

# Do World Product Mandates Really Matter?

Susan E. Feinberg\*  
UNIVERSITY OF MARYLAND

*This paper examines whether MNC subsidiaries with world product mandates fared better than non-specialized subsidiaries in the face of Canada-U.S. trade liberalization. Using confidential affiliate-level panel data on 445 Canadian subsidiaries of U.S. MNCs, empirical analysis finds that affiliates with higher levels of R&D and human capital resources grew relatively*

*more when trade was liberalized. However, R&D- and human-capital-intensive affiliates experienced systematically different growth patterns. The findings imply that world product mandates do reduce affiliates' vulnerability to downsizing, and that human capital development and R&D may be equally important in building world product mandates.*

## INTRODUCTION

In 1980, the Science Council of Canada proposed that the federal government should encourage Canadian subsidiaries of foreign MNCs to seek world product mandates –i.e., product development and marketing responsibilities— from their parent companies (Science Council of Canada, 1980; Rugman and Douglas, 1986). At the time, Canada was in the process of dismantling historically high tariff barriers which had initially lured much of the foreign direct invest-

ment (FDI) into the country. With declining tariff barriers, there was great concern that MNC subsidiaries in Canada, in particular US MNC subsidiaries, would leave Canada altogether or “hollow out” their Canadian operations (McFetridge, 1989). The acquisition of world product mandates by Canadian subsidiaries was not only seen as a way to increase the competitiveness of Canadian operations by reducing unit costs and improving technology and management capability, but also as a way to increase the importance of Canadian operations to the MNC

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\*Susan E. Feinberg is Assistant Professor of International Business at the Robert H. Smith School of Business, University of Maryland. Her research focuses on firm, country and industry determinants of MNCs' location decisions, and the impact of foreign direct investment on domestic industry.

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as a whole. By increasing the competitiveness and importance of Canadian operations, the establishment of world product mandates was seen as a way to protect MNC subsidiaries in Canada from being hollowed out by trade liberalization (see Crookell, 1986, 1990; McFetridge, 1989).

Using confidential firm-level data from the US Department of Commerce on US-based MNCs and their Canadian affiliates from 1983-1992, this paper examines whether Canadian subsidiaries with world product mandates (WPMs) fared better than non-WPM subsidiaries under Canadian trade liberalization. Specifically, I examine the sensitivity of US MNCs' Canadian subsidiaries' employment and capital investment levels to Canadian tariff reductions. A priori, it was expected that WPM subsidiaries would experience growth in employment and capital investment with lower trade barriers. Since tariffs increase product costs, lower tariffs should increase demand for goods produced by WPM subsidiaries.

This study makes several contributions to existing research on world product mandates. Most importantly, it is the first large sample empirical study using affiliate level panel data, including data on R&D expenditures conducted by MNC affiliates. In the WPM literature, most empirical work has been either case studies of successful WPMs (see for example, Rugman and Bennett, 1982, Beamish, 1993) or small-sample survey- or interview-based research focusing primarily on large MNCs (see, for example, D'Cruz, 1986, Birkinshaw, 1997). The sample in this study includes 445 US-based MNC parents and their Canadian affiliates from 1983-1992.

By using disaggregated panel data, I am able to construct a meaningful mea-

sure of subsidiary behavior and to link that measure with subsidiary characteristics. This is the second contribution of this research. The dependent variables are subsidiary-specific measures of the sensitivity of Canadian subsidiary employment and capital investment levels to changes in Canadian tariffs. These measures were constructed using affiliate-level panel data and disaggregated tariff data for a period in which Canadian tariffs decreased from an average of nearly 8% to only 3% (see Feinberg, Keane and Bognanno, 1998).

