294	10	15	15
Colombia	580	401	253	18	20	18
Costa Rica	960	544	370	22	22	19
Dom.Republic	720	363	238	21	17	10
Ecuador	590	282	216	22	20	13
El Salvador	460	300	231	21	12	14
Guatemala	570	367	274	16	13	10
Haiti	190	103	73	12	7	14
Honduras	360	276	203	22	19	13
Jamaica	1110	687	410	24	25	21
Mexico	1050	682	334	22	20	17
Nicaragua	700	455	254	23	15	12
Panama	1290	731	392	29	24	15
Paraguay	580	249	159	21	15	.
Peru	760	332	208	19	12	17
Puerto Rico	2300	2055	788	20	28	20
Uruguay	1300	837	620	13	11	15
Venezuela	2280	1078	623	24	22	19

Appendix A, Table I.8 (continued)

Countries*	GDP per capita 1975 $	1970 $	1960 $	Share of GFCF in GDP 1975 %	1970 %	1960 %
Region V - Africa						
Burundi	110	66	.	6	.	.
Cameroon	280	187	127	.	14	11
Centr.Afr.Empire	220	127	.	.	.	.
Chad	120	74	.	.	12	9
Congo	510	228	.	.	.	.
Ethiopia	100	72	49	10	12	12
Gabon	2540	1100	294	42	28	39
Ghana	590	256	198	12	12	20
Ivory Coast	540	347	.	22	20	.
Kenya	220	143	101	21	20	12
Liberia	410	268	.	.	20	.
Malawi	130	73	42	19	18	9
Mali	90	54	.	.	13	.
Morocco	470	229	154	26	15	10
Niger	130	100	.	.	6	.
Nigeria	340	140	79	31	16	13
Rhodesia	550	283	216	20	18	22
Senegal	360	217	190	.	10	.
Sudan	270	117	94	14	11	11
Tanzania	170	100	56	21	20	11
Tunisia	730	281	189	26	20	18
Uganda	230	135	83	.	12	.
Upper Volta	110	59	42	26	7	.
Zaire	140	132	91	26	16	12
Zambia	420	429	183	36	28	18
- Asia						
Afghanistan	150	83	.	.	.	.
Bangladesh	90	81	.	14	.	.
Burma	110	78	61	.	11	.
India	140	98	74	18	15	13
Indonesia	220	107	71	20	14	8
Korea, Rep.	560	267	152	25	25	11
Malaysia	760	369	278	22	16	11
Nepal	110	77	.	.	.	.
Pakistan	160	196	83	18	14	12
Philippines	380	259	164	24	18	12
Singapore	2450	916	432	36	33	10
Sri Lanka	190	174	142	15	19	15
Taiwan	.	.	.	.	.	.

Appendix A, Table I.8 (continued)

Countries*	GDP per capita			Share of GFCF in GDP		
	1975 $	1970 $	1960 $	1975 %	1970 %	1960 %
Region VI						
Algeria	870	320	248	.	36[a]	.
Egypt	260	216	129	25	11	15
Iran	1660	407	203	30	19	17
Iraq	1250	385	245	52	14	20
Kuwait	15190	3995	.	75	14	12
Lebanon	1070	603	487	.	19	.
Lybian Arab.Rep.	5530	1919	472	28	18	.
Oman	2300	380	.	31	13	.
Quatar	10970	1128	.	.	.	.
Saudi Arabia	4010	658	323	22	13	14
Syria	720	269	209	29	15	13
Yemen	.	.	.	.	8	.
Yemen Dem.Rep.	250	.	.	.	.	.

a = Includes increases in stocks

Note: As stated by the UN, GDP data at current prices, converted from national currencies to US dollars at the rates prevailing in 1960, 1970, and 1975. The compilation of GDP at current prices and current exchange rates is designed to facilitate cross section analysis at a given year.

Sources: Per capita GDP in 1975 compiled from World Bank Atlas [35] 1977; earlier years from U.N., Yearbook of National Accounts [10] 1976, vol. II, Table 1A.

Share of GFCF in GDP compiled from the UN Yearbook [10] standard table 2A and UN Monthly Bulletin [11].

*Countries grouped by IIASA Energy Modeling Regions.

Appendix A, Table I.9.
FRG Investments (GFCF) in the Energy Sector, 1950-1975.
All Data at Current Prices.

Year	Solid Fuels	Hydro-Carbons	Crude Oil & Nat. Gas	Petr. Refining	Utilities Electr. (Public & Industry)	Utilities Gas	Total Energy Sector (Estimated)
	10^6DM	10^6DM	10^6DM	10^6DM	10^6DM	10^6DM	10^6DM
1950	.	.	.	.	972	186	.
1951	.	.	.	.	1090	233	.
1952	.	.	.	.	1201	271	.
1953	.	.	.	.	1422	311	.
1954	.	.	.	.	1791	336	
1955	.	.	.	.	2123	361	.
1956	.	.	.	.	1842	330	.
1957	.	.	.	.	2041	309	.
1958	.	.	.	.	2112	327	.
1959	.	.	.	.	2123	365	.
1960	.	.	.	.	2420	290	.
1961	.	.	.	.	2773	291	.
1962	1106	30	87	796	3260	360	5639
1963	.	.	.	.	3450	488	.
1944	1032	a)	142	1074	3773	709	6730
1965	1045	a)	172	650	3846	620	6333
1966	839	a)	276	924	3802	707	6548
1967	888	a)	147	1668	3936	703	7342
1968	768	a)	105	533	3422	543	5421
1969	551	a)	58	828	3815	675	5927
1970	755	a)	139	1034	4885	778	7757
1971	1251	a)	228	1371	6580	1122	10552
1972	1038	a)	205	1586	8197	1237	12263
1973	903	a)	170	1518	8475	1250	12316
1974	982	a)	183	1683	9638	1363	13849
1975	1563	a)	332	1444	9642	1523	14504

Source: Compiled from "Industrie Statistik" and "Investitionen der Unternehmen der öffentlichen Energieversorgung", published in FRG Statistisches Jahrbuch 1977 and earlier issues.

a) = Separate data not available, may be included with solid fuels.

Appendix A, Table I.10.
EC Countries. Investments (GFCF) by Broad Sectors of the Economy, 1975.
Data in Current Prices and National Currencies.

Sector	Belgium (10^9B.Fr.)	France (10^9F.Fr.)	FRG (10^9DM)	Italy (10^{12}Lira)	Netherl. (10^9Fl.)	UK (10^6£)	Ireland (10^6£)	Denmark (10^9Kr.)
1. Agriculture	11.5	14.1	.	1.8	2.1	622	81	3.5
2. Energy	46.5	22.2	14.5*	1.9	5.1	3274	37	2.1
3. Mining and Manufacturing	112.7	50.7	.	5.3	7.8	3576	188	
4. Construction	8.9	7.3	.	0.3	0.8	412	17	28.1
5. Trade, Transport, Communication, Finance	272.8	194.3	.	12.6	22.3	10308	463	
6. Government and Other Non-Market Services	84.9	46.8	.	1.9	8.8	3016	61	6.6
1-6 Including Deductible TVA	537.3	.	224.9	.	46.9	21208	.	.
TVA Deductible	26.1	.	10.4	.	2.9	611	.	.
1-6 Total GFCF Excluding Deductible TVA	511.1	335.4	214.5	23.8	44.0	20597	847	40.3
			In Percentages					
1. Agriculture	2.1	4.2	.	7.6	4.5	2.9	9.6	8.7
2. Energy	8.7	6.6	5.5*	8.0	10.9	15.4	4.4	5.2
3. Mining and Manufacturing	21.0	15.1	.	22.3	16.6	16.9	22.2	
4. Construction	1.7	2.2	.	1.3	1.7	1.9	2.0	69.7
5. Trade, Transport, Communication, Finance	50.8	57.9	.	52.8	47.5	48.7	54.7	
6. Government and Other Non-Market Services	15.7	14.0	.	8.0	18.8	14.2	7.2	16.4
1-6 Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*See Table I.9.
Source: Compiled from EUROSTAT National Accounts Detailed Tables 1970-1976; Standard Table 7.

Appendix A, Table I.11.
EC Countries. Investments (GFCF) in the Energy Sector and Total Economy, 1970-1976.
Data in Current Prices and National Currencies.

	Belgium		France		FRG		Italy		Netherlands		UK		Ireland		Denmark	
	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.	Energy Sector	Total Econ.
	10^9BFr	10^9BFr	10^9FFR	10^9FFR	10^9DM	10^9DM	10^{12}Lira	10^{12}Lira	10^9Fl	10^9Fl	10^6£	20^6£	10^6£	10^6£	10^9Kr	10^9Kr
1970	19.3	286.2	11.6	183.0	7.8*	173.7	1.0	1[illegible].3	2.5	29.5	998	9467	25	368	1.3	25
1971	27.8	305.1	11.8	205.9	10.6*	203.1	1.1	1[illegible].8	3.5	33.4	1087	10546	30	443	1.4	27
1972	28.0	329.9	13.2	232.0	12.3*	214.3	1.1	1[illegible].6	3.9	34.7	1064	11671	26	521	1.6	32
1973	24.3	376.7	15.2	265.0	12.3*	225.4	1.3	1[illegible].2	3.7	38.7	1143	14199	46	681	1.6	38
1974	32.1	467.8	18.8	312.1	13.8*	216.4	1.8	22.8	4.1	41.4	1851	16943	42	762	2.0	41
1975	46.5	511.2	22.2	335.4	14.5*	214.5	1.9	23.8	5.1	44.0	3274	20597	37	847	2.1	40
1976	34.5	561.5	26.7	382.3	.	223.2	.	.	4.7	46.7	4098	23414	.	.	.	50

Source: Compiled from EUROSTAT National Accounts, Detailed Tables, 1970-1976; Standard Table 7.

* = See Table I.9; the amount may be understated.

Note: GFCF in Total Economy exclude deductible TVA.

Appendix A, Table I.12.
UK Yield on Consols (Consolidated Government Obligations), 1850-1977.

Year	Average Yield %	Year	Average Yield %	Year	Average Yield %	Year	Average Yield %	Year	Average Yield %
1850	3.1	1880	3.1	1910	3.1	1940	3.4	1970	9.16
1	3.1	1	3.0	1	3.2	1	3.1	1	9.05
2	3.0	2	3.0	2	3.3	2	3.0	2	9.11
3	3.1	3	3.0	3	3.4	3	3.1	3	10.85
4	3.3	4	3.0	4	3.3	4	3.1	4	14.95
5	3.3	5	3.0	5	3.8	5	2.9	5	14.66
6	3.2	6	3.0	6	4.3	6	2.6	6	14.25
7	3.3	7	3.0	7	4.6	7	2.8	7	12.32
8	3.1	8	3.0	8	4.4	8	3.2		
9	3.2	9	2.8	9	4.6	9	3.3		
1860	3.2	1890	2.9	1920	5.3	1950	3.54		
1	3.3	1	2.9	1	5.2	1	3.78		
2	3.2	2	2.8	2	4.4	2	4.23		
3	3.2	3	2.8	3	4.3	3	4.08		
4	3.3	4	2.7	4	4.4	4	3.75		
5	3.4	5	2.6	5	4.4	5	4.17		
6	3.4	6	2.5	6	4.6	6	4.73		
7	3.2	7	2.5	7	4.6	7	4.98		
8	3.2	8	2.5	8	4.5	8	4.98		
9	3.2	9	2.6	9	4.6	9	4.82		
1870	3.2	1900	2.8	1930	4.5	1960	5.47		
1	3.2	1	2.9	1	4.4	1	6.21		
2	3.2	2	2.9	2	3.7	2	5.94		
3	3.2	3	2.8	3	3.4	3	5.58		
4	3.2	4	2.8	4	3.1	4	6.03		
5	3.2	5	2.8	5	2.5	5	6.42		
6	3.2	6	2.8	6	2.9	6	6.80		
7	3.1	7	3.0	7	3.3	7	6.69		
8	3.2	8	2.9	8	3.4	8	7.39		
9	3.1	9	3.0	9	3.7	9	8.88		
1880	3.1	1910	3.1	1940	3.4	1970	9.16		

Sources:
B.R. Mitchell and Phyllis Deane [4]; UK Annual Abstract of Statistics [21]; and Economic Trends [33], July 1978.

Appendix A, Table I.13.
Germany: Interest Paid on Government Obligations (Communal), 1850-1913.

Year	Yield %	Year	Yield %	Year	Yield %
1850	3.80	1880	3.89	1910	3.98
1	3.82	1	3.84	1	4.03
2	3.75	2	3.83	2	4.04
3	3.72	3	3.88	3	4.07
4	3.74	4	3.90		
5	3.82	5	3.93		
6	3.88	6	4.00		
7	3.93	7	3.98		
8	4.09	8	3.93		
9	4.19	9	3.91		
1860	4.23	1890	3.89		
1	4.25	1	3.86		
2	4.31	2	3.91		
3	4.26	3	3.92		
4	4.16	4	3.92		
5	4.10	5	3.90		
6	4.09	6	3.85		
7	4.09	7	3.79		
8	4.03	8	3.77		
9	3.94	9	3.72		
1870	4.00	1900	3.69		
1	4.11	1	3.69		
2	4.15	2	3.71		
3	4.20	3	3.70		
4	4.31	4	3.71		
5	4.27	5	3.75		
6	4.14	6	3.79		
7	4.05	7	3.82		
8	3.96	8	3.88		
9	3.94	9	3.95		
1880	3.89	1910	3.98		

Source:
Die Verzinsung der öffentlichen Schulden 1850-1913;
in [6, p. 798].

Appendix A, Table I.14.
Bank and Primary Rates, UK, Germany/FRG, USA, 1870-1977.

