This study examines whether or not production shifts occur among the foreign subsidiaries of multinational corporations (MNCs) under the influence of differing macroeconomic conditions in their host countries. This study compares intra-MNC production shifts under the influence of exchange rate changes across different host countries. Our findings indicate that the increase of a subsidiary's production at the time of its host country currency depreciation decreases the production of other subsidiaries within the same MNC network. Our empirical evidence also shows that MNC subsidiaries that engage in production shifts with other affiliated subsidiaries command a higher performance. Copyright © 2012 John Wiley & Sons, Ltd.

INTRODUCTION

Managing uncertainty is not an option but a necessity in the strategies of multinational corporations (MNCs). In the international business world where the only certainty is uncertainty, it is natural for MNCs to be highly concerned regarding managing uncertainty when conducting business in many different countries. It is therefore no wonder that the literature on MNCs emphasizes operational flexibility under uncertainty (Chung, et al., 2010; Kogut and Kulatilaka, 1994; Lee and Makhija, 2009). Specifically, MNCs should be able to exploit cost differentials on a global scale by shifting production among their subsidiaries (Allen and Pantzalis, 1996; Chung et al., 2010; Huchzermeier and Cohen, 1996; Tang and Tikoo, 1999). However, prior research on operational flexibility has rarely examined whether or not this flexibility is actually exercised. Instead, it assumes that scattered operations in multiple countries are most conducive to an MNC’s ability to shift production among its subsidiaries under a high level of uncertainty. The assumption may be problematic because the prior geographic conditions for multinational operational flexibility may not be associated with the actual exercise of this flexibility. Without directly examining whether or not MNCs actually engage in production shifts, it would be difficult to determine whether or not enhanced firm
performance is directly due to production shifts within an MNC subsidiary network.

Undertaking this research need, we ask the following: do the foreign subsidiaries of MNCs actually utilize production shifts in times of foreign exchange rate fluctuations, and are their actual production shifts truly valuable? To find direct evidence of intra-MNC production shifts under the influence of foreign exchange rate changes, we first examine whether or not asymmetry exists in the production shifts between two directionalities of foreign exchange rate changes. An MNC subsidiary would likely engage in additional inter-MNC subsidiary production shifts under the depreciation of a currency, because decreased production costs would enable the subsidiary to produce for other subsidiaries with higher production costs. The opposite would be the case under the appreciation of a currency. We also examine whether or not production shifts in an environment of changing exchange rates actually increase subsidiary performance. We find that foreign subsidiaries, in fact, relocate their production to more favorable locations via their MNC subsidiary network. We also find that this inter-MNC subsidiary production shift enhances the performance of the subsidiary exposed to a favorable change in its host country currency.

LITERATURE REVIEW AND HYPOTHESES

MNC operational flexibility: direction of exchange rate change and production change

Among the macroeconomic uncertainty factors in host countries, changes in foreign exchange rates account for a significant portion of the total risk, since exchange rates influence both the cost of input and the price of output (Belderbos and Zou, 2009; Chung et al., 2010; Pantzalis, Simkins, and Laux, 2001). Specifically, appreciation of the local currency would increase production costs while depreciation would do the opposite. Foreign subsidiaries facing the appreciation of currency are likely to relocate production from more costly to less costly locations. For this reason, subsidiaries with a low cost advantage due to the depreciation of the local currency as reflected in exchange rates would increase their production. By contrast, subsidiaries with cost disadvantages due to the appreciation of currency would decrease their production.

The asymmetric effects between appreciating and depreciating foreign currency movements on the production shifts among subsidiaries must therefore be examined (Huchzermeier and Cohen, 1996; Miller and Reuer, 1998; Pantzalis et al., 2001). Here, a favorable change means that the host country currency of an MNC subsidiary is depreciated relative to other host countries’ currencies, and the MNC subsidiary can therefore produce at a lower cost. Meanwhile, an unfavorable change indicates that the host country currency of an MNC subsidiary is appreciated relative to other host countries’ currencies, and the MNC subsidiary will have higher production costs. We suggest the following:

Hypothesis 1: An MNC foreign subsidiary that experiences favorable change in its host country currency (such as a depreciating value of the host country currency) will increase its production compared to subsidiaries that experience an unfavorable change.