Finally, the results of this study have important managerial and public policy implications. From a managerial standpoint, there is considerable normative research on the benefits of gaining and maintaining subsidiary product mandates (see, for example, Crookell, 1990; Roth and Morrison, 1992). This study provides the first large-sample evidence that WPM subsidiaries benefited from trade liberalization more than non-WPM subsidiaries. From a policy perspective, however, the results indicate that designing a WPM policy with the aim of growing both employment and capital investment would be a complex undertaking.

This paper is organized into four sections. First, the literature on product mandates is briefly discussed with a focus on the expected relationship between affiliate WPM status and response to trade liberalization. Second, the data and methodology used in this research are discussed in detail. Section three reports the empirical results and the final section concludes.

### **THEORETICAL BACKGROUND**

World product mandates (WPM) are defined as the full development, production and marketing of a product line in an MNC subsidiary (Rugman, 1986). The

implications of WPMs are the location of functions such as R&D, production, marketing and strategic management in MNC subsidiaries (see D'Cruz, 1986; Rugman, 1986). Furthermore, because WPM subsidiaries may have unique control within the MNC of particular products, WPM subsidiaries tend to be both integrated within the MNC in that they export finished goods to other MNC subsidiaries, and autonomous in that they have a high degree of independence over strategic product-related decisions.

In many ways, the literature on product mandates reflects recent patterns of international trade and foreign direct investment. In particular, much of the WPM literature originated in and focused on Canada. For much of this century, small-market countries like Canada and Australia have raised high tariff barriers to lure inward direct investment (see Caves, 1982). In small, high-tariff countries, FDI often took the form of high-cost "mini-replica" plants. This issue was brought up nearly forty years ago by economists Eastman and Stykolt (1960) and management researchers (see, in particular, Safarian, 1966, 1983). When tariffs are prohibitively high, firms wanting to sell products in particular markets have to make them locally. As a result, MNC subsidiaries located in these markets tend to produce too many product varieties in suboptimally small production runs (see Baldwin and Gorecki, 1986).

Research on WPMs arose out of the realization that trade liberalization and globalization meant that MNC subsidiaries could no longer maintain their high-cost mini-replica structure. Specialization had to occur in order for subsidiaries to exist after trade liberalization. Crookell (1986, 1990) proposed that this specialization would take one of two

forms: rationalization-integration or world product mandates.

Rationalization-integration occurs when a subsidiary produces a component or product under assignment from the parent for the multinational as a whole. Product design and development are handled by the parent, and since the subsidiary is simply making an "assigned" product, no subsidiary-level marketing functions are required (Crookell, 1986). From an economic standpoint, rationalization-integration is a perfectly sensible strategy. MNCs can enhance efficiency by producing fewer product varieties in longer production runs in different national plants.<sup>1</sup>

As the above discussion indicates, both rationalization-integration and world product mandates share a common feature: MNC subsidiaries specialize and export a significant share of their output. The key difference between the two modes of specialization is the location of product development and marketing functions. In recent research, the rationalization-integration vs. world product mandate typology has been criticized for its failure to consider functional specialization (see Etemad and Dulude, 1986; Birkinshaw, 1997). For example, a Canadian subsidiary might specialize only in research and development and not in production. Similarly, the stylized extreme of producing only "assigned" products with little or no marketing or new product development assumes that product development and manufacturing are easily separable, which may not always be the case. Crookell (1986) does allow that some R&D might be done in rationalized-integrated subsidiaries, but "the money is spent largely on process technology for cost reduction rather than product innovation" (p.105).

For the purposes of this research, the critique of the WPM/rationalization-integration framework itself is not particularly important. Rather, the focus here is on the extent to which empirical evidence supports the claim that either form of specialization reduces subsidiaries' vulnerability to trade liberalization. Although the focus is on WPM subsidiaries, the empirical analysis discussed in the next section will attempt to distinguish between WPM and rationalized-integrated subsidiaries. From the following brief review of the WPM literature, the research question tested in this paper can be summarized as follows:

*Is WPM status associated with reduced vulnerability to trade liberalization? In particular, is the sensitivity of a subsidiary's employment and capital investment levels to tariff reductions associated with the subsidiary's WPM status?*

A priori, it is expected that subsidiaries that have specialized prior to trade liberalization (e.g., WPM and rationalized subsidiaries), will experience growth in employment and capital investment when trade is liberalized. In the next section, I describe the data and econometric techniques used in this paper.

