THE EVOLUTION AND DETERMINANTS OF CORPORATE PROFITS: AN INTERNATIONAL COMPARISON

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Abstract

This paper compares the trends and determinants of U.S. profits with those of Japan, Germany and Canada in a model of pricing-to-market in the export and domestic markets. We find that (i) all countries exhibit a negative-trended profit share; (ii) pass-through is incomplete for all countries, and exchange rate elasticities are larger in smaller countries; (iii) a currency appreciation hurts U.S. profits and helps Japanese profits via imported inputs channel; (iv) during the 1970s unit production costs lowered profits in all countries. After 1980, cost factors still affected profits except in the U.S. where loss of competitiveness due to lower real import prices depressed profits.

JEL Classification F40, F41
Key words: corporate profits, exchange rates, pass-through.

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Throughout the last decade the decline in U.S. corporate profits has caused concern among policymakers. From the mid-1970s to the 1990s the profit share of GNP fell by about 15 percent. Is this decline also reflected in other industrialized countries or is this purely a U.S. phenomenon? What are the factors behind this decline? This paper answers these questions by comparing the trends and the determinants of U.S. profits with those of Japan, Germany and Canada.

Profits are one of the key elements in the cyclical growth of economies because of the effect they have on investment and saving behavior, and therefore on capacity, productivity and competitiveness. The evolution of profits and relative income shares gives information about the cash flow position of firms, which may affect business investment. Chart 1 shows the close link between the U.S. profit share, defined as the ratio of nonfinancial gross operating surplus to output, and investment, defined as the ratio of gross private investment to output. Most of the turning points in the investment ratio coincide with or are preceded by turning points in the profit ratio. It is argued that this close link suggests that the decline in the profit share may be an important determinants of changes in investment.

Current literature offers surprisingly few studies of profit rates. A large body of literature is devoted to the study of "pricing-to-market", which encompasses price discrimination across destination markets, the "pass-through" effect, but does not address the feedback to profits.[1] Another approach is to analyze a related concept, the rate of return, defined as the ratio of the gross operating surplus to the replacement value of capital.[2]

Although the concept of the rate of return is more relevant for investment purposes, problems in measuring the stock of capital across countries make international comparisons difficult and ambiguous. Moreover, in the short run, the capital-output ratio typically does not change significantly. Therefore, several analyses use the ratio of profits to GNP with validity in profitability

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[1]See Krugman (1987), Baldwin (1988), Giovannini (1988) Froot and Klemperer (1989), Knetter (1989, 1993), Marston (1990), to name just a few.

[2]Dumenil, Glick and Levy (1991), and Uctum (1994) analyze the U.S. rate of return. For earlier studies of the capital return in the United States, see Nordhaus (1974), Feldstein and Summers (1977) and Liebling (1979). Real profits in the US manufacturing sector have been analyzed by Clarida (1992) and Hung (1993), who find a negative relationship between dollar strength and U.S. manufacturing profits.

measures.[3] In this paper, we adopt the latter approach and define profits as the ratio of gross operating surplus to nominal output.

Following Clarida (1990) we use Marston's (1990) model of pricing-to-market to analyze profits. However, unlike both studies, this analysis explicitly models imported inputs and alternative definitions of relative prices, and tests their significance in determining profits. The contribution of this study to the literature is threefold. First, we show that the exchange rate affects the price of domestic goods even under constant marginal cost. This result contrasts with most studies of pricing-to-market,[4] which assert that the exchange rate effect on domestic prices exists only under increasing marginal cost. Second, we add an international dimension to the empirical analysis by examining profit ratios across countries. Finally, we explore not only the effects on profits of exchange rates and relative prices but also that of production costs, such as unit labor and energy costs. It turns out that the impact of these costs is often substantially higher than that of relative prices or exchange rates, factors that have attracted much attention in the past.

In the first section we briefly review the stylized facts characterizing profits in each country. We show that profit rates in the United States, Japan, Canada and Germany do not exhibit a converging pattern. In the second section we lay out a theoretical model of imperfect competition in which firms discriminate between export and domestic markets. We analyze the implications for profits of pricing behavior under alternative assumptions about market structure. We show that if firms compete monopolistically in domestic and foreign markets, the relevant price ratio to the firm is the real exchange rate. If firms act as a single monopolist in the domestic market but compete monopolistically abroad, a second price ratio, import price relative to domestic goods price, has to be included as an explanatory variable.

In the paper's last section we conduct an empirical study to distinguish between models. We reach several conclusions. First, pass-through of exchange rate to profits is incomplete for all countries, and exchange rate elasticities of profits are in general larger in smaller countries like Canada and Germany because of higher foreign demand elasticities and/or larger pass-through coefficients. Second, a currency appreciation is likely to hurt U.S. profits while it helps Japanese profits by reducing the cost of imported inputs by more than export revenue. Third, during the 1970s production costs, in particular

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[3]See Okun and Perry (1970), Nordhaus (1974).

[4]See footnote 1.

unit energy cost, depressed profits in all four countries. Over the 1980s, cost factors continued to be the major factor behind changes in profits except in the United States, where loss of competitiveness caused by a decline in real import prices played an important role in the fall of profits. Finally, the significance of the negative trend in each country shows that the decline in the profit share is not a purely U.S. phenomenon. Since the 1970s profit shares in the other three countries exhibit an even steeper negative trend.

I. Stylized facts

Far from being a recent phenomenon, the decline in the U.S. profit share goes back to the 1950s (Chart 2). During the second half of this century the profit share dropped by almost 50 percent. Although a historical approach to the determinants of profits would be of great interest, this paper emphasizes the more recent history covering the last two decades.

More recently, profits varied widely over time and across countries (Chart 3). Both German and Japanese profit shares experienced a sharp drop following the first oil price shock and recovered thereafter. Profit shares in the United States and Canada, however, were on average higher in the late 1970s than in the 1980s[5].

Traditionally, profits are considered to be procyclical and changes in the profit share are attributed to changes in the economic growth rate. An increase in output increases firms' revenue and thus profit. Although cyclical factors may explain some of the decline in part of our sample, they do not account for the changes that occurred in the full sample for all the countries. The period after the 1980s in the United States provides a typical example. Following the 1979-82 cycle, the U.S. profit share continued to fall despite the economic recovery (shaded areas in Chart 3).

