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THE ASSESSMENT: INVESTMENT PERFORMANCE AND POLICY

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I. INTRODUCTION

Investment is the critical determinant of long-run economic performance. Investment involves the formation of capital: fixed (or tangible) capital, such as machinery or factories; intangible capital, such as reputations or technical knowledge; or human capital, such as skills or education. This issue of the *Oxford Review of Economic Policy* is concerned mainly with the first of these categories, namely investment in fixed capital.

Economists of almost all complexions are interested in investment. Macroeconomists are concerned about the relationship between investment and employment, and the influence of investment volatility on business cycles. Microeconomists are concerned with the effects of industry structure, taxation and supply-side policies on investment. Since investment has to be financed, those concerned with the efficiency of financial markets, corporate financing, and corporate governance also focus attention on investment. And for the burgeoning body of economists studying economic growth, investment is pivotal. Each constituency contributes its own theories and policy analyses about investment.

This issue reflects these various approaches to investment. The other articles in the issue consider the role of investment in new theories of economic growth; whether the social returns to investment exceed the private returns; whether the composition

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of fixed capital formation systematically influences its effectiveness; what impact financial constraints have on investment behaviour; the relationship between investment, domestic savings, and foreign direct investment; and how tax policy could be reformed to promote capital formation.

This paper provides an overall assessment of economic policies regarding investment, drawing upon these various concerns. The paper is organized as follows. In the next section we consider why the level of investment is potentially a matter of policy concern. A widespread misconception exists that investment is good and more investment is better. But investment can be too high as well as too low, and we first consider the reasons why the level of investment may not be optimal. In section III we present, in some detail, the stylized facts concerning various aspects of investment for the UK and other selected economies. We consider the flow of investment, the resultant stock of capital employed, and the composition of investment. We also consider how investment has been financed, and the possible influence of dividend policies and corporate governance. In section IV we consider the determinants of investment, drawing upon recent theoretical and empirical developments and evidence from business surveys. In the light of the stylized facts and suggested determinants of investment, we consider in section V the efficacy of various alternative policies to promote investment. Section VI concludes.

II. WHY DO WE CARE ABOUT THE LEVEL OF INVESTMENT?

Traditional, or neoclassical, economic analysis suggests no special role for investment. If production functions exhibit constant returns to scale (so that doubling all inputs would double output) but each factor of production is subject to diminishing marginal productivity, then the optimal capital stock will be at the point where the expected rate of return from the marginal investment project exactly equals the marginal cost of capital. Any investment beyond this level would be inefficient and result in a capital stock that was too high.

This static analysis of the optimal capital stock also carried over to neoclassical theories of growth. The Solow (1956) model predicted that in the long run the growth rate would be independent of the investment rate. This somewhat counter-intuitive result is derived as follows. Given the assumptions in the previous paragraph and a constant savings rate, in equilibrium there is a single optimal level of the capital stock at any point in time and a corresponding optimal capital–output ratio. If the growth rate of the capital stock were to rise above the growth rate of output, then production would become more capital-intensive and, as a result of diminishing returns, the increased rate of investment will have progressively smaller impacts on output. Of course, higher levels of investment will, for a given population, result in higher per capita output for as long as the marginal productivity of capital exceeds zero. But such investment will be increasingly inefficient and in the long run growth of output per head will be solely determined by technological improvements that lead to increases in total factor productivity. Neoclassical growth theory provided, of course, no explanation for the sources of these critical technological advances. Two broad strands of literature developed from the neoclassical analysis, which we will consider briefly in turn.

The first literature stressed the restrictive assumptions underpinning the Solow growth model, and questioned the neoclassical presumption that a market economy would gravitate naturally (or rapidly) to the optimal growth path. If the capital–output ratio along the actual growth path were lower than the optimal capital–output ratio, for example, then although the exogenously determined growth rate would be the same, the actual levels of output per head and consumption per head would also be lower than could be achieved on the optimal growth path. In this case, a policy intervention which succeeded in raising the actual capital–output ratio towards its optimum level could permanently increase the levels of output and consumption per head, even though the effect of higher investment on the growth rate would only be temporary. Such policy measures could have first-order effects on welfare, even though they did not change the long-run growth rate.

This literature emphasized the possibility that market failures, externalities, imperfect competition, or tax distortions could result in actual rates of saving and investment being too low (or, indeed, too high)

relative to the optimal growth path. For example, underinvestment could result from imperfect or missing capital markets or insurance markets, perhaps as a consequence of asymmetric information. Alternatively, there may be important externalities or spillovers associated with some forms of investment that embody technical progress or result in learning by doing, and this could also result in investment being below the optimum level.

A leading example of such policy concerns is whether the rate of return that companies (or, strictly, their investors) require on new investment—known to economists as the *cost of capital*[2] and more usually referred to in business as the *hurdle rate*[3]—is too high. Recent surveys by the Bank of England (1994) and the Confederation of British Industry (CBI, 1994) are very informative about the hurdle rates that UK companies actually impose. Both surveys produced similar results, and so we concentrate on the larger of the two. The CBI surveyed finance directors of a representative sample of manufacturing industry, and elicited 438 replies. While it is not always straightforward to interpret the results,[4] there are some striking findings. First, the average nominal required rate of return for new investment was around 17 per cent (the Bank of England survey suggested a 20 per cent nominal rate). At current inflation rates these surveys imply that companies estimate their *real* cost of capital[5] at around 15 per cent. Second, and broadly consistent with the previous finding, for those companies that formulated their investment rules in terms of a pay-back period, two-thirds required new projects to pay for themselves within 2–3 years. Such rules—either expressed as rate of return rules or pay-back periods—seem to imply extraordinary degrees of risk aversion, and form the basis of the concern that UK investment is stifled by excessive estimates of the cost of capital.

The interesting question is why do finance directors believe such high rates of return are required on new investment? The survey estimates are completely at variance with those produced by the regulators of the privatized utilities—who have investigated at length such issues in the context of the appropriate rate of return that they should allow—and with recent academic work (see, for example, Blanchard, 1993, or Jenkinson, 1993, 1994). Both groups produce estimates of the cost of capital that are considerably lower than those assumed by UK companies. If companies are systematically overestimating the cost of capital the result will tend to be an inappropriately low level of investment spending, particularly on projects whose returns are realized over long periods of time. Such issues are currently the subject of much policy debate. We discuss below some possible theoretical explanations (in particular, the recent irreversibility or 'real options' literature) and the possible influence of the financial system and institutions more generally on required rates of return.

The second, more recent, literature is that of (post-neo-classical) endogenous growth theories. As Crafts explains in his article in this issue of the *Review*, the basic idea behind endogenous growth is that the long-run growth rate itself depends on investment, although some endogenous growth theories suggest that the composition of investment may also be critical. The main point of departure from the neoclassical world is the assumption that there are constant (rather than diminishing) returns to *broad* capital accumulation. Broad capital is variously interpreted as including human capital and/or research and development (R & D) expenditures in addition to tangible investment. Under these conditions policies to raise the investment rate (which may, of course, include such diverse policies as education and training incentives or patent laws)

[2] Under the assumption of risk neutrality the cost of capital would be identical to the interest rate, as it would not matter how investment was financed (for example, by debt or equity). But given risk aversion on the part of investors the cost of capital will be equal to the interest rate plus a risk premium, and the latter will vary according to the type of finance employed and the fundamental business risk (as measured by beta in the capital asset pricing model), and could be time varying. Note that this measure of investors' required rate of return is *net* of depreciation, and is sometimes also referred to as the cost of finance. The required rate of return gross of depreciation is usually referred to as the *user cost of capital*.

[3] In practice, many companies tend to express their required rate of return in terms of a *pay-back period*. While this is not identical to a required rate of return rule, there is none the less a close relationship between the two.

[4] In particular, there seems to be strong evidence that some finance directors do not understand the difference between a *nominal* and *real* rate of return! (See charts 3 and 4 in the survey.)

[5] These are *pre-tax* cost of capital estimates. That is, the figures represent the rate of return that companies must earn before taxation at the corporate level. As we discuss below, the tax system tends to increase the cost of capital.

can have a direct impact on the long-run growth rate.

A different strand of the endogenous growth literature has focused instead on explaining (endogenously) the rate of total factor productivity growth, that was the unexplained (exogenous) determinant of growth in the pure Solow model. For example, some models relate total factor productivity growth to the amount of resources devoted to research, and hence relate growth to the incentives to invest in research. Here again, if there are constant returns to investment in research, it is possible permanently to increase the growth rate by allocating more resources to research. Even if there are diminishing returns to research, these models re-emphasize how the level of productivity (and hence output and consumption per head) can be influenced by policies which alter the scale of resources devoted to broad investment. The policy implications of these endogenous and semi-endogenous growth models are discussed further in the paper by Crafts.

A further challenge to the neoclassical model has been provided by DeLong and Summers (1991) who claim that the rate of fixed investment in *machinery and equipment*—rather than other forms of investment—is an important determinant of cross-country differences in growth rates. In contrast to much of the endogenous growth literature which stresses broad capital accumulation, DeLong and Summers concentrate on a narrow definition of capital. The paper by Oulton and Young subjects this claim to extensive empirical testing. The results obtained vary significantly according to the sample of countries considered and the econometric techniques employed, although the balance of the evidence is clearly against a special role for investment in machinery and equipment as an engine of growth.

Oulton and Young also test the role of overall investment in explaining cross-country differences in growth rates, as would be predicted by many endogenous growth theories. They pose the important policy question: does the social rate of return to investment of any kind exceed the private rate of return? If companies can appropriate all the gains from investment then there may be no role for government intervention to encourage investment. However, if, as many endogenous growth theories imply, investment generates externalities—for example in the form of new knowledge—then the social rate of return will exceed the private rate and policy intervention may be required to correct the market failure. In short, Oulton and Young find little evidence to support the claim that 'capital is special', either on an aggregate basis or when considering particular types of capital investments, including human capital. However, they caution against a hasty rejection of a possible role for, in particular, investment in education in explaining growth differences, as the data on educational attainments is fraught with problems of international comparability.

In summary, the reasons why the level of investment is an important policy concern can be broken down into two broad groups. There is a long-established set of concerns regarding the ways in which the neoclassical model may be inappropriate. These concerns include possible market failures (for example in international or domestic financial markets or product markets) and whether particular types of investment—such as machinery and equipment—have a special role. Many of these concerns existed long before endogenous growth theory emerged to challenge the predictions of (exogenous) neoclassical growth theory. Endogenous growth theories have introduced new, or perhaps re-emphasized old, reasons why the level of investment may be an important policy issue. In the next section we analyse the stylized facts regarding investment for some of the major economies, before considering explanations for this investment performance.

III. INTERNATIONAL EVIDENCE ON INVESTMENT

How does investment differ between countries? There can be few areas where the same basic facts have been interpreted in such diametrically opposed ways. For example, for the UK:

'There are a lot of myths about investment. In fact, it is a British success story.' William Waldegrave (Treasury Chief Secretary), news release, 23 February 1996.

'the key reason why British industry has been doing relatively poorly has been the underinvestment in manufacturing.' Kitson and Michie (1996), p. 196.

