PUBLIC AS OF JANUARY 1, 2009

RFD 630

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BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

Division of International Finance

REVIEW OF FOREIGN DEVELOPMENTS

January 31, 1968

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18 pages

# Flexible Exchange Rates and Oligopoly Pricing: A Study of Canadian Markets

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# FLEXIBLE EXCHANGE RATES AND OLIGOPOLY PRICING: A STUDY OF CANADIAN MARKETS

Robert M. Dunn, Jr.

The primary purpose of this paper is to demonstrate that a system of flexible exchange rates will not necessarily destabilize the prices of traded goods.[1/] It will be argued that the usual conclusion that traded goods prices in at least one market must move with the exchange rate is based on the implicit and unrealistic assumption of perfectly competitive markets, and that the realities of imperfect markets make stable prices likely over a range of exchange rates. This hypothesis is tested in a study of six markets during Canada's experience with flexible exchange rates between 1950 and 1962.

It is not the purpose of this paper to provide a general defense of flexible exchange rates, but instead merely to invalidate the argument that such a system cannot operate successfully for an open economy because too many prices will be forced to shift from day-to-day to offset exchange rate movements.[2/] The numerous other arguments against exchange rate flexibility are not discussed.

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1/ This paper is based on part of a dissertation. Robert M. Dunn, Jr., Flexible Exchange Rates and The Prices of Traded Goods: A Study of Canadian Markets, unpublished Ph.D. dissertation, Stanford University, 1967.

2/ Ronald McKinnon, "Optimum Currency Areas," The American Economic Review (September 1963), pp. 717-725.

If perfect competition is assumed, prices can differ between two markets only by transport costs and tariffs; if the two markets have separate currencies, and the exchange rate varies, at least one of the two prices of any traded good will have to shift to maintain the equality; percentage changes in the relationship between the two prices should equal the percentage changes in the exchange rate. This process provides a rather formidable argument against flexible exchange rates for an open economy; if a country faces high or infinite elasticities abroad, a high proportion of its internal prices will be in a continuous state of flux.[1/]

There is a rather striking contrast between the conclusions of international trade theory in this area and the work on pricing procedures which has been done by students of industrial organization. A large body of literature has grown up in the last 35 years which argues quite convincingly that the assumptions and constraints of perfect competition, or even simple profit-maximation, have very little relevance to actual pricing decisions. Economists have suggested a variety of pricing goals and policies which are used in large American firms, and a strong preference for price stability is a feature of all of them. Paul Sweezy's kinked oligopoly demand curve provides the most widely known argument for rigid prices,[2/] but there are others--general uncertainty about competitors

1/ Ronald McKinnon, op.cit., Randall Hinshaw, "Currency Appreciation as an Anti-Inflationary Device," Quarterly Journal of Economics, November 1951, pp. 447-62. And Arnold Harberger, "Some Notes on Inflation," Rio Conference, 1963, unpublished. The last two articles describe the price effects of a change in a fixed exchange rate, but the arguments are the same.

2/ Paul Sweezy, "Demand Under Conditions of Oligopoly," Journal of Political Economy, June 1939, pp. 568-73.

reactions, direct costs of making frequent changes, the desire by a firm appear stable and respectable, simple inertia, and customer opposition to frequent changes. Empirical work in this area indicates that managers find these arguments quite persuasive.[1/]

The same pressures for rigid prices in internal markets might be expected to extend to international markets. Flexible exchange rates provide an obvious difficulty for such a pricing policy. However, since an exporter who made all sales at one price in his own currency would have foreign currency prices which moved with the exchange rate; firms which desired stability in their prices to all customers might be expected, however, to try to maintain stable prices in both markets, and firms in oligopolistic markets might bring considerable market power to such efforts.

Some form of variable price discrimination might achieve the desired stability. A firm would set stable local currency prices in both markets and soak up changes in the exchange rate in export profits. The relationship between the two prices would be based on the firm's estimate of the long-run equilibrium exchange rate, and limited fluctuations of the market rate around that equilibrium would simply be ignored. If major exchange rate changes occur which change the firm's estimate

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1/ This literature begins with Gardner Means' work on administered prices in the 1930's. "Industrial Prices and Their Relative Inflexibility," Senate Document No. 13, 74th Congress, 1st Session, Washington, D. C. 1935. See also, William Fellner, Competition Among the Few, (Knopf and Co., New York, 1949), John M. Clark, Competition as a Dynamic Process, (Brookings Institution, 1961), and William Baumol, Business Behavior, Value and Growth, (The Macmillan Co., New York, 1959). The best known empirical work on industrial pricing in the U.S. was the Brookings study, A. D. H. Kaplan, Joel S. Dirlam, and Robert F. Lanzilotti, Pricing in Big Business: A Case Study Approach, (The Brookings Institution, Washington, 1958). Edward S. Mason's The Corporation in Modern Society, (Cambridge: Harvard University Press, 1959) contains articles by Carl Kaysen and Eugene Rostow which provide additional insight into corporate pricing attitudes.

of this equilibrium, discontinuous shifts will be made in relative prices, but variations in the exchange rate which are limited and which the firm does not believe to be permanent will be ignored.

