The Effects of the Exchange Rate on US Companies' Investments in 2000-2020

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Abstract

This paper analyzes how exchange rate movements affected US top importing and exporting companies' investments over the 2000-2020 period. The traditional view is that currency appreciation decreases investments. The study found that, when USD appreciates, US domestic importing companies increase investments, whereas importing US subsidiaries of foreign companies reduce investments. Investment decisions of US exporting companies do not depend on the exchange rate changes. The results of this study help further understand US companies' investments decisions.

1. Introduction

As the economy continues to rapidly globalize, exchange rate volatility has been a rising focus of many economic studies. It is essential for companies to understand how exchange rates may affect their businesses to execute wise business decisions. This study aims to identify the impact the real effective exchange rate, import channels, and export channels have on United States firms' investments. More specifically, this analysis attempts to understand how lagged investments, real effective exchange rate volatility, market power, and the prime lending interest rate affect US firms' investments. This paper focuses on the top importing and exporting companies of 2020 as an insight into the import and export channels, and uses changes in a company's property, plant, and equipment as an indicator of investments.

The conventional view is that when currency appreciates, investments decrease, but studies have shown that when home currency appreciates, investments may actually increase. There are two areas to explore in relation to this topic. First, when currency appreciates, demand for exports decreases, which leads to a decline in exports and revenues and then a decrease in investments. The second topic to explore is imports. With currency appreciation, imports become cheaper, costs decrease, then profits rise, and investments increase.

This paper is organized into five different sections. Section 2 is the literature review, which discusses previous studies relating to company investments dependent on exchange rate volatility and import and export channels. Section 3 discusses the estimation models used in this paper's regressions. Section 4 reviews the data, including descriptive statistics. Section 5 provides the results of tested regressions. Section 6 gives a conclusion of findings.

2. Literature Review

This section outlines previous articles studying exchange rate volatility, imports, and exports. The effect exchange rate volatility has on firms' investments through the import and export channels from previous studies is somewhat unclear. In other words, inconsistent findings occur due to study location and different variables analyzed. This raises the question as to how real effective exchange rate volatility affects export and import channels of US firms, which in turn influences US firms' investments.

This study is based on the premise of an analysis by Mihye Lee (2017) which looks at Korean firms' exports, imports, and domestic currency appreciation to determine investment capabilities. Additionally, a study performed by Masaki Hotei (2012), is used as a guide in understanding US firms' investment capabilities. Hotei studied the influence import channels, export channels and the real effective exchange rate have on Japanese firms' investments. The fundamentals of both studies are used for understanding how these channels affect firms in the US.

To establish a basis of understanding of exchange rates' influence on firms' investments, previous studies have been outlined. In Carranza's et al. (2003) study on exchange rate volatility and economic performance in Peru, he found that firms holding dollar denominated debt were negatively impacted by real exchange rate depreciation due to the liability of dollarization, as well as currency mismatch. Similarly, Ito and Haneda (2017) found that real effective exchange rates (REER) can negatively influence R&D investments for many Japanese manufacturing firms. Although there may be favorable demand conditions, R&D investments will not increase due to real effective exchange rate uncertainty, and costly mistakes that can follow. These studies found that exchange rate volatility negatively influenced companies' investments due to high risk aversion. Unlike Carranza et al. and Ito & Haneda's studies, which focuses on exchange rate volatility and risk tolerance, this study looks at patterns in global trade channels to offer insights into how exchange rate volatility might impact a US company's investment capabilities.

In understanding how exchange rate volatility and trade channels impact US companies' investments, it is important to understand how exchange rate uncertainty influences trade itself. A study by Cushman (2004) found that an increase in real exchange rate volatility resulted in a decrease in international trade overall. In accordance to Cushman's findings, a study by Kenen and Rodrik (1986) found that short-term volatility in exchange rates depressed the volume of international trade altogether. This is further confirmed by Maskus (1986), which observed US foreign exchange rates, focusing on the implications of when they were allowed to float in 1973. In this study, Maskus observed that exchange rate risk had modest negative effects on US trade, reducing it by around $13 billion USD. When considering how exchange rate volatility influences trade, it is essential to make distinctions between the export channel and the import channel.