Another popular argument is that profits are hurt by a loss of competitiveness. In this view, the real appreciation of the dollar in the 1980s made consumers switch their consumption from domestic goods to imported goods

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[5]At a first glance, it may seem odd that the nonfinancial corporate profit share in Canada is much lower than in the United States despite high capital mobility between the two countries. However, a close investigation of the data reveals that the Canadian corporate profit share tracts its U.S. counterpart closely. The difference depicted in Chart 3 is thus a reflection of substantially larger financial corporate profits in Canada. This result is not surprising since Canadian financial sector is largely dominated by the banking sector which is typically characterized by a small number of banks.

and, therefore, reduced profits of U.S. producers. However, the competitiveness argument is also only partially supported by international evidence. Chart 4 displays for each country the profit share and the real exchange rate, defined as the ratio of foreign consumer price index (CPI) in domestic currency to the domestic GDP deflator. Again, in the case of the United States, the profit share continued to deteriorate despite the real depreciation of the dollar in the latter half of the 1980s and the early 1990s.

Cyclical factors and relative prices are thus part, but not all, of the explanation for the trends in profits. We need to look further into the macroeconomic factors. In the next section we lay out a theoretical framework to derive the determinants of profits.

II. The Model

We assume that production activity is carried out by firms that produce and sell a differentiated product both at home and abroad, and can price-discriminate between the home country and the destination country. In such a framework the relative price term will depend on the market structure in which the firms operate. Following Marston (1990), the firm maximizes its profits Π_i, defined as

$$(1) \quad \Pi_i = P_{hi}H(T_i, Y) + SP_{xi}F(T_i^*, Y^*) - (C+SE)(H(.)+F(.))$$

where P_{hi} and P_{xi} are the prices at which firm i sells at home and abroad, in respective local currencies; S is the exchange rate defined as the foreign value of domestic currency (an increase in S represents a depreciation of the currency); H and F are domestic and foreign demand for the firm's product; Y and Y^* are domestic and foreign income. T_i and T_i^* are relative prices paid by consumers for the product at home and in the destination country. We will introduce a modification to Marston's model when we define these variables below in more detail.

Demand in the domestic and export markets is decreasing in price and decreasing in income, and revenue functions are concave. The last term on the right-hand side of (1) represents total costs faced by the firm, consisting of total labor cost and the energy bill. C is unit labor cost, incorporating any changes in productivity, and E is unit energy cost, defined in foreign currency (usually in dollars). Both costs are linearly increasing in output. It is also assumed that domestic firms are in a Bertrand-type of competition and do not react to each other's price change.

Log-linearization of equation (1) gives profit function in real terms:

$$(2) \qquad \pi = a_1 h + a_2 f + a_3(p_h - p) + a_4(s + p_x - p) - [a_5(c-p) + a_6(e+s-p)]$$

where lowercase letters denote variables in logarithm, p is the domestic price index, and the subscript i has been suppressed for convenience. The elasticities of the profit function with respect to its components are defined as follows:

$a_1=\pi^{-1}H(P_h-MC)$; $a_2=\pi^{-1}F(SP_x-MC)$; $a_3=\pi^{-1}(P_hH)$;
$a_4=\pi^{-1}(SP_xF)$; $a_5=\pi^{-1}C(H+F)$; $a_6=\pi^{-1}SE(H+F)$;
$MC=C+SE$.

All coefficients are positive and the following constraints hold by virtue of linearization: output elasticities sum to one, and they are less than price elasticities, ie., $a_1+a_2=1$, $a_1<a_3$ and $a_2<a_4$; the sum of price elasticities exceeds one, by a magnitude equal to the sum of cost elasticities, i.e., $a_3+a_4=1+a_5+a_6$.

The first-order conditions give prices as markups over the firm's marginal cost of production, C+SE. Both markups, $M=(\varepsilon/\varepsilon-1)$ and $N=(\varepsilon^*/\varepsilon^*-1)$, are defined in terms of price elasticities in the domestic market (ε) and foreign market (ε^*). Pricing-to-market requires markups to change with elasticities, which in turn vary with demand. Any convex or linear demand curve implies a negative relation between prices and markups, and a positive relation between income and markups. With a linear cost function, marginal cost is constant and prices thus can be written

$$(3) \qquad P_{hi} = (C+SE)\, M(T_i, Y) \qquad M_1<0,\ M_2>0$$

$$(4) \qquad SP_{xi} = (C+SE)\, N(T_i^*, Y^*) \qquad N_1<0,\ N_2>0.$$

If the firm is monopolistically competitive at home, it is producing a good that is differentiated from other domestic goods and imported goods. Therefore, it has to compete in prices with both domestic and foreign competitors in the domestic market. This can be captured in the simplest way by expressing the T_i as the ratio of the firm's price P_{hi} to an economy-wide price index that is a geometrically weighted average of domestic prices P_H and import prices P_m^* expressed in domestic currency:

$$(5) \qquad T_i = P_{hi}/[P_H^{\omega}(SP_m^*)^{1-\omega}] = P_{hi}/P,$$

where $P_H=P_{h1}^{\alpha 1}\ P_{h2}^{\alpha 2}\ \ldots\ P_{hn}^{\alpha n}$ is a geometrically weighted average of domestic competitors' prices (with α_1, α_2... being respective weights of domestic producers). The denominator can be approximated with the CPI which is a price index containing imported goods prices. With a domestic monopolist $\alpha_1=\alpha_2=...=\alpha_n=0$, therefore

$$(6) \quad T_i = (P_H/SP_m^*)^{1-\lambda} = (P_{hi}/SP_{m*})^{1-\lambda}.$$

Similarly, if the firm is monopolistically competing with other exporters in the country of destination, the relative price faced by foreign residents T_i^* is the ratio of the firm's price P_{xi} to an aggregate price index that is a geometrically weighted average of the destination country's domestic prices P_H^* and the foreign competitors prices P_x, both defined in terms of the local currency:

$$(7) \quad T_i^* = P_{xi}/P_H^{*\omega}P_x^{1-\omega} = P_{xi}/P^*$$

where $P_x=P_{x1}^{\alpha 1}\ P_{x2}^{\alpha 2}\ ...\ P_{xn}^{\alpha n}$ is a weighted average of foreign competitors' prices in the destination country. Again, the denominator can be approximated with the CPI of the foreign country. If the firm is the sole exporter to that country, then $\alpha_1=\alpha_2=...=\alpha_n=0$ and

$$(8) \quad T_i^* = (P_x/P_H^*)^{\omega} = (P_{xi}/P_H^*)^{\omega}.$$

Depending on the specification of the relative price term that reflects the market structure, we can express the first-order conditions and therefore profits in three different ways:

(i) *The firm competes monopolistically in domestic and foreign markets.* In this case domestic and foreign relative prices are described by equations (5) and (7), and can be interpreted as the ratio of the product price to the CPI of the country of destination. This case is analogous to Marston's specification with constant marginal cost. Replacing them into equations (3) and (4) and log-linearizing gives the optimal domestic and foreign prices charged by the firm:

$$(9) \quad p_h = (1-k)p + k[\theta y+\lambda c+(1-\lambda)(s+e)]$$

$$(10) \quad p_x = (1-k^*)p^* - k^*s + k^*[\theta^* y^*+\lambda c+(1-\lambda)(s+e)]$$

$k=1/(1-\delta)$ and $k^*=1/(1-\delta^*)$, where δ and δ^* are elasticities of domestic and foreign markups with respect to prices, and are negative because of the convexity of demand. Therefore, $0<k,k^*<1$. $\theta,\theta^*>0$, are elasticities of both markups with respect to income, and $\lambda=C/MC$, $1-\lambda=SE/MC$, are relative weights of labor and energy in total marginal cost.