Intra-MNC production shifts

One method of observing the behaviors of MNCs’ subsidiaries under the influence of differing production costs relating to changing exchange rates is to examine their production shifts within an MNC subsidiary network. Kogut and Kulatilaka (1994) argue that intra-MNC production shifts within its network reflect the capacity for operational flexibility among the MNC subsidiaries located in multiple countries exhibiting differing macroeconomic uncertainties. Subsidiaries located in host countries experiencing a favorable change in macroeconomic conditions would be in a position to take advantage of lower production costs. This relative advantage of lower production costs would induce a production shift from other subsidiaries within the same network to the focal subsidiary (Little, 1986).

A favorable change in foreign exchange rate should, therefore, increase a subsidiary’s production. At the same time, according to the multinational operational flexibility argument, an increase of production in a subsidiary enjoying a comparatively depreciated currency should be matched with a decrease in production for other subsidiaries within the same network. Therefore, if we find that
a favorable change in the exchange rate increases production in the focal subsidiary, we should also find that a decrease of production in one subsidiary must be matched with a corresponding increase in other subsidiaries. For example, assume that an MNC has subsidiaries in countries A, B, and C. A and B manufacture a product that is sold in C. Assume that both A and B have initially similar production costs. In the case of an unfavorable change in exchange rates and higher production costs in B, B’s production can be shifted from B to A. We argue the following:

Hypothesis 2: Given that MNCs shift production among their subsidiaries, the increase (decrease) of production in a focal MNC subsidiary will lead to the decrease (increase) of production in other subsidiaries of the same MNC.

Intra-MNC production shifts and subsidiary performance

By taking advantage of changes in production costs, foreign subsidiaries with a lower cost advantage would produce more, and subsidiaries with higher costs would produce less. In contrast, the counterparts of subsidiaries that engage in fewer intra-MNC production shifts are less able to take advantage of this changed cost structure and may suffer from it.

A subsidiary’s capacity to adjust its production volume when needed reduces the variable costs that account for a large amount of production costs that are not fixed to a certain location (Besanko et al., 1996; Rangan, 1998). In this sense, a foreign subsidiary connected via intra-MNC production shifts to the MNC’s other foreign subsidiaries can be a great source of lower production costs. The resulting improved performance provides the subsidiary with an important means of demonstrating value, particularly during times of environmental change (Birkinshaw and Hood, 1997; Feinberg and Keane, 2006). For the subsidiaries with low cost production, this would be the best time to demonstrate its worth by increasing its production, which would result in decreased production in some other subsidiaries.

Flexibly responding to a favorable exchange rate change is the source of a competitive advantage that will lead to higher levels of performance. Regarding the impacts of a subsidiary’s international network on its performance, Monteiro, Arvidsson, and Birkinshaw (2008) argue that if a subsidiary is isolated from the MNC’s other subsidiaries, it would not enjoy the benefit of its network, therefore showing relatively low performance. We propose the following:

Hypothesis 3: Given that MNCs shift production from higher cost to lower cost subsidiaries, an increase in the level of production in a subsidiary with lower production costs will lead to increase in performance of the subsidiary.

RESEARCH METHODLOGY

Data

In order to test our hypotheses, we utilize a dataset of Korean manufacturing MNCs’ foreign subsidiaries from 1990 to 2007. We include all publicly traded MNCs listed on the Korea Stock Exchange in 1990; after that year, Korean foreign direct investment (FDI) dramatically increased. We chose this longitudinal dataset because we expected that these subsidiaries have been exposed and have responded to differing levels of exchange rates in their host countries in different ways over time.