When looking at the export channel, many studies have found exchange rate volatility to have minimal to no effect on the volume of exportation. A study by Bailey et al. (1986) found that exports from the Big Seven OECD countries were not significantly reduced due to exchange rate volatility. Yet, it is critical to note that their study utilized nominal exchange rate volatility,

which typically finds insignificant trade change. About 2 years later, Bailey and Tavlas (1988), looking specifically at US exports, found the impact of exchange rate movements had an insignificant effect on trade. Yet, out of the 33 regressions ran by Bailey and Tavlas, three concluded a negative impact on exports. Unlike the other regressions, the three that found a negative effect included *real* exchange rate volatility within their tests. These results reflect similarly to those found by Cushman (2004), mentioned above. This may be an indication that real exchange rate volatility is an essential factor to consider when predicting how exchange rates influence trade. Risk aversion of firms within industry sectors also influences companies' ability to withstand exchange rate volatility and continuing to export. Unlike Bailey and Tavlas (1988), in an analysis of US exports performed by Klein (1990), he found that for certain export categories, when exchange rate volatility increased, the values of exports also increased. In response to an increase in the volatility of real exchange rates, risk neutral firms will increase their supply of price elastic exports.

Despite studies finding mixed results on the significance of exchange rate volatility on the export channel, the findings for the import channel are much clearer. A study by Arize (1995), determined that exchange rate volatility has a significant negative effect on the short-run and long-run volume of imports. The study found that exchange rate volatility affects the allocation of resources by market populations, concluding that increased risk decreases participation. Regarding the import channels between the US and Malaysia, Wong et al. (2012) found that US firms showed a weak negative linear relationship between exchange rate volatility and imports. He suggested that to increase imports, a stable exchange rate system would be preferred rather than exchange rate versatility.

Notably, many studies focusing on exchange rate volatility and trade between the US and Canada have opposing conclusions, a theme seeming to be constant among most studies regarding exchange rate volatility and trade. Bohmani-Oskoee and Bolhassani (2012) concluded that in the long run, exchange rate uncertainty influences less than one third of most trade industries between the US and Canada. Of these industries that were affected, all but one were considered to be small industries. Meaning, the implications and risks associated with exchange rate volatility would have a greater influence on smaller industries. Trade between the US and Canada is incredibly high, this is relevant as, according to this study, it exhibits the relationship between trade and exchange rate volatility – little to none. Similarly, a study performed by Caporale and Doroodian (1994), sought to determine if real exchange rate volatility influenced the overall trade between the US and Canada. Their study found that real exchange rate volatility had a significantly negative influence on trade flows between these two countries. The discrepancies between these two studies could be a result of the inclusion of real exchange rate volatility within Caporale and Doroodian's study. As mentioned before, including this factor within a regression has tended to result in a negative relationship.

Using real exchange rate volatility within these studies has had a significant influence on their results. A study performed by the Research Department of the International Monetary Fund (1998) further proved this. They found that only when real exchange rate volatility was included within their model did exchange rate volatility have a significantly negative affect on international trade. In other words, nominal exchange rate volatility did not cause a significant change. They further developed their study by restricting changes to the coefficients when using

the nominal exchange rate volatility. First, if changes between the fixed and flexible exchange rates were not significantly different between two time periods, they would not change from the precedent. Second, if the relative price variable was not statistically different than zero, it would be restricted to zero. Only once these restrictions were in place did the nominal exchange rate become significant, yet the significance was half of the statistical significance of real exchange rate volatility. From the studies mentioned above, it is evident that real exchange rate volatility has had an influence on global trade, but how this trade then influences US companies' investments is the focus of this study. More specifically, this paper analyses how the real effective exchange rate, import channels, and export channels influence a US firm's investments, which has yet to be researched.

3. Estimation Models

To estimate the influence real effective exchange rate volatility has on US companies' investments, Mihye Lee's (2017) paper and Masaki Hotei's paper (2012) were used as guides. Lee analyzed impacts of exchange rate on Korean firms' investment, while Hotei examined the effects of exchange rate on Japanese firms' investments.

Lee (2017) uses the domestic currency value to understand how its movements impact Korean firms' investments. More specifically, the author is looking at the exchange rate appreciation, and if this increases investments when considering a decline in import prices, or if investments are overall stable. Lee's paper looks directly at how the nominal exchange rate, revenue and cost channels, and other firm characteristics influence companies' investments. The baseline equation of Lee's study is as follows:

$$lnv_{i,t} = \beta_0 + \beta_1 E_t + \beta_2 E_t \times \text{Export Share} + \beta_3 E_t \times \text{Import Share} + X_{i,t} + R_t + \alpha_i + \mu_{i,t}$$

In this equation, $lnv_{i,t}$ is investments of firm i at time t. E_t represents the nominal KRW/USD exchange rate at time t. *Export Share* is the ratio of exports to sales, and *Import Share* is the ratio of imports to the cost of materials produced. Firm characteristics are represented through $X_{i,t}$, which can include a size indicator (ln(assets)) or a profitability measurement (ln(EBIT)). R_t represents the lending rate at time t, and α_i represents a firm fixed effect. To measure the investments, Lee uses the change in assets of property, plant, machinery, etc.