The exchange rate may affect prices through cost and/or price channels. In equations (9) and (10) the cost effect occurs through the imported input price. A depreciation of the currency pushes the cost of this input up, which is passed along less than proportionally in the form of increased domestic and foreign prices. Note that since marginal cost is constant, there are no cross effects, and without an imported input, the exchange rate would not affect the domestic price.

In equation (10), the negative sign in front of s illustrates the pass-through effect. Firms reduce their export price as a result of depreciation. The typical pass-through argument is as follows: pass-through is complete if k^*, the pass-through coefficient, is equal to 1. Then, the export price decreases one-to-one with the depreciation. This represents the case where the foreign markup is inelastic with respect to prices ($\delta^*=0$) which, in turn, occurs with constant elasticity foreign demand. For any $\delta^*<0$, pass-through is incomplete, and the more inelastic is foreign demand, the less the firm will be able to pass the exchange rate changes along to its price. In our framework, however, even if the markup coefficient were equal to 1, pass-through to the price is always incomplete, since the firm adjusts its price upwards by $1-\lambda$, the share of the imported input in marginal cost, to account for the rising cost of production.

Both prices rise through the markup effect following an increase in the income of the respective countries. An increase in either of the production costs leads the firm to raise its prices in both markets. A rise in the foreign CPI induces the firm to increase its foreign markup and therefore the export price less than proportionally. If the domestic currency depreciates simultaneously and proportionally, the net effect on the markup will still be positive.

(ii) *The firm is a monopolist in the domestic market but competes monopolistically in the foreign market.* The relative price equations are (6) and (7), which, upon substitution, give the following optimal pricing in each market:

(11) $p_h = (1-k)(s+p_m^*) + k[\theta y+\lambda c+(1-\lambda)(s+e)]$

(12) $p_x = (1-k^*)p^* - k^*s + k^*[\theta^* y^*+\lambda c+(1-\lambda)(s+e)]$.

Since equation (12) is the same as equation (10), the difference of this specification arises from equation (11). The exchange rate now also enters into the determination of the domestic price through the translation of import prices to local currency. A rise in import prices or a depreciation reduces the relative value of the domestic product and leads to an increase of the markup over marginal cost. This increase, in turn, raises the domestic price. Thus, despite a linear cost, a change in the exchange rate is passed along to the price of the good destined for the domestic market through a noncost term.

(iii) *The firm is a monopolist in the domestic and foreign markets.* The relevant price equations are (6) and (8) and the firm discriminates among the consumers by charging the prices

$$(13)\quad p_h = (1-k)(s+p_m^*) + k[\theta y+\lambda c+(1-\lambda)(s+e)]$$

$$(14)\quad p_x = (1-k^*)p_h^* - k^*s + k^*[\theta^* y^*+\lambda c+(1-\lambda)(s+e)]$$

As previously, the exchange rate affects the domestic price through import prices, and equation (13) is the same as (11). The main distinction in this specification comes from replacing P^*, the CPI in the foreign country, by p_h^*, the foreign currency price of the goods sold by foreign companies in their country of origin.

Substituting the first-order conditions into equation (2), we obtain the following general specification for the profit equation:[6]

$$(15)\quad \pi = \alpha_0(s+p_m^*-p) + \alpha_1(s+p^*-p) + \alpha_2 y + \alpha_3 y^* - [\alpha_4(c-p)+\alpha_5(e+s-p)]$$

The elasticities of the profit function with respect to its arguments are

$\alpha_0=a_1k\varepsilon+a_3(1-k)$; $\alpha_1=a_2k^*\varepsilon^*+a_4(1-k^*)$; $\alpha_2=a_1(\mu-k\varepsilon\theta)+a_3k\theta$;
$\alpha_3=a_2(\mu^*-k^*\varepsilon^*\theta^*)+a_4k^*\theta^*$; $\alpha_4=[(a_1\varepsilon-a_3)k+(a_2\varepsilon^*-a_4)k^*+a_5]\lambda$;
$\alpha_5=[(a_1\varepsilon-a_3)k+(a_2\varepsilon^*-a_4)k^*+a_6](1-\lambda)$;

with ε, μ, and ε^*, μ^* standing for price and income elasticities, at home and in

[6]Since the case of a monopolist in both the domestic market and the export market is an unlikely hypothesis, we will not use the resulting profit function in the estimation part. The expression of the profit function in this case is similar to equation (15) except that P^*, the CPI in the foreign country, is now replaced by P_h^*, the local currency price of goods sold by foreign companies in their country of origin.

the destination country, respectively.

A real depreciation affects profits through three channels: valuation, volume and cost channels.[7] The first two channels appear in both α_0 and α_1. Let us start by analyzing α_1, which is common to firms in all market structures. A depreciation of the currency leads the firm to lower its foreign currency price of exports, a move that increases its sales and hence profits (volume channel). The depreciation of the currency also raises the domestic currency value of exports, improving profits in domestic currency (valuation channel). The magnitude of this effect depends on the degree to which firms pass through the exchange rate effects to the foreign currency price of their exports. As k^* tends to 1, pass-through will be larger, and therefore the valuation effect will be smaller and the volume effect larger. In any case, the sum of both effects is positive, implying that everything else being constant, a depreciation of the currency benefits profits.

In the case of a domestic monopolist, the pass-through effect on profits of a change in the exchange rate is now reinforced through the import price effect α_0. A depreciation increases the domestic price of imported goods, thereby raising demand for domestic substitutes and boosting profits (volume effect). As a result of a rise in the foreign competitors' price, the monopolist firm also raises the domestic markup over marginal cost and hence increases the domestic price and profits through the valuation channel. Since the monopolist increases the domestic price less than proportionally to the import price, the volume effect is not reversed, and the sum of the volume and valuation effects remains positive.

