Appendix A: Profitability and Related Data

As noted in Section III of the text, most of the data used in this paper is taken from the latest version of the ISDB electronic database from the OECD, which in turn takes it from each country's national product and wealth accounts. The ISDB covers the years from 1960 to 1994-96, depending on the country involved. In the case of the US the data was extended back to 1947 using compatible estimates available from the U.S. Bureau of Economic Analysis, and in the case of Japan certain missing items were extracted from various OECD publications and from the Historical Statistics of Japan. For reasons explained in section II, the gross capital stock was used throughout. As is standard, inflation is accounted for by adjusting profits for inventory valuation changes, and by calculating capital stocks in current replacement prices (which also permits an inflation adjustment to depreciation allowances). Finally, capacity utilization for Japan is the manufacturing operating rate from official sources, while that for the US is based on the my own estimates derived from the studies by Foss and from the same McGraw-Hill survey data upon which the official Federal Reserve Board measure is based. Details and the rationale for this procedure are explained in what follows.

I. Basic calculations

In the notation of the text, the basic series consists of manufacturing data (unless otherwise specified), for

P = profits = nominal net operating surplus; K = nominal gross capital stock; Y = nominal net value added; u = the rate of capacity utilization; Yc = Y/u = the nominal value of capacity output; Kr = real gross capital stock (physical items valued in prices obtaining in 1990); Yr = real net value added, and Yrc = Yr/u = real value of capacity output.

In general, real (i.e. constant price) measures are connected to nominal ones via corresponding price indexes, with 1990 as the base year: Yr = Y/p, Kr = K/pk, and GDPr = GDP/py, where

p = price index of manufacturing output price index; pk = price index of manufacturing capital stock; and py = the price index of total Gross Domestic Product (GDP)

From these, we can define the variable appearing in the empirical figures (Figure 5 represents a theoretical example) and tables in the text.

Figure 1: r = P/K = the observed nominal rate of profit = (P/Y)·(Y/K) = (profit share)A(output-capital ratio); and rc = r/u = the normal capacity rate of profit = (P/Y)·(Yc/K) = (profit share)A(capacity-capital ratio)

Figure 2: P/Y = the profit share in nominal output

Figure 3: R = Y/K = the nominal output-capital ratio; and Rc = Yc/K = the nominal capacity-capital ratio

Table 1: all of the variables shown in Figures 1-3

Figure 4: p/py = the price index of manufacturing output relative to that of total GDP, for the US.

Figure 6: Rr = Yr/Kr = the real output-capital ratio; Rrc = Yrc/Kr = the real capacity-output ratio

Figure 7: p/pk = the price index of manufacturing output relative to that of manufacturing capital stock, for the US.

Most variables were directly available, but net value added and profits for manufacturing were calculated, as follows.

Y = Yg - D = nominal net value added, where Yg = gross value added and D = depreciation (consumption of fixed capital).
P = Y - IBT - EC = nominal net operating surplus, where IBT = indirect business taxes and EC = employee compensation. IBT in turn was calculated by multiplying the published ratio of indirect business taxes to gross value added by gross value added.

II. Data sources and methods by country

The basic data is from the ISDB database of the OECD, version 98.1 (OECD 1998a). For each country, data was available or estimated for Y, IBT, EC, Yr, K, Kr, GDP, and GDPr. This was used to calculate profit (net operating surplus) P = Y – IBT – EC, and price indexes p = Y/Yr, pk = K/Kr, and py = GDP/GDPr.

1. Germany: data used was for West Germany only, 1960-1994, since post-unification is not comparable due to the inclusion of what was formerly East Germany. Data was directly available for Yg, Ygr, K, Kr, D, Dr, IBT/Y, and EC. This was used to calculate the manufacturing price indexes p = Yg/Ygr and pk = Kg/Kgr, p = Yg/Ygr , as well as all other necessary variables. No data was available for manufacturing capacity utilization u.

