
Changes in the Japanese Manufacturing Industry's Competitiveness since Abenomics and Korea's Countermeasures

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1. Research Background and Objectives

The onset of the global financial crisis turned the game of competition and cooperation between Korean industries and Japanese ones much in the former's favor until 2012. The ratio of intra-industry division of labor in Korean and Japanese industries increased from 47.8 percent to 59.8 percent between 2000 and 2012. Vertical division of labor is diminishing, while horizontal division of labor has doubled its share from 14.4 percent to 28.8 percent of the same years.

The start of the so-called Abenomics, however, has begun to lower the value of the yen (JPY) against other currencies, greatly boosting the profitability of Japanese businesses and ushering in new changes in the competitive and cooperative relations between Korean and Japanese manufacturing industries. As much of the markets and products of the two countries' manufacturing sectors overlap to a high degree, the changes made to the competitiveness of Japan's manufacturing sector under Abenomics require serious attention and

countermeasures from Korean policy and research communities.

The objectives of this study include making in-depth analysis and assessment of the Abenomics-induced changes in the competitiveness of Japan's manufacturing sector, exploring the implication of such changes for the Korea-Japan industrial relations, and identifying and advising possible countermeasures the Korean government and industries may take in response.

We will begin by providing an overview of the effects of the Abenomics policies, focusing on such major measures as the Industrial Competitiveness Enhancement Act. Then we proceed to make an empirical analysis of the quantitative changes in the competitiveness and prices of Japanese products due to Abenomics-induced changes in the exchange rates. We also analyze trade statistics to determine changes in the competitive and cooperative relations between Korea and Japan, and how the changing exchange rate affects Korean exports. Finally, we analyze Japanese industries' increasing investment in R&D and facilities, restructuring and business reorganization, innovative strategies, and decision to lower the prices of exported goods. Based on these analyses, we identify the recommended course of action Korean policymakers and industries ought to take.

2. Competitiveness-Boosting Measures of Abenomics and their Outcomes

(1) Policy overview

Our review of Abenomics policies is primarily centered upon

the Industrial Competitiveness Enhancement Act (ICEA) and the Innovation Network Corporation of Japan (INCJ). The ICEA was enacted as the legislative instrument for realizing the Abenomics growth strategy, i.e., the “Japan Is Back” Plan of June 2013. The purpose of the legislation is to fix the problems of investment reluctance, burdensome regulations, and excessive competition in the Japanese economy so that Japanese companies would more actively invest in facilities and new businesses and thereby enhance their global competitiveness. The ICEA provides for cross-sectoral measures for deregulation as well as for enhancing the metabolism and competitiveness of Japanese industries. The law introduced the Business-by-Business Privilege Program to exempt individual businesses from regulatory requirements. It has also eliminated the regulatory grey zone in which it was formerly difficult to determine whether a given business was subject to a regulatory measure. The INCJ was also set up to provide, under the framework of open innovation, a massive public fund for supporting diverse inter-industry activities of innovation and convergence intended to pioneer new industries and markets.

(2) Achievements of Abenomics

Thanks to the Abenomics policy measures, a number of positive improvements have been occurring in Japan, first starting with increased investment in facilities. The tax benefits and exemptions on facility investment, in particular, have proven to be quite effective (Nissei Basic Research Center). The nominal amount of investment in facilities in Japan, which kept dwindling since reaching

JPY 78.5 trillion in 2007, rose back to JPY 71.1 trillion by the second quarter of 2015, above the target of JPY 70 trillion set in the Japan Is Back Plan.

Second, the employment rate has been on rise, as has the wage level. The size of the employed population in Japan grew from 62.52 million in December 2012 to 63.78 million in July 2015. The unemployment rate has dropped to 3.3 percent by July 2015, the lowest on record in 18 years. The rate of increase in the wage level also rose steadily from 1.7 percent in 2012 to 2.2 percent in 2015, raising hopes for increases in consumer spending. Mizuho Bank forecasts that Abenomics, with JPY 65 trillion set aside under the Japan Is Back Plan and an additional budget of JPY 32 trillion, would increase the employed population size by 9.05 million under the Plan and by another 3.19 million under additional measures over the next decade or so.