The third channel through which the exchange rate affects profits is imported inputs. The corresponding cost elasticity, α_5, may dampen the positive effect of the exchange rate on profits. However, following a depreciation, a rise in the domestic currency cost of the imported input is unlikely to dominate the relative price effect(s), since the cost elasticities of both factors are not unambiguously positive. A rise in the unit labor cost or unit energy cost has a direct effect (a_5 and a_6) that reduces profits. A rise in production cost leads the firm to raise both markups and pass the increase in cost to its prices. The rise in prices causes a decline in domestic and foreign demand, reducing

[7]The envelope theorem implies that for infinitesimal changes the indirect effects should be zero at the optimum. However, changes in relative prices and production costs are typically large and persistent enough to make the first-order approximation invalid, and to move the firm to a new optimum. We therefore relax the restrictive assumptions imposed by the envelope property of the optimization problem and allow volume effects.

profits (volume effect). These two effects go in the same direction. Nevertheless, the markup effect also puts an upward pressure on profits through the value effect. If domestic and foreign price elasticities are sufficiently high to allow the first two effects to dominate the price effect following a rise in the unit production cost, the net effect will be negative. If, however, the relative weight of imported input cost in total cost is sufficiently large, a depreciation may hurt profits.

Domestic and foreign income enter the profit equation in three ways. The first is the direct demand effect. Higher income raises demand for goods and improves profits. The two other effects are the indirect markup effects. As domestic (foreign) income rises, the firm increases its domestic (foreign) markup, and thus prices. The price effect raises profits through the valuation effect, but also reduces them by decreasing demand (volume effect). Since the price elasticity of demand decreases with income, the first effect is likely to dominate the second effect, and the net effect of a rise in domestic or foreign income should be a rise in profits.

III. Data, Methodology, and Estimation Results

In this section we estimate and compare profit functions for the United States, Japan, Germany, and Canada. The data cover the period 1970-91 and are reported quarterly, except for Germany; the German data reported annually, have been converted to quarterly values. Sources from which data have been collected and computed are presented in the Appendix.

The theoretical analysis presented above indicates three hypotheses concerning sizes/significance of the coefficients α_0, α_1, and α_5. The first testable hypothesis is $\alpha_0=0$ if firms are monopolistically competing both at home and abroad, and $\alpha_0>0$ if firms act as a monopolist in the domestic market but compete with other exporters in the country of destination. Furthermore, α_0 will be larger the more elastic is domestic demand and/or the higher is the domestic pass-through coefficient 1-k.[8] We conjecture therefore that, given k, α_0 will be larger in a country like the United States with a large domestic demand than, say, in Japan.

The second hypothesis is that in countries facing a relatively elastic

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[8]The last statement comes from differentiating α_0 with respect to k: $d\alpha_0/dk=a_1\varepsilon-a_3>0$ since $a_3<a_1$ and $\varepsilon>1$ from the profit maximization problem of the monopolist.

foreign demand, α_1 will be larger because the volume effect is larger than in countries facing a less elastic foreign demand. Therefore, we expect that smaller countries like (West) Germany and Canada will have a relatively more elastic foreign demand than the United States and Japan and, consequently, a larger exchange rate elasticity of profits α_1. Here also, the more elastic the foreign demand and/or the larger the pass-through coefficient, the larger is α_1.

Finally, the third hypothesis is that α_5, the elasticity of profits with respect to energy cost, will be larger in major oil importing countries such as Japan and Germany. Furthermore, the larger this elasticity, the more likely that a depreciation of the currency will hurt profits.

For the standard asymptotic theory to be valid, the variables used in the regression equation must be stationary or transformed into stationary variables. The results of the stationarity tests, the Augmented Dickey Fuller (ADF) t-test are presented in Table 1. The critical values come from Dickey and Fuller (1979). The ADF test statistic does not reject the null hypothesis of non-stationarity for all variables at the 5 percent significance level, except for y., which is not rejected at the 10 percent significance level. Furthermore, test results reject the null hypothesis for the first-differenced variables, indicating that all variables are I(1), or integrated of order 1.

If variables are I(1), they must be cointegrated in order to use standard regression analysis, meaning the regression error must be stationary. We thus seek a cointegrated relation between the profit ratio and its determinants that will give us a long-term stable relation between these variables while abstracting from short-run dynamics.

Table 2 shows the estimation results and the specification chosen for each country. Figures in parentheses are t-statistics based on Newey-West adjusted standard errors to account for heteroscedasticity.

The model explains the behavior of the profit ratios reasonably well over the sample period, as indicated by the adjusted R^2, in particular in Japan and Canada. The ADF statistics reject the null hypothesis of a unit root in residuals at the 5 percent significance level for three countries and at the 10% significance level for the United States. The test results thus indicate that the specification chosen for each country represents a stable, long-term relation between variables. We anticipated some differences across countries in the coefficient magnitudes because of international differences in data, but most of the coefficients fall in the expected range and are comparable.[9]

The test results of the first hypothesis show that in the United States and, to a lesser extent, in Japan, both the relative import price and the real exchange rate enter the regression equation significantly, while in the Canadian and the German equations only the real exchange rate appears.

The second hypothesis asserts that a more elastic foreign demand makes small countries likely to have larger real exchange rate elasticities. This hypothesis is verified by the α_1 coefficients in Germany and Canada, which are larger than those in the United States and Japan.

Thus, consistent with the implications of the theoretical model, estimation results indicate that a 1 percent real depreciation of the currency, all else being constant, raises profits in all countries, although more in Germany and Canada than in the United States and Japan. In Japan and the United States the overall exchange rate effects are 0.54 percent (0.23+0.31) and 0.35 percent (0.17+0.18), respectively. These numbers compare with 1.11% for Canada and 0.72% for Germany.

Regression results also support the third hypothesis, which states that α_5 is larger in oil-dependent countries. In Germany and Japan the elasticity of the profit share with respect to unit energy cost is at least double the size of the same elasticity in the U.S. and the Canadian equations. Thus, the effect of an exchange rate change net of imported input is different across countries. This effect remains the same for the United States since energy cost is denominated in U.S. dollars. In Japan, where energy cost is a substantial component of the profit equation, a 1 percent rise in oil prices reduces corporate profits in yen by 0.4 percent. A change in the value of the currency has therefore opposite effects on U.S. and Japanese profits. A 1 percent appreciation of the dollar hurts U.S. profits by reducing them by about 0.5 percent, while a 1 percent appreciation of the yen increases Japanese profits in this country by 0.04 percent since it reduces the imported input cost by more than the fall in total export revenue. The difference between the U.S. and Japanese exchange rate elasticities of profits may explain why an overvalued currency is sustainable for a longer period in Japan than in the United States.

