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SOME ANALYSIS OF THE PERFORMANCE OF FOREIGN OWNED SUBSIDIARIES IN CANADA WITH REGARD TO MATTERS OF PROCUREMENT

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Micro Economic Analysis Group
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Summary and Conclusions:

The Micro Economic Analysis Group has recently completed a statistical analysis of several interesting hypotheses related to the purchasing patterns of a sample of the largest foreign owned subsidiaries over the period 1964-1976. The paper "Performance of Foreign-Owned Subsidiaries in Canada with Regard to Matters of Procurement" by Norm Hutchinson of the Micro Economic Analysis Group, which was distributed last June, provided the data and the stimulation for the present paper. Given the data available from the previous work, the present paper examined three hypotheses and reached the following conclusions.

1. Are the trends towards more purchasing from foreign relative to domestic sources, significant trends?

Conclusions:

We noted that there has been a significant trend to purchasing from foreign rather than Canadian sources for 5 of the 12 industry groups in the sample, and no industries had significant trends towards domestic suppliers. The trend is stronger for the auto manufacturers than any other industry in our sample. Even when the auto industry was subtracted from the sample, we noted, for the remaining industries as a group, that purchases from foreign sources relative to domestic sources still increased significantly over the period 1964 - 1976.

2. Are the trends towards more purchasing from foreign relative to domestic sources related to a process of rationalization?

Conclusions:

We noted that 4 of the 5 industries with strong trends to increased use of international markets for purchases also exhibited strong trends to increased use of international markets for sales. None of the industries which showed stable imported purchases/total purchases ratios had a significant trend to a higher export/sales ratio. Thus, we can conclude that there are two types of behaviour evidenced in this sample. Four of the nine industries are making increased use of international relative to domestic markets for both their purchased inputs and sales of output. For four of the five industries (pulp and paper was the exception) which had a trend to international markets for purchasing, this was matched by a significant trend towards international markets for sales of output. This could be evidence of rationalization for these four industries. There are four industries which exhibit a completely different pattern of behaviour. These four industries are not making increased use of

international markets for inputs, and on the sales side their use of international markets is either decreasing or stable. There is therefore no evidence of rationalization in these industries.

3. How are domestic suppliers affected by the business cycle relative to foreign suppliers?

Conclusions:

We concluded this section by noting that for virtually all industries there was more variation in purchases from parents and affiliates than from domestic sources. When the demand for purchases was unusually high there was a tendency to shift relatively towards parents and affiliates. When demand was unusually low, this decreased demand was shared equally between parents and affiliates and domestic suppliers. We examined the hypothesis that when the business cycle turns down, foreign subsidiaries cut their orders first or most sharply from their domestic suppliers rather than their parents and affiliates. On the basis of the results of this examination of many of the largest foreign subsidiaries over the period 1964-76, we conclude that this hypothesis is probably false.

SOME ANALYSIS OF THE PERFORMANCE OF FOREIGN-OWNED SUBSIDIARIES IN CANADA WITH REGARD TO MATTERS OF PROCUREMENT

The paper "Performance of Foreign-Owned Subsidiaries in Canada with Regard to Matters of Procurement", June 1978, by Norm Hutchinson provides an interesting description of the purchasing patterns of a sample of large foreign-owned subsidiaries[1] over the period 1964-1975. Perhaps the key table in this report is Table 3 which provides the total imports of raw materials, components and goods for resale as a percentage of total purchases, for a sample of over 200 large foreign- owned firms by year, and by industry group.

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1 This survey covers approximately 200 large foreign-owned subsidiaries operating in the Canadian mining, primary metals, gas and oil, and manufacturing industries. Each company has assets greater than 5 million dollars, is majority-owned by a foreign parent and has voluntarily submitted information on their operations and financing to IT&C. For purposes of this report all of the activities of each company are grouped in a certain area of activity (e.g., transportation equipment) thus the classifications and industry definitions used here are not identical to those used by Statistics Canada. It is therefore not possible to incorporate data from other sources into the present analysis. The reader should be reminded that the data on purchases by foreign subsidiaries could be subject to some arbitrary decisions of transfer pricing.