In this section we present some cross-country evidence on investment, the capital stock, financing, and corporate control. Before plunging into the data, it is, however, worth stressing what investment, or capital stock, figures do not capture. Measured investment, as reported in national accounts, excludes many activities that should, in principle, be considered as investment. For example, expenditures on R & D, training, or computer programming are all likely to increase future productive potential, but will not appear as measured investment. The latter essentially captures increases in physical capital—buildings, equipment, stocks, etc.—rather than productive potential *per se*. It is difficult to estimate the relative importance of the excluded factors, but it is worth recalling that many policy prescriptions—such as the need to increase investment in R & D or human capital—relate to factors that are entirely excluded from conventional measures of investment. In the remainder of this section we focus on these conventional measures.

(i) Investment and the Capital Stock

International comparisons invariably encounter issues of data consistency, and investment is no exception. While it is relatively straightforward to measure gross investment, many problems arise when attempts are made to take into account changes in the existing stock of capital assets in a particular period. Two particular problems relate to the assumed lives of assets and their prices. In constructing a measure of the real capital stock, for example, it is necessary to estimate when assets will be retired (to determine the remaining stock) and appropriate price deflators for the various assets of different ages that constitute total capital employed (to remove the impact of inflation). As we discuss below, national accounting conventions differ significantly in both respects (see O'Mahony, 1993*b*) and necessitate the use of internationally comparable data.

We start this section by considering the flow of investment in each country before turning to the implications for the capital stock. We then briefly focus more narrowly on the manufacturing sector, where some have suggested particular problems exist for the UK.

Investment comparisons

Investment can be measured in a variety of ways. The share of resources allocated to investment is generally measured by considering the share of gross investment in national income. Gross fixed investment, or gross fixed capital formation, measures total expenditure on all fixed capital assets, including housing and non-residential structures, as well as plant and machinery. This includes replacement investment as well as expansionary investment, and covers spending by all sectors of the economy.

The main attraction of focusing on gross investment is that it does not depend on any assumptions about asset lives or depreciation. As a result it is relatively straightforward to compare the share of gross investment in gross domestic product (GDP) across countries. As we discuss below, there are serious difficulties in making international comparisons of either net investment or capital stock measures.

Table 1 reports OECD figures for the share of gross investment in GDP for Japan, Germany, France, Italy, the US, and the UK, over the periods 1980–93 and 1960–93. Since 1979, Britain has invested a lower share of GDP than any of these countries. Contrary to some recent suggestions, this is not explained by low investment in housing—although it is true that the UK does have the lowest share of housing investment in GDP. As Table 1 also shows, the shares of GDP allocated to gross investment excluding residential construction, and more narrowly to gross investment in machinery and equipment, have also been lowest in the UK over this period.

This is not a new phenomenon. As Table 1 reports, Britain has invested a lower share of GDP than Japan, Germany, France, Italy, and the US since 1960, and ranks second-last over this longer period even when housing investment is excluded. Indeed, there is a clear pattern in these figures. Japan is an outlier, investing a substantially higher fraction of GDP than the other countries on any of these measures. The Continental European countries come

Table 1
Investment as a Share of GDP

	Japan	Italy	Germany	France	US	UK
1980–93						
Gross fixed capital formation	29.7	20.6	20.5	20.5	18.2	17.3
Gross fixed capital formation excl. residential construction	24.1	14.8	14.6	14.9	13.9	13.7
Gross fixed capital formation: machinery and equipment	11.5	9.7	8.6	8.8	8.0	8.0
1960–93						
Gross fixed capital formation	31.3	22.8	22.4	22.4	18.4	18.1
Gross fixed capital formation excl. residential construction	25.1	15.9	15.9	15.5	13.8	14.4
Gross fixed capital formation: machinery and equipment	12.4	9.8	8.7	8.9	7.6	8.4

Note: All figures for Germany refer to West Germany.
Source: OECD Historical Statistics, 1960–93 (1995 edn), Tables 6.8–6.11

next, consistently allocating a higher share of national income to investment than either the US or the UK.

It should be noted that these figures relate to the economy as a whole, and include investment spending by the public sector as well as by the private sector. As the UK Department of Trade and Industry (DTI, 1996) has reported, OECD figures for investment by the 'business sector' suggest a different pattern, with the UK share of business-sector investment in GDP ranking second-highest rather than last among these countries after 1979. We believe that the aggregate figures reported here are both a more reliable and a more appropriate basis for comparison. First, there are inevitably grey areas in deciding whether investment is done in the 'business sector' or not, and differences in the classification across countries could distort the picture.[6] Second, it seems inappropriate, for example, to give a zero weight to public-sector infrastructure investment, in areas such as transport and education, when making these international comparisons. Indeed, if we accept the OECD's 'business sector' statistics at face value, they suggest that infrastructure investment has been chronically low in the UK by international standards.

As mentioned above, gross investment does not in itself measure the change in the amount of productive capital available, for which purpose an estimate of changes in the capital stock is more informative. However, such a transition is not straightforward, as many problems are encountered when measuring the capital stock. For example, it matters greatly how long assets are assumed to last. In national accounts, equipment is assumed to have an average service life of 23 years in the UK, 15 years in the US, and only 10 years in Japan. In general these official estimates of asset lives are not based upon extensive surveys of the actual useful lives of assets, but rather on less reliable sources such as the asset lives assumed for tax purposes. Such wide differences in assumed asset lives would, however, have an enormous impact on estimates of the capital stock (in particular they would result in relatively high estimates of capital employed for the UK, where assumed service lives are very long for all types of asset).

[6] For example, in some OECD statistics the UK Atomic Energy Authority was not classified as part of the 'business sector' before 1986, but has been included since. The increased use of contracting out in areas such as refuse collection may also have affected the balance between 'business sector' and non-business-sector investment.

Table 2
Comparisons of the Growth Rates of the Capital Stock (%)

	Germany*	Japan	UK	US
Growth rate of capital per worker				
1972–82	3.8	7.7	3.1	1.7
1982–92	1.2	5.3	2.6	2.3
1972–92	2.7	6.5	2.9	2.0
Growth rate of equipment per worker				
1972–82	3.6	6.0	2.6	2.6
1982–92	1.6	8.0	3.0	3.5
1972–92	2.7	7.1	2.8	3.1

Notes: * There are problems with the German figures for the capital stock for 1991 and 1992 reported in the Penn World Tables (as they suggest around a 20 per cent reduction in capital per worker in 1991). This may be due to the effect of unification, but for consistency the estimates of growth rates of capital per worker and equipment per worker reported for Germany only use data up to 1990.
Source: Penn World Tables, version 5.6. All data are expressed in constant 1985 international prices. All averaging periods are inclusive. Average growth rates are geometric averages of the annual growth rates. Capital per worker excludes residential construction.

A second important problem relates to the construction of constant price series, since there may be wide differences in the price of capital goods across countries as a result, for example, of protection or the extent of domestic competition. In such circumstances, a high reported expenditure on investment may reflect high prices rather than a large amount of physical investment.

One widely used set of data that attempts to overcome these problems is that presented in the Penn World Tables (see Summers and Heston, 1991). In this data set a common set of international prices for investment and the other components of national income is used to produce constant price series. Service lives of particular assets are also assumed to be the same across countries. This is not to deny that service lives probably do differ across countries, however, as O'Mahony (1993*a*) points out, 'the errors from assuming standard lives are lower than those using official lives. With standard lives cross country comparisons depend primarily on differences in investment flows which are more accurately measured'. The data are available[7] for a very large number of countries but we focus in this section on Germany, Japan, the US, and UK.

A measure of investment that is particularly relevant is the growth rate of capital per worker, which we present in Table 2. There is big leap between the figures presented in Tables 1 and 2, and it is perhaps worth stressing the differences. The growth rate of the capital stock measures investment relative to the existing capital stock, rather than relative to output. As we will see, this can make a big difference when capital–output ratios are different across countries. The capital stock measure reported here again excludes residential construction (i.e. housing). These growth rates are also measured over somewhat different time periods. Of course, as these figures are presented on a per-worker basis, the growth rate may rise simply because the number of workers falls, owing to increased unemployment. None the less, the growth of capital per worker is clearly an important measure of the changing capital intensity of an economy.

As can be seen, over the period as a whole the growth rate of capital per worker has been spectacularly high in Japan (mirroring the very high share of gross investment reported earlier), with the UK growth rate being the next highest at a little under 3 per cent per annum.[8] Surprisingly, perhaps, the

[7] The data are available from the NBER via the internet at http://nber.harvard.edu.

[8] As we will see in the following section, this difference between the UK's position in terms of the investment share in GDP and the growth rate of the capital stock is the result of a relatively low ratio of capital stock to GDP in the UK.

Table 3
Capital Stock Comparisons

	Germany*	Japan	UK	US
Capital stock per worker				
1972-82	39,404	18,546	15,297	26,436
1982-92	48,439	31,742	19,206	31,976
1992	50,116	41,286	22,509	35,993
Equipment per worker				
1972-82	10,858	4,554	7,027	7,751
1982-92	13,281	8,376	8,854	10,556
1992	14,183	12,634	10,669	12,634
Capital–output ratio				
1972-82	3.6	2.0	1.6	1.8
1982-92	3.8	2.5	1.6	1.9
1992	3.5	2.7	1.8	2.0

Notes: Capital stock is defined as non-residential capital stock. * There are problems with the German figures for the capital stock for 1991 and 1992 reported in the Penn World Tables (as they suggest around a 20 per cent reduction in capital per worker in 1991). This may be due to the effect of unification, but for consistency all figures reported for Germany only use data up to 1990.
Source: Penn World Tables, version 5.6. All data are expressed in constant 1985 international prices.

growth rate of capital per worker was higher for three of the four countries in the earlier decade from 1972–82 than that observed since 1982, with only the US showing an increased growth rate.

A final view of investment trends is provided by considering an even narrower definition of capital—namely equipment—which excludes expenditures on structures such as buildings and offices. There is considerable debate over whether it is this latter measure that is more significant in explaining differences in growth rates between countries, rather than measures that include buildings and other forms of construction. On this basis we again observe Japan as an outlier—with equipment per worker growing on average by over 7 per cent per annum—with the other three countries experiencing roughly similar growth rates. It is noticeable, however, that the recent behaviour of Germany in this respect is at variance to the other countries, with a much lower growth rate being experienced in Germany since 1982.[9]

From all these measures a few clear trends emerge regarding levels of investment. First, whether one looks at total gross investment or narrower measures of the growth of the capital stock, Japan has experienced extraordinary rates of investment over the last two decades. The implications of these investment rates will be seen in the next section where international comparisons of capital stocks are made. Second, the low share of UK gross investment in GDP is not reflected in the narrower measures of capital stock growth, where the growth rates experienced in the UK are similar, and often higher, than those seen in Germany and the US. However, this is principally because the growth rate of capital measures investment as a proportion of the capital stock (I/K) rather than as a proportion of output (I/Y) and in the case of the UK we shall see that the capital–output ratio (K/Y) is exceptionally low.

Capital stock comparisons

In Table 3 we present these comparisons of the capital stock, and also the implied capital–output ratios for each country. Several striking features emerge. First, the overall capital stock per worker in the UK is considerably lower than in any of the other countries: by 1992 (the latest year available in the

[9] Note that the data we consider for Germany is not affected by reunification.