Year	UK Bank Rate Mid Year	UK Bank Rate End Year	Germany, Bank Discount Annual Average	USA Prime Rate Comm. Paper 4-6 months
	%	%	%	%
1870	3.0	2.5	.	.
1	2.5	3.0	.	.
2	3.0	5.0	.	.
3	6.0	5.5	.	.
4	2.5	6.0	.	.
1875	3.0	4.0	.	.
6	2.0	2.0	4.16	.
7	3.0	4.0	4.42	.
8	3.0	5.0	4.34	.
9	2.0	3.0	3.70	.
1880	2.5	3.0	4.24	.
1	2.5	5.0	4.42	.
2	3.0	5.0	4.52	.
3	4.0	3.0	4.05	.
4	2.0	5.0	4.00	.
1885	2.0	4.0	4.12	.
6	2.5	5.0	3.28	.
7	2.0	4.0	3.41	.
8	2.5	5.0	3.32	.
9	2.5	6.0	3.68	.
1890	4.0	5.0	4.52	6.91
1	3.0	3.5	3.78	6.48
2	2.0	3.0	3.20	5.40
3	2.5	3.0	4.07	7.64
4	2.0	2.0	3.12	5.22
1895	2.0	2.0	3.14	5.80
6	2.0	4.0	3.66	7.02
7	2.0	3.0	3.81	4.72
8	2.5	4.0	4.27	5.34
9	3.0	6.0	5.04	5.50
1900	3.0	4.0	5.33	5.71

Year	UK Bank Rate Mid Year	UK Bank Rate End Year	Germany, Bank Discount Annual Average	USA Prime Rate Comm. Paper 4-6 months
	%	%	%	%
1900	3.0	4.0	5.33	5.71
1	3.0	4.0	4.10	5.40
2	3.0	4.0	3.32	5.81
3	3.0	4.0	3.84	6.10
4	3.0	3.0	4.22	5.14
1905	2.5	4.0	3.82	5.18
6	3.0	6.0	5.15	6.25
7	4.0	7.0	6.03	6.66
8	2.5	2.5	4.76	5.00
9	2.5	4.5	3.93	4.67
1910	3.0	4.5	4.35	5.72
1	3.0	4.0	4.40	4.75
2	3.0	5.0	4.95	5.41
3	4.5	5.0	5.89	6.30
4	3.0	5.0*	.	5.47
1915	5.0	5.0	.	4.01
6	5.0	6.0	.	3.84
7	5.0	5.0	.	5.07
8	5.0	5.0	.	6.02
9	5.0	6.0	.	5.37
1920	7.0	7.0	.	7.50
1	6.0	5.0	.	6.62
2	3.0	3.0	.	4.53
3	3.0	4.0	.	5.07
4	4.0	5.0	.	3.98
1925	5.0	5.0	9.15	4.02
6	5.0	5.0	6.74	4.34
7	4.5	4.5	5.83	4.11
8	4.5	4.5	7.00	4.85
9	5.5	5.0	7.11	5.85
1930	3.0	3.0	4.93	3.59

*On 1 August 1914 the UK bank rate rose to 10.0%.

Appendix A, Table I.14 (continued)
Bank and Primary Rates, UK, Germany/FRG, USA, 1870-1977.

Year	UK Bank Rate Mid Year	UK Bank Rate End Year	Germany, Bank Discount Annual Average	USA Prime Rate Comm.Paper 4-6 months
	%	%	%	%
1930	3.0	3.0	4.93	3.59
1	2.5	6.0	6.91	2.64
2	2.0	2.0	5.21	2.73
3	2.0	2.0	4.00	1.73
4	2.0	2.0	4.00	1.02
1935	2.0	2.0	4.00	.75
6	2.0	2.0	4.00	.75
7	2.0	2.0	4.00	.94
8	2.0	2.0	4.00	.81
9	2.0	2.0	.	.59
1940	2.0	2.0	.	.56
1	2.0	2.0	.	.53
2	2.0	2.0	.	.66
3	2.0	2.0	.	.69
4	2.0	2.0	.	.73
1945	2.0	2.0	.	.75
6	2.0	2.0	.	.81
7	2.0	2.0	.	1.03
8	2.0	2.0	4.27	1.44
9	2.0	2.0	4.47	1.49
1950	2.0	2.0	4.36	1.45
1	2.0	2.50	6.00	2.16
2	4.00	4.00	5.23	2.33
3	3.50	3.50	3.73	2.52
4	3.00	3.00	3.19	1.58
1955	4.50	4.50	3.20	2.18
6	5.50	5.50	4.71	3.31
7	5.00	7.00	4.41	3.81
8	5.50	4.00	3.30	2.46
9	4.00	4.00	3.00	3.97
1960	6.00	5.00	4.41	3.85

Year	UK Bank Rate Mid Year	UK Bank Rate End Year	Germany, Bank Discount Annual Average	USA Prime Rate Comm.Paper 4-6 months
	%	%	%	%
1960	6.00	5.00	4.41	3.85
1	7.00	6.00	3.20	2.97
2	5.00	4.50	3.00	3.26
3	4.00	4.00	3.00	3.55
4	5.00	7.00	3.00	3.97
1965	6.00	6.00	3.70	4.38
6	7.00	7.00	4.58	5.55
7	5.50	8.00	3.35	5.10
8	7.50	7.0	3.00	5.90
9	8.00	8.0	4.50	7.83
1970	7.00	7.0	6.88	7.72
1	6.00	5.0	5.13	5.11
2	6.00	9.0	3.39	4.69
3	11.50	13.0	6.23	8.15
4	.	11.50	6.91	9.84
1975	.	11.25	4.50	6.32
6	.	14.25	3.50	5.19
7	.	7.00	3.25	5.59

Appendix A, Table I.14. Sources.

United Kingdom. Rate of the Bank of England. For 1870-1939, compiled from "Changes in Bank Rate, 1797-1939" in R. Mitchell and Phyllis Deane *Abstract of British Historical Statistics*, [4, p. 546]; updated with UK Statistical Abstract and IMF *International Financial Statistics* [22].

Germany/FRG. Bank discount [Diskont] of the German Central Bank, later Reichsbank and Bundesbank. For 1870-1971, annual averages from Statistisches Bundesamt *Bevölkerung und Wirtschaft 1872-1972*, chapter XV, Geld und Kredit, table 7 [7, p. 215]; updated by weighted annual averages compiled from changes in the "Diskont" of the Bundesbank published in the Deutsche Bundesbank *Monatsberichte* [24].

USA. Open market rate in New York City for prime commercial paper, 4-6 months. 1870-1969 from *Historical Statistics of the United States from Colonial Times to 1970* [3]; updated with US *Statistical Abstract* [25] and *Survey of Current Business* [26].

Appendix A.II.

CAPITAL STOCK

Appendix A, Table II.1.
The Growth of Capital Stock, Total and Per Capita in Constant Prices of 1912/13, in Germany/FRG and USA, 1850-1974 (Selected Years).

Years	Total Capital Stock in Constant Prices of 1913 Germany Billion $[a]	1912 USA Billion $	Per Capita Capital Stock in Constant Prices of 1913 Germany $[a]	1912 USA $	Population Germany Million	USA Million
Germany						
1850	11.7	4.6[b]	331	197[b]	35.3	23.3
1860	13.9	.	371	.	37.6	.
1870	17.8	.	436	.	40.8	.
1880	23.5	23.3	521	463	45.1	50.3
1890	30.7	45.6	623	723	49.2	63.1
1900	42.3	56.9	756	747	56.0	76.1
1910	57.8	.	896	.	64.6	.
1912	.	89.8	.	942	.	95.3
1913	64.0	.	955	.	67.0	.
1922	.	111.0	.	1008	.	110.1
1925	58.0	.	930	.	62.4	.
1929	.	149.2	.	1225	.	121.8
1930	64.2	.	999	.	64.3	.
1933	.	147.6	.	1175	.	125.6
1935	66.5	.	995	.	66.9	.
1938	74.1	.	1116	.	66.4	.
1939	.	149.3	.	1141	.	130.9
FRG						
1950	37.5	199.2	740	1308	50.6	152.3
1952	40.0	215.7	775	1369	51.6	157.6
1960	64.8	288.3	1166	1595	55.6	180.7
1965	88.0	350.9	1490	1806	59.0	194.3
1968	104.3	399.1	1734	1989	60.2	200.7
1970	115.3	.	1901	.	60.7	204.9
1971	122.0	.	1990	.	61.3	207.0
1972	128.8	.	2088	.	61.7	208.8
1973	135.8	.	2191	.	62.0	210.4
1974	.	.	.	.	62.1	211.9

Source and methods see Appendix A, Tables II.3 and II.6

a = at 1913 exchange rates, 4 Mark = 1 US Dollar
b = data may be incomplete

Appendix A, Table II.2.
Capital Stock by Broad Economic Sectors, 1850-1974 (Selected Years); Germany, FRG and USA.

Year	Germany/FRG						USA						
	Total Values in Prices of 1913	Structures and Equipment					Total Values in Current Prices	Structures Only					
		Agriculture	Indust. Trade Services	Dwelling	Government	Total		Agriculture	Indust. Trade Services	Residential	Institutional	Government	Total
	Billion Mark	Percentages					Billion $	Percentages					
1850	46.77	52*	15	15*	18	100	2.7	25.9	40.7	29.6	3.7		100
1860	55.73	49*	16	16*	19	100	.	.	.	.	.		100
1870	71.17	44*	16	19*	21	100	.	.	.	.	.		100
1880	93.97	37*	17	22*	24	100	13.3	15.0	43.6	36.8	4.5		100
1890	122.68	31*	23	24*	22	100	25.0	10.8	41.2	43.2	4.8		100
1900	169.37	25*	29	25*	21	100	35.0	9.4	36.8	44.9	3.1	5.7	100
1910	231.30	21*	32	26*	21	100	.	.	.	.	.	.	.
1912	.	.	.	.	.	.	62.4	9.0	37.6	40.7	3.2	9.5	100
1913	255.94	21*	33	26*	20	100	.	.	.	.	.	.	.
1922	.	.	.	.	.	.	134.5	9.2	34.2	42.1	3.0	11.5	100
1925	232.19	19*	33	28*	20	100	.	.	.	.	.	.	.
1929	.	.	.	.	.	.	189.8	6.4	31.0	47.2	3.0	12.3	100
1930	256.96	19*	34	27*	20	100	.	.	.	.	.	.	.
1933	.	.	.	.	.	.	159.4	5.5	31.4	43.7	3.0	16.4	100
1935	266.13	19*	33	27*	21	100	.	.	.	.	.	.	.
1938	296.56	18*	35	26*	21	100	.	.	.	.	.	.	.
1939	.	.	.	.	.	.	188.6	4.8	28.7	45.7	2.9	17.9	100
	FRG Billion Mark (1913 Prices)												
1950	173.89	17*	40	23*	20	100	.	.	.	.	.	.	.
	FRG Billion DM (1962 Prices)												
1950	612	9	40	32	19	100	.	.	.	.	.	.	.
1952	653	8	40	33	19	100	576.3	5.1	20.1	47.0	2.6	25.2	100
1960	1047	7	43	33	17	100	924.5	4.2	19.0	46.8	2.9	27.0	100
1965	1435	6	46	31	17	100	1233.6	3.5	18.2	45.6	3.4	29.3	100
1968	1698	6	47	30	17	100	1536.9	3.6	18.8	44.4	3.3	29.9	100
1970	1881	6	48	29	17	100	.	.	.	.	.	.	.
1972	2103	5	49	29	17	100	.	.	.	.	.	.	.
1974	2333	5	50	28	17	100	.	.	.	.	.	.	.

Sources, notes see Appendix A, Tables II.4 and II.7. *Rural dwellings included with agriculture

Appendix A, Table II.3.
Germany and FRG Gross Capital Stock, Population and Prices, 1850-1975.

	Years	Capital Stock in Current Prices	Capital Stock in 1913 Prices	Capital Stock in 1962 Prices	Population	Deflators		Capital Stock in 1913 Prices, and 1913 Exchange Rates* Total	Capital Stock in 1913 Prices, and 1913 Exchange Rates* Per Capita
		Billion Mark	Billion Mark		1000	1913=100	1962=100	Billion $	$
Germany:	1850	32.40	46.77	.	35303	69.3	.	11.69	331
	1860	43.70	55.73	.	37609	78.4	.	13.93	371
	1870	56.80	71.17	.	40804	79.8	.	17.79	436
	1880	67.80	93.97	.	45093	72.2	.	23.49	521
	1890	102.20	122.68	.	49239	83.3	.	30.67	623
	1900	157.20	169.37	.	56046	92.8	.	42.34	756
	1910	213.60	231.30	.	64568	92.3	.	57.83	896
	1913	255.94	255.94	.	66978	100.0	.	63.99	955
	1925	362.40	232.19	.	62411	156.1	.	58.05	930
	1930	403.70	256.96	.	64294	157.1	.	64.24	999
	1935	327.50	266.13	.	66871	123.1	.	66.53	995
	1938	373.10	296.50	.	66424	125.8	.	74.13	1116
F.R.G.:		Bill.DM	Bill.DM	Bill.DM					
Hist.Series	1950	402.0	150	.	.	268	.	.	.
Current Ser.	1950	401.4	150	612	50601	268	65.6	37.5	741
	1951	472.1	155	632	51194	305	74.7	38.8	758
	1952	521.1	160	653	51603	325	79.8	40.0	775
	1953	525.9	166	676	52196	317	77.8	41.5	795
	1954	545.7	173	706	52685	315	77.3	43.3	822
	1955	592.7	181	740	53174	327	80.1	45.3	852
	1956	648.3	192	784	53008	337	82.7	48.0	906
	1957	706.3	204	832	53656	346	84.9	51.0	950
	1958	765.0	216	881	54373	354	86.9	54.0	993
	1959	836.0	228	931	55015	366	89.8	57.0	1036
	1960	963.1	259	1048	55577	372	91.9	64.8	1166
	1961	1070.1	273	1114	56173	392	96.1	68.3	1216
	1962	1189.0	291	1189	56974	408	100.0	72.8	1278
	1963	1268.0	311	1267	57606	408	100.1	77.8	1349
	1964	1425.0	330	1346	58290	432	105.9	82.5	1415
	1965	1574.0	352	1435	59041	447	109.7	88.0	1490
	1966	1736.0	374	1527	59676	464	113.7	93.5	1567
	1967	1861.8	397	1619	59872	469	115.0	99.3	1659
	1968	1983.2	417	1698	60165	476	116.8	104.3	1734
	1969	2155.0	437	1784	60842	493	120.8	109.3	1796
	1970	2435.9	461	1881	60651c	528	129.5	115.3	1901
	1971	2760.1	488	1990	61302	566	138.7	122.0	1990
	1972	3036.7	515	2103	61672	590	144.4	128.8	2088
	1973	3353.6	543	2218	61976	618	151.2	135.8	2191
	1974	3771.2	.	2333	62054	659	161.3	.	.
	1975	4035.5	.	2431	61800	.	166.0	.	.

*4 Mark = 1 US Dollar; c = Census data

Appendix A, Table II.3. Germany and FRG Gross Capital Stock, Population and Prices, 1850-1974.