Table 3

LARGER FOREIGN-OWNED SUBSIDIARIES

Total Imports as a percentage of total Purchases

Industry Group	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976[2]
Mining & Primary Metals	28.1	29.5	25.2	26.8	23.2	20.9	21.8	22.0	22.5	26.1	26.9	26.7	25.7
Gas & Oil	27.4	27.3	26.4	25.2	26.6	26.5	27.6	26.4	26.9	25.5	35.2	28.4	29.8
Machinery &Metal Fabrication	38.8	39.3	40.5	42.2	44.8	46.4	43.8	48.1	50.0	51.2	51.7	49.2	47.9
Transportation Equipment	44.6	53.3	56.3	63.4	71.3	74.2	76.2	77.7	80.3	80.1	81.6	83.6	85.1
Electrical Products	30.1	31.2	31.5	31.0	34.1	33.2	33.7	35.4	34.8	34.7	34.2	32.2	34.7
Chemical Products	35.7	36.0	33.4	32.1	33.9	34.7	34.4	32.1	32.2	34.7	33.3	32.4	36.9
Food & Beverage	24.5	22.3	19.9	20.2	19.8	20.0	19.1	18.0	19.3	17.6	19.2	21.8	20.9
Pulp & Paper	7.9	7.8	7.2	5.8	7.1	9.0	8.3	9.5	6.9	7.5	11.6	12.0	8.3
Other Manufacturing	33.0	34.0	31.5	30.3	33.2	32.7	30.2	33.2	36.0	36.5	42.0	42.0	42.4
Totals	32.2	34.9	35.7	38.5	43.8	45.6	44.5	46.2	47.5	47.0	48.5	47.5	48.9
Total Excluding Transportation Equipment	28.4	28.5	27.2	26.6	27.9	28.2	27.8	28.2	28.8	28.7	33.1	30.2	31.0

The principal conclusions from this table are:

(a) the level of imports in relation to total purchases varies greatly from industry to industry.

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2 Data for 1976 is now available so has been added to Table 3 of the earlier paper. It should also be noted that Table 3, page 7 of the earlier Hutchinson report includes results of all firms who reported to the survey. For purposes of the analysis in this paper all data was recalculated on the basis of those firms who reported for every year of the survey.

(b) purchasing by foreign-owned subsidiaries shifted towards foreign relative to domestic sources in the transportation equipment, gas and oil, machinery and metal fabricating, electrical, pulp and paper and the group of "other" manufacturing industries. On the other hand, purchasing shifted towards domestic sources relative to foreign sources in the mining and primary metals, chemical products, and the food and beverage industries. It must be noted that the transportation equipment industry, dominated by the auto manufacturers, accounts for almost one quarter of the total purchases of the sample. In this industry, imported purchases grew much more rapidly than purchases from domestic sources, but so did exports from this sector. This rationalization would be expected as a result of the auto pact.

The purpose of the present paper is to pursue the above conclusions with some statistical analysis. The analysis will be focussed on answering three questions:

(1) Are the trends towards more purchasing from foreign relative to domestic sources, significant trends?

(2) Are the trends towards more purchasing from foreign suppliers related to a process of rationalization?

(3) How does the business cycle affect domestic suppliers relative to its impact on foreign suppliers?

1. Are the Trends Towards More Purchasing From Foreign Relative to Domestic Sources, Significant Trends?

This question was answered by testing for the statistical significance of the time trend (1964-1976) of the ratio of purchases from foreign sources relative to domestic sources[3].

Industries that shifted significantly towards foreign sources for purchased imports were the following:

machinery and metal fabricating;

transportation equipment;

electrical products;

pulp and paper;

other manufacturing.

Industries where the ratio of purchases from foreign relative to domestic sources was relatively stable:

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3 See the Statistical Appendix, Part I, for details of the equations estimated and the results.

mining and primary metals;

gas and oil;

chemical products;

food and beverages.

There were no industries in the sample that exhibited a statistically significant trend towards purchasing from domestic rather than foreign sources. The trends for chemical products, mining and primary metals, and food and beverages were in this direction but only in food and beverages was it perceptible.

When the purchasing pattern of all firms grouped together in one sample is analyzed, the shift to foreign suppliers is statistically significant. Even when the automobile companies are subtracted, the trend remains statistically significant.

In 1964, the ratio of foreign relative to domestically sourced purchases for the total of all manufacturers in this sample was.47. The trend in this ratio over the period was .040 per year. According to this trend, the value predicted for this ratio in 1980 would be 1.17. Thus, where foreign sourced purchases were only 47% of domestically sourced in 1964, they are now about equal, and by 1980 are predicted to be about 17% greater.

Obviously, much of this shift is accounted for by the auto manufacturers. Subtracting the auto manufacturers from the sample, however, we find the ratio was .41 in 1964, .45 in 1976 and would be predicted to be .47 in 1980.