As our primary sample, we use 3,267 foreign subsidiary observations of 249 MNCs in 61 countries. Since operational flexibility is not constrained to any specific currencies (Huchzermeier and Cohen, 1996), this large number of host countries well suits our research on multinational operational flexibility. We exclude outliers in the percentage change in sales volume, which are three or more standard deviations from the mean. T-test results shows that these exclusions do not cause qualitative differences in the sample composition.

We collect the primary data from WISEfn and the Korea Information Service Web site that provides data on publicly traded Korean firms in the Korea Stock Exchange. Regarding the information about Korean foreign affiliates and host countries, we refer to datasets of the Korea Listed Companies Association (KLCA), each company’s homepage, and LEXIS/NEXIS.

Dependent variable

Change in production of a subsidiary

In order to measure the production change of a subsidiary, we use the sales volume of the subsidiary.
This sales information allows the examination of how production output in one subsidiary is related to the activities of subsidiaries in other host countries within the same MNC network. For empirical testing, we compute the percentage change in each subsidiary’s sales volume from \( t-1 \) to \( t \). This variable is used as the independent variable in Hypothesis 3. We locate sales information for each foreign subsidiary from the database of KLCA.

**Subsidiary performance**

In order to test Hypothesis 3 which posits a positive impact of production increase on subsidiary performance, we measure subsidiary performance using return on assets (ROA). Other alternative measurements of performance are discussed in the robustness check section.

**Independent variables**

**Change in foreign exchange rate**

In order to reflect the directionality of the exchange rate change relating to Hypothesis 1, we first calculate the magnitude of the annual percentage change in the host country’s exchange rates for each subsidiary as:

\[
\frac{\text{annual mean of exchange rates at time } t - \text{annual mean of exchange rates of at time } t-1}{\text{annual mean of exchange rates of host country at time } t-1}
\]

We then create a dummy variable (depreciation: 1, appreciation: 0) to indicate that depreciating currency is favorable for the focal subsidiary. The data of monthly exchange rates for each host country is obtained from the International Monetary Fund (IMF) website.

**Change in production of other subsidiaries in the same MNC**

In order to examine production shifts among foreign subsidiaries of the same MNC relating to Hypothesis 2, we include changes in the level of intra-MNC production shifts for the MNC’s other subsidiaries. We measure this variable by subtracting the sales volume of a subsidiary from the total sales volume of its parent MNC, then computing the annual percentage change in sales volume for the remaining subsidiaries.

**Control variables**

Subsidiary size reflects both investment amount and parent firm’s interest in subsidiary business. Larger-sized subsidiaries are expected to interact more with their headquarters and other peer subsidiaries and thus play an important role in MNCs’ retaining multinational operational flexibility (Lee, Makhija, and Paik, 2008). This is measured as the log of total assets for each subsidiary.

In order to assess the degree of each subsidiary’s control over its own business, we include subsidiary ownership level. Subsidiary ownership also reflects the parent MNC’s involvement in its investment decisions. Subsidiaries with high ownership are more able to timely relocate their productions for their own benefits. We use an ownership level of 95 percent, which is typically used to reflect effective control over foreign subsidiary operations (Hennart, Kim, and Zeng, 1998; Pamanahan and Cho, 1999).

Considering that more than one subsidiary belonging to the same MNC can exist in the same host country, we include a dummy variable showing whether or not a subsidiary is an MNC’s only subsidiary in a given host country. Following Belderbos and Zou (2009), we assign the value of 1 to a subsidiary that exists alone in its host country and 0 to a subsidiary that coexists with other subsidiaries in the same host country. Finally, we also include lagged subsidiary performance to address a potential reverse causality problem that indicates prior performance might influence both current performance and production shifts (Pangarkar and Yuan, 2009).

In order to consider production shifts driven by macroeconomic factors other than foreign exchange rate, we control for the percentage change in the gross domestic product (GDP) growth rate in the host country of each subsidiary. The GDP information of all host countries is referred to the IMF website.