Capital Stock (Bruttoanlagevermögen, Neuwert).
1850-1950 Historical Series. Data include structures, equipment and inventories, compiled from W.G. Hoffmann [6], p. 225, Table 40 (current prices) and p. 253, Table 39 (constant prices of 1913). Data relate to Germany, Reich.

Note: Data are available at source for all individual years 1850-1913; 1925-1938.

1950-1974 Current Series. Data include only structures and equipment, compiled from H. Lützel [28], p. 608 and *Statistisches Jahrbuch* [16], 1975, p. 521. Data relate to FRG including Saar and West Berlin from 1960 on.

Deflators. For sources and methods see Appendix B, Note on Compilation of Long-Term GFCF Deflators.

Appendix A, Table II.4.
Germany and FRG Gross Capital Stock by Major Sectors of the Economy, 1850-1975.

Years	Total	Industry, Trade, Services	Agriculture	Dwellings	Government	Total	Industry, Trade, Services	Agriculture	Dwellings	Government
	Billion Marks (1913 Prices)					In Percents				
	Germany					Germany				
1850	46.77	7.16	24.49*	6.98*	8.14	100	15	52*	15*	18
1860	55.73	8.65	27.52*	8.88*	10.68	100	16	49*	16*	19
1870	71.17	11.70	31.42*	13.40*	14.65	100	16	44*	19*	21
1880	93.97	16.05	34.63*	20.98*	22.31	100	17	37*	22*	24
1890	122.68	28.30	38.34*	28.84*	27.20	100	23	31*	24*	22
1900	169.37	49.80	42.86*	42.38*	34.33	100	29	25*	25*	21
1910	231.30	74.30	49.61*	61.27*	46.12	100	32	21*	26*	21
1913	255.94	85.20	53.21*	66.86*	50.67	100	33	21*	26*	20
1925	232.19	76.63	45.10*	62.95*	47.51	100	33	19*	28*	20
1930	256.96	86.70	48.58*	69.22*	52.46	100	34	19*	27*	20
1935	266.13	86.62	50.04*	73.00*	56.47	100	33	19*	27*	21
1938	296.56	103.22	53.54*	77.04*	62.76	100	35	18*	26*	21
	F.R.G.	Billion Marks (1913 Prices)				F.R.G.				
Hist.Series 1950	173.89	69.54	30.40*	39.70*	34.25	100	40	17*	23*	20
	F.R.G.	Billion D-Marks (1962 Prices)								
Current Ser. 1950	612	244	54	199	115	100	40	9	32	19
1951	632	253	55	206	118	100	40	9	32	19
1952	653	263	55	214	121	100	40	8	33	19
1953	677	272	57	224	124	100	40	8	33	19
1954	706	285	58	235	128	100	40	8	33	19
1955	740	302	59	247	132	100	41	8	33	18
1956	784	324	61	261	138	100	41	8	33	18
1957	832	349	63	276	144	100	42	8	33	17
1958	881	374	65	291	151	100	42	8	33	17
1959	930	398	68	307	157	100	43	7	33	17
1960	1047	453	72	348	174	100	43	7	33	17
1961	1115	491	75	365	184	100	43	7	33	17
1962	1189	531	79	384	195	100	45	7	32	16
1963	1267	574	83	403	207	100	45	7	32	16
1964	1346	616	86	422	222	100	46	6	32	16
1965	1435	664	90	443	238	100	46	6	31	17
1966	1527	711	94	466	256	100	47	6	31	16
1967	1619	759	98	489	273	100	47	6	30	17
1968	1698	798	100	511	289	100	47	6	30	17
1969	1784	843	102	533	306	100	47	6	30	17
1970	1881	898	105	554	324	100	48	6	29	17
1971	1990	962	108	576	344	100	49	5	29	17
1972	2103	1030	109	600	364	100	49	5	29	17
1973	2218	1098	110	628	382	100	50	5	28	17
1974	2333	1164	112	657	400	100	50	5	28	17
1975	2431	1218	113	680	420	100	50	5	28	17

Source: Appendix A, Table II.3.

* = rural dwellings included with agriculture

Appendix A, Table II.5.
FRG Capital Stock by 19 Activities, 1950-1972, in 1962 Prices.

	Total	1. Agriculture	2. Energy	3. Mining Excl. Fuel	Manufacturing										14. Construction	15. Trade	16 Transportation	17. Dwelling	18. Government	19. Other
					4. Quarrying	5. Food	6. Textiles	7. Clothing	8. Wood, Paper	9. Chemicals	10. Basic Metals	11. Metal Products	12. Vehicles	13. Machinery						
Year	Billion D-Mark	Percentage Distribution																		
1950	421.4	10.0	9.8	.4	1.2	3.2	1.7	.3	2.2	2.2	3.0	.9	.5	3.4	.8	4.4	12.5	33.0	7.7	2.9
1951	439.4	9.7	9.7	.4	1.2	3.1	1.7	.3	2.1	2.2	3.0	.9	.6	3.4	.8	4.5	12.1	33.2	8.0	3.0
1952	460.9	9.4	9.7	.4	1.2	3.1	1.7	.3	2.1	2.2	3.0	1.0	.6	3.4	.9	4.5	11.8	33.3	8.3	3.1
1953	487.8	9.1	9.7	.4	1.2	3.0	1.6	.3	2.1	2.2	3.0	1.0	.6	3.4	.9	4.6	11.6	33.4	8.6	3.3
1954	520.2	8.8	9.8	.3	1.2	2.9	1.6	.3	2.0	2.3	3.1	1.0	.7	3.4	1.0	4.6	11.3	33.4	8.9	3.3
1955	562.1	8.5	9.9	.3	1.2	2.8	1.5	.3	2.0	2.3	3.2	1.1	.7	3.4	1.1	4.6	11.0	33.2	9.2	3.5
1956	608.0	8.3	9.9	.3	1.2	2.8	1.5	.3	2.0	2.4	3.2	1.1	.7	3.4	1.2	4.7	10.8	33.0	9.6	3.6
1957	653.9	8.1	9.9	.3	1.2	2.7	1.4	.3	1.9	2.5	3.3	1.2	.8	3.4	1.3	4.8	10.6	32.6	9.9	3.8
1958	701.0	7.9	9.9	.3	1.2	2.6	1.4	.3	1.9	2.6	3.3	1.2	.8	3.4	1.4	5.0	10.5	32.3	10.1	4.0
1959	754.3	7.8	9.8	.3	1.2	2.5	1.4	.3	1.8	2.6	3.3	1.3	.8	3.4	1.5	5.2	10.3	31.8	10.5	4.2
1960	817.8	7.7	9.7	.3	1.2	2.5	1.4	.3	1.8	2.7	3.3	1.3	.8	3.4	1.7	5.4	10.0	31.2	10.8	4.4
1961	886.9	7.6	9.7	.3	1.2	2.4	1.3	.4	1.8	2.8	3.3	1.4	.8	3.4	1.9	5.6	9.8	30.7	11.2	4.6
1962	958.4	7.4	9.6	.3	1.1	2.4	1.3	.4	1.7	2.8	3.3	1.4	.8	3.4	2.1	5.7	9.6	30.1	11.7	4.7
1963	1029.6	7.2	9.6	.3	1.1	2.3	1.3	.4	1.7	2.9	3.4	1.5	.9	3.4	2.2	5.8	9.4	29.7	12.2	4.9
1964	1111.6	7.1	9.5	.3	1.1	2.3	1.3	.4	1.7	2.9	3.3	1.5	.9	3.4	2.4	5.8	9.1	29.2	12.7	5.2
1965	1195.4	6.9	9.5	.3	1.1	2.2	1.2	.4	1.6	2.9	3.3	1.5	.9	3.4	2.5	5.9	8.8	28.8	13.2	5.5
1966	1276.7	6.9	9.5	.3	1.1	2.2	1.2	.4	1.6	3.0	3.3	1.6	.9	3.4	2.5	5.9	8.5	28.5	13.6	5.8
1967	1345.5	6.8	9.5	.3	1.1	2.1	1.2	.4	1.6	3.0	3.3	1.6	.9	3.4	2.6	5.9	8.2	28.3	13.9	6.0
1968	1422.3	6.7	9.4	.3	1.0	2.1	1.2	.4	1.6	3.0	3.3	1.6	.9	3.4	2.6	6.0	7.9	28.1	14.3	6.3
1969	1509.8	6.6	9.4	.3	1.0	2.0	1.2	.4	1.5	3.0	3.3	1.6	.9	3.3	2.6	6.0	7.6	27.8	14.7	6.5
1970	1608.0	6.5	9.4	.3	1.0	2.0	1.1	.4	1.5	3.1	3.3	1.7	.9	3.3	2.7	6.0	7.3	27.6	15.0	6.7
1971	1707.1	6.5	9.4	.3	1.0	1.9	1.1	.4	1.5	3.1	3.3	1.7	.9	3.3	2.7	6.0	7.1	27.4	15.4	7.0
1972	1809.5	6.4	9.4	.3	1.0	1.9	1.1	.4	1.5	3.1	3.3	1.7	.9	3.3	2.7	6.0	6.9	27.2	15.8	7.2

Source: Data compiled by Pestel Team, Hannover, May 1976 [30]

Appendix A, Table II.6.
US Gross Capital Stock, Population and Prices, 1850-1968.

Years	Total Capital Stock (Structures and Equipment) in			Population	Deflators	Capital Stock in 1912 Prices	
	Current Prices	Constant Prices				Total	Per Capita
	Billion $	Billion $		Million	1912=100	Billion $	$
		1929 Prices					
1850	3.2*	8.3	.	23.3	69.9	4.6	197
1880	18.7	42.3	.	50.3	80.1	23.2	463
1890	35.3	82.7	.	63.1	77.4	45.6	723
1900	50.3	118.0	.	76.1	77.2	65.2	857
		1947-49 Prices					
1900	49.5	103.0	.	76.1	83.5	59.3	779
1912	89.8	162.8	293.9	95.3	100.0	89.8	942
1922	196.2		355.1	110.1	180.7	108.6	986
1929	270.4		501.0	121.8	176.5	153.2	1285
1933	214.3		485.5	125.6	144.1	148.7	1184
1939	255.3		490.4	130.9	170.3	149.9	1145
1945	366.4		494.2	132.5	242.2	151.3	1142
1946	463.2		543.1	140.0	279.1	166.0	1186
1947	561.8		566.1	144.7	324.2	173.3	1198
1948	622.3		593.5	147.2	342.8	181.5	1233
1949	634.2		618.0	149.8	335.3	189.1	1262
1950	728.6		651.0	152.3	365.7	199.2	1308
1951	791.5		679.1	154.9	381.0	207.7	1341
1952	838.3		705.1	157.6	388.6	215.7	1369
		1958 Prices					
1952	805.1	899.2	.	157.6	388.6	207.2	1315
1953	844.8	942.6	.	160.2	389.0	217.2	1356
1954	886.5	984.2		163.0	391.3	225.5	1383
1955	966.8	1036.6	.	165.9	404.9	238.8	1439
1956	1058.8	1083.5	.	168.9	424.4	249.5	1477
1957	1128.0	1126.8	.	172.0	434.1	259.8	1510
1958	1178.5	1161.2	.	174.9	434.1	271.5	1552
1959	1241.5	1204.1	.	177.8	447.7	277.3	1560
1960	1292.6	1251.1	.	180.7	448.4	288.3	1595
1961	1346.3	1291.4	.	183.7	452.7	297.4	1619
1962	1417.8	1340.1	.	186.5	459.3	308.7	1655
1963	1498.2	1393.5	.	189.2	466.7	321.0	1697
1964	1589.8	1453.5	.	191.9	474.9	334.8	1745
1965	1702.0	1523.7	.	194.3	485.0	350.9	1806
1966	1840.6	1598.0	.	196.6	500.1	368.0	1872
1967	1962.0	1660.9	.	198.7	513.0	382.5	1925
1968	2147.8	1731.9	.	200.7	538.2	399.1	1989

*incomplete data

Sources: Capital stock data current and in prices of 1929; 1947-49 and 1958 compiled from *Historical Statistics of the United States* [3; Tables F349-364, 365-376, 422-445, 446-469; pages 252-256].
Deflators: implicit in capital stock mentioned above.

Appendix A, Table II.7.
US Gross Capital Stock (Business, Government and Households), by Type of Assets, 1850-1968. Data in Current Prices.