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[9]Elasticities in the Canadian equation are in general larger than in the other equations because with corporate profits being a much smaller share of the economy in Canada (see footnote 7), a given change in an independent variable has a larger proportional impact on the profit share than in any other country. This is more noticeable with the labor cost elasticity since the share of the labor cost in the Canadian economy is also larger than in other countries.

A 1 percent real depreciation of the currency raises profits proportionally in Canada, while it increases profits by 0.5 percent in Germany net of the imported input cost. Despite differences in country sizes between Germany and the United States, the high cost component in German profits makes the net effect of the exchange rate change in this country comparable with that in the United States.

The two other factors that affect profits are unit labor cost and domestic income. Labor cost is one of the most important determinants of profits. A 1 percent decline in this cost raises profits proportionally in the United States and Germany, and increases them by about 2 percent in Japan and 7 percent in Canada. The relevance of the domestic income term varies across countries. For both the United States and Germany the LR test statistics did not reject the zero coefficient hypothesis on this variable at the 5 percent significance level. National income, however, is a significant component of the profit equation for Japan and Canada. A 1 percent expansion in income raises profits more than proportionally in both Japan and Canada.[10]

Foreign income was in general insignificant and the likelihood ratio (LR) test statistic did not reject a zero coefficient for this variable for all countries except the United States. In the U.S. equation, we nevertheless had to drop foreign income because it is multicollinear with the real exchange rate, which is a more important variable for our analysis. The absence of foreign income from the regression equations amounts to assuming that foreign demands are additively separable in income.

Note that the trend-decline in the U.S. profits is also evident in the profit ratios of the other three countries. The trend variable is highly significant in all countries and substantiates a general downward drift of the profit shares. In fact, the downward trend is even more pronounced in the other countries than in the United States.

Variations in Coefficients over Time

Because all four economies had to deal with two supply shocks and several slowdowns/recessions over the sample period, it would be interesting to see how the importance of the determinants of profits evolved over time. To capture the

[10]Note that if the regressions are run with real profits as the dependent variable instead of the profit rate (expressed in this paper as the ratio of the gross operating surplus to nominal GNP), the income elasticity of profits is larger and more significant than the current ones.

effect of exogenous shocks to economies we reestimated the model by dividing the sample into two periods. The first subsample includes the two oil-price shocks. It starts at the beginning of the sample period (1970 q1) for all countries and ends at the trough of the third economic cycle, which varies between 1982 q4 and 1983 q4 depending on the country. The second subsample starts right after the last trough and goes until the end of the sample period.

Table 3 presents estimation results of the profit equations for the two subperiods. The prediction failure test based on the forecast version of the Chow test is used to test general specification error (Chow 1960). The corresponding F_{PF} test statistic for Japan, Canada and Germany rejects at the 5 percent significance level the null hypothesis of prediction failure, indicating that the model is well specified in general. For the United States, on the other hand, the test result is less clear-cut. It falls short of rejecting the null at the 10 percent significance level. However, if we divide the subsample from peak to peak the model appears to be well specified. We expected to find instability in the regression coefficients due to structural breaks caused by supply shocks. Chow test results show that coefficients are, in fact, unstable in the case of Germany and the United States, but they remain statistically stable for Japan and Canada. The corresponding F_{SS} test statistic (Chow 1960) rejects the null hypothesis of unchanged coefficients for Germany and the United States, and fails to reject the null for the two other countries at the 5 percent significance level.

Although small-sample bias reduces the power of the diagnostic and cointegration tests, we nevertheless report them to give an idea of the evolution of the variables' significance. Regression results show that both in Japan and the United States the significance of the real exchange rate declines in the second subperiod. In contrast, real import price gains importance over the last decade in both countries.

Production costs in both countries follow an opposite trend to import prices. They appear to be the most important determinants of profits in the first subsample while their weight and significance regress in the second subsample. Despite a real depreciation of the dollar in the latter half of this period and a substantial decline in both unit labor cost and unit energy cost, estimation results indicate that almost half of the 8 percent decline in the US profit share between 1983 and 1991 can be attributed to a 17 percent decline in the real import price. This finding suggest that the real depreciation of the currency has not been sufficient to compensate the fall in import prices.

In Japan, by contrast, during the second subperiod, domestic demand and favorable production costs outweighed the downward pressure on profits caused by lower import prices. Most of the 17 percent rise in the profit share can be attributed to strong demand and substantially lower unit labor and energy costs. Between 1983 and 1991, cost factors alone improved profits by 12 percent, by declining a combined 16 percent.

Breaking with trends in the other three countries, labor cost in Canada emerges as the most important determinant of profits in both subperiods, and it increases in importance in the second subperiod. The significance of domestic demand and the real exchange rate declines in the second subperiod while labor cost alone explains roughly one third of the 17 percent fall in corporate profits. Trends in Germany in part track those in the United States and Japan. German production costs decline in importance over time, though they are significant in both subperiods. The influence of the real exchange rate on German profits increases over time. As in the United States, despite decreasing production costs, corporate profits declined by 8% between 1983-1991, half of which can be attributed to a 4% real appreciation of the DM.

IV. Conclusion

Profits influence investment and saving behavior very directly. The findings in this paper show that the factors that may be driving profit shares may vary across time and across countries. Policymakers seeking to stimulate investment must have a clear understanding of national profits to recognize the trends and the factors driving them in order to design an appropriate policy mix.

In this paper we developed a theoretical model and analyzed empirically the factors affecting profit shares in the United States, Japan, Germany and Canada since the 1970s. We found that profit shares follow different paths through time across countries. Both German and Japanese profit shares experienced a sharp drop following the first oil price shock and recovered thereafter. Profit shares in the United States and Canada were on average higher in the late 1970s than in the 1980s. In the early 1970s cost factors specifically, unit labor and energy costs put a downward pressure on profits in all countries, different factors affected trends in the 1980s. While real import prices declined in both Japan and the United States during the last decade, lower cost factors and strong demand pushed profits up in Japan. The U.S. profit share, by contrast, did not recover because lower production costs could not overcome the depressing effect of declining real import prices in this country. In Germany an overvalued currency and in Canada higher unit labor cost hurt profit shares.

We found that, as predicted by theory, exchange rate pass-through to profits is incomplete for all countries, and exchange rate elasticities are in general larger in Canada and Germany because of higher foreign demand elasticities and/or larger pass-through coefficients. We also found that an appreciation of the currency is likely to hurt U.S. profits more than Japanese profits. If the imported input (oil) is taken into account, an appreciation of the yen increases the profit share in Japan. Finally, the significance of the negative trend in each country shows that the decline in the profit share is not a purely U.S. phenomenon. Since the 1970s profit shares in the other three countries have exhibited an even steeper negative trend.