We control for two MNC-level variables as well. We include each parent firm’s size as it reflects the overall capability and slack resources, therefore affecting changes in the sales of its foreign subsidiaries. Parent firm size is measured as the log of its total assets (Aabo and Simkins, 2005). We also include the parent firm’s leverage because greater debt holdings in the Korean economic context may reflect the parent firm’s financial status as associated with production shifts.
among its foreign subsidiaries. This is measured as long-term debt divided by fixed assets.

Finally, year dummies are also incorporated to address unobserved variances in each year. We also controlled for industry using three-digit Korean Standard Industrial Classification codes. The results are not qualitatively different with or without this industry control. The Results section reports using firms without this industry control. Firm fixed effects are also considered to address unobserved heteroskedasticity.

Model specification and analytical procedures

We run two diagnostic tests to accommodate autocorrelation and unobserved heterogeneity issues related to panel data. First, the Durbin-Watson test statistic is 1.8, which is between 1.5 and 2.5 as a rule of thumb for the independence of observations, showing no evidence for autocorrelation. Second, a Hausman test supports a random effect model for our sample.

Generalized least squares (GLS) model

In order to test Hypothesis 1 which specifies the positive relationship between a positive change in the host country’s exchange rate and a positive change in subsidiary production, we ran a GLS model:

$$
\Delta Pit = a_0 + a_1 ERit + Fit + Git + Hit + si + t + \varepsilon_1,
$$  

where $\Delta Pit$ is the percentage change in sales of a subsidiary, ERit is the positive change in exchange rate of a subsidiary’s host country as a dummy variable, Fit is a vector of subsidiary-level controls, Git is a vector of MNC-level controls, Hit is a vector of country-level controls, si is subsidiary fixed effect, t is year fixed effect, and $\varepsilon_1$ is error term.

In the above equation, we specifically take potential endogeneity problems into consideration. In this model, P-it is endogenous because it is influenced by many unobservable factors, including the demand for products manufactured in the various locations, the quality of local management, and so forth. For this reason we use changes in interest rates as the instrument for changes in production (Bascele, 2008; Lee and O’Neill, 2003). This variable reflects price changes in other countries with MNC subsidiaries computed as the weighted interest rates of all other subsidiaries’ host countries by total investment amount in each country. We also include lagged P-it ($\Delta P-it-1$) to meet the condition of identification, which requires that for 2SLS to work, at least one unique variable should be incorporated to differentiate the first-from the second-stage model (Bae and Lawler, 2000; Bascele, 2008; Salomon and Shaver, 2005). With the use of a lagged endogenous variable, the contemporaneous and endogenous relationship between $\Delta Pit$ and $\Delta P-it$ is expected to disappear (Baum, Calabrese, Silverman, 2000; Rawley, 2010).

In order to assess the appropriateness of the instrument variable method and qualification of these instruments in terms of their relevance and exogeneity conditions (Bascele, 2008), we run two diagnostic tests. First, the Durbin-Wu-Hausman test rejects the null hypothesis that the instrument is not necessary at the one percent level (Bascele, 2008; Rawley, 2010). Second, the Sargan test does not reject the null hypothesis that the instruments are uncorrelated with the error term in all model specifications (Bascele, 2008).

Two-stage least square (2SLS) model

In order to test Hypothesis 2 which tackles the replacement of production among subsidiaries, we formulate Equation 2:

$$
\Delta Pit = b_0 + b_1 \Delta P-it + Fit + Git + Hit + si + t + \varepsilon_2,
$$  

where $\Delta Pit$ is the percentage change in sales of subsidiary i, $\Delta P-it$ is the percentage change in sales of other subsidiaries in the same MNC to subsidiary i, Fit is a vector of subsidiary-level controls, Git is a vector of MNC-level controls, Hit is a vector of country-level controls, si is subsidiary fixed effect, t is year fixed effect, and $\varepsilon_2$ is error term.