A firm can maintain such a pricing policy either by selling directly at two prices, or by operating through a marketing subsidiary in the foreign country. In the latter case the firm sells to all customers at one price, but it makes all foreign sales through the subsidiary. The subsidiary buys at a constant price in the parent company's currency, but maintains stable local currency prices to its customers by absorbing exchange rate changes in its markup. The parent firm ultimately receives a return on foreign sales which varies with the exchange rate in the form of profits from the subsidiary. Either variation of this system requires that: 1) the exporting firm must have large enough profit margins to absorb variations in its returns on export sales without severe strains or bankruptcy, 2) the exchange rate must vary within a limited range and without a noticeable trend, and 3) exports must be important enough to the firm for it to see the foreign market as separate and distinct from its domestic operations.

This system of pricing has two interesting effects. First, it reverses the usual relationship between a country's exchange rate and its terms of trade; with such pricing the depreciation of a currency will improve that country's terms of trade, and vice versa. To the extent that exporters in a world of flexible exchange rates stabilize prices in foreign markets through variable price discrimination, the

volume of trade in both directions tends to be unaffected by the exchange rate.[1/] Each country's import bill measured in its own currency tends to be constant as the exchange rate varies. Consequently the exporting firms' receipts in their own currency rise as their currency depreciates, and fall as it appreciates. The depreciation of a currency raises the profits of its exporters and reduces the profits of its foreign supplies. The effect is to transfer income from the rest of the world to a country with a depreciating currency. If the U.S. dollar depreciates, for example, Canadian expenditures on our goods remain unchanged in Canadian dollars, and therefore rise in terms of U.S. dollars. U.S. expenditures on Canadian goods remain unchanged in U.S. dollars and consequently fail in Canadian dollars. Although the volume of trade in both directions is unaffected, our exporters are making more and our importers' expenditures are unchanged. Canadian exporters are receiving fewer Canadian dollars for the same volume of goods, while Canadian dollar expenditures on U.S. goods are unchanged. A transfer of real income to the U.S. occurs because our exporters are making more money, and Canadians are making less, although both groups are selling the same volume of goods.

Second, this system of price stabilization changes the reaction of the merchandise trade account to changes in the exchange rate. The short-run nature of these effects depends on whether the system is

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1/ This conclusion assumes that the exchange rate changes are exogenous to the trade account. If shifts in traded goods markets cause the exchange rate to move, total exports and imports obviously move at the same time. The point is that exchange rate changes will not cause variations in the volume of trade.

operated through direct discrimination by the exporter or through a marketing subsidiary in the importing country. In the former case, the import bill defined in the importer's currency is unaffected by changes in the exchange rate; this means that the exporter's foreign exchange earnings do not vary with the exchange rate, and consequently behave as if the elasticity of demand were unity and the elasticity of supply were infinite in the usual discussions. In terms of the Marshall-Lerner condition, the two demand elasticities total two, and the reaction of merchandise trade to movements of the exchange rate must be stabilizing.

If marketing subsidiaries are used to maintain stable prices in the importing country, the effects on the exchange market are changed slightly. The merchandise trade account reacts to the exchange rate in a destabilizing manner, but this reaction is reversed by the eventual flow of profits from subsidiaries to the parent firm. As the exchange rate varies, the final customer is paying an unchanging price for the same quantity of imported goods, but this quantity of money does not flow through the exchange market. The subsidiary purchases the same quantity of goods at an unchanged foreign currency price. Consequently, the exporting firm is selling a constant quantity of exports at an unchanged price in its own currency. Its foreign exchange revenues from these sales vary with the exchange rate; they rise when the foreign currency depreciates, and fall when it appreciates. The reaction of the merchandise trade account to exchange rate changes is as if the demand elasticities were zero.

The flow of profits from subsidiaries to parent firms reverses this process. The depreciation of a currency reduces the profits of local subsidiaries of foreign exporters, and hence reduces their demand for foreign exchange for profit repatriation. The effects of the price stabilization scheme on export profits are eventually borne by the exporting firm exactly as if the discrimination were direct, but the marketing subsidiary creates an intermediate step in the process.[1/] If the profits of subsidiaries flow immediately to their parent firms, the net effect in the exchange market is exactly like the previous case of direct discrimination. The merchandise trade item in the balance of payments reacts in a destabilizing manner, but is offset by the stabilizing reaction of the profits item. The reaction of the exchange market is like the unitary demand elasticities--infinite supply elasticities case. Such profits may not flow back to the parent firm immediately, however, and the only immediate reaction of the exchange market therefore may be the destabilizing reaction of merchandise trade.

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1/ These conclusions are based on partial rather than general analysis, in that no allowance is made for possible income effects growing out of the exchange rate change. For instance, this model leads to the conclusion that the depreciation of a currency improves the terms of trade, and hence increases the real income of people living in that country. If there is no money illusion, this real income rise should lead to increased consumption expenditures, some portion of which will be for imports. This tends to further depreciate the currency. If the assumption of full employment is made, a high proportion or all of the increased consumption will produce corresponding imports or reduced exports, and further depreciation is encouraged. It is possible for the ultimate reaction of trade to the exchange rate to be destabilizing if the marginal propensity to import is high, or if the economy is fully employed.