### DATA AND METHODS

The data set used in this paper is from the Benchmark and Annual Surveys of US Direct Investment Abroad administered by the Bureau of Economic Analysis. The Benchmark and Annual Surveys provide the most comprehensive data available on the activities of US-based MNCs and their foreign affiliates. For this study, I use the BEA data disaggregated at the *individual foreign affiliate level* for each MNC from 1983-1992. Be-

cause the dependent variables are measures of sensitivity to tariff reductions, I use only single-industry affiliates in the sample (i.e. affiliates that reported sales in only one industry) so that all affiliate data and tariff and transportation cost data are expressed in the same 3-digit SIC codes. Additionally, since many non-manufacturing industries include non-tradables (such as retail sales and hotel services) which would not be directly affected by tariff reductions, I use only manufacturing affiliates. The sample includes 50 manufacturing categories.<sup>2</sup>

The data set in this paper is constructed from the data used in Feinberg, et al. (1998) and is described in greater detail in that paper. The sample in Feinberg, et al. (1998) consisted of 2881 firm-year observations on 701 US-based MNCs and their Canadian affiliates from 1983-1992.<sup>3</sup> In this study, the final sample includes 445 unique parent-affiliate pairs. Because affiliate R&D data is critical to this study and the BEA began collecting R&D data annually in 1989, I include in my sample only those affiliates observed at least once in 1989 or in a subsequent year.<sup>4</sup>

The aim of Feinberg, et al. (1998) was to examine the effect of US and Canadian tariff reductions on the employment and capital investment decisions of US MNC parents and their Canadian affiliates. US and Canadian employment and capital investment decisions were examined over a ten-year period that spanned both GATT tariff reductions and the Canada-US Free Trade Agreement. The study found that tariff reductions significantly affected MNCs' employment and capital allocation decisions. There was also considerable *within*-industry heterogeneity in MNCs' sensitivity to tariff reductions.

Because Feinberg, et al. (1998) examined the effect of tariff reductions on MNC decisions over time, the longitudinal structure of the data was critical to that research. In this study, the aim is to examine characteristics of MNC affiliates (e.g., WPM status) which are associated with their sensitivity to tariff reductions. The dependent variables, which are discussed in detail below, reflect the affiliates' sensitivity to tariff reductions *over the ten-year period*, and are thus averaged over time. Therefore, the longitudinal dimension of the data is not used here, and all affiliate-level variables are expressed as means over time. All variables denominated in dollar values are normalized to 1990 dollars.

### *Dependent Variables*

The two dependent variables BCTEMP and BCTPPE are measures of the sensitivity of Canadian affiliate employment and property, plant and equipment (PPE) to changes in Canadian tariff levels. These variables are the firm-specific Canadian tariff coefficients constructed from the regression model in Feinberg, et al. (1998). In Feinberg, et al. (1998), the dependent variables are employment and PPE of Canadian affiliate *i* in industry *j* at time *t*. The independent variables included US and Canadian tariffs in industry *j* at time *t*, transportation costs in industry *j* at time *t*, and controls for time, aggregate demand (GDP), cost of labor and cost of capital.

In Feinberg, et al. (1998), a "random coefficients" regression model was used which allowed the betas on US and Canadian tariffs to *differ across firms*. In other words, each firm has its own response coefficient to tariff changes. In a random coefficients model, betas are specified as  $(\beta_i = \beta + \mu_i)$  where  $\beta$  is a

mean coefficient (similar to an OLS beta), and  $\mu_i$  captures across-firm variation in responses (see Hsiao, 1986). Using Bayes law, estimates of the firm-specific betas,  $\beta_i$ , were constructed for the Canadian tariff coefficients for the two dependent variables affiliate employment and affiliate PPE.<sup>5</sup> These firm-specific Canadian tariff coefficients are the *dependent variables* in this study and can be interpreted as the sensitivity of Canadian affiliate employment and capital investment to reductions in Canadian tariffs.