Following results from the baseline equation, Lee then includes the market power of a company and the lagged values of imports and exports to discover if these variables are impacting a company's investments. The calculation for markup power is shown below. Once the markup is calculated, the interaction term of the lagged values of this markup and import and export channels are added in. Lee uses these additional variables as a robustness test to his analysis.

$$Mkup = \frac{values\ of\ sales\ +\ \Delta Inventories\ -\ Payrolls\ -\ Cost\ of\ materials}{value\ of\ sales\ +\ \Delta Inventories}$$

The results of these tests showed the import channel having the only significance on a companies' investments. To further solidify these results, Lee included the Real Effective Exchange Rate, the Consumer Price Index, and the GDP Gap. By dividing the firms into two groups, large and small firms, and running regressions considering these macroeconomic factors, the results held true for large firms. The import channel is statistically significant in increasing a firms' investments when the Korean Won appreciates. Simultaneously, neither the import channel nor export channel were significant for smaller firms.

The paper by Masaki Hotei (2012) looked at how import and export channels influence a Japanese firms' investment capabilities when the domestic currency appreciates. In his analysis, Hotei uses the real effective exchange rate in understanding how exchange rate volatility influences investment capabilities (when the real effective exchange rate rises, the Japanese Yen appreciates). Hotei attempts to uncover the impact of these variables on the rate of change of investment. Hotei's baseline equation is as follows:

$$\Delta \ln I_{i,t} = \gamma_0 + \sum_{k=1}^{7} \gamma_k \Delta \ln I_{i,t-k} + \beta_1 \Delta \ln S_{i,t} + \beta_2 \chi_{i,t-1} \Delta \ln EER_t + \beta_3 \alpha_{i,t-1} \Delta \ln EER_t + \tau_t + \nu_i + \varepsilon_{i,t}$$

$$\Delta \ln I_{i,t} = \ln I_{i,t} - \ln I_{i,t-1}, \qquad \Delta \ln S_{i,t} = \ln S_{i,t} - \ln S_{i,t-1}, \qquad \Delta \ln EER_t = \ln EER_t - \ln EER_{t-1}$$

$$\chi_{i,t} = \frac{Exports_{i,t}}{Sales_{i,t}}, \qquad \alpha_{i,t} = \frac{Imports_{i,t}}{Purchase_{i,t} + LCost_{i,t}}$$

$I_{i,t}$: Investments of company i at time t
$S_{i,t}$: Real sales of company i at time t
EER_t : real effective exchange rate at time t
$Exports_{i,t}$: Export amount of company i at time t
$Imports_{i,t}$: Import amount of company i at time t
$Purchase_{i,t}$: Purchase amount of company i at time t
$LCost_{i,t}$: Labor cost of company i at time t
$Purchase_{i,t} + LCost_{i,t}$: Variable cost
τ_t – Time effect
ν_i – Unobservable company heterogeneity
$\varepsilon_{i,t}$ – Disturbance term of company i of time t

This equation identifies how the export and import ratio multiplied by the real effective exchange rate influence a company's investment capabilities. The product of an increase in the real effective exchange rate and an increase in the export ratio, will result in lowered firm investments. Meanwhile, the product of an increase in the real effective exchange rate and an increase in the import ratio will result in a rise in firms' investments ($\beta_2<0$, $\beta_3>0$).

Hotei advances his equation by including the market power of companies. Hotei implements market power into his equation, to see if the influence of the real effective exchange rate increases dependent on company size. Commonly, smaller firms will decrease investments at a larger rate than bigger firms, as the implications of exchange rate volatility on profitability lessens their capacity to invest. Therefore, markup was calculated as follows:

$$mkup_{i,t} = \frac{OPROFIT_{i,t}}{S_{i,t}} \quad (0 \leq mkup_{i,t} \leq 1)$$

In this calculation, $OPROFIT_{i,t}$ represents the operating profit of company i at time t, and S represents sales of company i at time t. Operating profit as a portion of sales is used in this calculation to alleviate differences between foreign and domestic market power. When operating profit is below the previous year, then it will be set to zero. Therefore, the higher the $mkup_{i,t}$ variable, the greater the market power. Hotei implemented this into the baseline equation by setting a focus on low market power companies. The $mkup_{i,t}$ variable is applied to the equation as follows:

$$\begin{aligned}\Delta \ln I_{i,t} = \gamma_0 + \ & \Delta \ln I_{i,t-k} + \beta_1 \Delta \ln S_{i,t} \\ & + \beta_2 \chi_{j,t-1} \Delta \ln EER_t (1 - mkup_{i,t=1}) \\ & + \beta_3 \alpha_{i,t-1} \Delta \ln EER_t (1 - mkup_{i,t=1}) + \tau_t + \nu_i + \varepsilon_{i,t}\end{aligned}$$