Year	Total Structures and Equipment	Total Structures	Equipment	
			Producer Durables	Consumer Durables
	Billion $	Billion $	Billion $	Billion $
1850	3.2*	2.7*	0.2	0.3
1880	18.7	13.3	3.0	2.4
1890	35.3	25.0	5.8	4.5
1900	50.3	35.0	9.3	6.0
~~				
1912	89.8	62.4	13.8	13.6
1922	196.2	134.5	30.8	30.9
1929	270.4	189.8	38.4	42.2
1933	214.3	159.4	29.2	25.7
1939	255.3	188.6	34.2	32.5
~~				
1952	805.1	576.3	138.5	90.3
1956	1058.1	752.4	189.1	117.3
1960	1292.7	924.5	227.4	140.8
1965	1701.9	1233.6	285.1	183.2
1968	2147.7	1536.9	377.0	233.8

~~~ Change of Estimate

*incomplete data

Sources: *Historical Statistics* [3], Tables F-197-221, p. 151 and F-349-376, p. 252.
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Appendix A, Table II.8.
US Gross Capital Stock, Total and Business Economy, 1960 and 1968.

	1960 Total Economy	1960 Business Economy	1968 Total Economy	1968 Business Economy
	Current Prices $ Billion		Current Prices $ Billion	
STRUCTURES				
●Nonfarm				
Government (Public-Nonresidential)	249.2	-	459.8	-
Institutional	27.2	.	55.7	.
Private Manufacturing	176.1	70.0	288.7	108.3
Other Private, Nonresid.		268.5*		442.7*
Residential	433.1	-	682.7	-
●Farm Structures	38.9	21.4	50.0	27.2
TOTAL STRUCTURES	924.5	359.9	1536.9	578.2
EQUIPMENT				
●Producer Durables	227.4		377.0	
Farm	•	41.3	•	55.4
Manufacturing	•	95.7	•	154.8
Nonfarm, Nonmanuf.	•	190.3	•	321.3
		327.3		531.5
●Consumer Durables	140.8	•	233.8	•
TOTAL EQUIPMENT	368.2	•	610.8	•
TOTAL ALL SECTORS	1292.7	•	2147.7	•
●Business Sector	•	687.2	•	1109.7
●Business Sector as percent of total	•	53.2%	•	51.7%

*Includes business residential.

Sources: Compiled from 1975 *US Statistical Abstract* [25; p. 411, Table 674 (Total Economy) and Table 675 (Fixed Non-Residential, Business Capital)].

Appendix A, Table II.9.
US Gross Fixed Nonresidential Business Capital Stock, by Major Industry Groups, Current Prices 1925-1975 (Billions of Dollars).

End of year	Total			By major industry group								
				Farms			Manufacturing			Nonfarm nonmanufacturing		
	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures
1925	135.7	54.5	181.3	14.0	6.5	6.4	32.1	11.6	20.5	108.7	36.4	73.3
1926	139.4	56.5	183.0	15.0	6.7	8.3	33.0	12.1	20.9	111.5	37.7	73.8
1927	142.5	57.9	184.5	15.3	6.8	8.5	33.7	12.4	21.3	113.8	38.6	75.2
1928	145.9	60.0	185.9	15.2	7.3	8.0	34.9	13.1	21.7	115.8	39.7	76.1
1929	146.4	60.5	186.9	15.1	7.4	7.6	35.3	13.5	21.8	116.1	40.6	75.5
1930	145.4	59.4	186.0	14.2	7.4	6.8	35.8	12.8	23.0	113.4	39.1	73.2
1931	140.6	56.7	180.0	12.9	7.2	5.7	33.9	11.8	22.1	103.9	36.7	67.2
1932	134.6	52.0	83.6	11.8	6.9	5.0	26.0	11.0	15.1	96.7	34.3	62.5
1933	134.5	51.1	83.4	11.7	6.6	5.1	26.8	11.1	15.7	96.0	33.5	62.6
1934	136.7	51.4	85.3	11.6	6.3	5.3	28.0	11.4	16.6	97.3	33.8	63.4
1935	137.0	50.5	86.2	11.5	6.1	5.4	28.1	11.2	16.9	97.4	33.5	63.9
1936	144.1	52.3	91.8	12.2	6.3	5.8	30.4	11.8	18.3	101.6	34.2	67.4
1937	150.7	55.0	95.7	12.8	6.8	6.0	32.3	12.6	19.7	105.6	35.6	69.9
1938	148.0	54.7	93.3	12.7	6.9	5.8	31.7	12.5	19.2	103.5	35.3	68.2
1939	146.5	53.0	93.3	12.3	7.0	5.3	32.0	12.7	19.3	103.5	35.3	68.2
1940	146.2	48.1	98.1	13.4	7.3	6.1	34.4	13.7	20.8	103.4	37.1	71.3
1941	142.3	44.5	100.5	13.2	8.6	6.7	33.7	14.0	23.7	119.4	41.2	78.3
1942	137.0	48.1	118.9	16.6	9.4	7.3	31.6	15.5	26.1	138.8	43.3	85.5
1943	150.7	49.1	131.6	16.9	9.5	7.4	33.0	15.8	25.3	131.7	43.8	87.9
1944	163.6	71.3	192.4	17.4	10.0	7.4	42.4	18.4	38.0	152.9	44.8	89.0
1945	208.6	75.6	232.8	18.8	10.2	8.1	47.4	18.4	33.0	142.9	48.0	94.9
1946	245.9	89.6	156.3	21.2	11.0	10.2	60.0	22.1	37.9	164.7	56.5	108.2
1947	294.6	111.7	182.9	25.5	13.2	12.3	74.1	27.5	46.5	195.0	70.9	124.1
1948	335.4	130.2	195.2	29.1	16.1	13.1	83.3	33.5	49.7	214.0	81.6	132.4
1949	341.3	143.7	197.7	31.8	15.6	13.1	85.8	36.3	49.5	223.8	88.7	135.1
1950	373.5	163.6	213.9	35.5	21.5	14.3	96.0	45.0	51.0	245.7	100.1	145.6
1951	438.0	184.3	253.7	40.1	24.4	15.7	106.3	58.3	48.0	289.5	111.5	158.1
1952	490.5	205.4	285.1	45.5	28.5	16.3	112.4	62.8	49.6	365.7	119.4	166.3
1953	561.9	313.1	248.7	44.2	27.3	16.4	117.0	67.3	49.6	300.7	128.1	172.7
1954	622.5	336.9	285.6	45.5	28.9	16.6	122.6	62.5	60.1	314.3	135.5	178.9
1955	705.1	349.2	355.9	48.2	30.5	17.7	134.6	69.8	64.8	342.2	148.9	193.4
1956	778.9	378.9	399.1	51.1	32.0	19.1	150.1	78.8	70.4	377.7	165.1	212.5
1957	817.5	380.6	436.9	53.9	30.4	19.5	159.3	87.5	72.3	404.7	179.6	225.0
1958	859.1	414.3	444.7	54.2	34.5	19.4	163.9	91.5	72.4	420.9	188.0	232.9
1959	881.2	426.9	454.3	55.5	35.7	19.8	167.4	94.9	72.5	438.3	196.3	242.0
1960	893.6	436.6	463.9	55.9	35.7	20.2	171.9	97.7	73.4	463.6	203.3	250.3
1961	908.1	444.1	464.1	56.3	36.1	20.3	174.5	99.6	74.9	466.8	208.4	258.4
1962	921.1	458.4	467.5	55.3	36.6	21.7	179.0	101.7	77.3	483.7	215.1	268.6
1963	947.3	465.2	282.1	60.5	37.8	22.7	184.8	104.7	80.1	502.1	222.8	279.3
1964	782.7	353.7	400.0	62.7	38.9	23.8	193.6	109.8	83.8	527.5	234.0	293.5
1965	837.7	408.4	429.4	66.9	40.7	25.3	205.9	119.3	87.3	565.8	249.5	316.3
1966	910.7	444.3	466.5	70.5	43.3	27.9	224.8	129.8	94.9	615.4	271.3	344.3
1967	987.9	480.0	505.9	75.7	46.3	29.4	244.3	141.8	102.5	667.9	294.0	373.9
1968	1,087.1	525.5	561.6	82.0	49.4	32.6	266.6	153.4	113.3	738.5	323.7	415.8
1969	1,212.4	578.7	634.7	89.7	53.0	36.7	295.3	167.6	127.7	828.4	358.1	470.3
1970	1,339.0	632.4	706.6	97.8	57.1	40.6	321.6	181.7	139.9	919.8	393.6	526.2
1971	1,451.1	677.7	773.7	104.4	60.5	43.9	341.5	192.3	149.3	1,005.3	426.0	580.5
1972	1,569.7	726.4	856.4	113.0	64.2	48.8	364.5	203.4	160.6	1,106.7	459.0	647.8
1973	1,771.5	812.1	959.2	125.0	72.1	53.8	402.6	226.1	176.5	1,242.7	513.9	728.8
1974	2,021.8	930.1	1,091.7	140.7	85.3	61.4	456.8	250.4	197.4	1,418.3	585.4	832.9
1975	2,376.7	1,068.9	1,307.8	165.7	90.5	75.2	511.2	294.0	217.2	1,699.8	684.3	915.5

Source: *US Survey of Current Business* [26], April 1976, p. 46.
Note: Data on Business Capital by Legal Form of Organization (Corporate, Noncorporate) are also given in [26].

Appendix A, Table II.10.
US Gross Fixed Nonresidential Business Capital Stock by Major Industry Group, 1925-1975 (Billions of 1972 Dollars)

End of year	Total			By major industry group								
				Farm			Manufacturing			Nonfarm nonmanufacturing		
	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures	Equipment and structures	Equipment	Structures
1925	564.7	160.3	395.4	52.4	16.3	36.1	128.9	41.1	87.8	383.4	111.9	271.6
1926	580.5	174.8	405.7	53.0	16.9	36.0	133.0	42.5	90.5	394.5	115.3	279.2
1927	594.5	178.3	416.1	53.2	17.3	35.9	136.6	43.5	93.1	404.7	117.5	287.2
1928	608.0	182.2	425.8	53.6	18.0	35.6	141.0	44.7	96.3	413.4	119.5	293.9
1929	623.8	187.1	436.7	54.0	18.7	35.3	146.6	46.0	100.6	423.2	122.4	300.8
1930	633.2	188.8	444.4	53.8	19.2	34.7	148.5	46.3	102.2	430.9	123.3	307.5
1931	631.9	186.5	445.4	53.0	19.1	33.9	147.3	45.8	101.5	431.6	121.7	309.9
1932	621.7	180.6	441.0	51.3	18.4	33.0	143.9	44.2	99.6	426.5	118.0	308.4
1933	609.5	174.3	435.2	49.5	17.4	32.1	141.5	42.7	98.8	418.5	114.3	304.2
1934	599.1	169.3	429.8	48.2	16.9	31.3	139.3	41.4	97.9	411.6	111.0	300.6
1935	590.5	166.1	424.4	47.4	16.8	30.6	137.3	40.8	96.6	405.8	108.6	297.3
1936	587.0	166.1	421.0	47.2	17.2	30.0	136.9	41.0	96.0	402.8	107.9	294.9
1937	587.7	167.7	420.0	47.5	18.0	29.5	138.1	41.6	96.5	402.2	108.1	294.0
1938	581.6	165.1	416.5	47.0	18.2	28.9	136.3	41.0	95.3	398.2	106.0	292.3
1939	577.0	163.7	413.3	46.6	18.4	28.3	135.2	40.8	94.4	395.1	104.5	290.6
1940	576.5	164.9	411.5	46.3	18.6	27.6	136.0	41.6	94.4	394.2	104.7	289.5
1941	580.3	169.1	411.2	47.0	20.0	27.0	138.9	43.0	95.9	394.3	106.1	288.2
1942	573.7	168.1	405.6	46.8	20.4	26.4	137.7	43.3	94.4	389.2	104.3	284.8
1943	562.9	165.6	397.3	45.8	19.9	25.9	135.4	43.6	91.7	381.7	102.0	279.7
1944	557.2	166.9	390.3	46.0	20.6	25.4	134.3	44.9	89.4	377.0	101.4	275.5
1945	561.2	174.9	386.3	46.2	21.3	24.9	137.7	48.4	89.3	377.4	105.2	272.2
1946	583.2	189.9	393.9	47.6	21.8	25.8	150.7	54.5	96.2	385.5	113.6	271.9
1947	618.1	217.6	400.3	50.7	24.1	26.6	184.6	63.8	109.7	402.9	129.9	273.0
1948	647.4	240.3	407.1	54.7	27.5	27.2	174.0	70.9	103.7	418.0	141.9	276.1
1949	668.6	255.8	412.8	58.9	31.1	27.9	180.5	75.5	105.0	429.2	149.2	279.9
1950	693.6	274.0	419.6	63.2	34.7	28.5	185.9	80.3	105.7	444.5	159.1	285.4
1951	721.4	294.2	427.2	66.8	37.8	29.1	194.2	86.9	107.3	460.4	169.5	290.8
1952	747.0	312.5	434.5	69.7	40.0	29.7	202.0	93.3	108.6	475.3	179.2	296.2
1953	775.2	331.8	443.4	72.5	42.3	30.2	209.4	99.5	109.9	493.3	190.0	303.3
1954	800.6	347.0	453.6	74.5	43.7	30.8	216.9	105.6	111.3	509.2	197.7	311.5
1955	830.2	363.4	466.8	76.1	44.9	31.2	224.7	110.5	114.2	529.3	207.9	321.4
1956	861.1	379.5	481.6	76.8	45.1	31.7	233.9	117.2	116.7	550.4	217.2	333.2
1957	891.5	395.2	496.3	77.2	45.1	32.2	242.6	123.3	119.3	571.6	226.8	344.8
1958	912.8	403.7	509.1	78.1	45.5	32.6	247.3	125.8	121.5	587.4	232.4	355.0
1959	937.1	414.6	522.5	79.3	45.8	33.4	250.5	128.0	122.5	607.4	240.8	366.6
1960	963.9	426.0	537.9	79.6	45.5	34.1	254.4	130.5	123.9	629.9	250.0	379.9
1961	988.9	434.9	553.9	80.4	45.5	34.9	257.8	132.1	125.6	650.7	257.3	393.4
1962	1,018.2	446.1	572.1	81.5	45.7	35.8	261.6	134.1	127.5	675.1	266.3	408.8
1963	1,048.8	459.1	589.7	83.3	46.7	36.7	266.1	136.8	129.3	699.4	275.7	423.7
1964	1,085.5	476.6	608.9	85.1	47.5	37.6	271.9	141.1	130.9	728.5	288.0	440.5
1965	1,135.2	500.6	634.6	87.4	48.9	38.5	281.6	147.9	133.7	766.2	303.9	462.3
1966	1,193.1	530.7	662.4	90.4	50.8	39.6	294.8	157.0	137.9	807.9	322.9	484.9
1967	1,246.8	558.1	688.7	93.7	52.8	40.9	308.5	166.0	142.5	844.7	339.3	505.4
1968	1,304.0	588.4	715.6	96.3	54.4	41.9	319.7	173.8	145.9	888.0	360.2	527.8
1969	1,366.0	622.4	743.6	98.9	56.0	42.9	331.4	182.0	149.4	935.6	384.3	551.3
1970	1,421.8	651.4	770.1	101.7	57.7	44.0	340.8	188.9	151.9	979.0	404.8	574.2
1971	1,471.7	677.2	794.5	103.7	58.7	45.1	346.8	193.9	152.9	1,021.2	424.7	596.5
1972	1,527.8	707.5	820.1	106.2	60.3	45.9	353.5	200.1	153.4	1,068.0	447.1	620.8
1973	1,594.3	747.1	847.2	110.5	63.4	47.2	363.8	209.1	154.7	1,120.0	474.7	645.3
1974	1,658.1	783.8	874.2	115.5	66.7	48.8	375.5	218.6	156.9	1,167.1	498.6	668.5
1975	1,706.9	812.2	894.7	118.2	68.8	50.4	383.8	223.4	160.4	1,203.9	520.0	683.9

Source: *US Survey of Current Business* [26] April 1976, p. 48.
Note: Data on Business Capital by Legal Form of Organization (Corporate, Noncorporate) are also given in [26].

Appendix A, Table II.11.
UK Gross Capital Stock at 1970 Replacement Cost, by Industries, 1964-1974[1]

Data in £ Thousand Million

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Agriculture	2.6	2.7	2.8	2.9	3.1	3.2	3.3	3.4	3.5	3.7	3.9
Forestry and Fishing	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Mining and quarrying	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.8
Manufacturing:											
Food, drink and tobacco	3.4	3.6	3.8	4.0	4.2	4.3	4.5	4.7	4.9	5.2	5.4
Coal, petroleum products, chemicals and allied industries	5.3	5.6	5.9	6.2	6.6	6.9	7.3	7.7	8.0	8.1	8.4
Iron and steel	3.7	3.8	3.8	3.9	3.9	4.0	4.1	4.3	4.4	4.5	4.7
Other metals, engineering and allied industries	11.7	12.1	12.6	13.0	13.3	13.7	14.2	14.5	14.7	15.1	15.5
Bricks, pottery, glass, cement, etc	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	1.9
Timber, furniture, etc.	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Paper, printing and publishing	2.2	2.3	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.1
Textiles, leather, clothing and other manufacturing	4.4	4.5	4.7	4.9	5.0	5.3	5.4	5.6	5.7	5.9	6.1
Total	32.4	33.7	35.0	36.3	37.6	39.0	40.5	41.9	43.1	44.3	45.8
Construction	1.4	1.6	1.7	1.9	2.0	2.1	2.3	2.4	2.5	2.5	2.6