Tests for price rigidity in the Canadian experience

The hypothesis of the previous pages were tested through a study of six Canadian markets for traded goods (window glass, gasoline, crude oil, rolling mill products, copper, and coal). Time series for Canadian and U.S. prices were used to demonstrate that changes in the relationship between Canadian and U.S. prices in these markets were not determined or even influenced by changes in the exchange rate despite the fact that trade went on in all of the markets during all 12 years from 1950 to 1962. Percentage changes in relative prices were constructed for 6-month periods by subtracting the percentage change in the U.S. price from the concurrent percentage change in the Canadian price. Individual markets were studied because the unit value indices which Canada publishes for exports and imports contain statistical problems which made them useless for this study. The markets were chosen on the basis of the availability of Canadian and U.S. wholesale price series for the same goods. Scatter diagrams and regressions are used to demonstrate the lack of a relationship between changes in the exchange rate and changes in relative prices.[1/] A one period lag is tested for changes in

1/ The research for the dissertation from which this paper is drawn included an attempt to determine whether factors such as changes in Canadian and U.S. wages and demand pressures had greater effects on Canadian prices than did the exchange rate. Multiple regressions were used to determine whether the changes in the exchange rate had any residual explanitory power on changes in Canadian prices in these markets after these other factors were allowed for. In order to save space this part of the original research has been omitted from this paper. The results, however, support the conclusions of this paper; the exchange rate remains insignificant of a determinant of Canadian prices even after allowance for other relevant factors.

relative prices to allow for the possibility that prices change in some systematic manner after the exchange rate moves, but no relationships appear.

As a second source of information on pricing practices, questionnaires were sent to the Presidents of about 40 companies in these markets. The questionnaires asked how the pricing policies of the firms had been managed when the exchange rate was not at a fixed parity. The replies were surprisingly candid, and supported the hypothesis that various forms of variable price discrimination were used to avoid the destabilizing effects of exchange rate movements.[1/]

The results of the tests are reported here in abreviated form. With the exception of one letter which was particularly informative, the questionnaire replies have been omitted to save space.

The following scatter diagrams indicate the extent of the relationship between changes in the exchange rate and in relative prices in the six markets. The competitive markets model of standard trade theory would require that all of the observations fall along a "south-west to north-east" diagonal ($45^{o}$ line). The regressions shown in Table 1 indicate more precisely the lack of any relationship.

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1/ Informal conversations with executives in the newsprint and nickel industries indicate that dual pricing was also practiced in these markets to insure stable prices as the exchange rate varied. The representative of the nickel business indicated that the availability of scrap occasionally provided problems for the maintenance of these price differentials, and consequently, that price adjustments were made from time to time if the exchange rate moved sharply. The Canadian newsprint industry, however, apparently had few problems with its pricing stabilization, and simply quoted constant local currency prices to customers in each of the two markets.

Chart 1

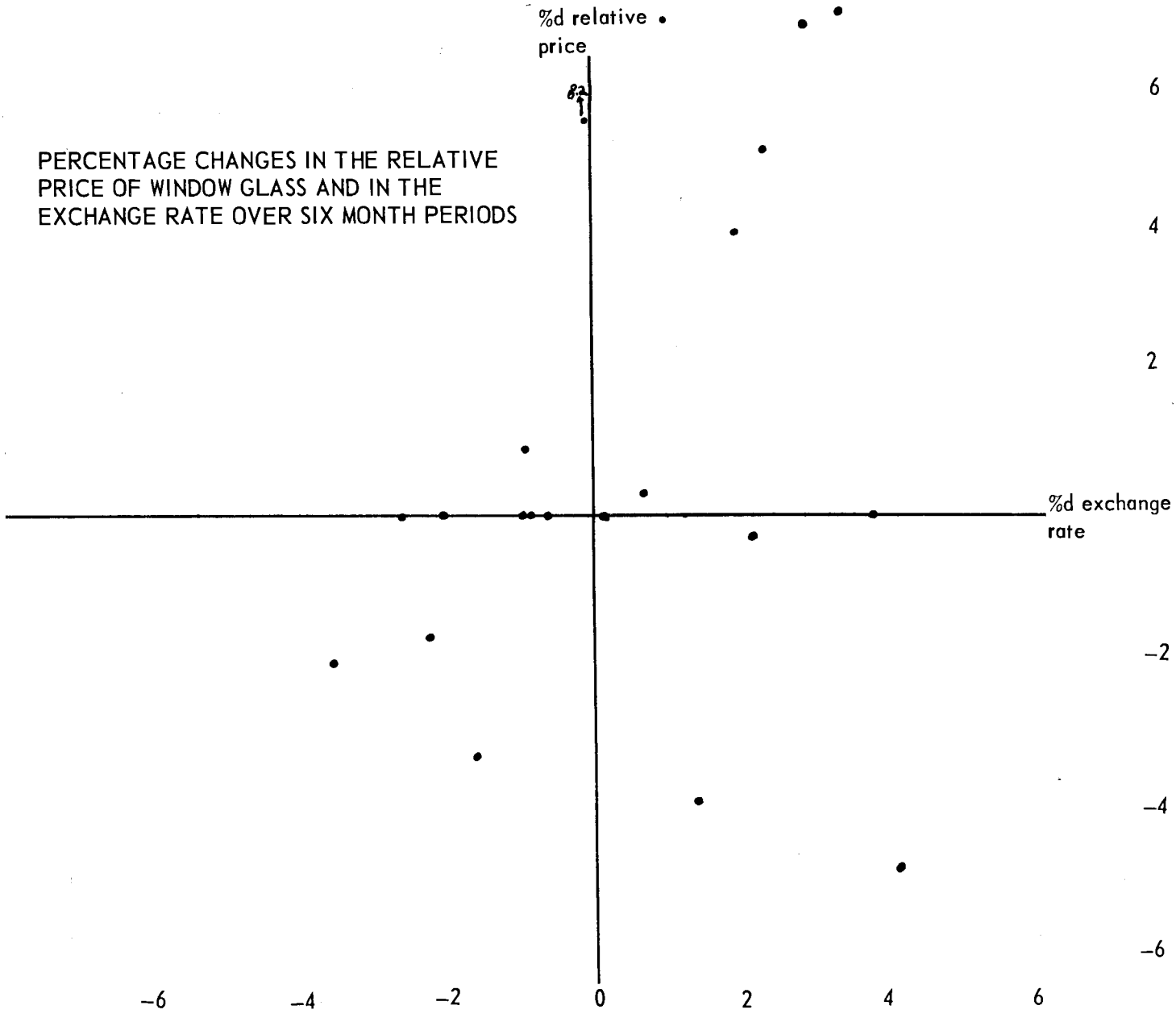
PERCENTAGE CHANGES IN THE RELATIVE PRICE OF WINDOW GLASS AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS
%d relative price
%d exchange rate
6
4
2
-2
-4
-6
-6
-4
-2
0
2
4
6