Finally, to understand financial constraints further, Hotei altered the baseline equation again, which included four more variables. In this alteration, he included four dummy variables to represent if a company had capital funds that were either less than or greater than the median. The dummy variables and equation alteration were as follows:

$Dhigh_{i,t}$: Dummy variable to be set to 1 for companies with capital funds greater than or equal to the median, 0 for the rest

$Dlow_{i,t}$: Dummy variable to be set to 1 for companies with capital funds less than the median, 0 for the rest

$$\begin{aligned}\Delta \ln I_{i,t} = \gamma_0 + \ & \Delta \ln I_{i,t-k} + \beta_1 \Delta \ln S_{i,t} \\ & + \beta_2 \chi_{j,t-1} \Delta \ln EER_t Dhigh_{i,t} + \beta_3 \chi_{j,t-1} \Delta \ln EER_t Dlow_{i,t} \\ & + \beta_4 \alpha_{i,t-1} \Delta \ln EER_t Dhigh_{i,t} + \beta_5 \alpha_{i,t-1} \Delta \ln EER_t Dlow_{i,t} + \tau_t + \nu_i + \varepsilon_{i,t}\end{aligned}$$

Hotei's findings concluded that investments significantly decreased (increased) when the export (import) ratio is higher and REER increased. In using lagged variables, Hotei found that investment increase (decrease) will affect the future decrease (increase) of investments of a company, while the coefficient for the rate of change of real investment opportunities ($S_{i,t}$) was not significant. Yet, the reasoning behind this is unclear.

This study uses components from both Lee and Hotei's methodologies to evaluate US companies' investments. An inability to attain the monetary export and import data for US companies resulted in this analysis to use the 2020 top ranked US public companies for exports and imports. Using the top ranked US public companies assumes that those on this list would have either a high export or high import ratio. The baseline equation of this paper is as follows:

$$\ln Inv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln Inv_{i,t-k} + \beta_1 \ln REER_t + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

Where $Inv_{i,t}$ represents real investments for company i at time t, $REER_t$ represents the real effective exchange rate at time t, $RPrime_t$ represents the bank prime lending rate at time t, and α_t represents the firm fixed effect. Lastly, the $\varepsilon_{i,t}$ represents an error term. In this study, only

companies with positive investments were used in equations, as the log of negative numbers or 0 is impossible.

Similarly to Lee's study, investments are measured as a change in property, plant, and equipment. Real investments were calculated as investments divided by the inflation index. Additionally, as Lee's study included the lending rate at time t, this baseline equation considers the bank prime lending rate at time *t*. Similarly to Hotei's study, this paper uses the real effective exchange rate. To use the real effective exchanger rate over the nominal exchange rate is purposeful, as in past studies it has shown to have a greater significance when looking at import and export channels and their influence over a company's investments.

Similarly to both Lee and Hotei's study, the market power of companies was included to determine its influence on company investment patterns. To measure market power, the markup of a company was included in the baseline equation as follows:

$$\ln Inv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln Inv_{i,t-k} + \beta_1 \ln REER_t(1 - mkup_{i,t}) + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \quad (2)$$

In this paper, $mkup_{i,t}$ represents the market power of company *i* at time *t*. This variable was calculated dividing earnings before tax and interest (EBIT) by sales (total revenue):

$$mkup_{i,t} = \frac{EBIT_{i,t}}{Sales_{i,t}}$$

A conventional view assumes that as a currency appreciates (REER increases), companies will invest less ($\beta_1 < 0$). The impact of the exchange rate change changes on investments will be stronger for firms with lower market power (higher 1 – *mkup*). In general, when interest rates go up, borrowing costs increase, lending to lower investments ($\beta_2 < 0$).