Table 1 reports descriptive statistics for BCTEMP and BCTPPE. The means of both variables (i.e.,  $\beta$ ) are negative. This implies that Canadian tariffs were negatively related to affiliate employment and affiliate PPE (meaning that employment and PPE *increased* with reductions in Canadian tariff levels). Note also that both BCTEMP and BCTPPE have maximum values (i.e., individual values of  $\beta_i$ ) which are greater than zero. Positive values of these betas indicate that for some affiliates, lower Canadian tariffs were associated with reduced levels of employment and capital investment.

To summarize the interpretation of BCTEMP and BCTPPE, large positive or negative values of both these variables imply that Canadian affiliate employment and PPE are sensitive to changes in Canadian tariff levels.<sup>6</sup> Large negative values imply that *increases* in employment and PPE are associated with lower Canadian tariffs. Large positive values of BCTEMP and BCTPPE indicate that *reductions* in employment and PPE are associated with lower Canadian tariffs. In the context of this study, affiliate WPM status is expected to lead to larger negative values of BCTEMP and BCTPPE.

**TABLE 1**  
**DESCRIPTIVE STATISTICS AND INTERPRETATION OF DEPENDENT VARIABLES**

Variable	Mean	St. Dev.	Min	Max	Meaning
BCTEMP	-0.03504	0.03443	-0.21905	0.12035	<i>The sensitivity of Canadian affiliate employment to changes in Canadian tariff levels. The negative sign on the mean beta indicates that lower Canadian tariffs were associated with higher levels of employment in the Canadian affiliates of U.S. MNCs. A one percentage point decrease in Canadian tariffs increases Canadian affiliate employment by 3.5%.<sup>1</sup></i>
BCTPPE	-0.08494	0.08386	-0.48029	0.36587	<i>The sensitivity of Canadian affiliate PPE (capital) to changes in Canadian tariff levels. The negative sign on the mean beta indicates that lower Canadian tariffs were associated with higher levels of PPE in the Canadian affiliates of U.S. MNCs. A one percentage point decrease in Canadian tariffs increases Canadian affiliate PPE by 8.5%.<sup>1</sup></i>

Notes. <sup>1</sup> These results are described in more detail in Feinberg, Keane and Bognanno (1998).

### *Independent Variables*

Table 2 summarizes the independent variables used in this study. Consistent with the Science Council of Canada (1980), Crookell (1986, 1990) D'Cruz (1986), and Rugman and Douglas (1986), real average affiliate R&D expenditures, *R&D*, is used as an indicator of affiliate WPM status. In this study, I assume that firms can also have human-capital-intensive WPM status. In other words, depending on the technology of the firm, it may be that the presence of highly-skilled workers is a better indicator of WPM status than R&D. I therefore include the variable *Wage*, which is each affiliate's ratio of real employee compen-

sation divided by number of employees. Both high R&D and higher levels of compensation-to-employment are expected to be negatively related to BCTEMP and BCTPPE (i.e., associated with larger negative values of the two dependent variables).