Gas	1.7	1.7	1.9	2.2	2.4	2.6	2.7	2.8	2.9	2.9	3.0
Electricity	8.3	9.0	9.8	10.5	11.0	11.4	11.7	12.0	12.2	12.4	12.5
Water	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.2	3.3	3.3	3.4
Railways	8.0	8.0	8.0	8.0	7.9	7.8	7.8	7.7	7.7	7.6	7.6
Road passenger transport	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Road haulage and storage	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.4	1.5
Shipping	3.1	3.1	3.1	3.1	3.1	3.3	3.5	3.6	3.9	4.2	4.4
Harbours, docks and canals	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.6
Air transport	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.2
Postal, telephone and radio communications	3.5	3.6	3.8	4.1	4.4	4.7	5.1	5.5	5.8	6.3	6.7
Distributive trades and other service industries	12.9	13.8	14.7	15.5	16.5	17.6	18.8	20.0	21.4	22.9	24.3
Private dwellings	28.5	29.2	29.9	30.6	31.4	32.2	32.8	33.7	34.6	35.5	36.2
Public dwellings	13.7	14.4	15.1	16.0	16.9	17.8	18.6	19.3	20.0	20.8	21.6
Roads[2]	3.2	3.4	3.6	3.9	4.2	4.5	5.0	5.4	5.7	6.1	6.4
Other public services	12.7	13.3	13.9	14.7	15.5	16.3	17.2	18.1	19.2	20.2	21.1
Total gross capital stock	140.9	146.6	152.6	159.1	165.9	172.6	179.5	186.4	193.4	200.6	207.7

[1] For an account of the principles of valuation, see *National Accounts Statistics: Sources and Methods*, pages 383–7. Figures relate to end of year.
[2] Excluding the non-renewable element more than 75 years old.

Source: *Annual Abstract of Statistics* [21], 1975, p. 328.

Appendix A, Table II.12.
Distribution of US, FRG and UK Gross Capital Stock by Industries, 1970.

Industries	USA Business Capital Stock in 1953 Prices		FRG Capital Stock, All Sectors of the Economy, 1962 Prices		UK Capital Stock at 1970 Replacement Cost	
	Billion $	%	Billion D-Mark	%	Billion £	%
AGRICULTURE	70.5	7.5	105.1	11.4	4.2	3.4
ENERGY						
Coal Mining	4.2		.			
Crude Petr.& Nat.Gas	58.5		.		8.4[b]	
Petr. Refining	15.0		.		12.5	
Electric Utilities	82.7[a]		.		3.0	
Gas Utilities	25.3		.			
TOTAL ENERGY SECTOR	185.7[a]	19.7	151.6	16.4	23.9[b]	19.5[b]
MINING, EXCL. FUELS	6.4	0.7	4.4	0.5	2.8	2.3
STONE QUARRYING	11.1	1.1	16.3	1.8	.	.
MANUFACTURING						
Food and Tobacco	22.8		32.1			
Textiles	7.3		18.5			
Clothing	5.0		6.3			
Wood,Paper,Printings	31.7		24.7			
Chemicals	35.5		49.5			
Metals-Basic Industries	36.3		53.0			
Metals-Processing	13.2		26.8			
Vehicles	17.1		14.3			
Machinery	34.8		53.4			
Armaments	1.6		-			
TOTAL MANUFACTURING	205.3	21.8	278.6	30.1	37.4[c]	30.5[c]
CONSTRUCTION	17.1	1.8	43.1	4.7	2.6	2.1
TRANSPORTATION	129.3	13.7	118.1	12.8	17.1	14.0
TRADE	85.2	9.0	96.8	10.5	24.3[d]	19.9[d]
OTHER SERVICES	232.7	24.7	108.4	11.8	10.1	8.3
TOTAL, EXCL. RESIDENTIAL AND GOVERNMENT	943.3 = 100		922.4 = 100.0		122.4 = 100.0	
RESIDENTIAL						
Business	40.8		.		.	.
Nonbusiness	-		.		.	.
Total Residential			443.8		57.8	.
GOVERNMENT	-		241.9		21.1[e]	
GRAND TOTAL	-		1608.1		207.7	.

Sources: US data summarized from capital stock data for 80 industries, in Department of Commerce, BEA study of Fixed Capital Requirements [15; p. 53-54].

FRG data supplied by Pestel team [30]. (The total differs from totals given in 1975 *Statistisches Jahrbuch.*)

UK data compiled from UK *Annual Abstract of Statistics* [21; p. 328].

a = Excludes federal power plants
b = Coal, petroleum and chemicals
c = Excludes chemicals
d = Includes other services
e = Roads and other public services

Appendix A, Table II.13.
World Capital Stock Percentage Distribution by Regions, 1950-1970.

Year	World Total 1963 Prices		Regions							
			Developed				Developing		USSR East. Europe	China (Mainland)
			North** America	West. Europe	Japan	Other Developed	Latin America	Others		
	Billion*$	%	%	%	%	%	%	%	%	%
1950	(2654.8)	100.0	58.7	18.6	1.0	2.4	3.9	3.8	6.4	5.2
1951	(2788.3)	100.0	58.0	19.0	1.1	2.4	3.9	3.9	6.6	5.1
1952	(2926.1)	100.0	57.3	19.3	1.2	2.4	3.9	4.0	6.8	5.1
1953	(3064.7)	100.0	56.5	19.7	1.3	2.4	3.9	4.1	7.0	5.1
1954	(3211.2)	100.0	55.7	20.0	1.4	2.5	4.0	4.0	7.3	5.1
1955	(3370.0)	100.0	54.8	20.4	1.5	2.5	4.0	4.2	7.5	5.1
1956	(3549.6)	100.0	54.0	20.9	1.6	2.5	4.0	4.1	7.8	5.1
1957	(3743.8)	100.0	53.0	21.3	1.7	2.5	4.0	4.3	8.1	5.1
1958	(3943.0)	100.0	52.1	21.7	1.8	2.5	4.0	4.4	8.4	5.1
1959	(4145.2)	100.0	51.0	22.0	1.9	2.5	4.0	4.6	8.9	5.1
1960	(4367.6)	100.0	50.0	22.3	2.1	2.5	4.0	4.6	9.4	5.1
1961	(4604.5)	100.0	48.9	22.7	2.3	2.5	4.0	4.7	9.8	5.1
1962	(4853.1)	100.0	47.7	23.2	2.5	2.5	4.0	4.8	10.3	5.0
1963	(5117.9)	100.0	46.7	23.6	2.8	2.5	4.0	4.8	10.7	4.9
1964	(5394.5)	100.0	45.7	24.0	3.0	2.5	4.0	5.0	11.0	4.8
1965	(5699.5)	100.0	44.7	24.5	3.3	2.5	4.0	4.8	11.4	4.8
1966	(6022.6)	100.0	43.9	24.8	3.5	2.5	4.0	4.9	11.6	4.8
1967	(6368.4)	100.0	43.0	25.1	3.7	2.5	4.0	5.1	11.8	4.8
1968	(6720.1)	100.0	42.2	25.4	4.1	2.5	4.0	5.0	12.1	4.7
1969	(7101.5)	100.0	41.4	25.6	4.4	2.5	4.0	5.2	12.3	4.6
1970	(7511.5)	100.0	40.6	25.8	4.8	2.5	4.0	5.2	12.5	4.6

Source: Compiled from W. Ströbele [31; p. 170-172].

* When checked against other sources, it was found that the dollar values estimated by Ströbele were too high; however, his percentage distribution within the regions checks with other sources.

** North America defined as United States and Canada.

Appendix A, Table II.14.
World Gross Capital Stock, by Regions, 1950 and 1970; Ströbele and UN Data. Percentage Distribution.

Region	W. Ströbele		UN *Future of the World Economy*
	1950 %	1970 %	1970 %
DEVELOPED			
North America	58.7	40.6	39.5
Western Europe	18.6	25.8	25.6
Japan	1.0	4.8	5.5
Other	2.4	2.5	1.9
DEVELOPING			
Latin America	3.9	4.0	3.5
Other	3.8	5.2	3.3
USSR, EASTERN EUROPE	6.4	12.5	18.1
CHINA, PEOPLES REP.	5.2	4.6	2.6
TOTAL IN PERCENT	100.0	100.0	100.0
IN BILLION $	2655*	7512*	5693+

*1963 Prices

+1970 Prices

Appendix A.III.

CAPITAL OUTPUT RATIOS

Appendix A, Table III.1.
World Average Capital/Output Ratios, by Regions, 1950-1970.

Year	Total World	Regions							
		North America	West. Europe	Japan	Total Western Industrialized	Latin America	Total Developing Countr.	USSR East. Europe	China (Mainland)
1950	2.23	3.88	2.09	1.06	3.14	2.45	1.75	1.65	3.78
1951	2.18	3.58	2.16	1.19	3.07	2.45	1.77	1.60	3.38
1952	2.14	3.71	2.19	1.31	3.09	2.49	1.80	1.61	2.99
1953	2.15	3.67	2.22	1.42	3.08	2.54	1.81	1.63	3.10
1954	2.15	3.85	2.26	1.49	3.18	2.47	1.82	1.58	3.09
1955	2.18	3.67	2.28	1.54	3.09	2.45	1.84	1.54	3.10
1956	2.16	3.76	2.32	1.59	3.14	2.48	1.86	1.57	2.92
1957	2.22	3.80	2.39	1.67	3.19	2.47	1.92	1.57	2.98
1958	2.20	3.98	2.53	1.79	3.34	2.44	1.94	1.58	2.83
1959	1.19	3.86	2.57	1.85	3.29	2.51	1.99	1.60	3.06
1960	2.33	3.89	2.56	1.84	3.28	2.49	1.99	1.65	3.29
1961	2.47	3.93	2.60	1.81	3.30	2.46	2.01	1.71	4.02
1962	2.51	3.79	2.68	2.00	3.27	2.49	2.05	1.80	4.13
1963	2.51	3.75	2.77	2.07	3.28	2.55	2.09	1.90	3.94
1964	2.46	3.69	2.80	2.08	3.25	2.48	2.07	1.89	3.75
1965	2.46	3.57	2.87	2.30	3.23	2.48	2.12	1.95	3.50
1966	2.48	3.45	2.97	2.37	3.21	2.49	2.16	1.94	3.46
1967	2.56	3.50	3.07	2.35	3.27	2.52	2.17	1.94	3.85
1968	2.58	3.45	3.11	2.35	3.25	2.49	2.18	1.96	3.94
1969	2.56	3.47	3.12	2.41	3.25	2.47	2.17	2.01	3.92
1970	2.54	3.62	3.19	2.52	3.36	2.47	2.19	1.99	3.79

Source: Compiled from W. Ströbele [31; p. 174/175, Tables 1.23 and 1.24].

Appendix A, Table III.2.
US Capital/Output Ratios, Selected Concepts[1], 1947-1974.

Year	Total Economy*			Business+	
	Total Capital Stock	GDP	Capital/ Output Ratio	Capital/Output Ratios Adjusted for Capacity Utilization	Not Adjusted
	Current Prices			1958 Prices	
	Bill.$	Bill. $			
1947	NA	231.3	NA	1.553	1.631
1948	NA	157.6	NA	1.516	1.633
1949	NA	256.5	NA	1.387	1.696
1950	NA	284.8	NA	1.436	1.599
1951	NA	328.4	NA	1.425	1.563
1952	916.0	345.5	2.651	1.404	1.573
1953	958.8	364.6	2.630	1.433	1.547
1954	1001.2	364.8	2.745	1.348	1.618
1955	1090.1	398.0	2.739	1.405	1.542
1956	1188.8	419.2	2.836	1.421	1.572
1957	1263.0	441.1	2.863	1.399	1.601
1958	1319.1	447.3	2.949	1.283	1.659
1959	1384.3	483.7	2.862	1.318	1.584
1960	1439.6	503.7	2.858	1.299	1.588
1961	1495.3	520.1	2.875	1.263	1.598
1962	1573.6	560.3	2.808	1.264	1.537
1963	1658.9	590.5	2.809	1.268	1.514
1964	1755.1	632.4	2.775	1.279	1.479
1965	1880.5	684.9	2.746	1.308	1.444
1966	1035.0	749.9	2.714	1.364	1.421
1967	2192.8	793.9	2.762	1.353	1.452
1968	2364.0	864.2	2.735	1.375	1.447
1969	NA	930.3	NA	1.412	1.471
1970	NA	977.1	NA	1.364	1.536
1971	NA	1054.9	NA	1.318	1.533
1972	NA	1158.0	NA	1.336	1.487
1973	NA	1294.9	NA	1.392	1.457
1974	NA	1397.3	NA	1.420	1.555

[1]see also Appendix A, Tables III.4 for Industry Capital/Output Ratios

*Total Capital Stock represents Total Reproducible Assets (Equipment Structures and Inventories) compiled from *Historical Statistics of the US* [3; p. 252, Table F349-376] and 1975 *Statistical Abstract of the US* [25].

+Department of Commerce, BEA [15].

Appendix A, Table III.3.
US Capital Stock and Capital/GNP Ratios for the Business Economy, 1947-1974.

(Billions of 1958 Dollars Where Applicable)

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Gross Capital Stock	Capacity Utilization Rates	Utilized Capital Stock (Col. 1 X Col. 2)	Private Business GNP	Capital/ Output Ratios (Adjusted) (Col. 3 ÷ Col. 4)	Capital/ Output Ratios (Unadj.) (Col. 1 ÷ Col. 4)
1947	445.0	.952	423.6	272.8	1.553	1.631
1948	467.1	.928	433.5	286.0	1.516	1.633
1949	482.8	.818	394.9	284.7	1.387	1.696
1950	502.4	.898	451.2	314.2	1.436	1.599
1951	522.8	.912	476.8	334.5	1.425	1.563
1952	540.0	.892	481.7	343.2	1.404	1.573
1953	558.0	.926	516.7	360.7	1.433	1.547
1954	574.9	.833	478.9	355.4	1.348	1.618
1955	594.3	.911	541.4	385.4	1.405	1.542
1956	616.6	.904	557.4	392.2	1.421	1.572
1957	636.4	.874	556.2	397.5	1.399	1.601
1958	650.0	.773	502.5	391.7	1.283	1.659
1959	664.5	.832	552.9	419.4	1.318	1.584
1960	682.1	.818	558.0	429.5	1.299	1.588
1961	698.3	.790	551.7	436.9	1.263	1.598
1962	717.4	.822	589.7	466.7	1.264	1.537
1963	736.9	.837	616.8	486.6	1.268	1.514
1964	760.8	.865	658.1	514.4	1.279	1.479
1965	792.6	.906	718.1	548.9	1.308	1.444
1966	831.2	.960	798.0	584.9	1.364	1.421
1967	867.9	.932	808.9	597.8	1.353	1.452
1968	906.4	.950	861.1	626.5	1.375	1.447
1969	948.2	.960	910.3	644.6	1.412	1.471
1970	984.8	.888	874.5	641.1	1.364	1.536
1971	1,017.3	.860	874.9	663.7	1.318	1.533
1972	1,054.5	.899	948.0	709.4	1.336	1.487
1973	1,097.5	.955	1,048.1	753.1	1.392	1.457
1974	1,141.1[e]	.913	1,041.8	733.8	1.420	1.555

Source: US Department of Commerce [15; p. 11].

Appendix A, Table III.4.
US Capital/Output Ratios at 80 Industry Level for Input-Output Aggregation, 1963 and 1967-1970.

Industry Number	1963	1967	1968	1969	1970	Average 1967-70	Method used to derive 1980 capital/output ratio
1-4	1.240	1.271	1.293	1.304	1.307	1.295	trend 1969-70
5	.651	.743	.934	1.037	1.128	.961	trend 1963-70
6	.731	1.097	1.195	1.177	1.176	1.161	1970
7	.934	1.224	1.265	1.251	1.295	1.259	average*
8	5.630	5.002	4.947	4.882	4.732	4.891	special*
9	.671	.853	.856	.806	.803	.832	1970
10	.673	.807	.887	1.062	.906	.916	average
11-12	.124	.143	.141	.145	.146	.144	1970
13	.140	.129	.122	.134	.178	.141	average
14	.232	.222	.226	.228	.232	.227	1970
15	.091	.100	.101	.106	.107	.104	trend 1963-70
16	.352	.364	.367	.355	.357	.363	average
17	.304	.276	.262	.255	.271	.266	1970
18a	.423	.322	.311	.284	.269	.297	trend 1963-70
18b	.087	.085	.092	.093	.100	.093	1970
19	.160	.138	.143	.134	.141	.139	1970
20-21	.380	.359	.367	.376	.360	.366	average
22	.201	.205	.204	.211	.212	.208	1970
23	.260	.218	.233	.224	.235	.228	average
24	.720	.843	.837	.832	.864	.844	average
25	.378	.426	.429	.444	.451	.438	trend 1967-70
26a	.374	.332	.325	.318	.340	.329	average
26b	.334	.358	.355	.360	.379	.363	1970