To determine if export channels and import channels influenced a company's investments, the data set was split into two groups – top ranked import companies and top ranked export companies. Once top importing and top exporting companies were separated, the baseline equation was re-run to determine if change in the previous years' investments, the real effective exchange rate, and the bank prime lending rate influenced either importing companies' investments or exporting companies' investments. The following two equations demonstrate the alteration of the baseline equation when considering imports and exports:

$$\ln ImpInv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln ImpInv_{i,t-k} + \beta_1 \ln REER_t + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \quad (3)$$

$$\ln ExpInv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln ExpInv_{i,t-k} + \beta_1 \ln REER_t + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \quad (4)$$

Where $ImpInv_{i,t}$ represents real investments of top importing public company *i* at time *t*, and $ExpInv_{i,t}$ represents real investments of top exporting public company *i* at time *t*.

To further distinguish between importing and exporting companies, the market power variable was also included in these altered equations. This establishes a more insightful differentiation between importing and exporting companies. Specifically, if previous quarters investments, the real effective exchange rate, market power, and the bank prime lending rate

have a statistically significant impact on importing (exporting) companies. The equations are as follow:

$$\ln ImpInv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln ImpInv_{i,t-k} + \beta_1 \ln REER_t(1 - mkup_{i,t}) + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \quad (5)$$

$$\ln ExpInv_{i,t} = \gamma_0 + \sum_{k=1}^{4} \alpha_k \ln ExpInv_{i,t-k} + \beta_1 \ln REER_t(1 - mkup_{i,t}) + \beta_2 \ln RPrime_t + \alpha_i + \varepsilon_{i,t} \quad (6)$$

If currency appreciates, imports are cheaper, costs decline, profits are higher, firms can invest more. Thus, β_1 for importers in equation (5) is projected to be positive.

If currency value increases, exports become expensive, and a country will export less, revenues will decline, companies' capacity to invest reduces. Hence, β_1 for exporters in equation (6) is expected to be negative.

4. Data

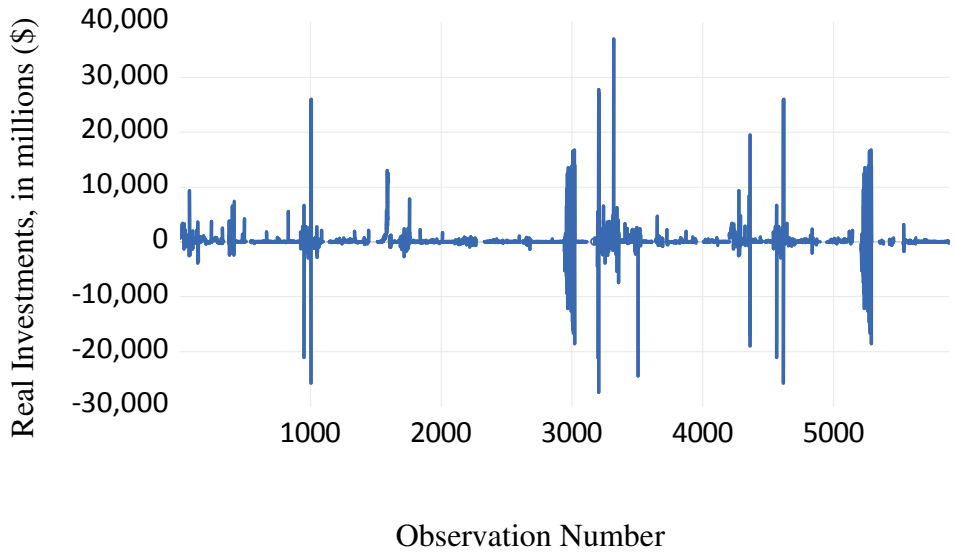
Using models (1)-(6), an empirical analysis was conducted for the 2020 top ranked US exporters and importers. This study evaluates how their investments depend on previous investments, the real effective exchange rate, market power, and the prime lending interest rate. Descriptive statistics of variables are given in Table 1.

The top US import and export companies list was compiled by Joc Group Inc. The lists formed by Joc Group provide information covering the global container shipping and logistics market through partnering with The Port Import/Export Reporting Service (PIERS). PIERS is the world's largest comprehensive database of US waterborne trade, and international business transportation. The importers and exporters listed are based on twenty-foot equivalent unit shipping containers (TEU), which is the most common measurement of ocean container shipping. The data recorded looked at owners of containerized cargo that entered or exited US ports by ocean vessel for the 2019 year, which established their 2020 ranking. The sample in this paper includes public companies from this ranking as financial statements for private companies are not in public domain, and it is difficult to obtain their investment measurements. Thus, the empirical analysis considers 62 US public companies – top 39 importers and top 31 exporters. Eight companies are listed in both top importing and exporting groups.

