

The Impact of Exchange Rate Fluctuations on Korean Firms and Its Policy Implications

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I. Research Objective

Financial liberalization of Korea has expanded the influence of the international financial market on the Korean economy. Monetary policy and financial shocks in major economies give rise to a greater influence on Korean Won exchange rate fluctuation. Korean government requires sophisticated policy responses. Since 2016, the US Treasury Department has designated Korea as one of the exchange rate monitoring list, which potentially increases the downward rigidity of the exchange rate. Thus, it is necessary to analyze the subsequent impacts of exchange rate movements on Korean companies and incorporate them into basic data for policy-making.

In normal time, the Korean won is one of the most stable currencies among emerging economies. When the global financial market becomes unstable, the volatility of the Korean won tend to become relatively more substantial than that of the other currencies. Recently concerns about rising exchange rate volatility are increasing due to the asymmetric monetary policies of developed countries, stemming from normalization of US monetary policy

and continued quantitative easing of Europe and Japan. Exchange rate fluctuation is expanding beyond the profitability of firms, meaning it will be important for companies that are affected by imports and exports to prepare for exchange rate fluctuations. However, there is insufficient research to analyze the effect of exchange rates on individual firms

Recently, firm-level data have been made public, enabling analysis of the effect that exchange rates on the individual companies. The results will serve as a valuable basis to formulate sophisticated policies for companies and policy-makers. The majority of previous studies related to exchange rates have been focused on macroeconomic variables or the analysis of industry effects. As a result, there is a limit when it comes to measuring the influence on individual companies and this, in turn, limits the sophistication of policy responses.

This study contributes to the line of literature that it not only investigates the effect that exchange rates on macro variables, but also analyzes the effects of exchange rate changes on firm activities.

II. Analyses and Results

We investigate the effect of exchange rate on Macroeconomic variables through the VAR analysis. We separate the analysis period into the following three cases; (1) 1990Q1-2016Q4; (2) 1980Q1-1996Q4; (3) 1999Q1-2016Q4.

The empirical results differed by period. The effects of the exchange rate on the expenditure components of Korean GDP after the foreign

exchange crisis were different from the pre-crisis period. The results can be summarized as follows. First of all, consumption and income decline when the exchange rate rises, confirming theoretical expectations. Secondly, the impact of the exchange rate is not clear in the investment sector. Lastly, one unusual aspect is that the exchange rate decreases exports.

Table 1. Effect of Exchange Rate on Expenditure Side: Summary of VAR Analysis

Time	Expenditure	Depreciation Effect	Remarks
1980. 1Q-2016. 4Q	Consumption	decrease	theory proved
	Facility Investment	decrease	theory proved
	Construction	decrease	theory proved
	Import	decrease	theory proved
	Export	not clear	-
1980. 1Q-1996. 4Q	Consumption	weak decrease	theory proved
	Facility Investment	not clear	-
	Construction	not clear	-
	Import	weak decrease	theory proved
	Export	not clear	-
1999. 1Q-2016. 4Q	Consumption	decrease	theory proved
	Facility Investment	decrease (not significant)	theory proved
	Construction	not clear	-
	Import	decrease	theory proved
	Export	weak decrease	against theory

The results indicate that an increase in exchange rate does not contribute to export growth are contrary to the traditional exchange rate theory. Theoretical and empirical research will be needed to identify possible causes. One of the possible reasons is that the overseas portion of the global value chain (GVC) of export products in Korea has increased. This result should be taken into consideration when deciding exchange rate policy.

The VAR analysis was also conducted for the supply sector of macro variables. Due to data constraints, we used quarterly data from the first quarter of 2000 to the fourth quarter of 2016. The main results are as follows: First, the depreciation of the won has a negative impact on economic growth and industrial growth. Second, the exchange rate effect on the supply sector is short-term. Whether negative or positive, the

effects of the exchange rate on the supply side have disappeared within two years. Third, the statistical significance of the exchange rate effect is relatively weak. Fourth, the supply side is more influenced by institutional factors and economic fundamentals than the exchange rate effect.

In the supply sector, the effect of exchange rate fluctuations is not large compared to the demand side. Supply-side variables are difficult to react to in the short term. This is because the effects of the exchange rate are already offset by other effects in the process of delaying supply sector variables in response to exchange rate changes.