A further indication of whether an affiliate has WPM status is the extent to which its sales are limited to the host country or are destined for export. However, as indicated earlier, a key distinction is made in the WPM literature on "rationalized-integrated" subsidiaries which produce largely for export to the parent and market goods which are mainly imported from the parent (see

**TABLE 2**  
**DESCRIPTIVE STATISTICS AND DEFINITIONS OF INDEPENDENT VARIABLES**

Variable	Definition and Measurement	Mean	St. Dev.
R&D	CA real R&D expenditures (000's of U.S. dollars)	540.82	2756.03
Wage	Ratio of real CA employee compensation (000's USD) to CA employment	69.22	436.60
CAtoUSP	CA real sales to U.S. parents (000's of U.S. dollars)	15025.53	152166.80
CAinCan	Log of CA real Canadian sales (000's of U.S. dollars)	43990.12	108931.30
CanInt	"Canadian sales intensity": CA real Canadian sales/CA real total sales	0.72	0.32
ForInt	"Foreign sales intensity": CA non-U.S. foreign sales/CA real total sales	.036	0.12
USParInt	"U.S. Parent sales intensity": CA real sales to U.S. parents/CA real total sales	0.091	0.18
R&D*CanInt	Interaction of Canadian sales intensity and CA real R&D expenditures	387.26	2484.19
R&D*ForInt	Interaction of Foreign sales intensity and CA real R&D expenditures	0.34	2.11
R&D*USParInt	Interaction of U.S. Parent sales intensity and CA real R&D expenditures	80.05	796.83
R&D*CAinCan	Interaction of CA real Canadian sales and CA real R&D expenditures	$1.07 \times 10^8$	$1.03 \times 10^9$
R&D*CAtoUSP	Interaction of CA real sales to U.S. Parents and CA real R&D expenditures	63366297	$1.02 \times 10^9$

Crookell, 1986, 1990) and WPM subsidiaries which have responsibility for worldwide development and production of products sold by the MNC. Both rationalized-integrated affiliates and WPM affiliates would be expected to export a significant portion of their output, but only the latter would be expected to export *R&D-intensive* products. *A priori*, all measures of export intensity were expected to be negatively related to *BCTEMP* and *BCTPPE*. In other words, affiliates with significant export sales were expected to experience increased growth in employment and capital investment with trade liberalization.

Because this study is essentially exploratory and there were no a priori expectations about the measurement of export intensity variables, two types of measures were used in the model: sales *levels* and *ratios* of export-to-total sales. *CAtoUSP* is the level of affiliate real average sales to US parents. *CAinCan* is the level of affiliate real average Canadian sales and is expressed in logs to mitigate problems of collinearity.<sup>7</sup> *CanInt*-- "Canadian sales intensity" is the ratio of Canadian-to-total sales. Note that the mean Canadian sales intensity is over .7, indicating that on average, Canadian affiliates sell more than 70% of their out-

put locally. However, the range of this variable is between 0 and 1 in this sample, meaning that some affiliates sell none or all of their output in Canada. A priori, *CanInt* was expected to be positively related to BCTEMP and BCTPPE. Affiliates with sales destined almost exclusively for the local market were expected to be more vulnerable to being downsized with trade liberalization (and thus have positive values of BCTEMP and BCTPPE).

*ForInt*—"Foreign sales intensity"—is the ratio of total foreign (non-US) sales of Canadian affiliates-to-total sales. Note that 3.6% of affiliates' total sales is to countries outside the US and Canada. *USParInt*—"US Parent Sales intensity"—is the ratio of Canadian affiliate sales to US parents-to-total sales. The affiliates in this study export approximately 9% of their output to US parents. Similar to Canadian sales intensity, US Parent sales intensity ranges from 0-100% of total sales for affiliates in the sample.

To distinguish WPM- and rationalized-integrated subsidiaries, I estimate five two-way interaction terms of the sales ratios and trade flows multiplied by affiliate average R&D expenditures. While "rationalized-integrated" and WPM affiliates should both have high export sales, only WPM affiliates should have both high R&D and high export sales. A priori, all the *R&D\*trade flow* and *R&D\*sales ratio* variables were expected to be negatively related to BCTEMP and BCTPPE.