In the above equation, we specifically take potential endogeneity problems into consideration. In this model, P-it is endogenous because it is influenced by many unobservable factors, including the demand for products manufactured in the various locations, the quality of local management, and so forth. For this reason we use changes in interest rates as the instrument for changes in production (Bascele, 2008; Lee and O’Neill, 2003). This variable reflects price changes in other countries with MNC subsidiaries computed as the weighted interest rates of all other subsidiaries’ host countries by total investment amount in each country. We also include lagged P-it ($\Delta P-it-1$) to meet the condition of identification, which requires that for 2SLS to work, at least one unique variable should be incorporated to differentiate the first-from the second-stage model (Bae and Lawler, 2000; Bascele, 2008; Salomon and Shaver, 2005). With the use of a lagged endogenous variable, the contemporaneous and endogenous relationship between $\Delta Pit$ and $\Delta P-it$ is expected to disappear (Baum, Calabrese, Silverman, 2000; Rawley, 2010).

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With the original endogenous variable (\(\Delta P_{it}\)) replaced with the instrumented \(\Delta P_{it}\), Equation 2 turns into:

\[
\Delta P_{it} = b_0 + b_1 \Delta P_{it} (\text{Instrumented}) + Fit + Git + Hit + si + t + \varepsilon_3
\]

(3)

We use a STATA command, ‘xtivreg,’ to run this 2SLS regression model with instrumental variables.

**GLS model**

We test Hypothesis 3 which posits the positive relationship between the production increase of a subsidiary and its performance using Equation 4:

\[
\text{Subsidiary performance} = c_0 + c_1 \Delta P_{it} + Fit + si + t + \varepsilon_4.
\]

(4)

**RESULTS**

Table 1 presents the mean and standard deviation of each variable as well as the correlation coefficients among variables. We check variance influence factors (VIF) to see how significantly a predictor affects other coefficients’ variances and check for potential multicolinearity problems (Hamilton, 2006). The highest VIF in this sample is 2.12, lower than the commonly used cut-off point of 10. This index means that multicolinearity is not a statistical concern in our sample.

**Testing for hypotheses**

Table 2 contains both the results of the GLS model relating to Hypothesis 1 and the results of the 2SLS model relating to Hypothesis 2. Table 3 summarizes the results of the GLS model relating to Hypothesis 3. The Wald chi-square statistics in these tables show that all models are highly significant, and that the models with additional variables show better fits.

Hypothesis 1 states that under a favorable change in its host country currency, a subsidiary is more likely to increase its production. Model 2 in Table 2 shows that this variable positively affects the production increase at a high significance level (\(\beta = 0.10, p < 0.01\)).

Hypothesis 2 addresses more direct evidence of intra-MNC production shifts among an MNC’s foreign subsidiaries. We predict that given the positive influence of the exchange rate in one country, a production increase in one country is associated with a production decrease in other countries within the same MNC network; a production replacement effect is expected to occur. As hypothesized, in Model 3 in Table 2, a change in production in other subsidiaries (\(\Delta P_{it}\)) shows a significant and negative relationship with a change in production for a given subsidiary (\(\Delta P_{it}\)) (\(\beta = -0.47, p < 0.01\)). This result shows that...
Table 2. Results for Hypotheses 1 and 2: intra-MNC production shifts

(1) GLS model: \( \Delta P_{it} = a_0 + a_1 \Delta E_{Rit} + F_{it} + G_{it} + H_{it} + \text{si} + t + \text{error term} \)
where \( \Delta P_{it} \): change in sales (or output) of a subsidiary, \( \Delta E_{Rit} \): Positive change in the exchange rate of the host country of a subsidiary, \( F_{it} \): a vector of subsidiary-level controls, \( G_{it} \): a vector of MNC-level controls, \( H_{it} \): a vector of country-level controls, \( \text{si} \): subsidiary fixed effect, \( t \): year fixed effect