27a	.674	.710	.694	.689	.707	.700	average
27b	.379	.455	.468	.504	.536	.491	trend 1967-70
28	.621	.703	.619	.631	.671	.656	average
29	.270	.253	.247	.250	.249	.250	1970
30	.191	.227	.235	.252	.259	.243	trend 1963-70
31	.585	.541	.522	.522	.511	.524	trend 1963-70*
32	.363	.443	.414	.400	.401	.415	1970
33-34	.137	.124	.125	.128	.135	.128	1970
35	.639	.616	.637	.647	.684	.646	1970
36a	.838	.776	.782	.793	.797	.787	1970
36b	.507	.459	.458	.462	.494	.468	1970
37a	.965	.952	.949	.965	1.012	.970	average
37b	.346	.376	.388	.400	.454	.405	trend 1967-70
38a	.368	.431	.399	.369	.413	.403	average
38b	.313	.372	.380	.390	.441	.396	trend 1963-70
38c	.304	.347	.357	.391	.463	.390	trend 1967-70
39	.387	.379	.367	.382	.362	.373	average
40	.284	.271	.274	.280	.287	.278	1970
41	.395	.310	.301	.333	.382	.332	1970
42	.291	.305	.304	.317	.335	.315	1970

Appendix A, Table III.4. (continued)

Industry Number**	1963	1967	1968	1969	1970	Average 1967-70	Method used to derive 1980 capital/ output ratio
43	.289	.331	.323	.308	.328	.323	1970
44	.252	.288	.305	.333	.333	.315	1970
45	.248	.319	.322	.322	.326	.322	1970
46	.178	.207	.211	.200	.211	.207	1970
47	.329	.377	.407	.408	.441	.408	trend 1967-70
48	.222	.292	.301	.301	.322	.304	trend 1967-70
49	.247	.336	.361	.357	.376	.358	1970
50	.253	.304	.348	.369	.384	.351	trend 1963-70
51	.219	.250	.240	.228	.237	.239	1970
52	.197	.211	.207	.188	.199	.201	1970
53	.256	.236	.249	.252	.261	.250	1970
54	.222	.224	.212	.213	.214	.216	1970
55	.218	.235	.235	.234	.243	.237	average
56	.165	.178	.178	.191	.209	.189	trend 1967-70
57	.260	.250	.280	.285	.304	.280	1970
58	.194	.203	.209	.214	.220	.212	trend 1967-70
59	.191	.221	.200	.197	.206	.206	1970
60	.189	.205	.198	.217	.230	.213	average
61	n.a.	.165	.149	.152	.154	.155	1970
62	.225	.227	.227	.225	.233	.228	1970
63	.324	.271	.274	.256	.266	.267	1970
64	.203	.205	.211	.207	.212	.209	1970
65a	5.255	4.998	5.063	5.033	4.876	5.005	average*
65b	2.300	2.563	2.601	2.566	2.658	2.597	1970*
65c	.880	.900	.892	.952	1.045	.947	1970*
65d	3.092	2.628	2.558	2.595	2.176	2.489	average*
65e	1.318	1.120	1.153	1.155	1.267	1.174	1970*
65f	4.403	3.951	4.018	3.875	3.850	3.924	average*
66	2.720	2.494	2.504	2.429	2.458	2.471	average*
67	.596	.749	.729	.782	.791	.763	1970
68a +	4.846	4.659	4.642	4.709	4.714	4.681	special*
68b	2.083	1.974	2.016	2.023	1.994	2.002	average*
68c	.965	.980	.956	1.008	1.020	.991	1970
69a	.311	.313	.319	.313	.314	.315	1970
69b	.595	.626	.635	.634	.628	.631	1970
70	.477	.498	.493	.529	.547	.517	1970
71	.442	.411	.414	.419	.420	.416	1970
72	1.232	1.207	1.226	1.241	1.174	1.212	average
73	.253	.261	.311	.337	.357	.317	trend 1969-70
75	.641	.671	.729	.749	.795	.736	trend 1967-70
76	1.221	1.480	1.473	1.672	1.727	1.588	1970
77	1.600	1.655	1.652	1.652	1.655	1.655	1970

*See Department of Commerce [15], methodological appendix on major producing and consuming industries.

+To compute the capital/output ratios for this industry, the output of government enterprises was excluded since the stock figures did not include government-owned capital.

**See Appendix A, Table III.7., US Industry Classification.

Source: US Department of Commerce, BEA [15; p. 48-49].

Appendix A, Table III.5.
US Capital/Output Ratios, 1963 and 1967-1970 for Selected Industries*, Adjusted for Capacity Utilization.

Industry Number**	1963	1967	1968	1969	1970	Growth Rate	Trend Period
1-4	1.022	1.051	1.077	1.086	1.094	0.7	1969-1970
5	.489	.626	.788	.873	.949	9.9	1963-1970
15	.085	.090	.090	.095	.096	1.8	1963-1970
18a	.388	.288	.276	.252	.238	-6.7	1963-1970
25	.347	.381	.382	.395	.400	1.6	1967-1970
27b	.351	.403	.418	.450	.477	5.3	1967-1970
30	.179	.208	.215	.230	.235	4.0	1963-1970
31	.588	.532	.509	.507	.494	-2.5	1963-1970
37b	.319	.338	.347	.357	.405	6.2	1967-1970
38b	.289	.332	.338	.347	.391	4.4	1963-1970
38c	.289	.319	.326	.355	.418	9.4	1967-1970
47	.292	.332	.357	.358	.387	5.2	1967-1970
48	.200	.260	.268	.268	.286	3.2	1967-1970
50	.221	.267	.305	.325	.338	6.3	1963-1970
55	.154	.162	.162	.173	.189	5.3	1967-1970
58	.167	.175	.181	.186	.191	3.0	1967-1970
73	.201	.257	.307	.334	.354	6.0	1969-1970
75	.493	.613	.668	.687	.730	6.0	1967-1970
8+	4.054	3.877	3.824	3.767	3.633	-2.1	1967-1970

*Industries for which a trend was used to project 1980 capital/output ratios.

**See Appendix A, Table III.7, US Industry Classification.

+Because of "special energy" considerations, the negative trend for this industry was not projected to 1980.

Source: US Department of Commerce, BEA [15; p. 51].

Appendix A, Table III.6.
US Required Level of 1980 Capital Stock for Production of Full Employment GNP (Fixed 1970 Capital/Output Ratios).

	(1)	(2)	(3)	(4)	(5)	(6)
Industry Number**	Proj. 1980 Outputs 1967 $	Fixed 1970 Capital/ Output Ratio	Required 1980 Capital Stock (Col.1 x Col.2) (58 $)	1970 Capital Stock (Scaled)* (58 $)	Diff. in Capital Stock 1970-1980 (Col.3 - Col.4) (58 $)	Ratio 1980 Capital Stock / 1970 Capital Stock (Col.3 ÷ Col.4)
1-4	77,776	1.094	85,087	70,525	14,562	1.206
5	1,554	.949	1,475	1,257	218	1.173
6	2,795	1.022	2,856	2,085	771	1.370
7	4,934	1.174	5,793	4,211	1,582	1.376
8	13,059	3.633	47,443	58,514	-11,071	.811
9	3,188	.747	2,381	2,121	260	1.123
10	1,466	.835	1,224	901	323	1.358
11-12	134,942	.140	18,828	17,118	1,710	1.100
13	7,451	.156	1,162	1,594	-432	.729
14	115,158	.210	24,183	21,818	2,365	1.108
15	8,960	.096	860	843	17	1.020
16	23,372	.316	7,386	5,928	1,458	1.246
17	9,518	.242	2,303	1,440	863	1.599
18a	9,384	.238	2,233	1,626	607	1.373
18b	28,157	.089	2,507	1,966	541	1.275
19	8,708	.127	1,106	742	364	1.491
20-21	20,402	.319	6,508	4,818	1,690	1.351
22	8,406	.194	1,631	1,322	309	1.234
23	4,284	.216	925	761	164	1.216
24	26,517	.755	20,020	14,109	5,911	1.419
25	9,703	.400	3,883	2,895	988	1.341
26a	18,763	.308	5,779	4,368	1,411	1.323
26b	16,033	.333	5,339	3,882	1,457	1.375
27a	35,056	.621	21,770	16,197	5,573	1.344
27b	3,791	.477	1,808	1,470	338	1.230
28	21,271	.585	12,444	6,767	5,677	1.839
29	27,030	.226	6,109	3,829	2,280	1.595
30	4,414	.235	1,037	783	254	1.324
31	35,368	.494	17,472	15,027	2,445	1.163
32	35,247	.350	12,336	6,517	5,819	1.893
33-34	4,402	.123	541	707	-166	.765
35	6,054	.603	3,651	2,821	830	1.294
36a	10,013	.712	7,129	6,266	863	1.138
36b	4,823	.441	2,127	2,120	7	1.003
37a	27,381	.926	25,355	24,860	495	1.020
37b	8,876	.405	3,595	3,186	409	1.128
38a	13,343	.374	4,990	3,046	1,944	1.638
38b	15,633	.391	6,113	4,245	1,868	1.440
38c	3,060	.418	1,279	1,011	268	1.265
39	5,532	.309	1,709	1,463	246	1.168
40	19,483	.252	4,910	3,855	1,055	1.274
41	9,132	.333	3,041	3,352	-311	.907
42	19,790	.296	5,858	4,355	1,503	1.345
43	8,307	.285	2,367	1,448	919	1.635
44	7,663	.294	2,253	1,293	960	1.742
45	11,384	.288	3,279	1,973	1,306	1.662
46	4,347	.194	843	563	280	1.497
47	11,329	.387	4,384	3,149	1,235	1.392
48	7,631	.286	2,182	1,619	563	1.348
49	14,300	.333	4,762	2,683	2,079	1.775
50	5,754	.338	1,945	1,304	641	1.492
51	15,956	.210	3,351	2,008	1,343	1.669
52	14,100	.179	2,524	1,250	1,274	2.019
53	16,112	.236	3,802	2,806	796	1.284
54	11,122	.192	2,135	1,393	742	1.533
55	8,030	.214	1,718	1,131	587	1.519
56	26,445	.189	4,998	3,771	1,227	1.325
57	16,816	.269	4,524	2,676	1,848	1.691
58	6,536	.191	1,248	752	496	1.660

Appendix A, Table III.6. (continued)

Industry Number **	(1) Proj. 1980 Outputs 1967 $	(2) Fixed 1970 Capital/ Output Ratio	(3) Required 1980 Capital Stock (Col.1 x Col.2) (58 $)	(4) 1970 Capital Stock (Scaled) (58 $)	(5) Diff. in Capital Stock 1970-1980 (Col.3 - Col.4) (58 $)	(6) Ratio 1980 Capital Stock / 1970 Capital Stock (Col.3 ÷ Col.4)
59	80,004	.182	14,561	10,165	4,396	1.433
60	21,912	.204	4,470	5,191	-721	.861
61	18,167	.140	2,543	1,652	891	1.539
62	10,289	.212	2,181	1,597	584	1.366
63	10,617	.241	2,559	1,608	951	1.591
64	15,998	.161	2,576	1,872	704	1.376
65a	15,511	4.262	66,108	58,759	7,349	1.125
65b	5,181	2.178	11,284	9,433	1,851	1.196
65c	26,257	.969	25,443	20,285	5,158	1.254
65d	6,233	2.208	13,762	15,301	-1,539	.899
65e	21,075	1.279	26,955	17,492	9,463	1.541
65f	3,353	3.189	10,693	8,011	2,682	1.335
66	46,296	2.207	102,175	54,159	48,016	1.887
67	3,853	.698	2,689	2,502	187	1.075
68a	48,666	3.946	192,036	82,727	109,309	2.321
68b	16,150	1.515	24,467	25,304	-837	.967
68c	5,172	.769	3,977	3,048	929	1.305
69a	121,363	.274	33,253	21,036	12,217	1.581
69b	166,057	.549	91,165	64,230	26,935	1.419
70	86,905	.438	38,065	22,668	15,397	1.679
71	180,623	.325	58,702	40,831	17,871	1.438
72	23,117	.922	21,314	31,482	-10,168	.677
73	87,061	.354	30,820	21,059	9,761	1.464
75	21,653	.730	15,807	11,765	4,042	1.344
76	13,184	1.451	19,130	14,278	4,852	1.340
77	94,266	1.272	119,906	71,773	48,133	1.671
Total	2,199,043	-----	1,376,942	984,768	392,174	-----

*Adjusted for Capacity Utilization

**See Appendix A, Table III.7, US Industry Classification

Source: US Department of Commerce, BEA [15]

Appendix A, Table III.7.
US Industry Classification.

Industry Classification for Capital Requirements Study	
Capital Requirement Industry Number *	Title
1-4	Agriculture, Forestry and fishery
5	Iron and ferroalloy ores mining
6	Nonferrous metal ores mining
7	Coal mining
8	Crude petroleum and natural gas
9	Stone and clay mining and quarrying
10	Chemicals and fertilizer mineral mining
11-12	New and maintenance construction
13	Ordnance and accessories
14	Food and Kindred products
15	Tobacco manufactures
16	Broad and narrow fabrics, yarn and thread mills
17	Miscellaneous textile goods and floor coverings
18a	Hosiery and knit goods
18b	Apparel
19	Miscellaneous fabricated textile products
20-21	Lumber, wood products and wooden containers
22	Household furniture
23	Other furniture and fixtures
24	Paper and allied products except containers and boxes
25	Paperboard containers and boxes
26a	Newspapers, periodicals and book publishing
26b	Commercial printing
27a	Industrial chemicals
27b	Fertilizers and agricultural chemicals
28	Plastics and synthetic materials
29	Drugs, cleaning and toilet preparations
30	Paints and allied products

Appendix A, Table III.7. (continued)

Industry Classification for Capital Requirements Study	
Capital Requirement Industry Number*	Title
31	Petroleum refining and related industries
32	Rubber and miscellaneous plastics products
33-34	Leather, footwear and leather products
35	Glass and glass products
36a	Cement, clay and concrete products
36b	Miscellaneous stone and clay products
37a	Blast furnaces and basic steel products
37b	Iron and steel foundries and forgings
38a	Primary nonferrous metals
38b	Nonferrous rolling and drawing
38c	Miscellaneous nonferrous metal products
39	Metal containers
40	Heating, plumbing, and fabricated structural metal products
41	Screw machine products, bolts, nuts, etc. and metal stampings
42	Other fabricated metal products
43	Engines and turbines
44	Farm machinery
45	Construction, mining, oil field machinery equipment
46	Materials handling machinery and equipment
47	Metalworking machinery and equipment
48	Special industry machinery and equipment
49	General industrial machinery and equipment
50	Machine shop products
51	Office, computing, and accounting machines
52	Service industry machines
53	Electric transmission and distribution equipment and electrical industrial apparatus

Appendix A, Table III.7. (continued)

Industry Classification for Capital Requirements Study	
Capital Requirement Industry Number *	Title
54	Household appliances
55	Electric lighting and wiring equipment
56	Radio, television and communication equipment
57	Electronic components and accessories