In concluding this analysis of trends in purchasing patterns, we note that there is a significant trend to purchasing from foreign rather than Canadian sources for 5 of the 12 industry groups in the sample, and no industries had significant trends towards domestic suppliers. The trend is stronger for the auto manufacturers than any other industry in our sample. Even when the auto industry is subtracted from the sample, we noted that for the remaining industries as a group, purchases from foreign sources relative to domestic sources still increased significantly over the period 1964 - 1976.[4]

2. Are the Tends Towards More Purchasing from Foreign Relative to Domestic Sources Related to a Process of Rationalization?

In the previous section, we found that five industries exhibited strong trends to purchase inputs from foreign rather than domestic sources. If this trend was part of a rationalization process which led to cost reductions, we might expect the resultant competitive advantage to be evidenced by an increasing tendency towards exports. Although an increasing trend to both purchasing and

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[4] Note this is simply an analysis of the past time trend - several factors such as changes in productivity, labour costs and exchange rate depreciation could cause a divergence in the future, from past time trends.

selling abroad can be evidence of rationalization it must be noted that it is not proof of rationalization. Equally important, there could be significant and successful rationalization without this marked tendency towards utilization of international markets. The following analysis then is a search for some evidence of rationalization, not a strict or complete test of rationalization.

The first step in this analysis was to examine the time trends in the ratio of imported purchases relative to total purchases. These results were consistent with those of the previous section for every industry. That is, industries with a significantly positive time trend in the import/domestic purchases ratio also had significant trends in the import/total purchases ratio. It is the imports/total purchases ratio that is a counterpart of the export/sales ratio for the present analysis of rationalization.

To permit an analysis of the rationalization hypothesis the time trends in export/sales ratios for each industry were estimated. The transportation equipment industry, the machinery and metal fabricating, and the group of "other" industries which evidenced significant trends to purchasing from foreign relative to total purchases also exhibited statistically significant trends to increased exports relative to total sales[5]. The only other industry to exhibit

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5 For detailed results of the equations estimated and the results see Statistical Appendix Part 2.

a significant trend to increased exports was the gas and oil industry. This industry had a reasonably strong, but not quite statistically significant trend to increased imports from foreign relative to total sources. Thus, 4 of the 12 industries in the sample have strong trends to increased use of international markets. No other industries exhibited this significantly positive trend in the export/sales ratio.

The pulp and paper industry which also had a significant trend towards foreign sourced imports had a significant trend towards decreased exports relative to total sales. Some preliminary checking indicates that this sharp trend towards a balance of trade deficit amongst this group of foreign owned subsidiaries in the pulp and paper industry does not have important conclusions regarding ationalization. Any explanation of this interesting observation must be left to further study.

Of the four industries that did not show a significant trend towards purchasing from foreign sources, two (food and beverages and mining and primary metals) showed a significant trend towards lower export/sales ratios.

If we analyze the entire sample as one group, we find a significantly positive trend in the export/sales ratio, but this is largely caused by the performance of the auto manufacturers. When auto manufacturers are subtracted from the sample there is no significant trend to the export/sales ratio.

In conclusion, we note 4 of the 5 industries with strong trends to increased use of international markets for purchases also exhibited strong trends to increased use of international markets for sales. None of the industries which showed stable imported purchases/ total purchases ratios had a significant trend to a higher export/ sales ratio. Thus, we can conclude that there are two types of behavior evidenced in this sample. Four of the nine industries are making increased use of international relative to domestic markets for both their purchased inputs and sales of output. For four of the five industries (pulp and paper was the exception) which had a trend to international markets for purchasing, this was matched by a significant trend towards international markets for sales of output. This could be evidence of rationalization for these four industries. There are four industries which exhibit a completely different pattern of behavior. These four industries are not making increased use of international markets for inputs, and on the sales side their use of international markets is either decreasing or stable. There is therefore no evidence of rationalization in these industries.

3. How Are Domestic Suppliers Affected by the Business Cycle Relative to Foreign Suppliers?

There are at least two competing hypothesis regarding the impact of the business cycle on domestic suppliers relative to foreign suppliers. One hypothesis (which will be referred to as "first hypothesis")

would be that foreign owned firms would plan to purchase from domestic sources and that the fraction of their purchases imported from parents and affiliates would rise only when the demand for material inputs was unexpectedly strong and the extra volume could not be provided by domestic suppliers. Likewise, if demand was unexpectedly weak it would be purchases from parents and affiliates, rather than purchases from domestic suppliers that would be reduced.

A competing hypothesis (which will be referred to as the "second hypothesis") to that above would be that foreign owned subsidiaries have close ties to their parents and affiliates, that they plan to purchase from parents and affiliates, and that the fraction of their purchases going to domestic sources would rise only when their demand for material inputs was unexpectedly strong. According to this hypothesis, if demand was unexpectedly weak it would be the domestic suppliers who would be cut off.