Table 2. Impact of Exchange Rate Changes on Supply Side: Summary of VAR Analysis

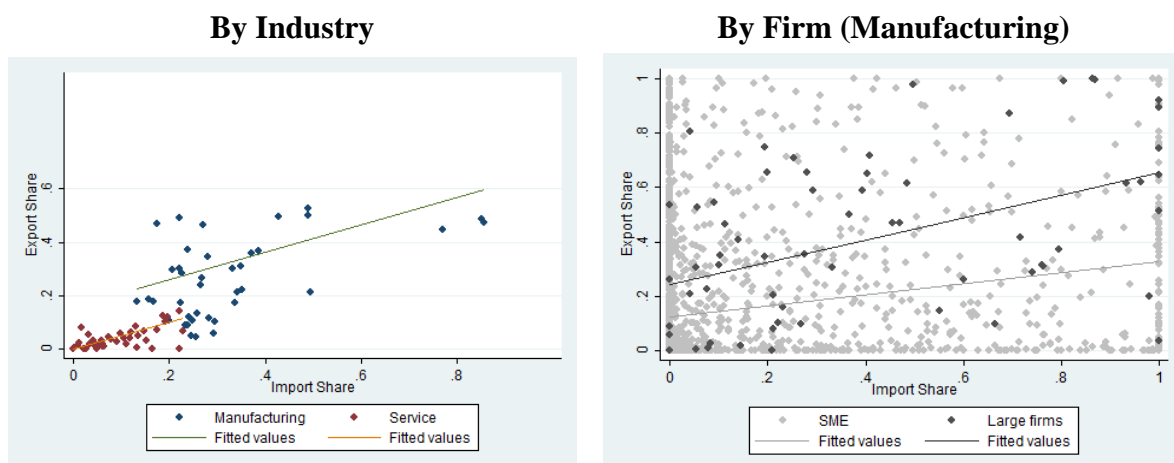
Period	Items	Depreciation Effect	Remarks
2000. 1Q – 2016. 4Q	Economic growth	increase after decline	theory proved
	Employment	increase (not significant)	-
	Industrial production	weak reduction	against theory

Also, we investigate the effects of exchange rate movements on firm characteristics such as firm productivity and profit.

Exchange rates affect the productivity and competitiveness of individual firms through export and import activities. After controlling for industry, export and import shares, we estimate the effect of exchange rate changes on individual firms. We separate heterogeneous firm characteristics into industry factor and idiosyncratic firm characteristics within an industry.

We find that industry-level export share and import share are highly correlated. Manufacturing sectors show relatively high shares of export and imports, compared to service sectors. Export and import shares are relatively high in large firms compared to SMEs, but heterogeneity across firms is large, making it difficult to find clear patterns.

Figure 1. Export and Import Share



In order to estimate the exchange rate elasticity of firm productivity and profitability that depends on export and import shares, we estimate the following equation:

$$Y_{it} = \alpha + (\beta_1 + \beta_2 \times \psi_{it} + \beta_3 \times S_{it} + \dots) e_t + \alpha_i (+ \alpha_t) + \varepsilon_{it}$$

where Y_{it} is firm productivity or profitability, e_t is the industry-level real effective exchange rates, ψ_{it} and S_{it} are industry-level export and import shares, respectively.

Exchange rate changes do not have significant effects on firm productivity. However, the effects differ between the manufacturing and service sector. For manufacturing firms, 10%p appreciation of real exchange rate may lead to 2%p increase in firm productivity. For service

firms, on the other hand, 10%p appreciation of real exchange rate may lead to 2-3%p decrease in firm productivity. For the industries that are more linked with export (higher export share), appreciation of the real exchange rate causes a loss in the price competitiveness of firms and decrease their productivity – 10%p appreciation of real exchange rate may have an additional 1-1.8%p decrease of firm productivity for industries that only produce export goods, compared to industries that only produce domestic goods. On the other hand, firms with low exports and high reliance on intermediate imports show little impact on their productivity. This result is robust with measures of productivity such as total factor productivity, labor productivity and total value added.

Table 3. Real Effective Exchange Rate (REER) and Total Factor Productivity (TFP)

Dependent Variable : ln(TFP)	Total		Manufacturing		Service	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(REER)	0.029 (0.018)	-0.020 (0.019)	0.195*** (0.023)	0.142*** (0.024)	-0.198*** (0.029)	-0.213*** (0.031)
ln(REER) × Export Share		-0.096*** (0.007)		-0.127*** (0.009)		-0.047*** (0.011)
ln(REER) × Import Share		0.101*** (0.007)		0.162*** (0.010)		0.053*** (0.009)
⋮						
Observations	60,254	59,481	34,536	34,536	25,602	24,829
R-squared	0.834	0.835	0.789	0.795	0.869	0.870

In terms of firm profit, 10%p appreciation of real exchange rate may lead to 5%p drop in firm net profit. As for manufacturing firms. The increase of currency value weakens the export competitiveness of industries that have a relatively high export share, whereas industries with high import share have benefited from the cost reductions. These results are

consistent with economic theory, and this fact is confirmed in the micro-level data of firms in Korea.

Table 4. Real Effective Exchange Rate (REER) and Net Profit

Dependent Variable: ln(Net Profit)	Total		Manufacturing		Service	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(REER)	-0.474*** (0.047)	-0.580*** (0.050)	-0.600*** (0.064)	-0.628*** (0.067)	-0.273*** (0.070)	-0.458*** (0.078)
ln(REER) × Export Share		-0.169*** (0.018)		-0.191*** (0.023)		-0.251*** (0.033)
ln(REER) × Import Share		0.162*** (0.018)		0.321*** (0.026)		0.0429* (0.025)
⋮						
Observations	50,797	50,042	29,029	29,029	21,673	20,918
R-squared	0.818	0.812	0.776	0.779	0.859	0.848

We analyze the exchange rate exposure of firm value, which is proxied by stock prices. Foreign exchange exposure is defined as the change in the value of the corporation due to unexpected changes in exchange rates. Assuming that the stock price reflects the value of the corporation, it is measured by the influence of exchange rate fluctuations on the stock price return.