Chart 2

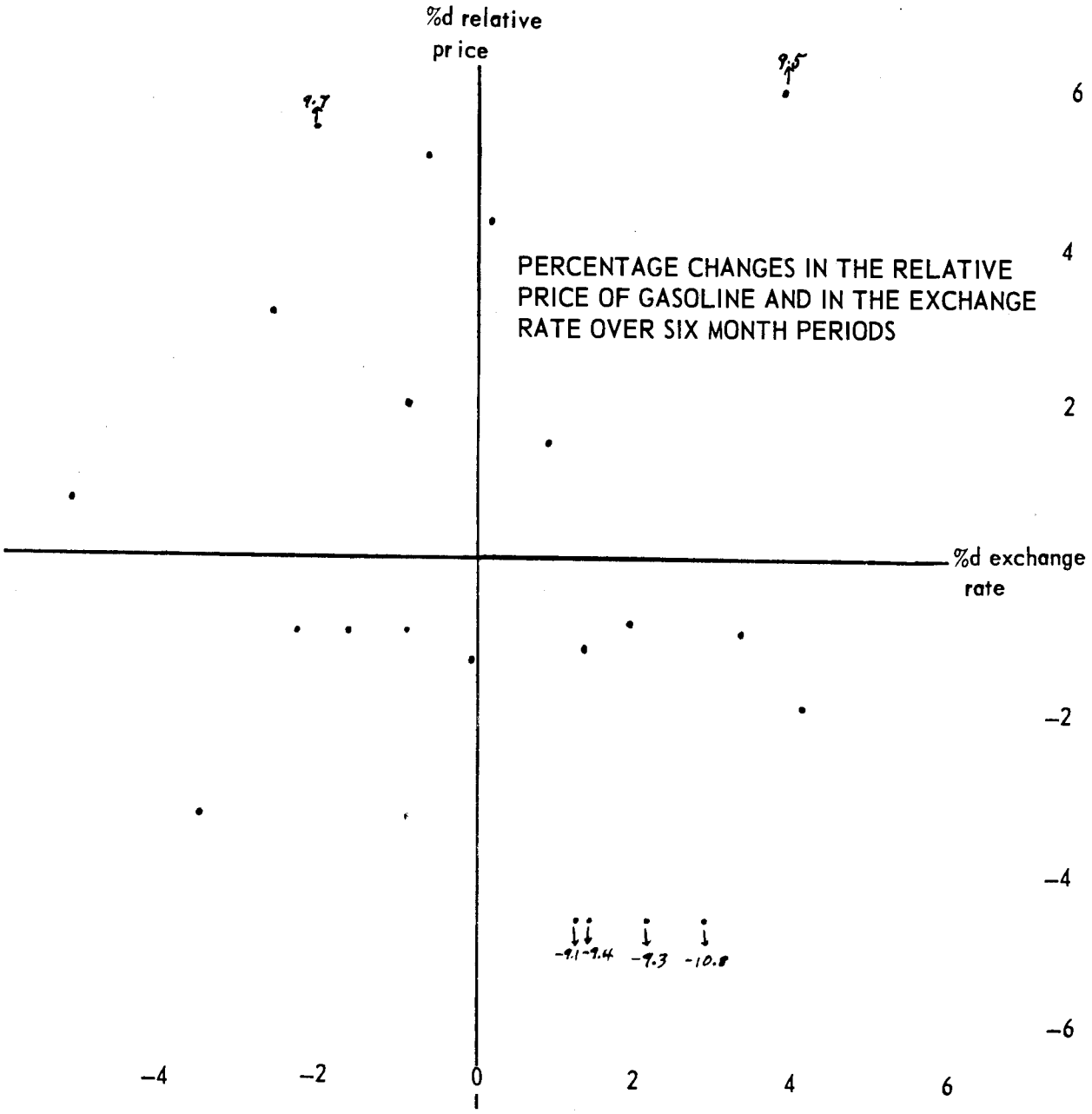
%d relative price
PERCENTAGE CHANGES IN THE RELATIVE PRICE OF GASOLINE AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS
%d exchange rate
6
4
2
−2
−4
−6
−4
−2
0
2
4
6
9.7
9.5
-9.1
-9.4
-9.3
-10.8