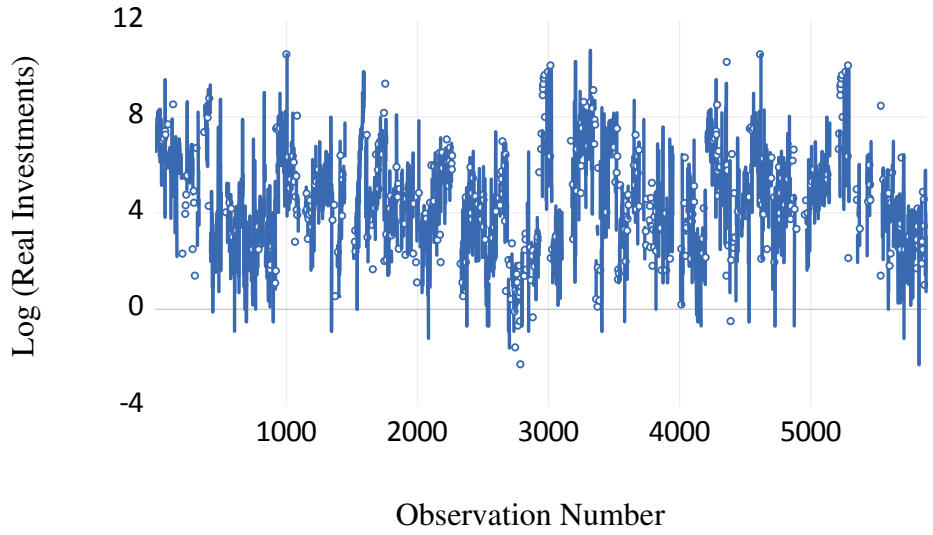
Companies' quarterly financial statements were collected from over the past 20 years. From the financial statements, quarterly numbers for property, plant, and equipment (representation of investments), total revenues (representation of sales), and earnings before interest and tax (EBIT) were collected from 2000 to 2020 when available. This data was collected from balance sheets and income statements from S&P Global on their Capital IQ website. Capital IQ is a financial database provided by Standard and Poor's Global Market Intelligence. Investments were calculated as changes in property, plant, and equipment for companies. Real investments for companies ranged from -$27,430.18 to $36,987.28 (in millions), averaging $168.79 million. The standard deviation of company investments was $2,265.82 million. Graph 1 and Graph 2 demonstrate the comparison between real investments and log of real investments. Both graphs have observation number on the horizontal axis. The

observation number is derived as $i \times t$, where i is the firm index, $i = 1,\ldots, 70$; and t shows time, $t = 1,\ldots, 84$.

Graph 1. Real Investments of Companies (Year 2000 to Year 2020)



Graph 2. Log of Real Investments of Companies (Year 2000 to Year 2020)



Companies' Sales and EBIT were collected from company income statements to calculate the market power of companies. This independent variable was used to determine market power's influence on companies' investments. Table 1 includes the statistics for markup power. The minimum markup for companies was -4.054124 and the maximum markup was 0.419412. The standard deviation for company market power was 0.104848.

This paper includes the real effective exchange rate in the regressions. The real effective exchange rate for the US from 2000 to 2020 was collected from BIS statistics explorer. BIS calculates the real effective exchange rate as a weighted average of real exchange rate with trading partners. The weights are trade weights of countries. This study uses the REER found as the weighted average of real exchange rates with 60 US trading partners. The real exchange rate is found by taking the nominal exchange rate and multiplying it by the Foreign Price Index divided by the Domestic Price Index. The real effective exchange rate has varied slightly over this 20-year period. The minimum REER is 93.65000, whereas the maximum REER is 128.6600, with a standard deviation of 9.471564, shown in Table 1.

To calculate real investments, sales, and EBIT, the Consumer Price Index (CPI) data was collected. The CPI was collected for the years 2000 - 2020, from the Federal Bank Reserve of Saint Louis, sourced by the US Bureau of Labor and Statistics. The bank prime lending rate from 2000 to 2020 was also collected from the Federal Bank Reserve of Saint Louis, FRED database. The prime lending interest rate was used to determine how accessibility to debt lending influenced a company's investments. Table 1 shows the prime lending rate ranges from 3.25% to 9.5%, with an average of 4.68%. Moreover, the standard deviation of the prime lending rate is 1.76%, meaning variability in collected data was low.