Because of differences in scaling between the independent variables, which are expressed in levels (i.e., the trade flows and the interaction terms), and the dependent variables, the former were multiplied by 0.00001. Finally, in an initial regression not reported here, several

variables were used to control for affiliate size: real affiliate assets, real affiliate total sales (average) and average affiliate employment. However, the size variables were highly correlated with *CAinCan* (affiliate Canadian sales), as this variable averages 70% of total sales. As such, *CAinCan* can be roughly interpreted as a proxy for affiliate size.

### EMPIRICAL RESULTS

Table 4 reports the regression results for the two dependent variables BCTEMP and BCTPPE. Before describing the results in detail, a feature of the model should be noted. Many of the variables such as BCTEMP and BCTPPE, the export ratios, and the interaction terms are expressed in units which are not easily interpreted. In such a situation, a useful way of interpreting estimated parameters is to evaluate the effect on the dependent variables of a 1 standard deviation change in the independent variables. This result is obtained using the formula:  $\beta_x \cdot (\text{Standard Deviation})_x / (\text{Standard Deviation})_y$ .

Table 3 clarifies the interpretation of a 1 standard deviation change in BCTEMP and BCTPPE. Note that a one standard deviation increase in BCTEMP and BCTPPE reduces these variables to nearly zero. Recall that when BCTEMP and BCTPPE are close to zero, changes in Canadian tariffs have no effect on affiliate employment and PPE. By contrast, reducing BCTEMP and BCTPPE by one standard deviation approximately doubles the increase in employment and PPE associated with a one percentage point reduction in Canadian tariffs.

Turning to the results for BCTEMP reported in Table 4, the first surprising finding is the significant positive relationship between R&D expenditures and employment. Recall that a positive sign

**TABLE 3**  
**EFFECT OF A 1 STANDARD DEVIATION CHANGE IN BCTEMP AND BCTPPE**  
**ON CANADIAN AFFILIATE EMPLOYMENT AND PPE**

Variable	St. Dev.	1 St. Dev. Increase	1 St. Dev. Decrease
BCTEMP	0.0344	Raises BCTEMP to $-0.00061$ . Implies that a one percentage point decrease in Canadian tariffs only increases CA emp't. by .06% rather than 3.5%.	Reduces BCTEMP to $-0.0695$ . Implies that a one percentage point decrease in Canadian tariffs increases CA employment by nearly 7%.
BCTPPE	0.0839	Raises BCTPPE to $-0.0011$ . Implies that a one percentage point decrease in Canadian tariffs only increases CA PPE by .11% rather than 8.5%.	Reduced BCTPPE to $-0.1688$ . Implies that a one percentage point decrease in Canadian tariffs increases CA PPE by nearly 17%.

indicates that higher average R&D is associated with reduced affiliate employment. Indeed, the coefficient on *R&D* is positive and significant at the 5% level, and using the above formula, a 1 standard deviation increase in affiliate R&D expenditures increases BCTEMP by more than 1 standard deviation. A 1 standard deviation increase in BCTEMP raises this variable to approximately zero, meaning that affiliates with higher R&D experienced little to no change in employment when Canadian tariffs were reduced. Although contrary to the expectations in the WPM literature, the R&D-employment relationship makes sense when examined in the context of *all* the results. As I describe below, the results point to a fine-grained pattern of affiliate specialization in which R&D-intensive affiliates experienced increased capital investment but not employment and high-wage affiliates experienced increased employment but not capital investment.

Although R&D is positively associated with BCTEMP, *Wage* is significant at the 1% level and negatively related to

BCTEMP. It appears that firms with greater human capital resources experienced employment growth with trade liberalization. The strong negative relationship between *Wage* and BCTEMP supports the WPM hypothesis in that it may indicate the presence of senior management or high-paid skilled workers. Human capital resources may be similar to R&D in that they indicate the existence of specialized functions related to product mandates.