Chart 3

PERCENTAGE CHANGES IN THE RELATIVE PRICE OF CRUDE OIL AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS

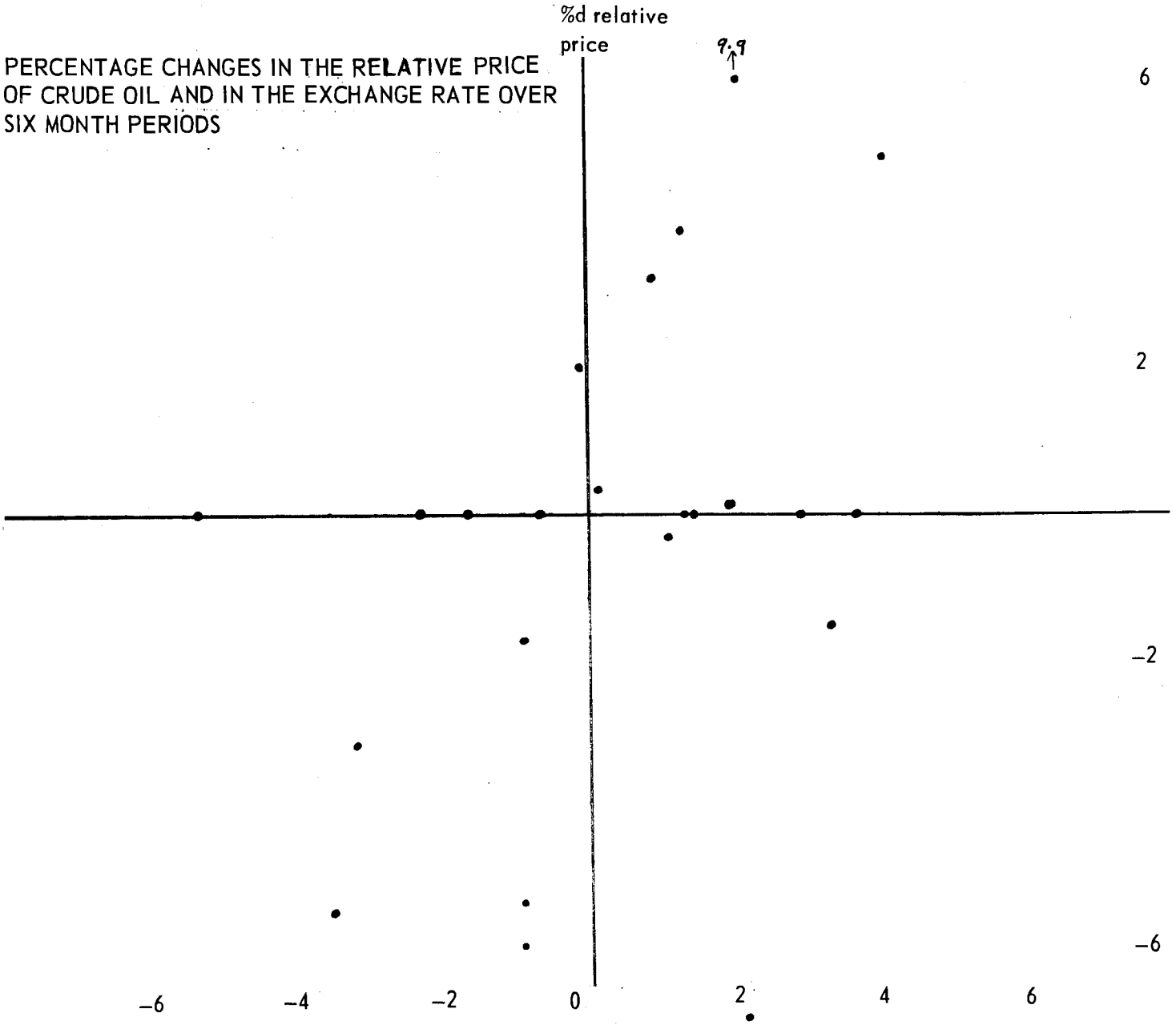

Chart 4

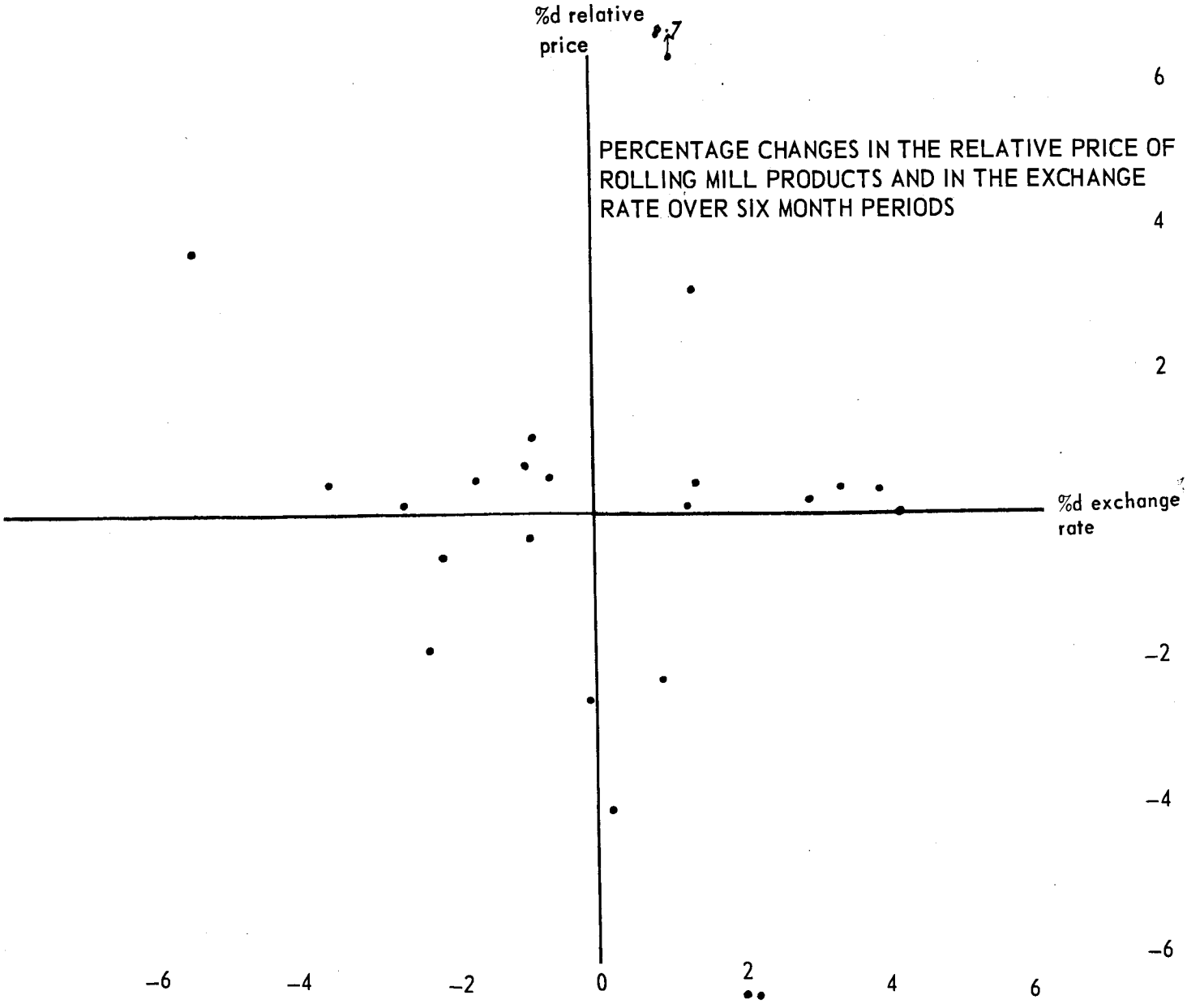
%d relative price
PERCENTAGE CHANGES IN THE RELATIVE PRICE OF ROLLING MILL PRODUCTS AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS
%d exchange rate
6
4
2
−2
−4
−6
−6
−4
−2
0
2
4
6

Chart 5

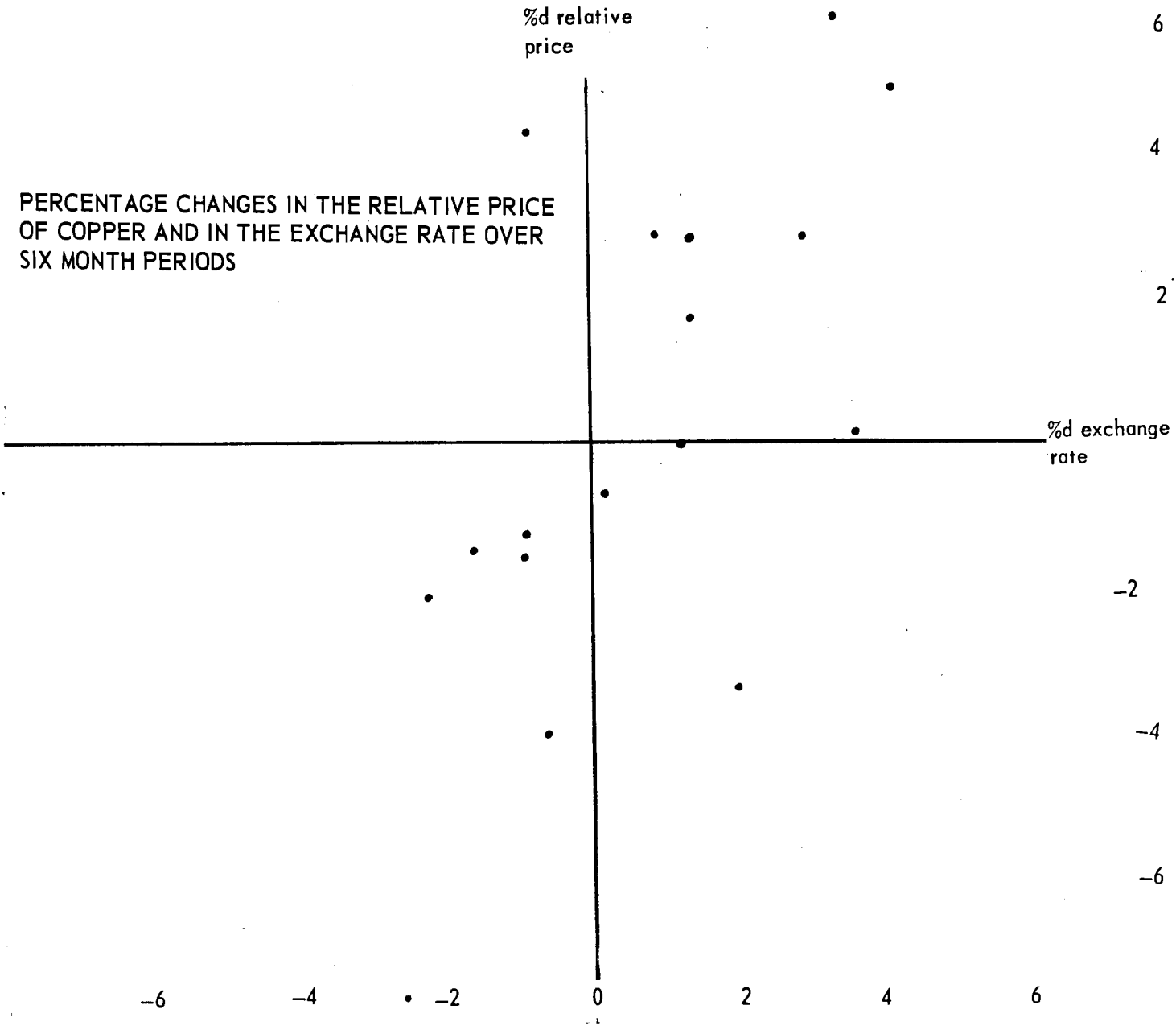
PERCENTAGE CHANGES IN THE RELATIVE PRICE OF COPPER AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS
%d relative price
%d exchange rate
6
4
2
−2
−4
−6
−6
−4
−2
0
2
4
6