58	Miscellaneous electrical machinery, equipment and supplies
59	Motor vehicles and equipment
60	Aircraft and parts
61	Other transportation equipment
62	Professional, scientific and controlling instruments, and supplies
63	Optical, ophthalmic and photographic equipment and supplies
64	Miscellaneous manufacturing
65a	Railroad transportation
65b	Local transit and intercity bus
65c	Truck transportation and warehousing
65d	Water transportation
65e	Air transportation
65f	Pipeline and other transportation services
66	Communications, except radio and television broadcasting
67	Radio and television broadcasting
68a	Electric utilities
68b	Gas utilities
68c	Water and sanitary services
69a	Wholesale trade
69b	Retail trade

Appendix A, Table III.7. (continued)

Industry Classification for Capital Requirements Study	
Capital Requirement Industry Number*	Title
70	Finance and insurance
71	Real estate and rental
72	Hotels and lodging places, personal and repair services, except automobile repair
73	Business services
75	Automobile repair and services
76	Amusements
77	Medical, educational services, and nonprofit organizations

*Does not include industries 78-87 because these industries do not generate any direct requirements for private fixed capital.

Source: US Department of Commerce, BEA [15]

Appendix A, Table III.8.
FRG Capital Stock/GDP Output Ratios, by Major Sectors of the Economy, 1950-1974 (Based on Capital Stock and GDP in Constant Prices of 1962).

Year	All Economic Sectors	Thereof: Enterprises, including Agriculture, Forestry, Fishery, Dwelling	Enterprises, Excluding Agriculture Forestry, Fishery, Dwelling	Agriculture, Forestry, Fishery
1950*	4.3	4.0	2.3	4.2
1951*	4.0	3.7	2.1	3.7
1952*	3.9	3.5	2.0	3.7
1953*	3.7	3.4	1.9	3.8
1954*	3.6	3.3	1.8	3.8
1955*	3.4	3.1	1.7	3.9
1956*	3.3	3.0	1.7	4.1
1957*	3.4	3.0	1.7	4.1
1958*	3.4	3.1	1.7	4.0
1959*	3.4	3.1	1.7	4.0
1960*	3.3	3.0	1.7	4.0
1960	3.3	3.0	1.7	4.0
1961	3.3	3.0	1.7	4.2
1962	3.4	3.1	1.8	4.5
1963	3.5	3.2	1.9	4.5
1964	3.5	3.1	1.9	4.4
1965	3.5	3.1	1.9	5.1
1966	3.6	3.2	2.0	5.2
1967	3.8	3.4	2.1	4.8
1968	3.8	3.3	2.0	4.8
1969	3.7	3.2	2.0	5.1
1970	3.6	3.2	2.0	5.1
1971	3.7	3.3	2.1	5.0
1972p	3.8	3.4	2.1	5.2
1973p	3.8	3.4	2.2	5.1
1974p	4.0	3.5	2.3	4.8

* = excluding Saar and Berlin

p = preliminary

Source: Compiled from H.Lützel [28; Tables 5 and 6, p. 10] and [16; 1974, p. 521].

Appendix A, Table III.9.
FRG Capital Output Ratios for 19 Activities, 1950-1972.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1950	2.68	4.22	1.43	1.75	1.25	1.74	.37	1.55	1.73	3.20	.83	.87	1.33	.40	.85	4.75	33.38	2.33	1.00	2.76
1951	2.58	3.66	1.33	1.46	1.13	1.79	.35	1.50	1.63	2.23	1.02	.78	1.16	.40	.86	4.41	34.09	2.45	1.02	2.61
1952	2.42	3.75	1.47	1.41	1.08	1.41	.36	1.41	1.45	2.18	.94	.68	1.05	.40	.85	4.31	33.40	2.54	1.00	2.51
1953	2.46	3.86	2.12	1.31	.94	1.30	.33	1.29	1.35	2.39	.91	.68	1.04	.37	.84	4.29	33.22	2.73	1.00	2.46
1954	2.49	3.77	2.17	1.26	.94	1.29	.33	1.19	1.33	2.22	.84	.62	1.01	.40	.83	4.23	33.74	2.89	1.01	2.42
1955	2.43	3.74	2.59	1.16	.91	1.25	.32	1.18	1.35	2.24	.89	.56	.89	.40	.83	3.80	33.33	2.96	.96	2.35
1956	2.57	3.72	1.97	1.21	.91	1.26	.33	1.17	1.41	2.21	.60	.60	1.09	.44	.84	3.76	33.32	3.09	.98	2.37
1957	2.66	3.84	1.71	1.23	.95	1.21	.34	1.20	1.42	2.62	.74	.64	.95	.50	.85	3.82	32.20	3.11	1.02	2.41
1958	2.75	4.06	1.60	1.31	.96	1.32	.36	1.21	1.55	2.00	1.11	.62	1.03	.55	.92	3.90	31.67	3.27	1.08	2.50
1959	2.87	4.29	1.48	1.24	.93	1.41	.39	1.16	1.52	2.51	.83	.62	1.07	.55	.96	3.83	31.35	3.52	1.10	2.50
1960	2.99	4.34	1.32	1.23	.98	1.38	.40	1.13	1.56	2.13	1.05	.58	.96	.61	1.01	3.71	29.42	3.64	1.15	2.45
1961	3.09	4.70	1.49	1.31	.95	1.62	.42	1.16	1.61	2.22	1.06	.59	.92	.64	1.02	4.18	27.92	3.77	1.25	2.56
1962	3.03	4.81	1.81	1.32	.96	1.63	.44	1.17	1.63	2.40	1.14	.62	.98	.70	1.08	4.28	26.11	4.03	1.35	2.66
1963	3.02	4.80	2.21	1.33	.97	1.72	.47	1.23	1.62	2.65	1.24	.60	1.05	.79	1.14	4.35	28.74	4.34	1.45	2.76
1964	3.14	4.78	2.47	1.33	.97	1.73	.49	1.20	1.56	2.45	1.24	.60	1.06	.82	1.19	4.37	28.56	4.76	1.60	2.79
1965	4.58	4.87	2.64	1.33	.97	1.71	.49	1.18	1.49	2.65	1.30	.62	.99	.89	1.22	4.34	28.51	5.06	1.72	2.84
1966	4.71	4.91	2.89	1.38	.99	1.79	.55	1.25	1.49	2.85	1.37	.63	1.08	.92	1.28	4.37	28.38	5.33	1.85	2.95
1967	4.39	5.33	3.38	1.50	1.00	2.02	.63	1.28	1.56	2.86	1.47	.76	1.21	1.02	1.35	4.46	27.92	5.59	1.98	3.11
1968	4.45	5.22	3.60	1.45	.99	1.90	.64	1.25	1.38	2.57	1.39	.67	1.19	1.06	1.38	4.23	27.53	5.86	2.15	3.07
1969	4.85	5.16	4.26	1.38	1.00	1.83	.65	1.18	1.25	2.17	1.23	.64	1.17	1.06	1.36	3.98	27.69	6.20	2.24	3.01
1970	5.14	4.98	4.51	1.33	1.02	1.92	.70	1.21	1.26	2.13	1.23	.61	1.18	1.09	1.38	3.83	27.99	6.45	2.32	3.03
1971	5.20	5.11	4.64	1.33	1.04	1.95	.74	1.24	1.31	2.28	1.36	.63	1.15	1.14	1.43	3.83	28.51	6.72	2.45	3.13
1972	5.33	5.21	4.76	1.34	1.04	1.96	.77	1.26	1.36	2.85	1.55	.64	1.03	1.18	1.48	3.82	28.06	7.10	2.57	3.21

Activities:

1 - Agriculture
2 - Energy
3 - Mining, Excl. Coal, Gas, Oil
4 - Quarrying
5 - Food
6 - Textiles
7 - Clothing
8 - Wood, Paper, Printing
9 - Chemicals
10 - Metals I
11 - Metals II
12 - Vehicles
13 - Machinery
14 - Construction
15 - Trade
16 - Transport
17 - Dwellings
18 - Government
19 - Other
20 - Total

Source: Data supplied by Pestel Team, May 1976 [30].

Appendix A, Table III.10.
UK Capital/Output Ratios, 1964-1974.

Year	(1) Gross Capital Stock at Replacement Cost of 1970 10^9 £	(2) GDP Factor Cost 1970 Prices 10^9 £	(3) GDP Market Price of 1970 10^9 £	(4) Capital/Output Ratio Factor Cost	(5) Capital/Output Ratio Market Price
1964	140.5	37.7	44.4	3.74	3.17
1965	146.6	38.6	45.4	3.80	3.23
1966	152.6	39.4	46.3	3.87	3.29
1967	159.1	40.4	47.5	3.94	3.35
1968	165.9	41.9	49.1	3.96	3.38
1969	172.6	42.5	49.7	4.06	3.47
1970	179.5	43.3	50.8	4.15	3.53
1971	186.4	44.2	52.0	4.22	3.58
1972	193.4	45.0	53.4	4.30	3.62
1973	200.6	47.3	56.3	4.24	3.56
1974	207.7	47.8	56.7	4.35	3.66
1975	.	47.0^p	.	.	.

Source: Compiled from UK *Annual Abstract of Statistics* [21], 1975, Table 345, p. 328 for col. (1) and Table 337, p. 320 for columns (2) and (3).

(4) = (1) : (2); (5) = (1) : (3)

p = preliminary

APPENDIX B.

NOTE ON COMPILATION OF LONG-TERM GFCF DEFLATORS

GERMANY AND THE FRG

For the period 1850 to 1938, the deflator is implicit in the capital formation, including stocks, at market prices, current and constant of 1913, shown in B.R. Mitchell *European Historical Statistics*, 1750-1970 [5].

The question is how to link the capital formation price index, 1913 = 100 with the deflators of the post World War II years? According to the Statistisches Bundesamt, backtracking of current price indices to pre-World War I years is possible only for the cost of living; basic materials; and residential construction prices (*Bevölkerung und Wirtschaft 1872-1972* [7; p.245]). The cost of living index is not applicable for prices of capital formation; we also decided against the "basic materials" index, because it includes agriculture, forestry, and imports. We did select the residential construction price index, because construction is an important item in capital formation. Here the assumption is that residential construction prices moved in the same way as nonresidential construction.

Table 1. Germany/FRG Long-Term Price Index Numbers

		Cost of Living (1)	Basic Materials (2)	Residential Construction Prices (3)	Deflator Capital Formation (4)
Germany	1913	.	100	100	100
	1913-14	100.0	102.5	103.5	.
		|	|	|	|
	1925	141.8	139	171	160.2
		|	|	|	|
	1937	125.1	96	135	121.3
	1938	125.6	95	136	117.7
FRG	1950	195.7	182	252	.
	1951	211.0	218	291	.

Sources: Columns 1, 2, and 3 compiled from Statistisches Bundesamt *Bevölkerung und Wirtschaft* [7; Chapter IX, Prices]. Column 4 = deflator implicit in German capital formation data compiled from B.R. Mitchell [5].

We then took the capital formation deflator, implicit in current statistics, with 1962 = 100 and shifted the base to 1950 = 100. The next step is to take the residential construction price index in the FRG for the year 1950 as 252 (1913 Reich = 100) and to extrapolate it with the above mentioned capital formation deflator, 1950 = 100.

The result of these calculations is that the FRG 1974 capital formation deflator rose to 659 of 1913 (Reich) = 100; at the same time, the USA 1974 capital formation deflator stood at 657.3 of 1912-16 = 100.

UK DEFLATORS

For the period 1830-1913, the deflator is implicit in the capital formation data in current and 1900 prices compiled from B.R. Mitchell *European Historical Statistics* [5]. We shifted the price basis for this period from 1900 to 1913. Next we have a series of capital formation data for the period 1913 to 1947, in current and constant prices of 1938, also from B.R. Mitchell. Again we shifted the price basis to 1913 = 100 and extrapolated the above mentioned deflator.

Current series of capital formation are contained in the UK Central Statistical Office *Economic Trends* annual supplement, 1975 [33]. This source gives capital formation in current prices 1946 to 1974, and in constant prices of 1970, for the period 1948 to 1974.

The question is therefore how to link the two deflators 1830-1946 and 1947-1974 when there is no deflator for 1947. We bridged this gap by assuming that the four year average (1948-1951) was similar to the five year average (1947-1951) which we could not get.

We could have refined our estimates by assuming that the GFCF deflators movement was similar to that of the wholesale prices (WPI).

UK Wholesale Price Index, 1947 = 100 [5; p. 739]

1946	91
1947	100
1948	114

However, the adjustment did not seem to warrant the effort--because of the various uncertainties involved in our long term series.

FRANCE

The deflators are implicit in the gross fixed capital formation data in current and constant prices, shown in the *European Historical Statistics* [5] as follows:

1825/1834 to 1935/38: see GFCF in 1905/13 prices
1938 and 1949 to 1959: see GFCF in 1959 prices
1959 to 1971: see GFCF in 1963 prices

The only missing link are 1938 GFCF in 1905/13 prices. We overcame this handicap by assuming that the 1938 deflator was the same as the 1935/38 average. We looked at the French wholesale price index, 1900 to 1972, shown in the *Annuaire Statistique* [34; 1974, p. 612] and found that the 1938 prices were somewhat above the 1935/38 average, as France by 1938 was recovering from the depression. However, considering the very long time span covered, it would not have been worthwhile to make an adjustment. For a comparison of the French wholesale price index with the base shifted to 1905/13 = 100 see Table 2 below:

Table 2. French Wholesale Price Index and GFCF

	Wholesale Price Index 1905/13=100	Gross Fixed Capital Formation Deflator 1905/13=100
1905/13	100	100
1920/24	497	442
1925/34	622	525
1935/38	569	515
1938	746	.
1950	14925	9090
1951	19067	11050
1952/56	19201	13110
1967/61	23537	16510
1962/66	27231	20320
1967/71	31149	24350
1972	36463	

These data show that the GFCF deflators though trailing the WPI, are within the same (astronomic) order of magnitudes.

UNITED STATES

The historical series on gross domestic capital formation 1869/1873 to 1927/31 are given in current and constant prices of 1929, *Historical Statistics* [3; Tables F104-130 and F131-157]. The deflator, implicit in these series is extrapolated to 1942/46 on the basis of the deflator implicit in the gross domestic government investments in current and constant prices of 1958,