ii. Japan: Data was directly available from 1960-96 for Y, Kr, IBT/Y and EC. Ygr was directly available only from 1970-96, but earlier years from 1960-69 were available from BLS (1999), which matches exactly in the overlap year 1970. Manufacturing depreciation D was taken directly from the UN National Accounts (1994, Part I, Table 4.3) for 1980-94. For 1960-79, it was estimated by multiplying total consumption of fixed capital (Dtot) by the ratio of manufacturing output (Y) to total GDP, where Y was from the ISDB, GDP was from the OECD (1998) CD-ROM database, and Dtot was calculated from UN (1982, Part I, Tables 6 and 4, respectively, which list economy-wide totals and % manufacturing) for 1970-79, from UN (1974, Part I, Table 11) for 1963-69, and from UN (1970, Part I, T 9) for 1960-62. Finally, the manufacturing capital stock index pk was approximated as the implicit price deflator of gross capital formation for the *whole* economy, as calculated by taking the ratio of the nominal and real gross capital formation (OECD 1998). This estimated pk was then used to estimate the nominal gross capital stock K = Kr A pk, as well as to estimate real depreciation Dr = D/pk. Finally, manufacturing capacity utilization in Japan was taken to be the index of the operating rate in manufacturing, as shown for 1973-96 in JSY (1998, 1993/4, Table 7-40, 1990=100), and for 1960-72 from HSJ (1987, Vol 2, rebased from 1980=100 to 1990=100 by rescaling so that the data matches the 1973-96 series in the overlap year of 1980).

iii. US:

All variables were available for 1960-1996, except for nominal and real gross capital stock (K, Kr), which were available only until 1993 because the most recent publications from the BEA no longer list gross stocks. This data was then filled in for 1947-59 by taking Y, Yr, IBT, and EC from BEA (1995), K and D from BEA (1993, Tables A7 and A6, respectively, which match exactly in the overlap year of 1960), and Kr and Dr from the same source after being converted from 1987-$ to 1990-$. This last set of conversions was accomplished by using the nominal and real measures of capital and depreciation, respectively, to first calculate implicit price deflators for each in 1987-$, and then rescaling these price deflators so that their values matched those implicit in the ISDB data for the overlap year of 1960. The rescaled deflators were then used to recalculate Kr and Dr in 1990-$.

Finally, a new index for capacity utilization in the US was developed, as explained below.

## Appendix B: Capacity Utilization

Capitalist accumulation is inherently turbulent, subject to a variety of conjunctural factors such as wars, economic policies, and natural events. In addition, one must account for intrinsic fluctuations encompassing a variety of cycles such as short 3-5 yr. inventory cycles (which we nowadays call 'the' business cycle), medium 7-11 yr. cycles equipment cycles (which the classicals called 'the' business cycle), and possible longer ranging from 15-20 yr. cycles structures cycles to 40-50 long waves (van Duijn, 1983, ch 1). The purpose of adjusting for variations in capacity utilization is to be able to distinguish long term structural changes in the rate of profit from such cyclical and conjunctural fluctuations.

In this regard, it is useful to distinguish between 'engineering capacity', which is the maximum sustained production possible over some interval, and 'economic capacity', which is the lowest cost level of operation. For instance, the higher costs of a second shift may make it only most profitable to operate only one 40-hr shift a week. This would be the economic, or normal, capacity. But it may be physically feasible to operate 20 hours a day 7 days a week, for a total of 140-hrs per week. Thus an actual working week of 36 hrs would represent an economic capacity utilization rate of 90%, but an engineering capacity utilization rate of only 26% (Foss 1963, p. 25; Shapiro 1989, p. 184). It is the former which is relevant for capitalist decision making, since an economic capacity utilization persistently below 100% signals the need for a slowdown in further capacity expansion, while that persistently above 100% signals the need for accelerated expansion.

The problem of estimating economic capacity would be relatively simple if one could accept the widely held (neoclassical) assumption that, except for fluctuations arising from the short (3-5 yr) business cycle, capitalist economies generally operate at normal capacity. Indeed, this is the premise of the well- known Wharton method, which estimates 'capacity' as the peak output achieved in each business cycle or conjunctural fluctuation. This simply assumes that all short-run peaks in output represent the same level (100%) of capacity utilization (Hertzberg, et al, 1974; Schnader, 1984), thereby automatically excluding the very possibility of medium and long term variations in capacity utilization.