Table 1. Descriptive Statistics for Real Investments, Markup, Real Effective Exchange Rate, and Prime Lending Rate

Sample: 2000Q1 2020Q4

	INV_REAL (In Millions of $)	MKUP	REER	R_PRIME
Mean	169.1069	0.075692	110.0674	4.682711
Median	12.56750	0.072024	111.2800	4.040000
Maximum	36987.28	0.419412	128.6600	9.500000
Minimum	-27430.18	-4.054124	93.65000	3.250000
Std. Dev.	2278.974	0.104848	9.471564	1.760062
Skewness	1.186530	-25.64107	-0.016626	1.247308
Kurtosis	75.78504	999.8965	1.945784	3.467162
Observations	4835	4835	4835	4835

5. Empirical Analysis

Table 2 and Table 3 show the results of the GMM estimation of our dynamic panel models (2), (5), (6) predicting company investments. For each estimated model, coefficients and the t-statistic for independent variables are provided. Column 1 displays results from testing model (2) for the entire sample. Column 2 displays model (6) results for exporting companies, and Column 3 displays model (5) results for importing companies. Table 3 presents results of tests when their domesticity is considered. Column 4 shows model (6) results for US domestic

Table 2. Estimation of Exchange Rate Impact on Investments

	1. Entire Sample		2. Exporters		3. Importers	
Dependent Variable	Coeff	t-statistic	Coeff	t-statistic	Coeff	t-statistic
log(Inv, t-1)	-0.1751***	-10.4045	-0.0969**	-2.3406	-0.0204***	-3.7884
log(Inv, t-2)	-0.1100***	-14.7069	-0.0303	-1.0106	-0.0234	-1.2017
log(Inv, t-3)	-0.0480***	-6.7531	-0.0605**	-2.0263	0.1073***	8.4392
log(Inv, t-4)	0.1674***	32.1806			0.1317***	5.1140
log(REER)*(1-(Mkup, t-1))	-0.0938	-1.2413	-0.1517	-0.4770	0.2804***	8.2429
log(RPrime)	0.1261***	3.7687	-0.5221***	-6.5550	0.7160***	37.1648
Number of observations	711		464		477	
J-statistic	48.2691		18.8137		26.3060	
Prob(J-statistic)	0.2684		0.4688		0.3914	

Note
***, **, * indicate the significance respectively to 1%, 5%, 10%

exporting companies. Column 5 shows model (6) results for US domestic importing companies, and Column 6 shows model (5) results for foreign subsidiary importing companies.

The first prediction test aims to identify how lagged investments, the real effective exchange rate, and the prime lending rate influence investments for the overall sample. The overall sample consisted of 711 observations, including both exporting and importing companies. In this test, all independent variables are statistically significant, except for the real effective exchange rate. This means that the real effective exchange rate is not statistically significant in predicting company investments. The negative coefficients for the real investments over the past four quarters indicate that if a company invests over the previous four quarters, their current investments will decrease. These findings are similar to results in Hotei's (2012) study and Carranza's (2003) study, in which previous quarters investments resulted in negative coefficients within the model. Lastly, interest rates are significant in predicting a company's investment. A positive coefficient for the interest rate implies that an increase in interest rates is associated with increased investments. Lee (2017) also obtains a positive coefficient for interest rates in estimating investments of Korean firms. The J-statistic for this test was 48.2691, and the probability of the J-Statistic was 0.2684, which means this is a satisfactory model in predicting company investments.

After this prediction test, the sample was divided into exporting companies and importing companies. The second model tested if the independent variables were significant in predicting exporting companies' investments. There were 464 observations in this model. The test showed that log of quarter 1 investments, log of quarter 3 investments, and the prime lending rate were statistically significant. Therefore, the log of quarter 2 investments and the real effective exchange rate were not statistically significant for US top exporting companies. The coefficients from this test indicate that if the exporting company increases their investments in quarter 1 and quarter 3, then investments in the current quarter will decrease. Additionally, for exporting

companies, if the prime lending rate increases by 1%, then their real investments will decrease by 0.5221%. This can be explained through an increase in the cost of debt financing leading to limitations placed on exporting companies. Meaning, higher borrowing costs can result in less investing by top exporting companies. The probability of the J-statistic for this model was 0.4688. Some sources say this J-statistic probability is a little high but is accepted in this study.

The third model identified how the independent variables influenced the investments of importing companies. There were 477 observations included in this model. Of the independent variables, all but the log of quarter 2 investments were statistically significant. For importing companies, if they increase their investments in the previous quarter, their current investments will decrease. On the other hand, if the importing companies increase their investments in the previous quarter 3 and quarter 4, their current investments will increase. The real effective exchange rate was statistically significant in predicting importing companies' investments. A positive change in the real effective exchange rate means appreciation of the US dollar. When the US dollar appreciates, imports become cheaper, which reduces costs for importing companies. Therefore, considering these costs reductions, importing companies have more money to spend on investing. This aligns with the positive coefficient associated with the real effective exchange rate in this model. The prime lending rate was also statistically significant in this model. The positive coefficient for the interest rate indicates that US top importers' investments increase as interest rates go up. The probability of the J-statistic was 0.3914.