To test which of the above hypotheses is most consistent with our data, we first estimate the expected total demand for purchased inputs for each year. We then measure the deviations from this trend. Next, a measure of the changes in the ratio of purchases sourced from parents and affiliates relative to domestically sourced purchases is calculated.

We then test, whether the relationship between excess demand is positively related to changes in the ratio (first hypothesis) or negatively related (second hypothesis)[5].

Industries where unexpected strong demand was related to a shift to parents and affiliates as sources of supply rather than domestic suppliers (first hypothesis) were chemical products, transportation and equipment, machinery and fabricating, gas and oil, food and beverages and the group of "other" manufacturers. Those industries where unexpected strong demand was related to a shift towards purchasing from domestic suppliers relative to parents and affiliates as suppliers (second hypothesis) were electrical products, mining and primary metals and pulp and paper. In none of the above cases were the shifts sufficiently strong to be considered statistically significant. We can thus conclude that even though more industries tended to shift towards parents and affiliates rather than domestic suppliers when demand was unexpectedly high, none of these tendencies were strong.

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5 See Statistical Appendix, Part 3 for a detailed description of the equations estimated and the results.

6 This is also a test of whether unexpected weak demand is related to to a shift away from parents and affilliates as sources of supply.

As a further test of these two hypothesis we grouped the observations from all industries into one sample then subdivided this sample into those instances when demand was unexpectedly high and another sample of these observations when demand was unexpectedly low. What we found was that when demand was unexpectedly low there was no tendency to change the fraction of purchases from parents and affiliates relative to domestic suppliers. On the other hand, when demand was unexpectedly high there was a definite, but not strong (statistically significant only at the .10 level) tendency to increase purchases from parents and affiliates relative to domestic suppliers.

The above conclusions are consistent with the calculation that the variation of purchases from parents and affiliates (standard deviation divided by mean) is greater than the variation in domesticlly sourced purchases for all industries except food and beverages.

We conclude this section by noting then that for virtually all industries there was more variation in purchases from parents and affiliates than from domestic sources. When the demand for purchases was unusually high there was a tendency to shift relatively towards parents and affiliates, this is consistent with the first hypothesis. When demand was unusually low this decreased demand was shared equally between parents and affilitates and domestic suppliers. Our analysis, therefore, offers no support whatsoever for the second hypothesis. That is, we examined the hypothesis that when the business cycle turns down, foreign subsidiaries cut their orders first or most sharply from their domestic suppliers rather than their parents and affilliates. On the basis of the results of this examination of many of the largest foreign subsidiaries over the period 1964-76 we conclude that this hypothesis is probably false.

APPENDIX I

Equation estimated: $\frac{TM}{CAN} = a + bT$, where

TM is total imported purchases
CAN is total purchases in Canada
T is the time vector, 1964, 1965...1976

Industry/Coefficients	a	b	t-statistic of b[1]	D.F.	R^2
1) Mining & Primary Metals	6.63	-0.003	-0.74	13	0.05
2) Gas & Oil	-12.10	0.006	1.73	13	0.21
3) Machinery & Metal Fabricating	-66.98	0.034	6.56	13	0.80
4) Transportation Equipment	-781.34	0.398	26.90*	13	0.99
5) Electrical Products	-13.23	0.007	3.32	13	0.50
6) Chemical Products	4.81	-0.002	-0.77	13	0.05
7) Food & Beverages	6.75	-0.003	-1.59	13	0.19
8) Pulp & Paper	-5.24	0.003	1.89*	13	0.24
9) Other Manufacturing	-44.06	0.023	4.46*	13	0.64
10) Total	-78.51	0.40	8.31*	13	0.86
11) Total less 4 auto makers	-10.61	0.006	2.98*	13	0.45

[1]* statistically significant at the .05 level

APPENDIX 2

Equations estimated: (1) $\frac{TM}{TP} = a + bT$

(2) $\frac{EX}{SA} = a + bT$, where

TM is total imported purchases
TP is total purchases
EX is exports
SA is total sales
T is time vector