Turning to the export intensity variables, we note that surprisingly, none are significantly related to BCTEMP. However, as expected, affiliate sales in Canada is positive and significantly associated with BCTEMP. This implies that affiliates with higher average sales in Canada experienced reductions in employment with trade liberalization. This result might also indicate that larger affiliates were downsized when trade was liberalized, since Canadian sales is highly correlated with size. Such a pattern would be consistent with some kinds of specialization which were observed in Canada during the 1980s.<sup>8</sup>

**TABLE 4**  
**REGRESSION RESULTS FOR BCTEMP AND BCTPPE**

Variable	BCTEMP		Expected Sign	BCTPPE		Expected Sign
	Coeff.	t-ratio		Coeff.	t-ratio	
Constant	-3.4807	-6.24 <sup>a</sup>		-13.3788	-6.89 <sup>a</sup>	
R&D	1.4097	1.97 <sup>b</sup>	-	-5.5372	-1.62 <sup>d</sup>	-
Wage	-0.0019	-5.24 <sup>a</sup>	-	0.0009	1.00	-
CanInt	-0.3828	-0.59	+	-3.3017	-1.65 <sup>c</sup>	+
ForInt	1.6505	1.09	-	-4.1712	-1.10	-
USParInt	-0.8111	-0.69	-	2.2068	0.75	-
CAtoUSP	0.0050	1.00	-	-0.0373	-2.96 <sup>a</sup>	-
CAinCan	0.0077	2.53 <sup>b</sup>	+	0.7909	3.29 <sup>a</sup>	+
R&D*CanInt	-1.5409	-2.00 <sup>b</sup>	-	1.0488	0.55	-
R&D*USParInt	-1.2440	-1.51 <sup>d</sup>	-	1.1499	0.54	-
R&D*ForInt	0.0456	0.02	-	3.0450	0.46	-
R&D*CAtoUSP	-0.0016	-1.81 <sup>c</sup>	-	0.0051	2.67 <sup>a</sup>	-
R&D*CAinCan	0.0002	0.26	-	0.3531	1.34 <sup>d</sup>	-
R-Square		0.097			0.048	

Notes. Sample size is 445. Numbers in parentheses are standard errors.

<sup>a</sup> Significant at the 1% level.

<sup>b</sup> Significant at the 5% level.

<sup>c</sup> Significant at the 10% level.

<sup>d</sup> Significant at the 10% level (one-tailed test).

F-values for the 2 models are significant at the .0001 and .04 percent respectively. Parameter estimates are expressed in 4 decimal places due to scaling effects.

Finally, turning to the interaction terms, three sales (level or ratio)\*R&D interactions are significant and negative, indicating that affiliates with high R&D and high Canadian-to-total sales (*CanInt*), US parent-to-total sales (*USParInt*), and average sales to US parents (*CAtoUSP*), experienced employment growth with trade liberalization. These results are in the expected direction and provide evidence that WPM affiliates' employment levels were sensitive to changes in Canadian tariffs, and that the employment levels grew with Canadian tariff reductions. It is interesting to note that with regard to affiliate employment, neither export sales alone nor R&D alone

were associated with increased affiliate employment. Only affiliates with R&D-intensive exports and local sales fared better, in terms of employment growth with trade liberalization. This result seems to indicate that rationalized-integrated affiliates did not experience employment growth. If that had been the case, we would have expected export sales *alone* to be significant and negative.

Turning to the results for BCTPPE, affiliate R&D expenditures are significant, negatively related to BCTPPE and important in their effect. Indeed, a 1 standard deviation increase in R&D reduces BCTPPE by 1.8 standard deviations, in-

dicating that higher levels of affiliate R&D are associated with increased affiliate capital investment. Contrary to the findings for affiliate employment, affiliates with high levels of R&D *alone* experienced growth in capital investment with trade liberalization.

It is not surprising that in an environment of trade liberalization, employment increased in high wage affiliates and capital investment increased in capital-intensive affiliates. Given the many alternative ways in which MNCs can specialize international production, it makes sense that the same factors may not contribute to *both* employment growth and increased capital investment. For example, affiliates might specialize in R&D functions but actually manufacture and export very little in a given host country. As such, they might have fewer employees who earn higher wages, which would be consistent with the findings for BCTEMP. Furthermore, they would likely be more technology intensive and have modern facilities, which would be consistent with higher levels of capital investment.