Figure 1(*a*)
Capital Stock per Worker

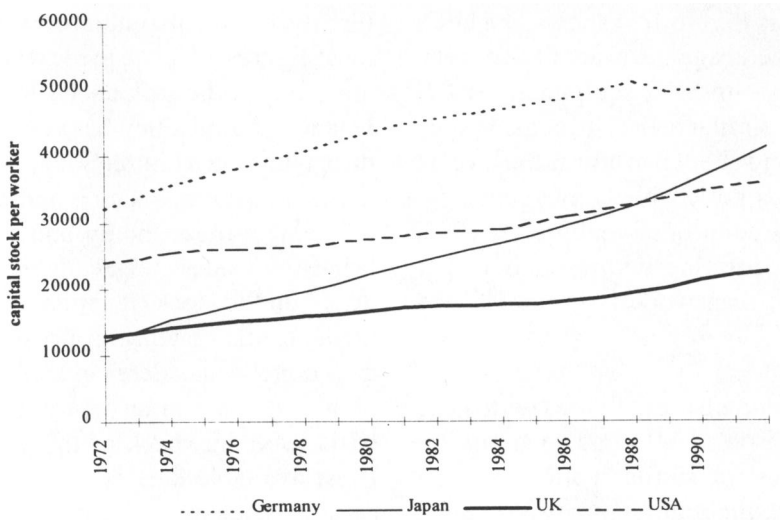
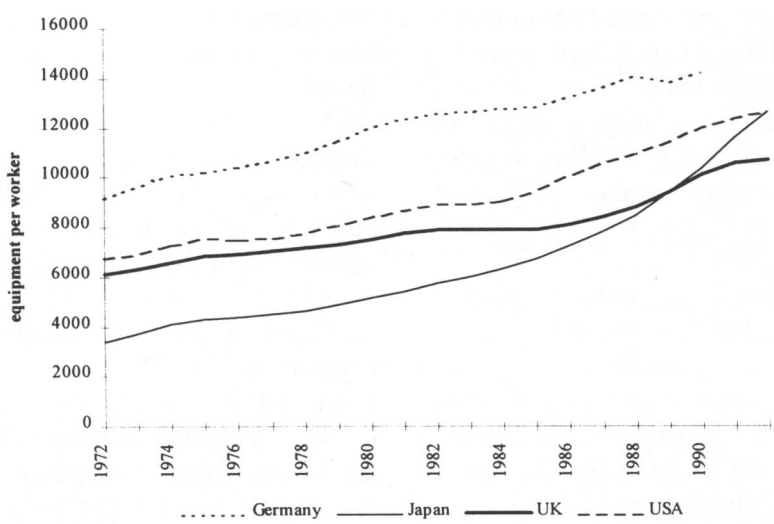


Figure 1(*b*)
Equipment per Worker



Source: Penn World Tables, version 5.6. All data are expressed in constant 1985 international prices.

Penn World Tables) the UK capital stock per worker was less than two-thirds that of the US and only about a half that of Japan or Germany. These trends are also reflected in the capital–output ratios of the four countries considered, with the UK having consistently the lowest capital–output ratio.

Second, as can be seen from Figure 1(*a*), there have been important differences in the trends in the capital stock over time. In particular, in 1972 the UK was estimated to have a capital stock per worker similar to that of Japan, with both countries lying below the US, which in turn lay below Germany. However, the exceptionally high rates of investment throughout the 1970s and 1980s in Japan have resulted in it steadily increasing capital intensity—with capital per worker rising by more than threefold—while the UK capital intensity has remained relatively low and only increased by around three-quarters over the period as a whole.

Third, it is noticeable that the differences between the countries become far less pronounced when a narrower definition of equipment per worker is

examined. As mentioned above, some economists have suggested that it is precisely investment in equipment that is most likely to lead to economic growth. Although, as Figure 1(*b*) shows, the UK's relative performance is again towards lower relative capital intensity—in 1972 equipment per UK worker was roughly similar to the US, considerably higher than Japan, and about two-thirds the level in Germany—there is a noticeable convergence between the other three countries over time. By 1992, UK workers were operating with around 15 per cent less equipment than workers in the US and Japan.

It is interesting to compare these figures with those produced by Maddison (1991). Using a similar methodology he finds a similar pattern for the capital–output ratios, although Germany is not such an extreme outlier using his data.[10] He also suggests similar differences in the share of equipment per worker. However, Maddison does suggest somewhat higher figures for total capital per worker for all the countries, and suggests that Germany and the US are rather similar on his measures. Whatever the differences in definition and coverage, both sources confirm that the UK productive capital stock is low in comparison to other major economies.

The evidence on the stock of capital and investment can be pulled together to draw the following conclusions. First, the UK has traditionally operated with considerably less capital per worker (whether equipment or structures) than the other major countries considered in this paper. With the notable exception of Japan, the last two decades have witnessed rather similar growth rates of the capital stock, with the result that the UK's relative position has changed little with respect to the US and Germany. Second, while there is considerable variance between countries in the overall capital stock per worker, there is noticeably less variance when one focuses narrowly on equipment. While the UK still has consistently lower levels of equipment per worker than the other countries, the differences are much less pronounced; for example in 1992 the estimates suggest that equipment per worker in the UK was around 85 per cent of Japanese levels. The implied mystery is how the UK manages with so few non-residential structures, such as offices, factories, or infrastructure.

Finally, it is worth reiterating two points. First, that these figures all relate to the whole economy and so are likely to be influenced by differences in the balance of production between services, manufacturing, and agriculture. Some economists consider the manufacturing sector is particularly important to the health of the economy, and in the next section we briefly consider the available international evidence on the stock of capital and flows of investment in manufacturing alone. Second, we have deliberately considered evidence over a prolonged period of time on an internationally comparable basis. One drawback of this approach is that the latest available data is for 1992, and there have certainly been some interesting developments since 1992. Most notable among these would probably be the dramatic falls in investment in Japan during the last four years. However, concerns over low investment in the UK have tended to be reinforced by the stuttering recovery in investment over the same period.

Manufacturing

The data employed to date have made no distinction between different sectors of the economy. However, it is interesting to consider how investment has varied between sectors, and in particular whether the performance of manufacturing investment is in line with the rest of the economy. In the Penn World Tables data employed in the previous section there is no breakdown of investment between sectors of the economy, and so we rely, instead, upon the estimates produced by O'Mahony (1993 *a*,*b*) for the manufacturing sector, which we report in Table 4.

Considering first the average growth rates of the manufacturing capital stock, the UK experienced consistently, and markedly, lower rates of growth than the other three countries over the period 1973–89. This is as true for equipment as it is for all capital assets. Indeed, over the more recent period, 1979–89, the growth rates in the UK have been particularly low—a result that contrasts sharply with the earlier evidence for the economy as a whole (albeit over somewhat different averaging periods). In part, the different relative performance can be

[10] Maddison's estimates for the capital–output ratio in 1987 are: Germany 3.0; Japan 2.8; UK 2.0; US 2.3.

Table 4
Capital Stock Comparisons for Manufacturing (%)

	Germany	Japan	UK	US
Growth rate of manufacturing capital stock: total assets				
1973–9	2.5	6.0	2.1	4.1
1979–89	1.2	5.2	0.0	2.0
Growth rate of manufacturing capital stock: equipment				
1973–9	2.9	5.5	2.6	5.0
1979–89	1.7	5.0	0.2	2.4
Capital stock per worker hour in manufacturing (index, UK=100)				
1989	134	113	100	137

Note: All figures are estimates of the gross capital stock.
Source: O'Mahony (1993*a*,*b*).

explained by the fact that, in contrast to the figures reported earlier for the whole economy, this data is not expressed on a *per worker* basis. Thus, the relatively sharp reduction in the size of the manufacturing sector in the UK (to currently around 21 per cent of GDP), underlies the zero growth rate of the overall manufacturing capital stock between 1979 and 1989.

The impact of considering investment per worker can be seen in the final line of Table 4 in which the capital stock is measured on a per-worker-hour basis (thus capturing international differences in hours worked). While the UK still appears to have the lowest level of capital intensity measured on this basis, the differences are not as great as would be implied by the low investment rates. Hence, in the case of manufacturing, the main issue is as much the overall reduction in the size of the sector as the investment rate itself.

In summary, the more worrying aspects of UK investment performance are without doubt (i) that manufacturing has shown a lower growth of the capital stock in the 1980s than the 1970s, (ii) that the UK investment boom in the later 1980s was overwhelming concentrated in services and did not encompass manufacturing, and (iii) in comparison to other countries, UK manufacturing investment has become increasingly weak. The causes of this decline in the manufacturing sector, and the longer-term implications for the UK economy are, however, both highly contentious and outside the scope of this assessment.[11]

(ii) The Financing of Investment

So far all the evidence presented has been about the trends in investment and the capital stock. However, investment has to be financed, and the terms upon which finance is available and the efficiency of financial markets in providing finance, are likely to have an important impact on investment performance. In principle, it would be interesting to examine international evidence on the cost of various forms of finance in order to estimate the overall cost of capital. However, it is notoriously difficult to obtain consistent evidence across countries, and, in any case, international financial liberalization has resulted in the globalization of many capital markets[12] with the resultant arbitrage tending to erode international differences in the cost of some forms of finance.

The factors that are less internationally mobile are institutional features, such as the differing role of

[11] The symposium on 'deindustrialisation and Britain's industrial performance since 1960' in the January 1996 edition of *The Economic Journal* contains a number of opposing views on this subject.

[12] For example, there has been an enormous growth in the eurobond market at the expense of many domestic corporate bond markets, some of which have virtually disappeared.

Table 5
The Financing of Investment: Flow-of-funds Estimates (%)

	Germany	Japan	UK	US
Internal finance	80.0	69.9	93.3	96.1
Bank finance	10.8	26.8	14.6	11.1
Bond finance	−1.4	3.9	4.2	15.4
New equity	0.2	3.5	−4.6	−7.6
Data sample	1970–92	1970–94	1970–94	1970–94

Notes: Internal finance comprises retained earnings and depreciation. The figures do not add up to 100 per cent as various categories of finance are not reported (such as trade credit and capital transfers). The figures represent weighted averages where the weights for each country are the level of real fixed investment in each year in that country.
Source: Corbett and Jenkinson (1996*b*).

banks, systems of corporate governance, tax systems, and patterns of corporate ownership. All these factors are likely to have as much, if not more, influence on the way investment is financed than cost alone. In this section we present some stylized international evidence on the way fixed investment has been financed, and how dividend pay-out ratios differ, before going on to summarize how systems of corporate governance compare.

There are two main ways of analysing the importance of different forms of finance. The traditional approach is to use stock estimates of gearing (the proportion of debt in total capital employed) from the balance sheets of companies. An alternative approach, which is also widely used, is to consider the flows of funds associated with fixed investment. The latter approach allows one directly to answer the question 'How is new fixed investment being financed?' whereas the former answers the question 'How was the existing capital stock financed over a past period of accumulation?' For present purposes the more relevant issue is how new investment is financed and so we first present some flow-of-funds evidence (Table 5) before checking the results against balance-sheet estimates of gearing (Table 6).

The first striking result from the flow-of-funds data in Table 5 is the reliance on internally generated funds in the UK and the US: over the period as a whole, 93 per cent of all fixed investment was funded from internal sources in the UK and 96 per cent in the US. This is considerably higher than in Germany and, particularly, Japan.