Chart 6

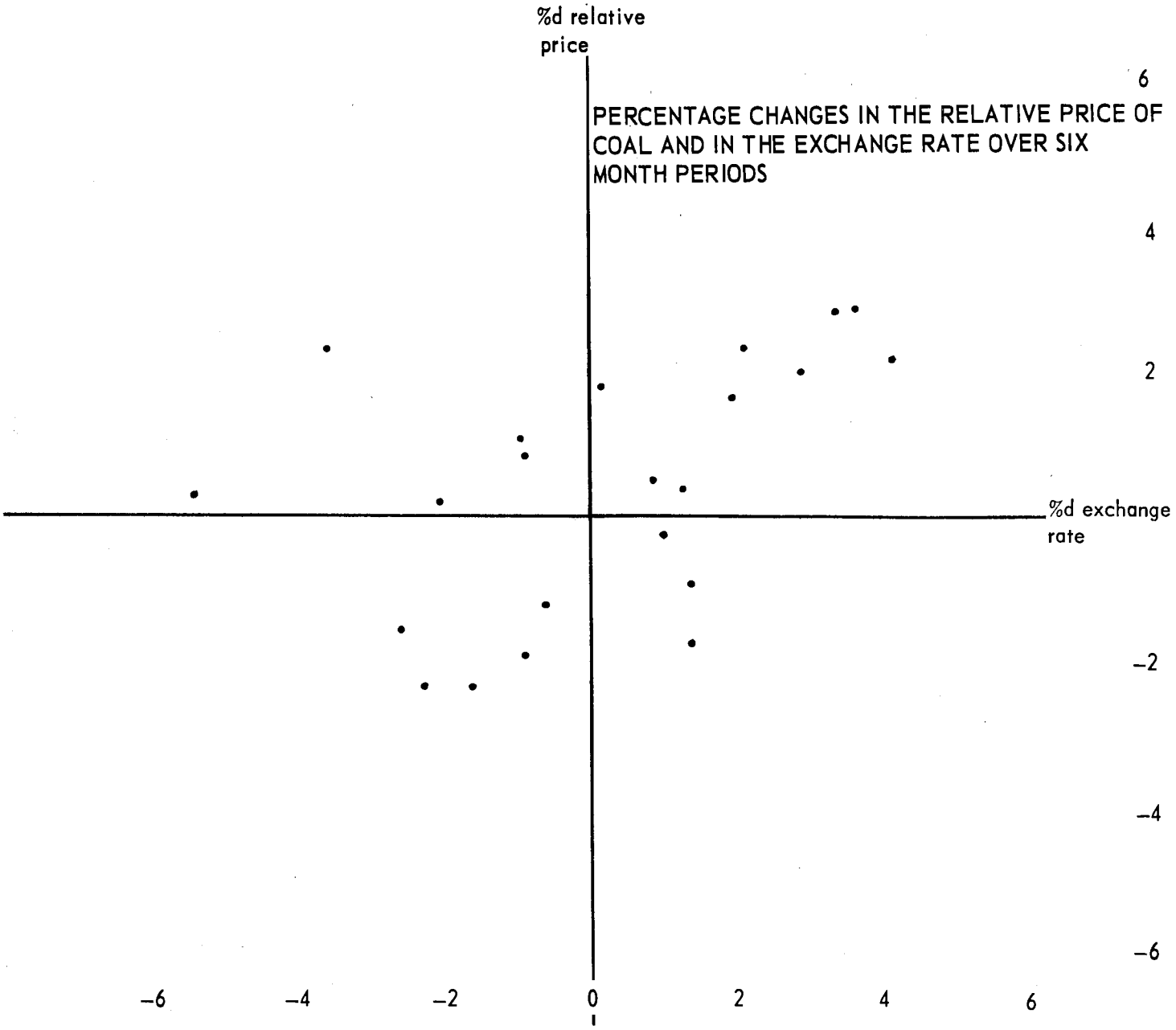
%d relative price
PERCENTAGE CHANGES IN THE RELATIVE PRICE OF COAL AND IN THE EXCHANGE RATE OVER SIX MONTH PERIODS
%d exchange rate
6
4
2
−2
−4
−6
−6
−4
−2
0
2
4
6