Industry/Coefficients	EQUATION (1) a	b	t-stat. of b[1]	D.F.	R^2	EQUATION (2) a	b	t-stat. of b[1]	D.F.	R^2
1) Mining & Primary Metals	3.01	-0.001	-0.69	13	0.04	6.27	-0.003	-1.84	13	0.23
2) Gas & Oil	-5.84	0.003	1.76	13	0.22	-7.30	0.004	2.29	13	0.32
3) Machinery	-19.87	0.010	6.89*	13	0.81	-20.31	0.010	12.88*	13	0.94
4) Transportation Equip.	-60.45	0.031	8.51*	13	0.87	-55.85	0.029	3.81*	13	0.57
5) Electrical Products	-5.89	0.003	3.35*	13	0.51	0.96	-0.0004	-0.35	13	0.010
6) Chemicals	2.20	-0.0009	-0.78	13	0.05	0.42	-0.0002	-0.20	13	0.004
7) Food & Beverage	4.21	-0.002	-1.51	13	0.18	7.69	-0.004	-5.63*	13	0.74
8) Pulp & Paper	-4.29	0.002	1.87*	13	0.24	28.07	-0.014	-7.95	13	0.85
9) Other	-17.27	0.009	4.39*	13	0.63	-2.43	0.001	2.54*	13	0.37
10) Total	-26.35	-0.13	7.47*	13	0.83	-12.98	0.007	3.03*	13	0.45
11) Total ex. 4 Auto	-5.09	0.003	3.04*	13	0.46	1.35	-0.0006	-1.32	13	0.14

1* Statistically significant at the .05 level

APPENDIX 3

Equations estimated: (1) $\frac{TP}{ISP} = a + bT$ where: ISP is industry selling price
TP is total purchases
T is time vector

(2) $\frac{(PA)}{(CAN)} = a + bT$ where PA is purchases from parents and affiliates
$\frac{(PA)}{(CAN)}$ is $\frac{PA_t}{CAN_t} - \frac{PA_{t-1}}{CAN_{t-1}}$

TP* is $\frac{TP - TP}{TP}$ where TP is derived from equation (1) above.

	EQUATION (1)					EQUATION (2)				
Industry/Coefficients	a	b	t-stat. of b[1]	D.F.	R^2	a	b	t-stat. of b[1]	D.F.	R^2
1) Mining & Primary Metals	-26,123	13.46	12.00*	13	0.93	-0.003	-0.006	-0.02	12	0.0000
2) Gas & Oil	-556,878	284.08	8.65*	13	0.87	0.005	0.057	0.37	12	0.014
3) Machinery	-86,516	44.39	9.41*	13	0.89	0.021	0.080	0.34	12	0.011
4) Transportation Equip.	-680,094	347.34	13.98*	13	0.95	0.32	0.88	1.19	12	0.12
5) Electrical Equipment	-76,226	39.12	17.38*	13	0.96	0.006	-0.34	-1.52	12	0.18
6) Chemicals	-85,990	44.05	9.45*	13	0.89	0.005	0.160	1.17	12	0.12
7) Food & Beverage	-123,463	63.33	7.2*	13	0.82	-0.002	0.006	0.13	12	0.002
8) Pulp & Paper	-46,484	23.89	7.77*	13	0.85	0.0002	-0.066	-1.35	12	0.15
9) Other	-62,394	32.05	10.69*	13	0.91	0.017	0.30	1.30	12	0.14
10) Total	-1,743,687	891.50	21.20*	13	0.98	0.035	0.43	1.17	12	0.12
11) Total Less 4 Auto	-1,068,456	546.80	10.87*	13	0.91	0.006	0.060	0.47	12	0.02

[1]* Statistically significant at the .05 level

Estimations over Grouped Observations

Equation 1 $\frac{(PA)}{(CAN)} = a + b\ TP^*$
all observations

$= .042 + .225\ TP^*$ $\quad R^2 = .017$, $DF = 108$

t stat's (3.42)* (1.36)

Equation 2 $\frac{(PA)}{(CAN)} = a + b\ TP^*$ $\quad R^2 = .046$, $DF = 51$
those obs.
with TP* 0

$= .014 + .645\ TP^*$
(.43) + (1.54)

Equation 3 $\frac{(PA)}{(CAN)} = a + b\ TP^*$ $\quad R^2 = 0.0$, $DF = 57$
those obs. with
TP* 0

$= .034 + .016\ TP^*$
(.152) .05

COEFFICIENTS OF VARIATION[1]

Industry	PA	CAN
1) Mining & Primary Metals	.418	.365
2) Gas & Oil	.786	.660
3) Machinery & Metal Fab.	.523	.382
4) Transportation Equipment	.654	.191
5) Electrical Products	.418	.413
6) Chemical Products	.568	.492
7) Food & Beverages	.339	.461
8) Pulp & Paper	.526	.413
9) Other Manufacturing	.558	.331

[1] coefficient of variation is equal to std. dev./mean.

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