Refinement of the model and applications to different data sets are possible extensions of this study. Our results are trend sensitive, indicating that the model could be improved. Moreover, the literature on the pricing-to-market suggests that conducting the analysis at a more disaggregated level is likely to be fruitful. Although data limitations may impose constraints on the choice of countries, pursuing the analysis in this direction is our next step.

Data Appendix: definition and sources

Nonfinancial corporate profits

It is defined as pre-tax nonfinancial corporate gross operating surplus inclusive of nonfinancial depreciation and nonfinancial net interest (not adjusted for IVA or CCA).

United States: The profit series are taken from the *USNA*, depreciation series from *HAVER (USECON)* and the net interest series from *USNA*.

Japan: All series are taken from the *Bank of Japan, Economic Statistics Annual*.

Germany: The series are computed as corporate profits less bank profits. All series (annual) are taken from the *Monthly Report of the Bundesbank*.

Canada: All series are from the data provided by *Statistics Canada*.

Nominal GNP

It is defined as the GNP at market prices.
United States: *HAVER (USECON)*
Japan: *Bank of Japan, Economic Statistics Monthly, T 127(3)*.
Germany: *Stat. Bundesamt, Wirtschaft und Statistik*.
Canada: *Canadian Economic Observer, sect 5. T 1.4*.

Import prices in domestic currency

Series for the United States, Canada, and Germany are from *International Financial Statistics*. Series for Japan come from *Bank of Japan, Economic Statistics monthly, T 127(4) and Economic Planning Agency, National Accounts Annual*.

Producer price index

Series for all countries are taken from the *OECD Main Economic Indicators*.

Foreign CPI index in domestic currency

For each country it is computed as the trade-weighted CPIs of its FM6 trade partners. The series are then converted to domestic currency using bilateral exchange rates. The CPI for the FM7 countries are obtained from
United States: *HAVER (USECON)*.
Japan: *Bank of Japan, Economic Statistics Monthly, T 199(1)*.
Germany: *Bundesbank, suppl. to M. report, ser. 4 T III.23 col 8*.
Canada: *Canadian Economic Observer, sect. 5 T 3.2*.
France: *INSEE, Banque de France Quarterly Bulletin, T 64 col 8*.
Italy: *Itstat, Bollettino Mensile di Statistica T 13-7*.

Consumer price index

Same sources as above.

Unit labor cost

United States (nonfinancial corporate sector): *HAVER (USECON)*
Japan (economy): *INTL*.
Germany (manufacturing): *Bundesbank, unpublished series*.
Canada (Nonfarm industries): *Bank of Canada, unpublished series*.

Unit energy cost

The series are computed as the ratio of oil bill to nominal output. Oil bill is calculated as the producer price index for energy times energy demand in industry. The producer price indices for energy are from *OECD Main Economic Indicators*, and energy demands are taken from *IEA (International Energy Association)*.

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Table 1: The Augmented Dickey Fuller Test Results*

	United States	Japan	Germany	Canada
π	-2.28	-2.81	-2.48	-2.45
$d\pi$	-4.68	-3.90	-5.44	-3.61
$s+p^*-p$	-1.47	-2.70	-1.84	-1.46
$d(s+p^*-p)$	-3.10	-5.06	-3.34	-3.28
$s+p_m^*-p$	-2.09	-2.05	-1.81	-2.18
$d(s+p_{m*}-p)$	-3.41	-4.20	-3.84	-3.30
$u-p$	-1.63	-0.80	-2.41	-1.93
$d(u-p)$	-4.75	-4.31	-4.11	-4.58
$s+e-p$	-1.37	-1.42	-1.56	-1.70
$d(s+e-p)$	-3.97	-3.61	-4.10	-3.32
y	-1.11	-0.64	-0.45	-2.85
dy	-3.50	-3.30	-2.21	-3.24
y^*	-1.19	-1.31	-2.46	-0.97
dy^*	-2.90	-2.89	-4.05	-3.47

*The ADF 5% level critical value is -2.90

Table 2: The long-run nonfinancial corporate profits equations*: Full sample 1970Q1-1991Q4

	United States	Japan	Germany	Canada
Constant	-1.13	-10.90	-0.99	-28.35
	(20.1)	(4.2)	(4.1)	(16.4)
Trend	-0.004	-0.02	-0.02	-0.03
	(3.5)	(6.2)	(5.0)	(10.4)
$s+p_m^*-p$	0.31	0.18	-	-
	(8.1)	(1.6)		
$s+p^*-p$	0.23	0.17	0.72	1.11
	(2.4)	(1.9)	(3.5)	(4.1)
u-p	-1.50	-2.11	-0.88	-7.09
	(4.8)	(10.3)	(4.9)	(10.75)
s+e-p	-0.12	-0.39	-0.20	-0.08
	(1.8)	(3.1)	(6.2)	(1.8)
y	-	1.15	-	3.28
		(3.5)		(15.31)
Adjusted R^2	0.65	0.81	0.77	0.89
ADF	-4.12	-5.99	-5.22	-5.32

*t statistics in parentheses are based on Newey-West adjusted standard errors.

Table 3: The long-run nonfinancial corporate profits equations: Subsamples*

	United States		Japan	
	70Q1-82Q4	83Q1-91Q4	70Q1-83Q1	84Q1-91Q4
Constant	-1.11	-1.33	-11.18	-35.83
	(22.0)	(22.7)	(3.9)	(2.1)
Trend	-0.004	0.002	-0.02	-0.04
	(3.0)	(0.3)	(5.5)	(1.9)
$s+p_m^*-p$	0.11	0.15	0.30	0.85
	(1.7)	(1.3)	(2.0)	(1.3)
$s+p^*-p$	0.52	0.03	0.20	-0.77
	(3.8)	(0.7)	(1.6)	(1.2)
u-p	-1.63	-0.11	-2.43	-0.88
	(4.2)	(0.4)	(9.4)	(1.0)
s+e-p	-0.20	0.17	-0.33	-0.25
	(4.6)	(4.5)	(2.0)	(1.2)
y	-	-	1.15	4.01
			(3.2)	(1.8)
Adjusted R^2	0.84	0.72	0.78	0.63
ADF	-3.35	-6.15	-5.40	-4.26
F_{PP}	2.16		1.04	
F_{SS}	16.49		1.89	