Table 1. Regressions of Changes in Relative Prices on Changes in the Exchange Rate

| | | | |
|---|---|---|---|
| Window Glass: | $Pr_1 = .31 + .23X + .15X_o$ | $r^2 = .14$ | |
| | (.32) (.14) | 22 observations | |
| Gasoline: | $Pr_1 = .77 - .51X_1 - .05X_o$ | $r^2 = .05$ | |
| | (.50) (.53) | 22 observations | |
| Crude Oil: | $Pr_1 = .42 + .15X_1 + .51X_o$ | $r^2 = .12$ | |
| | (.33) (.35) | 22 observations | |
| Rolling Mill Products: | $Pr_1 = .59 - .37X_1 + .39X_o$ | $r^2 = .20$ | |
| | (.23) (.24) | 22 observations | |
| Copper: | $Pr_1 = .45 + 1.09X_1 - .25X_o$ | $r^2 = .44$ | |
| | (.34) (.35) | 17 observations | |
| Coal: | $Pr_1 = .12 + .35X_1 - .02X_o$ | $r^2 = .16$ | |
| | (.19) (.20) | 22 observations | |

$Pr_1$ = Percentage changes in the relative price of the commodity over six month periods.
$X_1$ = Percentage changes in the Exchange Rate (Canadian price of U.S.$) over concurrent six month periods.
$X_o$ = Percentage changes in the Exchange Rate lagged by one period of six months.

The simple correlations between percentage changes in the exchange rate and in the Canadian prices in these markets over the same six month periods are: window glass +.28, gasoline -.12, crude oil +.18, rolling mill products -.36, copper +.31, and coal -.01. None of these is significantly different from zero at the 10 per cent confidence level. Canadian prices did not react to the exchange rate in these markets.

One of the more interesting questionnaire replies follows. It is drawn from a letter which was written by the Vice-President of a large Canadian copper producer.

"Your chief concern is why copper prices in Canada and the United States were apparently so unresponsive to changes in the Canadian exchange rate. In my opinion, it is because it would be impractical to have the price fully responsive and therefore a perfectly logical theory gave way to the greater strength of traditions and practices. Unlike many small mines with a short life, the major producers are, or should be primarily interested in following policies which over an extended period will be most beneficial to them and short-term considerations are, or should be, minimized. Most major producers of copper believe that if copper prices fluctuate too greatly, aluminum (which has a good record for price stability) will eat into the copper market. This is the reason why most Free World copper today is sold outside the U.S. at the equivalent of about U.S. 42 cents per pound (in Europe 336 pounds per 2240 pounds), although prices of U.S. 80 to 85 cents per pound are obtainable. The current 36 cents price in the United States is out of line with all others for reasons which are well known. In my opinion, the fact that a number of copper producers have also gone into the aluminum business in the past few years is not pure coincidence.

I believe most sellers are reluctant to have the price of their product changed too frequently, and most buyers presumably have the same preference. Because of this, prices once published will not be changed to take into account changes such as a 1 to 2 per cent variation in exchange rates. Undoubtedly, you are aware that Canada is a large net exporter of copper, unlike the U.S. A very high percentage of its export copper is going to the same customers to whom it went five to 10 years ago, for very few sellers would leave their traditional markets or customers because they could realize a slightly higher net elsewhere."

It seems clear that no model which assumes perfect competition can explain how actual industrial prices would react to a flexible exchange rate. None of the six markets showed a close relationship between changes in the exchange rate and changes either in relative prices or in Canadian prices. The following table indicates that firms in most of the six markets not only avoided reacting to the exchange rate, but that they also did not change prices very often in response to other factors.

Table 2: Changes in Reported Canadian Wholesale Prices
(140 Observations)

| | Number of Months in Which Prices Did Not Change[1/] | Number of Months in Which Price Did Change | Longest Period of Time With No Price Change |
|---|---|---|---|
| Window Glass | 129 | 11 | 38 months (twice) |
| Gasoline | 107 | 33 | 14 months |
| Crude Oil | 123 | 17 | 28 months |
| Rolling Mill Products | 105 | 35 | 10 months |
| Copper | 38 | 102 | 9 months |
| Coal | 24 | 116 | 2 months |

1/ The exchange rate changed between the 15th of the month in all but one of the 140 observations.

If the six markets of this study are at all typical, Canada's flexible exchange rate did not have the undesirable side effect of destabilizing internal prices of traded goods, theoretical arguments to the contrary notwithstanding. Firms in both countries apparently allowed export profits to absorb the effects of exchange rate variations. Since such behavior would be impossible in competitive markets, the results of this study suggest that international trade theory might become more realistic and useful if provisions were more often made for the effects of imperfect market patterns.