It would be tempting to associate these high shares of internal finance in the UK and US with the low shares of investment in GDP shown in Table 1, and conclude that investment in the Anglo-US financial systems has been held back by problems in raising external finance. However, such comparisons potentially confuse supply and demand. We really cannot tell from these figures whether investment has been low because external finance has been expensive, or whether the demand for external finance has been low because desired investment has itself been low for independent reasons.

The second notable feature is the relatively small contribution of bank finance in Germany. Only 11 per cent of total fixed investment was funded by banks, which is less than in the other countries. It would be tempting to conclude that the characterization of Germany as a 'bank-based' financial system is hard to justify. However, aggregate financing flows capture only one, albeit important, aspect of the relationship between financier and industry. Nevertheless, in purely quantitative terms, banks in the 'market-based' financial systems of the UK and US have contributed a larger proportion of the funds for fixed investment over the last 25 years than their German counterparts.

The traditional view of Japan seems less at odds with the figures presented here. Banks provided 27

Table 6
Balance Sheet Measures of Gearing (%)

	Germany	Japan	UK	US
Market value				
median	15	17	11	23
aggregate	6	28	13	31
Book value				
median	18	37	16	33
aggregate	10	49	19	45

Notes: Estimates are for 1991. Gearing is measured broadly as total debt over total assets. The sample of firms comprise those non-financial companies covered by the Global Vantage data set that reported consolidated balance sheets in 1991. These figures are the adjusted estimates provided by the authors. Adjusted liabilities are defined as total liabilities, less pension liabilities (in Germany), less cash. Adjusted debt is measured as the book value of debt, less cash and marketable securities. Adjusted assets are total assets, less cash and short-term securities, less pension liabilities (in Germany), less intangibles. Adjusted book value of equity is book equity, plus provisions, plus deferred taxes, less intangibles.
Source: Rajan and Zingales (1995).

per cent of the funds for fixed investment in Japan over the period as a whole. However, as reported by Corbett and Jenkinson (1996*b*), the share of bank finance in Japan has fallen noticeably since 1970: for example over the five-year period 1970–74 the average contribution of banks was around 43 per cent, whereas by 1990–94 this share had fallen to just under 20 per cent.

Equity markets have apparently been small providers of finance in Germany and Japan, while in the UK and US equity has actually been a net *use*, rather than a *source*, of funds. Since these are aggregate figures over a prolonged period of time, new equity may well have been a significant source of funds for particular types of firms, or in particular years. The negative figures reflect, in the main, two factors: (i) the vigorous mergers and acquisition process in the UK and US: a firm that uses its cash flow to buy the equity of another company (from the household or financial sector), and issues no additional equity, will produce a negative net source of finance figure for equity; and (ii) the restructuring of liabilities that has taken place in recent years, for example, the widescale use of debt (bank finance in the UK and bonds in the US) to replace equity in the 1980s resulted in large net flows of finance, often unrelated to physical investment.

The flow-of-funds estimates produced in Table 5 suggest that total debt financing—in the form of bank finance and bonds—has been most important in Japan (where debt has comprised nearly one-third of the total net sources of finance) and least important in Germany (less than 10 per cent). The US usage of debt (at around 26 per cent) is unusual in that bond finance constitutes the majority. The UK has the second highest share of bank finance but little use (on a net basis) of bond markets, resulting in a relatively low share of debt (at around 19 per cent).

It is interesting to compare these results with balance-sheet estimates of gearing recently produced using company accounts information. The results are broadly consistent with those obtained from the flow-of-funds data. Results vary considerably according to whether market values or book values are used (especially in the cases of Japan and the US), but on an aggregate basis German companies have the lowest use of debt finance. The leverage of the median firm in the sample is actually lowest in the UK, although the median German firm has a very similar level of debt finance. On all measures US and Japanese firms are noticeably more leveraged, which is again consistent with the flow-of-funds evidence.

One result that is difficult to reconcile is the broadly similar estimates of leverage on a market value basis between the median Japanese and German companies. This is likely to be due to sampling problems in the Japanese data, where, as Rajan and Zingales (1995, p. 1425) point out, there is a strong bias towards large companies. Large companies might be expected to rely less on debt than smaller companies and, hence, it seems likely that the flow-of-funds estimates (which are for the entire non-financial corporate sector) give a more accurate picture of the relative importance of debt than the balance-sheet information in the case of Japan.

Taking the financing evidence as a whole, one is more struck by the similarities between countries than the differences. This is especially true of the UK, US, and Germany, where internal finance plays the dominant role, banks provide relatively little finance, and financial markets are often a net *use* of finance rather than a *source* (the notable exception being the US bond market). Japan is clearly an exception, with banks being a significant provider of finance, although we have also noted that the pattern of investment finance in Japan is converging towards that found in the other countries. It is notable that financial markets are also a more important (and more consistent) source of finance in Japan than in many other countries. While there has traditionally been a distinction between the 'market-based' systems of the UK and US and the 'bank-based' systems of Germany and Japan, at least in terms of their provision of finance, a more accurate classification would be to label Germany, UK, and US together as 'internally financed', while Japan is legitimately classified as 'bank financed' (see Corbett and Jenkinson, 1996*a*).

(iii) Dividend Pay-outs

Despite the fact that the Modigliani–Miller (1961) theorem—built upon the theoretical assumptions of no taxes, transactions costs, or asymmetries of information—suggests that the value of a firm is independent of its dividend policy, there remain possible links between investment, dividend policy, and the value of the firm.[13] In the theoretical world, if a company paid out its entire profits as dividends and was presented with a new investment opportunity it would instantly have access, without incurring transactions costs, to additional finance from external sources (such as stock markets, bond markets, or banks). In the real world, matters are somewhat more complicated. The transactions costs of raising external finance can often be significant, and the differential tax treatment of certain forms of finance affects the relative cost of the various sources of finance. Additionally, problems of asymmetric information between investors and managers can lead to agency cost and signalling problems that may seriously limit the scope for financial manoeuvre.[14]

While it is true that companies that retain a large proportion of their profits will have immediate access to finance for new investments, it should be remembered that such 'internal finance' is essentially shareholders' money that is being re-invested on their behalf by management. If the financial flexibility afforded by the retention of such funds results in the timely exploitation of profitable investment opportunities, then everyone will be happy. However, if the result is entrenched managers subject to little monitoring by financial markets whose investments turn out to be a poor use of resources, then shareholders may well prefer to reduce the financial resources (or 'free cash flow' to use the terminology of Jensen, 1986) available to the company. Managers would then be required to justify more systematically their proposed investment projects to those providing finance. Hence, while a high dividend pay-out ratio may be a cause for concern, it may equally reflect the way a financial system overcomes potential principal–agent or other asymmetric information problems. Of course, it may also reflect the tax treatment of alternative sources of finance.

Notwithstanding these caveats, one frequently cited shortcoming of the Anglo-US financial systems is

[13] On this latter link a substantial empirical literature has demonstrated the importance of dividend policy to investors and firms; for a survey see Copeland and Weston (1988).

[14] For example, a company that had paid out all its retained earnings as dividends and needed to raise finance for a new investment opportunity could, in principle, raise external equity finance (via a rights issue in the UK). However, some theories suggest that rights issues should be interpreted as a negative signal to investors, and, in practice, many managers would only resort to external equity finance in extreme circumstances.

the high dividend pay-out ratios, which reflect, supposedly, financial institutions' desires for dividends now, rather than higher profits in the future. This is not the place to pass judgement on the general allegation of 'short-termism', although our reading of the evidence suggests that a verdict of 'not proven' would be reached. We limit ourselves to the simpler issue of how dividend pay-out ratios differ across countries in an attempt to put another piece into this complex empirical jigsaw.

It is notoriously difficult to produce internationally comparable estimates of the proportion of a company's available resources that is paid out as dividends. Some evidence is presented by the UK DTI (see DTI, 1995), suggesting that dividend pay-out ratios (i.e. dividends as a proportion of profit after tax, interest, and depreciation) are highest in the US, followed closely by the UK, with German pay-out ratios at a substantially lower level. However, there are considerable problems in making such international comparisons and it is not clear whether these DTI figures are really comparable. For example, in Germany companies are required to transfer a proportion of their profits to a legal reserve (*gestzliche Rucklage*) and only the balance is available for distribution to shareholders. It is clearly necessary to calculate pay-out ratios out of total available profits (or preferably cash flow) rather than out of the headline profits. Correia da Silva (1995) provides consistent estimates for samples of 250 German and UK industrial and commercial companies which suggest much less divergence in dividend pay-out ratios. He found that over the period 1990–92 German companies paid out an average of 25 per cent of their cash flow as dividends while UK companies paid out nearly 30 per cent. However, he also notes that dividend payments by German companies are more flexible, particularly downwards, than dividend payments by UK companies.

In summary, while it is true that dividend pay-out ratios are on average higher in the UK and US than in Germany and Japan, the differences—when consistently measured—are not as great as some commentators have suggested. The dividend decision is a complex one for companies, reflecting such diverse considerations as the corporate and personal tax systems, the availability of alternative sources of finance, and the impact of financial structure on managerial incentives and performance. The available evidence falls some way short of demonstrating that dividend pay-outs are particularly inappropriate in the UK.

(iv) Corporate Control

While the previous two sections have considered the way investment is financed and how companies differ in their dividend pay-outs, it is misleading to consider such factors without taking account of the alternative systems of corporate control that exist in different countries. A large theoretical and empirical literature has evolved around the theme of how information problems may account for observed differences in both financing patterns and mechanisms for corporate control. Many of the problems are of the principal–agent kind, with the principals (the investors, such as shareholders or bankers) attempting to monitor and control the agents (the managers) with the latter often having access to superior information about the company. Research has suggested numerous possible solutions to these principal–agent problems, which tend to stress the design of the contracts between the principal and agent, including the availability of alternative forms of finance, and the arrangements by which investors monitor managers (see Hubbard, 1990).

While there is some evidence, as we saw above, of convergence in the way investment is financed in different countries, there is much less convergence in the way companies are controlled. For example, the hostile takeover as a means of monitoring and controlling managers is virtually unknown in Japan and Germany. In the US hostile bids are common, although such threats have resulted in an enormous growth of anti-takeover provisions—such as poison pills and super-majority charter amendments—which for many companies essentially remove the takeover threat at least until the pill expires. In contrast, the UK has both an active hostile takeover market and a system of company law (not to mention shareholder attitude) that makes the adoption of many forms of anti-takeover defences impossible. As a result, Jenkinson and Mayer (1994) suggest that UK managers are uniquely vulnerable to a hostile bid, with few effective defences available to them. This is especially true in the case of cash bids,

against which incumbent managers have virtually no defences (other than attempting to encourage a 'white knight' to enter the bid contest), irrespective of the pre-bid performance of the company.

However, one has to be extremely careful before inferring too much from the observed differences in mechanisms of corporate control. Japanese companies are not subject to the threat of hostile acquisition but there is considerable monitoring of companies by other companies as a result of the widespread use of cross-shareholdings that form part of the *keiretsu* system. Many German companies are required to have supervisory boards upon which banks are frequently represented, which may allow a closer degree of monitoring than other institutional arrangements (although Edwards and Fischer (1994) note the limitations on supervisory boards' ability to assess management performance and question what incentives banks have for acting solely in shareholders'—rather than their own—interests). These examples illustrate that there exist many different ways of monitoring and controlling companies. These differences have long historical, institutional, and legal roots. It would be a mistake, we believe, to look overseas at the existing alternative systems of corporate control and attempt to superimpose such systems on to the UK, or any other country, when the appropriate institutions do not exist or the regulatory and legal framework is quite different.