(2) 2SLS model: \( \Delta P_{it} = b_0 + b_1 \Delta P_{it} (\text{instrumented}) + F_{it} + G_{it} + H_{it} + \text{si} + t + \text{error term} \)
where \( \Delta P_{it} \): change in sales of a subsidiary, \( \Delta P_{it} (\text{instrumented}) \): percentage change in sales of other subsidiaries of a firm, \( F_{it} \): a vector of subsidiary-level controls, \( G_{it} \): a vector of MNC-level controls, \( H_{it} \): a vector of country-level controls, \( \text{si} \): subsidiary fixed effect, \( t \): year fixed effect

---

### Variables | (1) The impact of positive exchange rate change on production increase | (2) Production shift among subsidiaries
<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidiary size</td>
<td>0.06(2.25)*</td>
<td>0.06(2.20)*</td>
<td>0.14(2.67)**</td>
</tr>
<tr>
<td>Subsidiary ownership</td>
<td>0.34(3.22)**</td>
<td>0.36(3.36)**</td>
<td>0.15(0.31)</td>
</tr>
<tr>
<td>Sole subsidiary dummy</td>
<td>-0.51(2.16)*</td>
<td>-0.51(2.10)*</td>
<td>-0.61(1.67)†</td>
</tr>
<tr>
<td>Performance at ( t-1 )</td>
<td>0.01(0.13)</td>
<td>0.01(0.18)</td>
<td>0.03(1.00)</td>
</tr>
<tr>
<td>Change in GDP growth rate</td>
<td>0.05(1.95)†</td>
<td>0.04(1.76)†</td>
<td>0.03(0.64)</td>
</tr>
<tr>
<td>Parent firm size</td>
<td>0.09(3.28)**</td>
<td>0.08(3.04)**</td>
<td>0.62(2.23)*</td>
</tr>
<tr>
<td>Leverage</td>
<td>1.04(4.00)***</td>
<td>1.03(3.89)***</td>
<td>1.37(3.08)**</td>
</tr>
<tr>
<td>Subsidiary fixed effect</td>
<td>Included</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Included</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Positive change in exchange rate</td>
<td>Included</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Percentage change in production in all other subsidiaries (instrumented)</td>
<td>0.10(2.75)**</td>
<td></td>
<td>-0.47(2.61)**</td>
</tr>
<tr>
<td>Constant</td>
<td>1.08(1.68)</td>
<td>1.01(1.37)</td>
<td>1.48(1.79)†</td>
</tr>
<tr>
<td>Number of observations</td>
<td>3,267</td>
<td>3,267</td>
<td>3,267</td>
</tr>
<tr>
<td>Wald chi square</td>
<td>82.77***</td>
<td>98.30***</td>
<td>86.89***</td>
</tr>
</tbody>
</table>

† \( p<0.10 \), * \( p<0.05 \), ** \( p<0.01 \), *** \( p<0.001 \).

Numbers are GLS regression coefficients.
Numbers in parentheses are Z statistics in absolute terms.

---

Hypothesis 3 suggests that under a favorable change in the exchange rate, a subsidiary increases its production or output sales to other subsidiaries through which the subsidiary experiences improved performance. In Model 4 in Table 3, \( \Delta P_{it} \) shows the expected sign and significance (\( \beta = 0.97, p < 0.001 \)).

Some control variables warrant further explanation. Higher ownership shows a positive and significant relationship to sales increase, supporting the positive role of effective coordination associated with a controlling ownership stake. Subsidiary and parent firm size both positively influence changes in production volume, indicating that a high level of resource commitment and parental firm support help a subsidiary to effectively adjust its production volume in accordance with changing macroeconomic conditions. The leverage level of a parent firm also positively affects its foreign subsidiary’s production shifts, implying that a parent firm’s financial status influences inter-MNC subsidiary production shifts across countries.

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Robustness check

Performance measures

In order to check the robustness of our results, we compare our performance measure with other performance measures. First, we compute the relative performance by subtracting the ROA of each subsidiary from the averaged ROA of all subsidiaries within the same MNC network (Chung et al., 2010). Second, we also use return on sales (ROS) and relative ROS. These measures do not produce qualitatively different results.