Table 3: The long-run nonfinancial corporate profits equations: Subsamples (continued)*

	Germany		Canada	
	70Q1-82Q4	83Q1-91Q4	71Q1-82Q4	83Q1-90Q4
Constant	-1.98	-1.47	-30.84	-26.84
	(16.0)	(8.6)	(13.1)	(3.2)
Trend	-0.003	-0.01	-0.03	-0.03
	(1.5)	(3.3)	(5.0)	(3.5)
$s+p^*-p$	0.005	0.20	1.80	-0.39
	(0.0)	(0.9)	(5.5)	(1.0)
u-p	-0.63	-0.50	-5.78	-9.74
	(2.8)	(2.1)	(7.2)	(4.0)
s+e-p	-0.20	-0.16	-0.24	-0.03
	(3.2)	(2.1)	(1.0)	(0.2)
y	-	-	3.59	3.08
			(11.7)	(2.9)
Adjusted R^2	0.78	0.43	0.87	0.88
ADF	-3.88	-3.37	-3.50	-5.18
F_{PF}	1.12		1.22	
F_{SS}	3.31		2.30	

*t statistics is parentheses are based on Newey-West adjusted standard errors. F_{PF} is the Chow test for prediction failure, and F_{SS} is the Chow test for coefficient stability.

CHART 1:
GROSS PRIVATE DOMESTIC INVESTMENT AND PROFITS
As a share of GNP

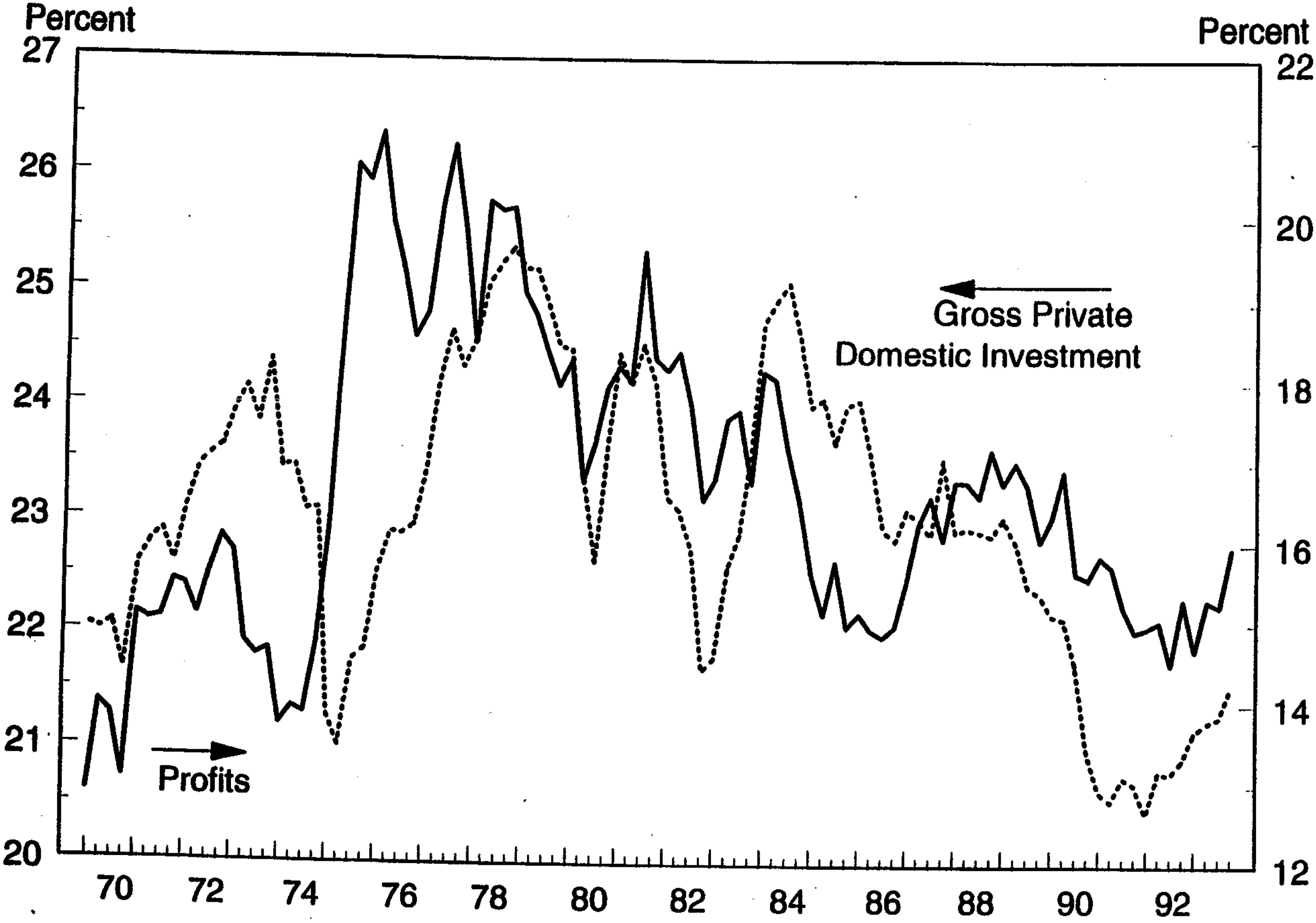

CHART 2: PROFIT SHARE, 1950 TO PRESENT

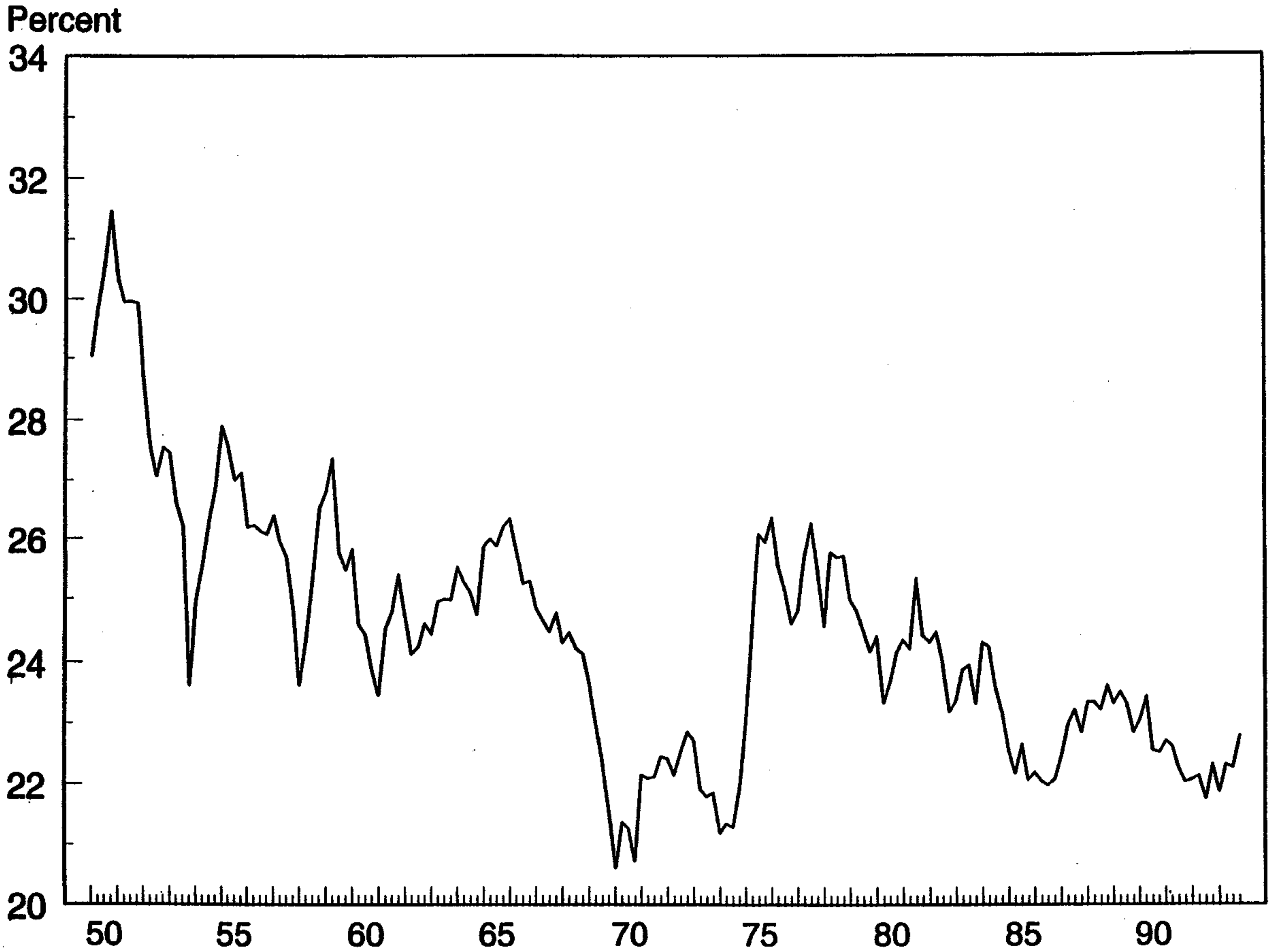

CHART 3: PROFIT SHARES

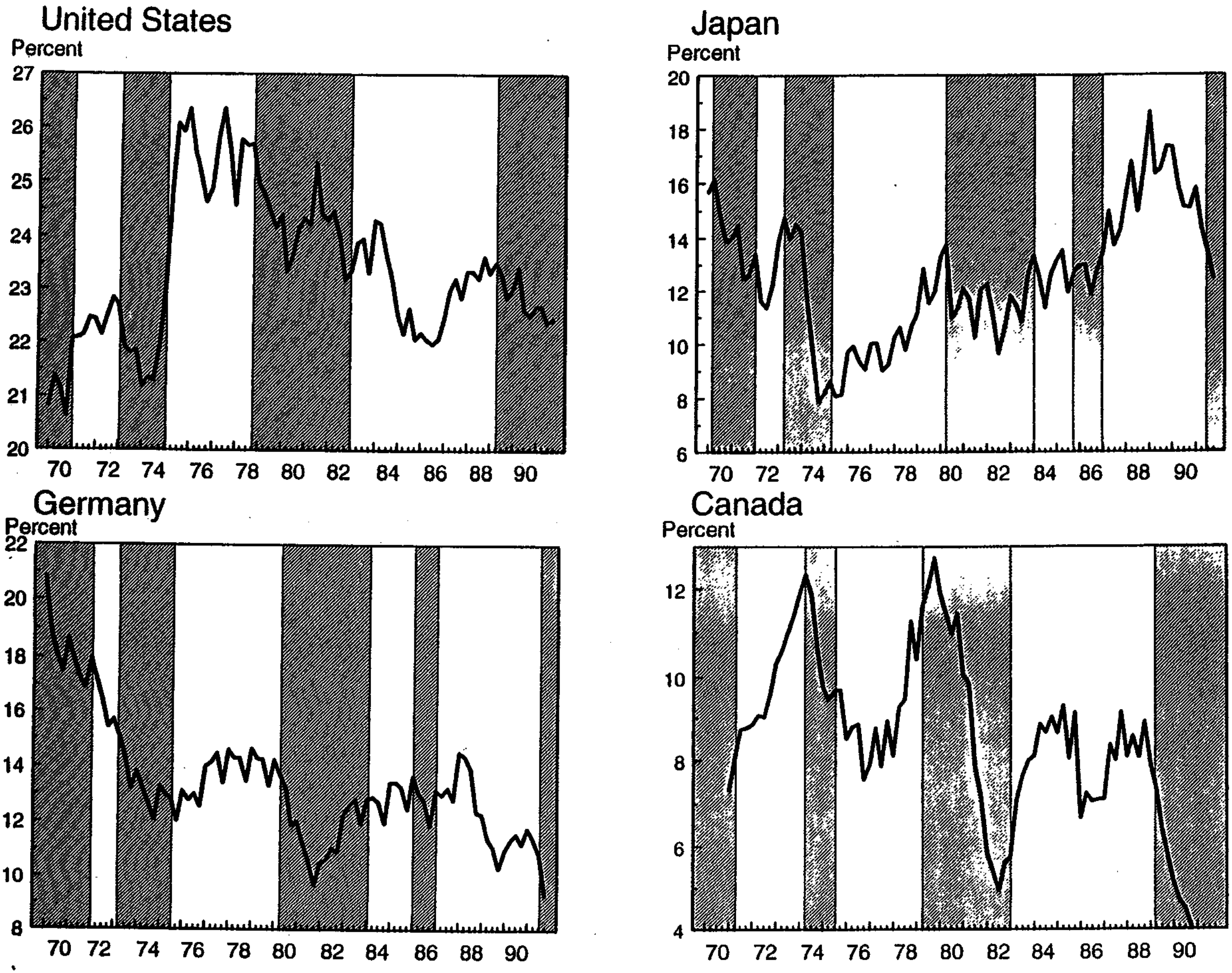

CHART 4: PROFIT SHARES AND REAL EXCHANGE RATES