In the case of the UK, corporate control is essentially mediated through the takeover market. Banks have traditionally played little role in monitoring company performance and are almost never represented on boards of directors. There are a few, relatively insignificant, examples of cross-shareholdings, implying that companies play little role in monitoring themselves. Institutional investors, despite owning an increasing proportion of UK shares, are themselves highly diversified with relatively small holdings in each company.[15] The result is that individual institutions only occasionally organize an uprising against incumbent management, and, in the main, view their role quite narrowly as investors rather than management advisors.

One of the main reasons why systems of corporate control differ so greatly is that far fewer companies are quoted on stock markets in most continental European countries than in the UK and US, and that even for those companies that are publicly quoted a large proportion have dominant shareholders. For example, Franks and Mayer (1995) report that nearly 85 per cent of the largest companies in Germany have at least one shareholder with a stake of more than 25 per cent, whereas in the UK the opposite is true: in around 85 per cent of cases no single shareholder owned a stake of more than 25 per cent. Such differences fundamentally affect how control can be mediated.

With banks, other companies, and large investors playing little role in controlling companies, the takeover market in the UK plays the leading role.[16] The implications of this relatively high threat of hostile takeover for investment have certainly attracted some concerns: the takeover threat may discourage investment directly if managers are unable to share fully in the benefits of long-term investment programmes; and the high and inflexible dividend pay-out ratios, which may not be entirely unrelated to this takeover threat, could indirectly affect investment if they exacerbate the impact of financing constraints. But restricting the free operation of the takeover market, as some have suggested, will not remove the underlying principal–agent problem unless alternative methods of monitoring and control develop as a result.

The influence of financial, legal, and regulatory institutions on the performance of the corporate sector, and in particular on investment incentives, is without doubt a fertile area for research. However, many international stereotypes—such as the German bank providing finance for investment as well as monitoring and controlling companies—have, on close examination, proved to be of limited accuracy. While there is little disagreement about the nature of

[15] This is, of course, especially true of the increasing proportion of funds that track a particular index rather than actively manage their portfolios.

[16] It is worth pointing out, however, that the targets of many hostile takeover bids show little evidence of poor pre-bid performance (see, Jenkinson and Mayer, 1994).

the underlying principal–agent problem, the superiority of any particular system of corporate control in dealing with it remains the subject of considerable debate. In the case of the UK financial system the catch-all indictment of 'short-termism', while an attractive slogan, remains to be convincingly proven.[17]

In this section we have found that both the share of investment in GDP and the resulting capital–output ratio and levels of capital per worker are lower in the UK than in other leading economies; and that the UK approach to investment finance and corporate control differs in a number of other, possibly related, respects. In the next two sections we examine some theory and evidence on the factors which influence the level of investment, and the likely effects of a number of policies which governments may use to influence investment.

IV. WHAT DETERMINES INVESTMENT?

The basic tenet of most economic analysis of investment is that firms invest to make money. This may not be universally accurate: some managers may proceed with unprofitable investment projects in order to expand their empires of influence, while others may refrain from profitable expansion, preferring a quiet life. Nevertheless, the basic idea that firms invest primarily to make profits has proved both durable and very useful in thinking about what factors influence the level of investment.

It follows from this assumption that firms will undertake investment projects whose returns are judged to outweigh their costs. Since the returns generally accrue in the form of higher net revenues in the future, these returns have to be discounted back to the present in order to compare them with the cost of undertaking the investment expenditure.[18] Since the returns are generally not known with certainty, investors have to form expectations as to what these returns are likely to be. The risk associated with these expected returns may also affect the discount rate used to value uncertain future profits. These steps lead to the expected present value of the returns from the investment project, which may be compared to the project's cost. If the resulting *net present value* is positive, the project will increase the value of the firm and the wealth of its owners, and is likely to be pursued.[19]

This simple account points to a number of factors which are likely to influence the level of investment. Other things being equal, the higher the price at which firms expect to be able to sell additional output resulting from the investment project, the higher will be the stream of future net revenues yielded by the investment. These price expectations will in turn be related to expectations about the future level of demand for their products. On the cost side, the higher the level of interest rates and hence the cost of capital, the higher will be the discount rates applied to future profits, and the lower will be the present value of any given stream of future profits.

This effect of the cost of capital on the profitability of investment can also be considered in terms of the opportunity cost of having wealth tied up in the project. Funds that are used to purchase capital equipment could alternatively have been lent out (or deposited with a bank) to earn interest. The investment project will have to generate a stream of net revenues which at least compensates investors for the loss of this forgone interest. Higher interest rates will therefore be associated with higher required rates of return on investment projects.

A further influence on the rate of return that investment projects are required to earn in order to be judged commercially viable is likely to be the tax system. The return yielded by an investment project is taxed in a number of ways: profits earned by firms are subject to corporate income tax; and the owners of these firms may be subject to further taxation on dividends and capital gains. Other features of tax systems, such as capital allowances, provide tax relief for some of the costs associated with investment. The net effect of taxation may in principle be

[17] For one of the more serious attempts to test for short-termist behaviour, see the interesting debate between Miles (1993, 1995) and Satchell and Damant (1995).

[18] For example, if the interest rate is 10 per cent, investors will be indifferent between receiving £1 this year and £1.10 next year, and the *present value* of £1.10 next year is said to be £1.

[19] This is provided the firm is able to finance the investment expenditure.

Table 7
Factors Limiting Investment (%)

	1985–90	1991–6	1985–96
Inadequate net return on proposed investment	44.8	43.8	44.3
Uncertainty about demand	36.5	52.2	44.3
Shortage of internal finance	19.5	23.8	21.7
Cost of finance	11.8	6.7	9.3
Inability to raise external finance	1.7	3.3	2.5
Shortage of labour inc. managerial and technical staff	6.0	5.0	5.5
Other	3.0	1.8	2.4

Note: Averages of responses to the question 'what factors are likely to limit (wholly or partly) your capital expenditure authorisations over the next twelve months?' Sample sizes range from 1,199 to 1,588 firms.
Source: CBI Industrial Trends Surveys, 1985–96 (April surveys).

to increase or reduce the required rate of return, but tax systems in most countries typically result in higher required rates of return.

Happily it is not just abstract economic theory which points to these influences on investment from expected demand and required rates of return. The CBI Quarterly Industrial Trends Survey regularly asks a sample of between 1,200 and 1,500 UK firms to report which factors are currently limiting their investment spending. Table 7 summarizes the results of 12 April surveys over the period 1985–96. The two categories which are cited most frequently are 'uncertainty about demand' and 'inadequate net return on proposed investment'. Both of these answers are consistent with demand expectations being a major influence on investment decisions. It is true that the category 'cost of finance' is referred to by only 10 per cent of the sample. However, this proportion increased to 17 per cent during the period 1989–92, when UK interest rates were high. Moreover, the willingness of firms to cite 'inadequate net return' is consistent with the basic idea of investors requiring a rate of return on funds invested, and this idea of a required rate of return points to interest rates and possibly taxes as further influences on investment decisions.

Not surprisingly, indicators of demand and the cost of capital also play a leading role in most econometric models of investment. Explaining fluctuations in the level of investment presents major challenges for econometric modelling. Investment rates are more volatile than consumption or output. The key influences on investment spending that we have identified in this section—*expected* future demand, and the *required* rate of return—are either not directly observable or extremely difficult to measure. Moreover, there are important resource costs associated with evaluating, planning, and implementing investment projects over and above the direct costs of purchasing capital equipment; and, once implemented, some types of investment projects may be extremely costly to reverse. These 'adjustment costs' imply that there may be rather complicated lags between firms observing some improvement in expected demand or reduction in the required rate of return, being persuaded that these changes justify additional capital expenditure, and this being implemented in the form of an investment programme.

Many econometric models of investment have been developed in response to these challenges, and we do not attempt to review this literature here.[20] Early 'accelerator' models emphasized the link between investment and output growth. So called 'neoclassical' models generalized this approach to allow for effects from the cost of capital.[21] 'Error correction' models follow essentially the same approach, but

[20] Schiantarelli in this issue reviews the leading econometric models that have been used in the literature relating investment and financial constraints. For a more comprehensive survey of econometric investment models, see Chirinko (1993).

[21] Jorgenson (1971) and Nickell (1978) provide comprehensive reviews of these approaches.

typically allow for more flexible characterizations of the lag structures linking investment to changes in output and the cost of capital.[22]

These models relate investment to output or output growth, as a measure of demand, and to the cost of capital, as a measure of the required rate of return. They tend to provide a reasonably good explanation of aggregate investment, and are the leading investment equations used in macroeconometric forecasting models. A robust empirical finding is that while there is a strong link between investment and output, the evidence relating investment to interest rates or the cost of capital tends to be much weaker.

We do not find this particularly surprising, in view of the considerable difficulties involved in measuring the required rate of return. Even if interest rates were the only consideration, the required rate of return would depend on the *ex-ante* real interest rate, which itself depends on unobservable expectations of inflation. Thus measured, *ex-post* real interest rates were negative for a number of years in the 1970s, but it seems unlikely that this interest rate measure was closely related to the required rate of return on investment perceived by firms. How to incorporate differences between the cost of debt finance and the cost of equity finance, risk premia, and the impact of tax systems into summary measures of the cost of capital have generated vast literatures in their own right. In short, there is a serious measurement error problem here, and it is not surprising that cost of capital measures have often been found to be only weakly related to investment.

The modelling approaches discussed above generally pay little explicit attention to *expectations* of future demand or future profitability. Thus it is difficult to know on the basis of these models to what extent investment is related to past output growth, because it takes time for firms to adjust investment programmes to observed changes in demand, or because observed changes in demand influence firms' expectations about future levels of demand and profitability. This may not matter very much for some purposes—e.g. for forecasting, provided a stable relation between investment and past output growth can be identified. However it may be crucially important for other questions—e.g. whether investment is related to past profits because firms face constraints in credit markets, or because past profits help to forecast future profitability, may have very different implications for policy.

Models developed in the last 15 years have sought to control for these expectational influences on investment spending more explicitly. This approach typically characterizes the optimal adjustment of a firm's capital stock in response to new information about demand or the cost of capital, allowing explicitly for some form of 'adjustment costs' and for uncertainty about the future. Under simplifying assumptions, this gives a precise formulation of how expected future profitability will influence current investment decisions, and suggests observable indicators of the relevant expectational influences. The best-known example of this approach is the so-called Q model, which relates investment to forward-looking stock-market valuations of the firm's assets.[23] The Q approach has been remarkably popular in recent microeconometric modelling of investment using individual firm-level data, even if the empirical results have generally been disappointing.[24]

These structural models relate investment to the same underlying influences as the earlier reduced form approaches, but appear very different in their implementation. So far they have not been conspicuously successful in characterizing observed fluctuations in investment. To what extent this is due to imposing unduly restrictive assumptions on the form of 'adjustment costs', or due to the inherent difficulties of measuring the relevant expectational influences, remains an open question.