A second group of estimates tries to get around this problem by relying on economic surveys of operating rates, as in those by the Bureau of Economic Analysis (BEA) and the Bureau of the Census. Here, firms are typically asked to indicate their current operating rate, i.e. their current rate of utilization of capacity. The difficulty with such surveys is that they do not specify any explicit definition of what is meant by capacity. This means that not only are the respondents free to choose between various measures of capacity, but so too are the analysts who use this data -- in manners consistent with their theoretical premises. A typical case in point is the widely used Federal Reserve Board (FRB) measure of capacity utilization in manufacturing. It begins with a preliminary estimate of capacity by using two different surveys, one by McGraw-Hill (recently discontinued), and one by the Bureau of the Census. But in doing so, the Federal Reserve combines them in a way that appears to be sensible to it (i.e. to be consistent with its theoretical expectations), in a manner which it does not make public. Even so, it frequently finds that the resulting estimates of capacity utilization are less cyclical than it finds plausible, so it further operates on the estimated capacity figure to smooth it out, using regressions on the capital stock and on time (Shapiro 1989, pp. 185-188). Various other adjustments are also made so as to "move the capacity estimate from a peak engineering concept toward an economic concept" consistent with its underlying theory. It is one of the stated goals of these adjustments that the resulting measure of capacity utilization rate is not "chronically below 'normal' capacity utilization" (Shapiro 1989, pp.187-188). *In other words, just as in the case of the Wharton method, the operative premise here is that capitalism generally operates at or near full capacity.*

A third type measure sidesteps the difficulties inherent in the first two by attempting to directly measure the rate of capacity utilization. In a now classic study, Foss (1963) showed that it is possible to estimate capacity utilization by measuring the utilization rate of the electric motors which are used to drive capital equipment. Foss's initial estimates for selected years were subsequently developed into an annual series by

Jorgenson and Grilliches (1967) and then improved and extended by Christensen and Jorgenson (1969) to cover the period from 1929-1967, and by Shaikh (1992) to cover the period from 1909-1928. But there exists a major obstacle to the forward extension of this series: namely, that the data on the installed capacity of electric motors, which is crucial to the construction of the series, was dropped after the 1963 Census. It is here that I developed a method to extend the series, by combining certain key pieces of direct survey data with existing objective series on capital equipment motor usage. The annual McGraw-Hill survey on business plans yields two crucial bits of information: the annual additions to capacity in manufacturing (DCAP), and the annual proportion of gross investment which goes toward the expansion of capacity (E). These two series are widely used in research on capacity and investment spending, respectively (e.g. Feldstein and Foot, 1971). A key point concerns the interpretation of the additions to capacity DCAP: McGraw-Hill assumed that the survey responses refer to net additions to capacity, but found that then estimated capacity measure grew much more rapidly than seemed plausible. This, combined with the fact that the prior question on the survey refered to gross investment, led others to conclude that the survey response referred to gross, not net, additions to capacity (Rost, 1983).

If the survey responses of firms referred primarily to gross rather than net additions to capacity, then we could derive the true net additions by multiplying the gross additions (DCAP) by the proportion which goes towards capacity expansion (E). Cumulating these derived net expansions of capacity would give us a new index of capacity. On the other hand, if the survey response referred primarily to net additions, these could be cumulated directly (as the FRB both does and rejects). Without further evidence, it becomes a matter of choice based on other considerations. But we *do* have further evidence, at least for the first half of the postwar period, in the form of the electric motor utilization rate by Foss and others. And because of this, I assumed that the responses contain an unknown proportion p of gross and (1-p) of net additions, and then found the value of p which gave the greatest correspondence between the subjective survey based measures and the objective electric motor utilization rate, over their period of overlap from 1947-1962. Interestingly, the optimal value turns out to be p=1, so that the survey responses seem to refer to gross additions, just as Rost concludes. This then allowed me to splice the electric motor use and the McGraw-Hill measures to create a complete capacity utilization series from 1947-1985 (Shaikh 1992). For the purposes of this paper, the measure was further extended to 1994 by regressing my measure on the FRB measure. Further detail is provided in Shaikh (1987, 1992), and further discussion of the subject can be found in Winston (1974), Gabish and Lorenz (1989, pp. 26-40), and Tsaliki and Tsoulfidis (1999).

Figure 1 depicts my measure (UMH1) and the Federal Reserve Board measure (UFRB). As is to be expected, the principal differences are in longer run patterns, as in the Vietnam War buildup during the 1960's, and post-Reagan profit boom from the 1980's onward. Unlike the FRB measure, mine is neither symmetric nor stationary over the long run, and it exhibits much greater fluctuations.

(Figure 8 about here)

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