Finally, I note three additional interesting findings for BCTPPE. First, contrary to the findings for BCTEMP, affiliates with R&D-intensive sales to US parents ( $R\&D*CAtoUSP$ ) and R&D-intensive Canadian sales ( $R\&D*CAinCan$ ) experienced *reduced* capital investment with trade liberalization. Second, Canadian affiliate sales in Canada ( $CAinCan$ ) is significant and positively related to BCTPPE. Again, this most likely reflects downsizing of large affiliates. Finally, Canadian affiliate sales to US parents ( $CAtoUSP$ ) *alone* is significant at the 1% level and negatively related to BCTPPE, indicating that affiliates that sell larger volumes of product to their US parents experienced increased capital invest-

ment with trade liberalization. Note that this result is nearly opposite to the results for BCTEMP. Affiliates that do more R&D and sell more to their parents benefited from higher levels of capital investment but reduced employment. This finding, combined with the positive relationship between the R&D\*export interactions for BCTPPE, would seem to indicate that affiliates which benefited from increased capital investment were either rationalized-integrated (in that they simply export more to their parents) or may have a functional specialization in R&D. They do not appear to be WPM affiliates in the traditional sense that they do not export R&D-intensive products.

## CONCLUSION

Using disaggregated data on a large sample of MNCs, this study examined whether Canadian subsidiaries with world product mandates fared better, in terms of growth in employment and capital investment, in the face of Canadian trade liberalization than did non-WPM subsidiaries. In general, specialized affiliates with higher wages and R&D experienced growth in employment and capital investment respectively. As noted above, the results point to a very different relationship between R&D and employment and R&D and physical capital investment. It is evident that there are many dimensions along which MNCs may configure production when trade is liberalized. These dimensions appear more complex than the simple WPM vs. rationalized-integrated subsidiary continuum. Overall, however, the finding that high wages and R&D do reduce affiliates' vulnerability to downsizing when trade is liberalized supports the contention that world product mandates do matter.

The results of this study have implications for both subsidiary managers and policy-makers. For subsidiary managers, the results imply that there are multiple avenues to pursue product mandates, and that human capital development may be as important as R&D functions in remaining competitive within the MNC. For policy makers, the results imply that a more complex mix of policies than R&D subsidies alone may be required to encourage MNCs to simultaneously create jobs and increase local R&D.

### NOTES

1. In the normative literature, rationalization-integration is seen as an inferior alternative from the subsidiary point of view in that it does not contribute to the development of subsidiary technology or management capabilities and it greatly reduces the autonomy of subsidiary managers.

2. More detail is available from the author.

3. A "firm-year" observation is a parent-affiliate pair observed in a given year.

4. Although 256 parent-affiliate pairs were dropped from the original sample, there is no evidence that there is systematic bias resulting from this screen. The distribution of affiliates by number of employees and total assets does not differ here from the distribution reported in Feinberg, et al. (1998).

5. In Feinberg, Keane and Bognanno (1998) the mean Canadian tariff coefficients were significant at the 1% and 5% level respectively for the dependent variables Canadian affiliate employment and Canadian affiliate PPE.

6. Values of BCTEMP and BCTPPE which are close to zero indicate that affiliates' levels of employment and PPE

are not sensitive to reductions in Canadian tariffs.

7. In general, collinearity was not a problem with the regression model. Results were robust to alternative specifications. Space constraints prevent a more detailed discussion of regression diagnostics and reporting of correlation matrices. Details are available from the author.

8. Extensive qualitative interviews with managers at MNC affiliates in Canada were conducted as part of this research. The companies interviewed all experienced some downsizing in middle management during the years covered by this study.

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