The CBI survey responses discussed above point to two further influences on investment which have both been the subject of considerable research in the last decade: internal finance and uncertainty.

[22] See Bean (1981), for example.

[23] The Q model was developed by Hayashi (1982) and Summers (1981), although the idea of relating investment to forward-looking asset prices was suggested much earlier. See, for example, Tobin (1969).

[24] See Blundell *et al.* (1996) and Schiantarelli in this issue for surveys of this approach and related models.

The traditional neoclassical model of investment assumes that firms operate in perfect capital markets, in which they can borrow or lend as much as they like at a given rate of return. In this case, and in the absence of significant differences in the tax treatment of different sources of finance, external sources of finance for investment, such as borrowing or issuing new shares, are a perfect substitute for internal finance from retained profits. If this were true, investment spending should never be limited by a shortage of internal finance. Thus the fact that almost a quarter of large British manufacturing firms report that their investment is constrained by the availability of internal finance casts doubt on the validity of this assumption.

The question of whether internal finance does limit investment expenditure for a significant fraction of firms has been the subject of extensive econometric testing, following the influential work of Fazzari *et al.* (1988).[25] This literature is surveyed in this issue of the *Review* by Schiantarelli. Almost all published studies have rejected the hypothesis that financing constraints are unimportant, or that external finance and internal finance are perfect substitutes—consistent with the survey evidence reported above. Most of this evidence is consistent with the idea that external finance is perceived to be more expensive by firms, perhaps because suppliers of external finance have less information about the quality of the firm's investment opportunities, or because raising external finance subjects the firm's managers to additional monitoring. This cost differential results in a financing constraint on investment spending for firms whose desired investment exceeds their available internal finance, but whose marginal investment is not so profitable that it justifies paying the additional cost of external finance.

Evidence that investment may be subject to financial constraints does not necessarily imply that capital markets are inefficient, still less that investment should be subsidized. However, the presence of financial constraints does affect the way in which investment is likely to respond to other policy measures, as will be discussed further in section V and in the paper by Schiantarelli.

The effects of uncertainty on investment have long been the subject of controversy, and this remains the case.[26] The potential role of uncertainty in reducing the desired level of investment has been highlighted in recent work which has stressed the case where today's investment decisions are irreversible.[27] In this approach it is assumed that the capital stock can be adjusted upwards by investment, but cannot be adjusted downwards other than through depreciation. When investment is irreversible, expansion today may leave the firm with too high a capital stock over a prolonged period, should future conditions turn out to be less favourable than currently expected.[28] Conversely, not investing today leaves the firm with an option to expand later, should expansion indeed prove to be warranted. Investing today eliminates this option, and the loss of the value of this option can be considered as part of the cost of investing.

As noted by Dixit and Pindyck (1994), this insight can be viewed in two formally equivalent ways. On the one hand, if investment is indeed irreversible, the conventionally measured net present value must exceed zero by at least the value of the forgone option to expand later, before an investment project will appear to be attractive to the firm. Alternatively, the usual net present value calculation may be adjusted to count the lost option value explicitly as

[25] Early empirical research on company investment such as Meyer and Kuh (1957) had also emphasized the role of internal finance. Interest in this area waned under the influence of the Modigliani–Miller theorem, but was revived by the development of models with asymmetric information.

[26] In considering the role of uncertainty, it is important to distinguish between lower expected returns and less certain returns. For example, if we used to think there was an equal one-third probability of the rate of return on a particular investment project being –5 per cent, 10 per cent, or 25 per cent, but we now think there is an equal one-third probability of these returns being –10 per cent, 5 per cent, or 20 per cent, we have become more pessimistic about the expected rate of return, without becoming more uncertain. On the other hand, if we now think there is an equal one-third probability of the rate of return being –10 per cent, 10 per cent, or 30 per cent, the expected return has not changed, but we have become more uncertain of the outcome being close to this expectation.

[27] See Dixit and Pindyck (1994) for an excellent exposition of recent work in this area. Earlier work on irreversible investment includes Arrow (1968) and Nickell (1978).

[28] Among other things, this asymmetry implies that downside risk has a different impact on investment than upside risk. This is reflected in the 'bad-news principle' of Bernanke (1983).

one of the costs associated with the project, in which case the 'positive net present value' rule survives, albeit with a modified measure of net present value. In either case, the required rate of return on investment will appear to be higher than the conventionally measured cost of capital, and this approach offers one possible explanation for the very high 'hurdle' rates of return discussed in section II.

The relationship between uncertainty and investment is also rather different from the traditional analysis in which investment decisions are assumed to be reversible. Uncertainty may affect investment even in the traditional framework. However, the kind of risk which affects the required rate of return in this approach is covariance (or beta) risk,[29] rather than, say, the variance of earnings, since idiosyncratic risks can be diversified away by investors holding a portfolio of assets.

In contrast, the value of the option to expand later that has been stressed in the recent literature on irreversibility, is increasing with the level of uncertainty. In the simplest models, which assume that investment is literally irreversible and that there are no adjustment costs associated with expanding the capital stock, this creates a simple link, with more uncertainty being associated with a higher cost of the forgone option, and therefore with lower investment.

However, this simple relationship does not appear to be robust to more general specifications. The complete irreversibility assumption, that the capital stock cannot be adjusted downwards (other than through depreciation) at any cost, may be a good approximation for some investment decisions, such as the decision to build an oil rig in the middle of the North Sea. However, it is surely too extreme in many other cases, and, not surprisingly, recent work has explored models with 'partial irreversibility', in which there are costs associated with contracting the capital stock that do not affect expanding the capital stock, but in which these additional costs of reversing investment decisions are not infinitely high. Abel and Eberly (1994), for example, highlight a model of this sort in which higher uncertainty is associated with a higher level of investment. More recently, Abel *et al.* (1995) have considered a model in which there are additional costs associated with *delayed expansion*, which again results in an ambiguous relationship between uncertainty and investment.

Despite these important theoretical developments, agreement on the effects of uncertainty on the level of investment remains elusive. In contrast to the literature on financial constraints, empirical work in this area is still notably scarce.

This does not imply that uncertainty is not an important influence on investment, merely that the links between uncertainty and investment remain to be well understood and convincingly demonstrated. We can be sure that this will be a major area for future research. For example, we note that in the industrial organization literature it is increasingly common to model company behaviour as the outcome of a principal–agent relationship in which self-interested and risk-averse managers are only imperfectly monitored by shareholders. The implications for investment of the departures from simple value-maximizing company behaviour that can result from this framework remain to be fully explored. However, the actions of risk-averse managers provides a further channel through which uncertainty may influence investment.

V. GOVERNMENT POLICY AND INVESTMENT

There can be no doubt that governments in Britain and elsewhere have sought to influence the level and allocation of investment expenditure, and very little doubt that governments in the future will continue to do so. Interventions have ranged from temporary measures introduced as part of a countercyclical demand management policy; through structural reforms intended to improve the allocation of investment (e.g. 'levelling the playing field') and to achieve a once and for all improvement in the level of productivity, as part of a conventional supply-side policy; to more ambitious interventions intended permanently to increase the level of investment, with the aim of raising the rate of productivity growth, at least temporarily. A more recent devel-

[29] Loosely, this is the extent to which the returns on a particular project can be expected to fluctuate in a common way with the returns on other projects, rather than in an idiosyncratic way.

Table 8
Average Corporate Tax Wedges

Germany	Japan	US	UK	OECD average
0.6	1.4	0.8	0.9	0.9

Note: A corporate tax wedge of 0.9 raises the cost of capital from 5.0 per cent to 5.9 per cent. These figures assume a common real interest rate of 5 per cent and a common inflation rate of 4.5 per cent. They refer to tax systems as of 1 January 1991, and reflect an average across different types of assets and different sources of finance.
Source: OECD (1991), Table 4.4.

opment has been the use of policies designed to attract or retain inward investment, given the increasingly mobile nature of many productive activities and the increasingly international nature of many large companies.

Whatever the motivation, an important question remains concerning the effectiveness of many policies that are intended to influence investment. Supposing the government did want to increase the level of investment (temporarily or permanently), or to influence the allocation of investment between different industries, is it the case that policy interventions could have a significant impact? In this section we review some evidence on the effectiveness of a number of tax and other policy options.

(i) Taxation

Tax measures can influence investment decisions in numerous ways. Attention has traditionally focused on the impact of corporate income taxation on the cost of capital. However, we will also briefly consider the possible effects of the taxation of dividend income, and the tax treatment of savings more generally.

Corporate income taxation
While it would be quite possible to tax company profits in ways which did not increase the cost of capital, as discussed by Bond, Devereux, and Gammie in this issue, in practice almost all corporate income taxes have tended to raise the cost of capital for most types of investment expenditure. Corporate income taxes tax the higher net revenues which result from investment projects, but typically do not give full allowance for the costs incurred when investing. Although tax allowances for depreciation on capital assets often appear to be generous, tax allowances for the opportunity cost of financing investment expenditure are generally restricted to interest payments on borrowing, which as we saw in section III generally finances only a small proportion of total investment expenditure. The result is that for projects which would be just commercially viable in the absence of corporate taxation, the post-tax return is likely to be inadequate. In other words, the minimum required rate of return or cost of capital is increased by the corporate income tax.

Bond, Devereux, and Gammie discuss this further in the context of the current UK corporation tax, noting that the juxtaposition of widespread concern over low rates of investment in Britain and a tax system which clearly discourages investment may not be sustainable. However, it should be stressed that Britain is certainly not unique in imposing this kind of tax disincentive to company investment. The effects of different corporate tax systems on the cost of capital are compared in OECD (1991). Table 8 reports their average estimate of the corporate tax wedge (i.e. the difference between the cost of capital with and without the corporate income tax) for a number of countries at the beginning of 1991, assuming a common real interest rate of 5 per cent and a common inflation rate of 4.5 per cent. The tax wedge in the UK is higher than that in the US or Germany, but about average for the 24 OECD countries considered.

While it is relatively uncontroversial to measure the impact of corporate taxation on the cost of capital, it is a quite different matter to translate this into an impact on the level of investment. As we discussed in section IV, econometric studies face a number of difficult specification issues in relating investment to

the cost of capital, and a wide range of estimates can be found in the literature.[30]

Until quite recently this lack of robust econometric evidence had resulted in widespread scepticism about whether taxes have any significant impact on investment at all. If correct, this would be rather extraordinary, implying that firms undertake investment expenditure more or less regardless of the costs. Moreover, it would imply that the government could raise considerably more revenue from corporate taxation, without having a detrimental impact on investment—a conclusion which some proponents of the 'taxes don't matter' viewpoint from within industry would doubtless find less palatable.

However, more recent experience of the behaviour of investment around major tax reforms tends to refute the idea that the cost of capital has no impact on investment. In the UK, Bond *et al.* (1993) have noted that large fluctuations in company investment during the period 1984–6 were consistent with the large temporary effects on the cost of capital that resulted from the reform of corporation tax in 1984. In the US, a more formal study of investment behaviour around four major corporate tax reforms[31] by Cummins *et al.* (1994) also found a large and significant response of investment to these large and visible changes in the cost of capital. While this evidence still leaves us a long way short of an empirical consensus on the size of the response of investment to the cost of capital,[32] the balance of probabilities has shifted away from the view that taxes have no impact at all.