Models 4, 5, and 6 test to see if the domesticity of a company influences their investments. The importing and exporting companies were further separated into either a domestic group or foreign group. The foreign data set represents those companies that are US subsidiaries of foreign companies.

Model 4 tests domestic exporting companies. This model had a sample of 450 observations. In this model, log of investments for quarter 1 and the log of investments for quarter 2 were both statistically significant. The prime lending rate was also statistically significant. In this model, the real effective exchange rate was not statistically significant. For domestic exporting companies, if their previous 2 quarter investments increased, there current investments will decrease. Additionally, if the prime lending rate increases, their investments decrease. The probability of the J-statistic of this model was 0.2805. This statistic indicates that this model did well in predicting domestic exporting company investments.

Model 5 tested domestic importing companies. This model had a sample of 564 observations. From this model, all independent variables were statistically significant. For domestic importing companies, if investments increased in quarter 1 and quarter 2, their current investments would decrease. Additionally, if the real effective exchange rate increased by 1, the current investments of domestic importing companies will in increase. Notably, the real effective exchange rate was only significant at 7.85 percent. The probability of the J-statistic was 0.3626.

In this study, the foreign subsidiary of exporting companies is not included, as when testing the independent variables to predict company investments, no output was given by the GMM model. Therefore, for foreign subsidiary companies tested, only importing companies were analyzed.

Model 6 tests the independent variables against foreign subsidiary importing companies' investments. This test had 220 observations. The log of quarter 1 real investments, the log of quarter 2 real investments, and the real effective exchange rate were all statistically significant. The model shows that if the foreign subsidiary importing company increased investments in quarter 1 and quarter 2, the current investments will decrease. Notably, the real effective exchange rate affects foreign subsidiary importing companies' investments differently than all other models. The coefficient for this model was -0.9662, indicating that if the real effective exchange rate increases or USD appreciates, the investments for these top importing subsidiaries of foreign companies would decrease. The prime lending rate was statistically insignificant. Investments of importing foreign subsidiaries do not depend on US interest rates. A reason for this could be due to the ability of these companies to use abroad financing measures. The probability of the J-statistic for this model was 0.4321, which is acceptable for this study.

The models presented allow conclusions to be drawn regarding exporting and importing companies' investments when considering other variables. Overall, there is a pattern of previous quarter investments negatively impacting current quarter investments for both exporting and importing companies. This effect is most attributed to quarter 1 and quarter 3 real investments. The prime lending rate is significant in all situations, except for the foreign subsidiary importing companies model, which can be explained through borrowing abroad. Regarding the real effective exchange rate, the models show that only importing companies' investments are impacted by the real effective exchange rate. This aligns with previous studies by both Hotei and Lee, in which they found that the real effective exchange rate was significant for importing companies only, as well. Most notably from the models when considering the real effective exchange rate, only for foreign subsidiaries of importers does the real effective exchanger rate decrease the current companies' investments. In all other cases, an increase in the real effective exchange rate (appreciation of the USD), will increase current importing companies' investments.

6. Conclusion

This study analyzed the effects of USD movements on top US importing and exporting companies' current investments. First, when considering rises in the real effective exchange rate or USD appreciation, the results indicate that the appreciation is significant in affecting top US importing companies' investments but does not affect top US exporting companies' investments. The paper finds that domesticity of companies influences investment decisions. Importing foreign subsidiaries reduce investments if USD appreciates, while importing companies with the headquarters in the US increase investments when the USD appreciates. These findings regarding importing companies contradict the traditional view that currency appreciation will negatively affect a companies' investments.

Second, previous company investments have demonstrated some effect on their current investments. In almost all instances, an increase in previous quarter investments would negatively affect current quarter investments. This was true for all models except for quarter 3 and quarter 4 for top US importing companies. In other words, for top US importing companies,

if their investments had increased in previous quarter 3 and quarter 4, then their current investments would increase.

Third, the bank prime lending rate demonstrated a strong affect on the top US importing companies' investments and top US exporting companies' investments. For foreign subsidiaries, the prime lending rate did not affect these companies' investments, which can be explained through the ability to attain abroad funding.

To further solidify the findings of this study, it could be useful to attain a larger sample size to include more companies' data within the models. Additionally, it would be beneficial to include company industry information within studies to further understand how company characteristics influence their investments.

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