Exchange rate exposure is measured by the coefficient β_{2t} of the following estimating equation:

$$R_{it} = \beta_{0t} + \beta_{1t}R_{mt} + \beta_{2t}\Delta s_t + \varepsilon_{it}$$

where R_{it} is the stock return of the company i at time t , R_{mt} is the return of the market portfolio (KOSPI Index), Δs_t is the percentage change of the won/dollar exchange rate. The estimation coefficient β_{2t} represents the change in the rate of return due to the exchange rate change taking into account the market rate. β_{2t} can be interpreted as the marginal exchange rate exposure on the company. Since the exchange rate exposure may vary depending on the analysis frequency, we analyze the exchange rate exposure by changing analysis frequencies.

In the short run (weekly and monthly frequencies), the depreciation of the Korean won has a

negative impact on the stock return to a relatively large number of companies. In the medium run (annual frequency), the proportion of firms whose stock return is positively influenced by the depreciation to the Korean won increases, so that the number of firms with positive exchange rate exposure is similar to the number of firms with negative exchange rate exposure. In particular, we find that firms with substantial external assets, firms with low external debt, firms with high capital adequacy ratio, firms with high cash holding ratio, and firms with high profitability are better at controlling for exchange rate changes.

Table 5. Exchange Rate Exposure

	Total Company	Positive FX Exposure		Negative FX Exposure	
		Number of Companies	Proportion (%)	Number of Companies	Proportion (%)
Weekly return($h=1$)	706	28	4.0	387	54.8
Monthly return($h=4$)	705	44	6.2	238	33.8
3-month return($h=13$)	703	85	12.1	212	30.2
Annual return($h=52$)	685	181	26.4	193	28.2

Note: 1) We count the number of firms that show positive/negative FX exposure at 10% statistically significant level.

2) Newey-West long-run variance estimators are used.

Source: Author's calculation

IV. Policy Suggestions

Contrary to general wisdom, our results confirm that exchange rate appreciation is not necessarily positive on a macroeconomic basis. In other words, unlike the conventional wisdom, the depreciation of the Korean won may have a negative impact on the macro economy for a certain period of time. This fact is reflected not only in macroscopic analysis using aggregate data but also in micro analysis using corporate data. This implies that the devaluation of the exchange rate does not necessarily contribute to the expansion of exports or the growth rate.

Although the effect of exchange rate fluctuations is short-lived, the level and frequency of exchange rate volatility have increased. Thus, policies that aim to strengthen stability by lowering the volatility of the exchange rate, rather than policies targeting the exchange rate level itself, will contribute more to the economy. The impact of foreign factors on our economy has expanded, and the real sector and financial sector have been influencing each other. Since the impact of the exchange rate may vary depending on the circumstances of a specific period, it would be desirable to

select a policy that can yield more obvious policy effects than uncertain policy effects.

Not only does the economic effect of the exchange rate fluctuate with the passage of time, it also has different effects depending on industry-specific situations. Therefore, a customized exchange rate policy is required to meet policy objectives. Since firms showing negative or positive impacts from exchange rate changes have different characteristics, a rise in the exchange rate does not necessarily provide favorable conditions for all companies. The level to which exports depend on imports and imports of intermediate goods differs by company. A failure to take this into consideration may lead to policies having different results than expected. It is difficult to achieve specific economic targets only by exchange rate policy. Therefore, it is necessary to develop a policy mix that applies related policies, such as fiscal policy and employment policy, to control negative impacts and produce the desired effects.

Appreciation of the Korean won may deteriorate the exports and profitability of manufacturing companies in the short term, but it could also be an opportunity to increase the produc-

tivity of individual companies. The KRW appreciation can be used as an opportunity to strengthen national competitiveness through restructuring measures, such as the exit of marginally insolvent companies. On the other hand, for small and medium-sized exporters whose profitability may deteriorate due to the appreciation of the won, active policy support such as F/X insurance and SME loan support is required.

It should be noted that devaluation of the exchange rate is no longer necessarily advantageous to our economy. Up to now, the exchange rate has mostly been discussed in regard to the adequacy of exchange rate levels, based on the assumption that devaluation of the exchange rate is favorable to economic growth and the macro-economy. The results of this study show that these assumptions are not necessarily correct in macroeconomic or microeconomic analysis. To accurately identify these phenomena related to the depreciation of the exchange rate, detailed follow-up studies are needed, taking into account exchange rate levels and the rate of change. At the least, the results of this study can be useful when discussing exchange rate policies and Korea's exchange rate policy with the US. **KIEP**