We also note that if investment is constrained by a shortage of internal finance for a significant proportion of companies, then the full impact of corporate income tax on investment is no longer summarized by its effects on the cost of capital. For those firms affected by financial constraints, how much tax they actually pay will also have an impact on their investment spending. In particular, a tax change which left the cost of capital unchanged but raised the amount of corporate tax paid by companies, would no longer be predicted to have no impact on the level of company investment, as it would in the traditional perfect capital markets model.

Dividend income taxation

According to traditional corporate finance theory, as we discussed in section III, the dividend decision[33] should be irrelevant for investment, and therefore tax influences on the dividend decision should be similarly irrelevant. This is an implication of the famous Modigliani–Miller theorem, according to which the firm's real and financial decisions are independent.[34]

This result follows from the assumption that external sources of finance are a perfect substitute for internal finance. As we have seen, there is now considerable evidence against this assumption. The dividend pay-out ratio may not be irrelevant for investment when some firms face financial constraints on their investment spending. For example, if firms perceive a need to pay out high (or inflexible) dividends, there may also be times when they perceive the shortage of available internal finance for investment to be more acute. In this case, a tax regime which gives firms an incentive to pay out a high share of profits as dividends may not be favourable for investment.

It is well known that the tax treatment of dividends in the UK gives a substantial tax incentive for dividends to be paid out to tax-exempt shareholders, including pension funds and the pension business of insurance companies. This may not be unrelated to the high dividend pay-out ratio in the UK that we have described above. These issues and their relation to investment are discussed further by Bond, Devereux and Gammie in this issue of the *Review*.

[30] See Chirinko (1993) for a comprehensive survey of this literature.

[31] These occurred in 1962, 1971, 1981, and 1986.

[32] In particular, in considering the response of investment to tax reforms, it remains difficult to distinguish between long-run effects and intertemporal substitution. While we may occasionally observe large *temporary* changes in the cost of capital associated with tax reforms, we are most unlikely ever to observe a large *permanent* change in the cost of capital.

[33] That is, what fraction of profits to distribute as dividends to shareholders, and what fraction to retain and invest within the firm.

[34] The dividend irrelevance proposition appeared in Miller and Modigliani (1961). For a survey of more recent theoretical analysis of the dividend decision, see Edwards (1987).

The taxation of savings

In a closed economy, it would make little sense to discuss the level of investment without at the same time discussing the level of savings, since the two would necessarily be equal. In this case it may well be that tax incentives to promote higher savings would be as effective in stimulating higher investment as tax measures intended to promote investment directly.

On the other hand, in the context of a small open economy with perfect capital mobility, there is complete separation between savings and investment. Any desired level of investment in excess of domestic savings will simply be financed by net capital imports (i.e. borrowing from abroad) at the going world rate of return. While this certainly has implications for the current account of the balance of payments, a policy aimed at increasing the level of domestic savings would not be expected to raise the level of domestic investment.

The trends towards globalization of economic activity and liberalization of international financial markets have tended to make this small open economy model the dominant paradigm for thinking about savings and investment, at least in the context of developed countries. However this view has been challenged in recent work by Feldstein and Horioka (1980) and Feldstein (1994). They note that the correlation between savings and investment as a share of GDP has remained high, and claim that outward foreign direct investment has the effect of reducing domestic investment pound for pound. Feldstein concludes from this that tax policies aimed at promoting investment will be ineffective, and policy should focus instead on raising domestic savings.

These questions are discussed further by Devereux in this issue of the *Review*. We concur with his conclusion that Feldstein's case is far from proven. The available evidence is not hard to reconcile with a high degree of capital mobility, in which case measures to promote domestic savings will have little impact on domestic investment. However, one important lesson from this debate is that if a government were to be successful in permanently raising the rate of investment, it will either have to succeed also in raising the rate of domestic savings, or be faced with a persistently higher balance of payments deficit.

(ii) Financial Markets and Corporate Governance

In section III we considered the stylized facts regarding the sources of finance for investment and some of the main differences in systems of corporate governance. On financing, we observed the relatively high proportion of UK investment that is financed out of retained profits. In terms of control we noted the unique vulnerability of UK managers to the threat of hostile takeover. Framing policy proposals in these areas, however, encounters many problems.

First, it is often very difficult to isolate what the underlying 'problem' is. For example, is there anything wrong with corporate investment being predominantly internally financed? Second, even if a problem can be identified, proposed solutions are frequently 'institutional' in nature. Institutions and attitudes are the result of history, accident, the legal framework, regulations, etc., and it is often difficult to isolate the appropriate policy levers. However, there remain some legitimate areas of policy concern.

One concern regarding the high proportion of investment funded out of retained earnings is that such patterns may make investment more sensitive to the economic cycle. A recession that reduces the level of retained profits may result in a lower level of investment in economies relying to a greater extent on internal sources of finance. We discuss this issue further in the next section.

On takeovers and corporate governance, there are legitimate grounds for concern regarding the vulnerability of UK managers arising from hostile takeovers. Some element of 'tenure' is as important to academics as it is to managers. The former often argue that without tenure great works of lasting significance (that might take years to complete) would be discouraged in favour of more frequent and less ambitious research outputs. Analogous arguments can be made in the case of managers. In the presence of incomplete information and incomplete contracts there may be lower expected returns

(to the *manager*, but not to the company nor even society) from investing in projects whose benefits are realized some way into the future. As Jenkinson and Mayer (1994) note, there is a distinction between static and dynamic efficiency: static efficiency requires managers to minimize costs and earn the highest current rate of return for shareholders given the capital stock of the firm; dynamic efficiency requires managers to pursue investment policies that maximize long-term shareholder value. A constant threat of hostile acquisition is likely to encourage static efficiency, although it is worth noting that numerous other spurs to static efficiency exist—such as product market competition. However, such threats may impair dynamic efficiency, particularly for companies with large long-term investment opportunities.

However, even in the presence of such problems, intervention by government may not be necessary. Shareholders of companies could, in principle, protect their managers from the threat of being ousted in the wake of a hostile takeover. While poison pills and various other US-style defences would contravene UK company law, it would be possible for shareholders to agree to changes in the articles of association of the company that would offer protection. For example, shareholders could agree to a 'self-denying ordinance' that removed their power to accept a hostile offer for some period of time. In order to avoid management entrenchment such self-restraint could be reviewed every few years in the light of actual management performance over the whole period. Such changes would not necessarily require a change in legislation, but they would certainly require a fundamental change in philosophy on the part of investors, in particular institutional investors.

In the absence of such action by shareholders (perhaps as a result of coordination difficulties), governments may well be tempted to use the levers at their discretion in an attempt to effect similar changes. For example, there have been suggestions that reducing the rate of capital gains tax (CGT) on long-term equity holdings (say, of over a year) would help to lengthen the time horizon of investors. However, such policies are likely to be of limited efficacy. An increasing proportion of UK equity investment takes place via tax-exempt funds, such as pension funds and personal equity plans, which pay no CGT anyway. Even those investors who do potentially pay CGT would not necessarily change their behaviour given the size of typical bid premia; even after tax, a bid premium of 25–30 per cent may well be too tempting. It is, in general, difficult to frame government policy in this area. Corporate governance is likely to be most effectively improved by the action of companies and investors themselves, as witnessed by the positive response to the Cadbury proposals. However, we have no illusions that proposals to limit the power of shareholders continuously to auction off their shares would require a fundamental change in attitude on the part of UK investors.

(iii) Macroeconomic Stability

The idea that macroeconomic instability is a serious impediment to investment remains influential in many discussions of government policy towards investment. As we saw in section IV, there is no theoretical consensus on the direct relationship between uncertainty and investment, and little empirical evidence on this issue. To what extent popular discussion properly distinguishes between the effects of uncertainty *per se*, as opposed to *pessimism* about the future level of returns to investment, may also be open to some doubt.

However, even if uncertainty *per se* is not a major impediment to investment, there are certainly ways in which macroeconomic instability can affect investment. As discussed by Schiantarelli in this issue, there is some evidence that financial constraints on investment are more severe during recessions, when the supply of internal finance from retained profits is low. Thus protracted periods of recession may reduce the overall level of investment by increasing the impact of financial constraints. Experience of protracted recessions may also directly reduce expectations of future levels of demand. The absence of complete indexation in contracts and the tax system means that high inflation may also reduce investment. Both the level of corporate tax payments and the impact of taxes on the cost of capital tend to increase with the rate of inflation.[35] Higher nominal interest payments, as well as higher tax

[35] See Bond *et al.* (1989).

payments, will tend to reduce the level of investment if the availability of internal finance is indeed an important determinant of investment.

There is also some empirical evidence that macroeconomic instability is associated with lower investment and/or lower average rates of growth. Baily (1978) suggested that macroeconomic stability had a positive effect on investment. Both Oulton (1995) and Ramey and Ramey (1995) suggest that OECD countries that have had either more variable or more skewed rates of growth have also tended to have lower average growth rates.[36] Certainly few commentators have argued that macroeconomic instability is good for investment.

Even if we accept this diagnosis, there remains a serious problem in translating this into a policy prescription—since different schools of thought hold more or less diametrically opposed views as to what macroeconomic policies should be pursued to promote stability. To Keynesian macroeconomists, this suggests counter-cyclical demand management policies aimed at dampening real fluctuations in output and employment. This is anathema to more classical economists who emphasize the importance of financial stability, and hence recommend stable monetary policies.

The logic underlying the latter view is that policy is impotent in relation to real stability, but quite capable of producing monetary instability, associated with high and variable rates of inflation and nominal interest rates. In the absence of complete indexation, this financial instability has real consequences that deter investment, and the best the government can do is to avoid such instability.

As with many macroeconomic questions, the essence of this disagreement lies in different views about the speed at which nominal wages and prices adjust to disturbances. If nominal adjustment is indeed very rapid, then business cycles cannot be caused by nominal shocks and cannot be moderated by monetary or fiscal policies. However if we maintain the view that there is a short run trade-off between output and inflation as a result of 'sticky' nominal wages and prices, then there may also be short run trade-off between output stability and inflation stability. If it is real rather than nominal stability that primarily matters for investment, then the strict pursuit of an inflation target may not promote the most favourable environment for investment.

We do not attempt to adjudicate between these conflicting prescriptions. Macroeconomic policy mistakes that aggravate recessions or fuel inflationary booms are unlikely to encourage investment. The record of macroeconomic management in the UK over the last 30 years is certainly suspect, with high interest rates and an overvalued exchange rate contributing to the last two recessions, and loose fiscal and monetary policies aggravating inflation in the late 1980s. Avoiding these mistakes in the future should have some benefit for investment. However, the ambiguity discussed above should caution against placing too much reliance on the notion that policies to promote a particular view of macroeconomic stability are the key to raising the level of investment.

VI. CONCLUSIONS

In this Assessment we have presented some comparative evidence on investment, particularly in Japan, Germany, the UK and the US. We have also reviewed some theoretical and empirical research on the role of investment, and on the impact of government policies on investment.