shown for the period 1929 to 1971 in the *Survey of Current Business* [26; February 1973, p. 9]. Here, the assumption is that the domestic government and private investment price movement was the same as that of domestic government investment.

The 1947/51 deflator is then extrapolated to 1974 on the basis of the deflator implicit in the series on gross domestic private investments in current and 1958 prices, given in the *Survey of Current Business* [26], 1973 supplement and monthly issues. Here the assumption is that government and private gross domestic investment prices rose by the same rate as gross domestic private investment.

The extrapolations indicated above, and the shifting of base periods from 1929 and 1958 to 1912/16 may account for minor inaccuracies in the data.

APPENDIX C.

THE UN *FUTURE OF THE WORLD ECONOMY* [9] COMPARISON OF SELECTED DATA WITH OTHER SOURCES

The following comparisons do not relate to the UN projections; they are limited to some of the statistics of the year 1970 serving as basis for the UN projections. These data are:

- World GDP
- Capital formation (annual investments)
- World capital stock by regions.

GROSS DOMESTIC PRODUCT

Because of differences in systems of national accounts the GDP of market economy countries is not comparable to net material products compiled by centrally planned economies. However, the UN *Future of the World Economy* [9] includes with Western countries the national accounts and input/output data for USSR, Eastern Europe, and China; these data are expressed in terms of US dollars.

The question is: What was the adjustment, if any, to make the "net material product" commensurate with GDP? Next question, what exchange rates were used to convert the CPE data to US dollars?

We have checked the GDP data from the UN *Future of the World Economy* against the W. Ströbele data [31] and find considerable agreement between the two sources, both as regards absolute values, and percentage distribution by regions, etc. For details see Table 1.

CAPITAL FORMATION

Coverage

As stated above in section 1, we included under the "annual gross fixed domestic capital formation" the additions in "Equipment and Structures from All Sectors of the Economy" (government, business and residential or households). UN *Future of the World Economy* data are not given with sufficient detail to check on their coverage. We tried to check it out for Japan, because this seemed to be the only case where data for an individual country were shown; see Table 2 below. It seems that UN *Future of the World Economy* data, like ours, exclude inventories from capital formation. However, UN *Future of the World Economy* capital formation data seem to be limited to certain sectors of the economy; they exclude government and possibly the owner occupied residential building and a number of services.

Table 1. GDP Selected Countries and Regions, 1970.

Region	UN *Future of the World Economy* (Current Prices) $ Billion = %	W. Ströbele (In Prices of 1963) $ Billion = %
North America (Incl. US, Canada, Puerto Rico)	1059.5 = 32.9	841.1 = 33.3
Japan	199.8 = 6.2	143.1 = 5.7
Soviet Union	434.9 = 13.5	473.1 = 18.7*
Eastern Europe	164.4 = 5.1	*
China, Peopeles Republic	134.8 = 4.1+	90.7 = 3.5
World	3220.0 =100.0	2525.6 =100.0

*Eastern Europe included with Soviet Union
+Korea, Mongolia included

Note: Assuming that the GDP deflator rose from 1963 = 100 to 1970 = 125, the Ströbele World GDP could be estimated as $3157 billion in 1970, which is quite similar to the UN *Future of the World Economy* $3220 billion.

Table 2. Capital Formation, Japan 1970.

	UN *Future of the World Economy* $ Billions	IIASA Data Compiled From UN *Yearbook of National Accounts Statistics* Yen Bill. = $ Bill.	
INVESTMENTS			
Equipment	20.9	Equipment }	}
Plant	23.7	Econstruction } 24843.6 =	} 69.47
Selected Sectors	44.6	All Sectors 24843.6 =	69.47
GDP	199.8	71167.0 =	199.7
INVESTMENT AS PERCENT OF GDP	22.3%	34.9% =	34.7%

Investment Coefficients

In the above study the investment coefficient is defined as the percentage share in total GDP of gross fixed capital formation (structures and equipment) from all sectors of the economy (government, business, residential). This definition checks with the one used by Simon Kuznets, who had observed that before World War II, developed countries saved at most 20% of their GDP, whereas we found that lately the rate had increased to 25%.

The UN *Future of the World Economy*, using another concept, states that "the ratio of gross fixed investment to total final internal use (sum of investment, private and public consumption) is expected to increase from 20% on the average in 1970, to 41% in 2000 in the Middle East and African oil countries; from 17-20 to 31-33% in Latin America; and from 15 to 23-25% in nonoil Asia and Africa" (UN *Future of the World Economy* [9; p. 31]).

As stated above, it would be useful to find out how the UN *Future of the World Economy* defines "gross investment" (plants and equipment), which sectors of the economy are included, and what is the source of the data (input/output tables or national accounts). Likewise, as regards consumption, may we assume that this relates to all sectors of the economy, and what is the source of the data (national accounts?).

WORLD CAPITAL STOCK BY REGIONS

Absolute Values

The 1970 capital stock data in the UN *Future of the World Economy* are broken down into equipment and plant; we have compared the North America region against US data for the total economy and for the business economy; and against the Ströbele data for the North America Region. We also compared the Japan capital stock data in the UN *Future of the World Economy* against the Ströbele data.

For the North America region, the 1970 capital stock data in the UN *Future of the World Economy*, which include Canada and Puerto Rico, are about the same as the US capital stock, all sectors, for 1968. This means that, in fact, the UN *Future of the World Economy* data are lower than the US *Statistical Abstract* data, a matter which can be explained by the fact that the UN *Future of the World Economy* limits the capital stock data to certain sectors of the economy. For the world as a whole (and for Japan where we could easily test it), the UN *Future of the World Economy* capital stock data are much lower than the Ströbele data shown above. Thus, in 1970, according to the UN *Future of the World Economy* Planet Earth costs "only" $5.7 trillion (current 1970 prices) against Ströbele's $7.5 trillion (1963 prices) or $9.4 trillion (1970 prices) assuming that the deflator has increased from 100 in 163, to 123 in 1970 (see Table 3).

Table 3. Gross Capital Stock (Structures and Equipment) in North America and the World, 1970.

	UN *Future of the World Economy*	US *Statistical Abstract*		W. Ströbele	
		All Sectors	Business Sector	All Sectors of Economy	
	1970 Prices	1968 Prices		1963 Prices	1970* Prices
	10^9	10^9	10^9	10^9	19^9
North America	2252	2148+	1339+	3047	3809
World	5693	.	.	7511	9389

*Estimated deflators

1963 = 100
1970 = 125

+United States

Regional Distribution of World Capital Stock

The percentage distribution of the world capital stock by regions in the UN *Future of the World Economy* is quite similar to that of the Ströbele data. In both compilations, the North American region accounts for about 40% of 1970 world capital and total developed countries with market economies account for about 73% of the world capital stock.

As regards the rest of the world, there are some, perhaps minor, descrepancies given the uncertainty of the data involved. Thus, in 1970, the share of the centrally planned economies (Eastern Europe, Soviet Union, China) amounts to 20.7% of world capital stock in the UN *Future of the World Economy*, and to somewhat less, namely 17.3% in the Ströbele data. For details, see Table 4.

Table 4. Capital Stock by Regions, 1970.

UN *Future of the World Economy*		W. Ströbele	
	1970 Capital Stock Current Prices Billion $ = %		1970 Capital Stock 1963 Prices Billion $ = %
Developed Market Economies			
North America:	2251.7 = 39.5	North America	3047.1 = 40.6
W. Europe, High Income	1345.7 = 23.6	W. Europe	1937.6 = 25.8
W. Europe, Medium Income	115.7 = 2.0		
Japan (and Ryukyu Islands)	313.2 = 5.5	Japan	361.2 = 4.8
Oceania	79.3 = 1.4	Other developed	191.0 = 2.5
South Africa	27.0 = 0.5		
	= 72.5%		= 73.7%
Developing Market Economies			
Latin America		Latin America	298.5 = 4.0
Medium Income	155.3 = 2.7		
Low Income	48.5 = 0.8		
Middle East/Africa, Oil	26.7 = 0.5	Middle East	77.1 =
Asia, Low Income	110.1 = 1.9	South East Asia	251.2 = 5.2
Africa, arid	26.6 = 0.5	Middle Africa	68.4 =
tropical	21.2 = 0.4		
	6.8		9.2
Centrally Planned Europe			
Eastern Europe	288.4 = 5.1	USSR/East. Europe	941.6 = 12.5
Soviet Union	737.9 = 13.0		
China	147.1 = 2.6	China	343.9 = 4.6
	20.7		17.1
World	5693.0 = 100.0	World	7511.5 = 100.0
	(5694.4)		(7517.6)

APPENDIX D.

US Department of Labor, LBS; Office of Economic Growth; Note on Capital Stocks Data Base*:

"The Office of Economic Growth maintains a data base containing estimates of capital stocks for approximately 170 industries and various aggregations of these industries. Data series are developed at the three-digit SIC (1972 definition) level of detail for manufacturing industries and for selected nonmanufacturing industries, roughly corresponding to the two-digit SIC level of detail. Capital stocks estimates are available for plant and equipment assets separately and are measured in both historical and constant (1972 = 100) dollars for the years 1947-74. For each of the above four classifications, twenty data series are developed including two measures of capital stocks--gross stocks and net stocks. Gross stocks represent the value of capital assets accumulated over time and adjusted for discards of worn-out assets. Net stocks represent an index of capital efficiency (measured in dollars) based on the value of capital assets accumulated over time and adjusted for both discards of worn-out assets and for the decline in potential productivity of the assets as they age. The decline in efficiency (potential productivity) is similar to depreciation with the exception that it is assumed that assets decline in efficiency more in the later years of service than in the early years. This is conceptually different from most accounting forms of depreciation where most of the depreciation of assets is assumed to occur in the early years of service rather than in the later.

Other series available relate the level of gross and net stocks to annual investment flows and break the values of gross and net stocks into age distributions which illustrate the relative ages of capital assets for a given year. Consult other documentation in this series for a complete definition of each data series available and a complete list of all industry data maintained in the data base.

Data are available in a printed form, on computer tape or on punched cards. In addition, the data may be provided as a straight listing of each data series or in a tabular form which displays related series in a readable manner. Examples of the various standard output forms may be obtained from the Office of Economic Growth."

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*Text supplied by BLS, Office of Economic Growth, April 1978.