Region dummies

Following Forbes and Rigobon’s (2002) argument, we take into account possible contagion...
Table 3. Result for Hypothesis 3: performance implications of production shifts

GLS model: $\text{ROA} = c_0 + c_1 \Delta \text{Pit} + \text{Fit} + \text{si} + t + \text{error term}$, where $\Delta \text{Pit}$: change in sales of a subsidiary, $\text{Fit}$: a vector of subsidiary-level controls, $\text{si}$: subsidiary fixed effect, $t$: year fixed effect

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidiary size</td>
<td>1.56(4.91)**</td>
</tr>
<tr>
<td>Subsidiary ownership</td>
<td>3.29(3.32)**</td>
</tr>
<tr>
<td>Sole subsidiary dummy</td>
<td>-0.49(0.73)</td>
</tr>
<tr>
<td>Performance at $t-1$</td>
<td>0.01(0.64)</td>
</tr>
<tr>
<td>Subsidiary fixed effect</td>
<td>Included</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Included</td>
</tr>
<tr>
<td>Change in production</td>
<td>0.97(4.31)**</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.47(1.59)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>3,267</td>
</tr>
<tr>
<td>Wald chi square</td>
<td>42.74***</td>
</tr>
</tbody>
</table>

† p<0.10, * p<0.05, ** p<0.01, *** p<0.001.
Numbers are GLS regression coefficients.
Numbers in parentheses are Z statistics in absolute terms.

Second, the subsidiary level approach allows us to examine whether or not a network of affiliated subsidiaries experiencing production shifts in the form of intra-MNC sales transactions exercises operational flexibility, thereby increasing subsidiary performance. The positive relationship between favorable changes in the exchange rate and intra-MNC production shifts supports our argument that MNCs are able to increase their upside potential and limit their downside risk by responding asymmetrically to both favorable and unfavorable changes in host country currencies. By finding a robust causal relationship among foreign exchange rates, production shifts among foreign subsidiaries, and subsidiary performance, our study adds value to multinational operational flexibility literature.

Our findings also carry managerial implications. First, to flexibly respond to the volatile macroeconomic conditions in MNCs’ host countries, firms must structure their FDI so that they are able to relocate production via a portfolio of their foreign subsidiaries. The choice of geographic locations should be made based on a closer examination of the host country’s environment, particularly when MNC subsidiaries experience sudden changes in the value of local currencies. Second, in order to exploit the operational flexibility embedded within its multinationality, an MNC should also be able to effectively and rapidly coordinate the operations of its foreign subsidiaries dispersed in multiple countries. Our results show that production shifts from higher cost to lower cost subsidiaries at the time of a change in the value of local currencies. In this sense, continuous monitoring of the production costs in each subsidiary and readily shifting production would be a pertinent strategy in times of exchange rate changes, rather than leaving each subsidiary isolated.

However, this study is not without limitations, primarily due to the data used to test the boundary conditions of our main findings. These boundary conditions concern how financial costs change differentially across countries; how the liability of foreignness changes; and how host government-provided incentives in investment, export, or tax change in the advent of a currency fluctuation. It would also be informative to consider the different globalization strategies of firms, since different global strategies such as multidomestic and global strategies may affect the roles of foreign subsidiaries from their parent firms’ standpoints.
Lastly, additional studies that broaden the scope of analyses to other countries’ MNCs are required to make further statements regarding our conclusions.

CONCLUSION

While past research on MNC operational flexibility argues that MNCs shift productions from one subsidiary to another, it has rarely been examined whether or not this operational flexibility is actually exercised. In this research, we show that the increase of production in response to changing exchange rates in a focal subsidiary decreases the production of other subsidiaries within the same MNC subsidiary network, and vice versa. We also show that foreign subsidiaries engaged in intra-MNC production shifts have better performance.

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