In considering the international evidence, it is clear that the UK stands out in a number of ways. The share of GDP allocated to capital formation is low by international standards, and this is associated with low levels of capital per worker and a low capital–output ratio. This is true both for the economy as a whole, and within manufacturing. The British approach to corporate control is also very different from that found in other developed countries, with widely diversified ownership of companies and a high level of merger and acquisition activity, particularly in the form of hostile takeovers. There is also evidence that UK firms finance a high share of their investment expenditure from internal sources, and pay out a high share of their profits as dividends to shareholders. The US is the one other developed

[36] Although Ramey and Ramey (1995) find that volatility is *not* associated with lower investment.

country with many similarities to the UK, and the US has also had a low share of investment in GDP by international standards in the last 35 years.

Whether or not it is accepted that the economy's growth rate can be permanently increased by devoting a higher share of resources to investment, it has long been widely agreed that investment plays a crucial role in the growth process. Traditionally this was reflected in the view that higher investment could move the economy on to a better growth path, with a higher capital–output ratio and higher productivity, associated with higher levels of output and consumption per head. The growth rate would be higher in the short run as these gains were achieved, but would return to normal in the longer run if the predictions of the Solow growth model were accepted.

More recently, proponents of endogenous growth models have shown how higher investment may also result in a permanently higher growth rate. This prediction generally relates to a broader notion of capital formation than conventional measures of fixed investment, and could also include spending on human capital formation (education and training) and knowledge capital formation (R & D and technology transfer). Moreover, this prediction remains controversial, as discussed by Crafts in this issue of the *Review*, and is by no means established by the existing empirical evidence.

It would be foolish to suggest that more investment is always and everywhere a good thing. Welfare depends directly on consumption rather than on investment, and postponing current consumption will only increase welfare if the return in the form of higher future consumption is sufficiently high. Nevertheless, our comparison of investment levels suggests that the balance of concerns for the UK is more likely to lie with investment being too low than too high.

In interpreting the international evidence, we have stressed that it is very difficult to disentangle causes from effects, and that various aspects of the investment picture are likely to be interrelated. It is easy to suggest that the UK system of corporate control—with relatively weak monitoring of companies by diversified shareholders and reliance on the hostile takeover mechanism—may be a reason for low levels of investment—perhaps because managers are unable to share fully in the returns from long-run investment projects, or because high dividend pay-out ratios exacerbate the impact of financing constraints. However, it remains difficult to point to evidence that convincingly establishes this case. It is also easy to counter that low investment demand is the result of other weaknesses—perhaps on the supply side in relation to education, training, and labour relations, or on the demand side in relation to inappropriate macroeconomic management. In our view the available empirical evidence neither confirms nor refutes these diagnoses, and there is likely to be some truth in both positions.

Even if we were convinced that corporate control was at the heart of the problem, we would caution that it would be very difficult to change this system quickly, and potentially disastrous to import some aspects of, say, the German system without major changes in other areas. For example, merely making hostile takeovers more difficult without ensuring that other effective monitoring arrangements were in place could produce an even worse outcome, with protected managements pursuing low-yield investments or postponing desirable innovations.

Given the obvious difficulties of reforming the entire financial system, we are led to consider less radical policy measures that may contribute to raising the level and/or improving the allocation of investment at the margin. Any supply-side improvements that increase the returns on investment spending can rightly be considered as investment policies. Fiscal and monetary policies that avoid the extremes of either aggravating recessions or fuelling inflationary booms are likely to encourage investment. Finally, tax reform stands out as one area where there is scope for reducing current distortions to company behaviour that discourage spending on investment.

REFERENCES

Abel, A. B., Dixit, A. K., Eberly, J. C., and Pindyck, R. S. (1995), 'Options, The Value of Capital and Investment', Working Paper 15-95, R. L. White Center for Financial Research, The Wharton School, University of Pennsylvania.

— Eberly, J. C. (1994), 'A Unified Model of Investment under Uncertainty', *American Economic Review*, **84**, 1369–84.

Arrow, K. J. (1968), 'Optimal Capital Policy with Irreversible Investment', in J. N. Wolfe (ed.) *Value, Capital and Growth: Papers in Honour of Sir John Hicks*, Edinburgh, Edinburgh University Press.

Baily, M. N. (1978), 'Stabilization Policy and Private Economic Behaviour', *Brookings Papers on Economic Activity*, **1**, 11–59.

Bank of England (1994), *Inflation Report*, May.

Bean, C. R. (1981), 'An Econometric Model of Manufacturing Investment in the UK', *Economic Journal*, **91**, 106–21.

Bernanke, B. S. (1983), 'Irreversibility, Uncertainty and Cyclical Investment', *Quarterly Journal of Economics*, **98**, 85–106.

Blanchard, O. J. (1993), 'Movements in the Equity Premium', *Brookings Papers on Economic Activity*, **2**, 75–138.

Blundell, R. W., Bond, S. R., and Meghir, C. (1996), 'Econometric Models of Company Investment', Ch. 26 of L. Matyas and P. Sevestre (eds), *The Econometrics of Panel Data* (2nd revised edn), Dordrecht, Kluwer Academic Publishers.

Bond, S. R., Denny, K., and Devereux, M. P. (1993), 'Capital Allowances and the Impact of Corporation Tax on Investment in the UK', *Fiscal Studies*, **14**(2), 1–14.

— Devereux, M. P., and Freeman, H. (1989), *Corporation Tax and Inflation: A Growing Burden for Business*, IFS Commentary No. 16, London, Institute for Fiscal Studies.

CBI (1994), *Realistic Returns: How do Manufacturers Assess New Investment?* Special Survey, Confederation of British Industry, London.

Chirinko, R. S. (1993), 'Business Fixed Investment Spending: A Critical Survey of Modelling Strategies, Empirical Results and Policy Implications', *Journal of Economic Literature*, **31**, 1875–911.

Copeland, T. E., and Weston, J. F. (1988), *Financial Theory and Corporate Policy*, Addison Wesley.

Corbett, J., and Jenkinson, T. J. (1996*a*), 'The Financing of Industry, 1970–89: An International Comparison', *Journal of the Japanese and International Economies*, **10**, 71–96.

— — (1996*b*), 'The Financing of Industry: An International Comparison', mimeo, University of Oxford.

Correia da Silva, L. (1995), 'Dividend Policy in Germany: Stylised Facts', mimeo, University of Oxford.

Cummins, J. G., Hassett, K. A., and Hubbard, R. G. (1994), 'A Reconsideration of Investment Behaviour using Tax Reforms as Natural Experiments', *Brookings Papers on Economic Activity*, **2**, 1–74.

DeLong, J. B., and Summers, L. H. (1991), 'Equipment Investment and Economic Growth', *Quarterly Journal of Economics*, **106**(2), 445–502.

DTI (1995), *Competitiveness: Forging Ahead*, Department of Trade and Industry, White Paper, Cm 2867, London, HMSO.

— (1996), *UK Investment Performance: Fact and Fallacy*, Department of Trade and Industry and Cabinet Office, Competitiveness Occasional Paper.

Dixit, A. K., and Pindyck, R. S. (1994), *Investment under Uncertainty*, Princeton, Princeton University Press.

Edwards, J. S. S. (1987), 'Recent Developments in the Theory of Corporate Finance', *Oxford Review of Economic Policy*, **3**(4), 1–12.

— Fischer, K. (1994), *The German Financial System*, Cambridge, Cambridge University Press.

Fazzari, S. M., Hubbard, R. G., and Petersen, B. C. (1988), 'Financing Constraints and Corporate Investment', *Brookings Papers on Economic Activity*, **1**, 141–95.

Feldstein, M. (1994), 'The Effects of Outbound Foreign Direct Investment on the Domestic Capital Stock', NBER working paper 4668.

— Horioka, C. (1980), 'Domestic Saving and International Capital Flows', *Economic Journal*, **90**, 314–29.

Franks, J., and Mayer, C. P. (1995), 'Ownership and Control', in H. Siebert (ed.), *Trends in Business Organisation: Do Participation and Cooperation Increase Competitiveness?*, Kiel, Mohr.

Hayashi, F. (1982), 'Tobin's Marginal q and Average q: A Neoclassical Interpretation', *Econometrica*, **50**, 213–24.

Hubbard, R. G. (1990), *Asymmetric Information, Corporate Finance and Investment*, University of Chicago Press.

Jenkinson, T. J. (1993), 'The Cost of Equity Finance: Conventional Wisdom Reconsidered', *Stock Exchange Quarterly*, Autumn, 23–7.

Jenkinson, T. J. (1994), 'The Equity Risk Premium and the Cost of Capital Debate in the UK Regulated Utilities', mimeo, University of Oxford.
— Mayer, C. P. (1994), *Hostile Takeovers*, McGraw-Hill.
Jensen, M. C. (1986), 'Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers', *American Economic Review* (Papers and Proceedings) **76**, 323–9.
Jorgenson, D. W. (1971), 'Econometric Studies of Investment Behaviour: A Survey', *Journal of Economic Literature*, **9**, 1111–47.
Kitson, M., and Michie, J. (1996), 'Britain's Industrial Performance since 1960: Underinvestment and Relative Decline', *The Economic Journal*, **106**, 196–212.
Maddison, A. (1991), *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press.
Meyer, J. R., and Kuh, E. (1957), *The Investment Decision*, Cambridge, MA, Harvard University Press.
Miles, D. (1993), 'Testing for Short-termism in the UK Stock Market', *The Economic Journal*, **103**, 1379–93.
— (1995), 'Testing for Short-termism in the UK Stock Market: A Reply', *The Economic Journal*, **105**, 1224–7.
Miller, M. H., and Modigliani, F. (1961), 'Dividend Policy, Growth and the Valuation of Shares', *Journal of Business*, **34**, 411–33.
Nickell, S. J. (1978), *The Investment Decisions of Firms*, Cambridge, Cambridge University Press.
O'Mahony, M. (1993*a*), 'Capital Stocks and Productivity in Industrial Nations', *National Institute Economic Review*, August, 108–17.
— (1993*b*), 'International Measures of Fixed Capital Stocks: A Five Country Study', National Institute of Economic and Social Research, Discussion Paper 51.
OECD (1991), *Taxing Profits in a Global Economy*, Paris, Organization for Economic Cooperation and Development.
Oulton, N. (1995), 'Supply Side Reform and UK Economic Growth: What Happened to the Miracle?', *National Institute Economic Review*, No. 154 (November), 53–70.
Rajan, R. G., and Zingales, L. (1995), 'What do we Know about Capital Structure? Some Evidence from International Data', *Journal of Finance*, **50**(5), 1421–60.
Ramey, G., and Ramey, V. A. (1995), 'Cross-country Evidence on the Link between Volatility and Growth', *American Economic Review*, **85**(5), 1138–51.
Satchell, S. E., and Damant, D. C. (1995), 'Testing for Short-termism in the UK Stock Market: A Comment', *The Economic Journal*, **105**, 1218–23.
Solow, R. M. (1956), 'A Contribution to the Theory of Economic Growth', *Quarterly Journal of Economics*, **70**, 65–94.
Summers, L. H. (1981), 'Taxation and Corporate Investment: A q Theory Approach', *Brookings Papers on Economic Activity*, **1**, 67–140.
Summers, R., and Heston, A. (1991), 'The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950–88', *Quarterly Journal of Economics*, May, 327–68.
Tobin, J. (1969), 'A General Equilibrium Approach to Monetary Theory', *Journal of Money, Credit and Banking*, **1**(1), 15–29.