Third, Abenomics has noticeably increased the amount of ordinary income for manufacturing industries. According to the Japanese Ministry of Finance, the amount of Japan's ordinary income rose by 7.9 percent to JPY 50.4 trillion in FY2012, and again by 5.9 percent to JPY 65.9 trillion in FY2014 (with each fiscal year starting in April and ending at the end of March the next year). The amount of ordinary income in the second quarter of 2015 reached JPY 19.2 trillion, 14.8 percent up from the same quarter the previous year.

In sum, notwithstanding criticisms over Abenomics' inability to boost Japan's economic growth rate, Abenomics has solved the six major difficulties with which the Japanese manufacturing sector had struggled, and achieved considerable outcomes in the process.

3. Price Competitiveness of Japanese Manufacturers under Abenomics

(1) Changing price competitiveness of Japanese manufacturers

① Change in export prices

The Abenomics-induced depreciation of the yen has lowered the export prices in the contract currency base to a lesser extent than the yen depreciation that took place in the early 2000s. More specifically, the rate of export price decrease due to the recent yen depreciation, from August 2012 to May 2015, amounted to 0.20, less than half of the 0.48 observed in the early 2000s.

The fact that the yen depreciation has induced not has great a drop in the contract currency base export prices means that the majority of Japanese companies are using the yen depreciation not to maintain and increase their share of the international world market by lowering the export prices of their products, but instead to improve their export profitability. In other words, the recent yen depreciation is offering an opportunity for Japanese businesses, which have long struggled with a protracted recession and yen appreciation, to recover their profits. Another factor that limits the decrease in the export prices of Japanese goods can be found in the expanding structure of international division of labor and outsourcing. Japanese companies are ever more dependent on imported intermediate materials, needed to produce finished goods in Japan, than ever. The yen depreciation has raised the cost of importing such intermediate materials, and thus prevents

Japanese manufacturers from lowering the export prices of their finished products.

② Change in the quantities of exports

Despite the drastic depreciation of the yen under Abenomics, the total quantity of exports from Japan has not increased as dramatically. The first and foremost reason for this is that the export prices of Japanese goods in the contract currency bases still remain relatively high. The level of operating income in Japanese companies has improved significantly, particularly in export-oriented industries, under Abenomics. This reflects the fact that Japanese exporting manufacturers have not lowered the prices of their products in line with the yen devaluation.

One probable cause for this reluctance to lower the price is the fact that Japanese companies now operate much of their production overseas. The Lehman Brothers crisis radically spiked the value of the yen, exerting a massive downward pressure on Japan's exports of electronics and mobile phones. Japanese companies have thus relocated their production bases overseas, retaining only the production of high-end products on the domestic front. According to a recent Japanese Cabinet Office survey, 71.6 percent of Japanese manufacturers produced their goods overseas as of 2013. The ratio will likely to go up and reach 73.0 percent by 2019. Japanese output overseas as a percentage of Japan's gross domestic product (GDP) amounted to 22.3 percent in 2013, and is expected to grow to 26.2 percent by 2019.

Japanese companies are also increasingly outsourcing the pro-

duction of, and importing, intermediate materials from abroad. The drastic drop in the value of the yen has raised the cost of these imported materials, leaving little room for discount on the export prices of finished goods.

Another factor inhibiting the growth of Japan's exports is the slowdown in the pace of growth of the Chinese and other economies that are major buyers of Japan's goods. China alone was the importer of 18.3 percent of all Japan's exports as of 2014.

Nevertheless, as Japanese manufacturers begin to lower the export prices of their goods in the long run, the total quantity of exports from Japan is likely to increase. Clear signs of growth have been observed, since 2014, in the export quantities of such industries as automobiles and vehicles, textiles, metals, and machinery, in which manufacturers began to lower their export prices ahead of manufacturers in other industries.

③ J-curve effect

The fluctuation in the value of the yen, represented by a J-curve, exerted quite dramatic effects on Japanese exports from January 1985 to December 1998. Our empirical analysis of the exchange rate fluctuations from January 1999 to July 2015, however, does not show a clear J-curve effect. This means that, the more finished products Japanese manufacturers export, the more intermediate materials Japanese manufacturers also import from Asian and elsewhere.

(2) Forecasts on the outcome of Japanese manufacturers' export price strategy

With the goal of identifying how Japanese manufacturers tailor their export prices to fluctuations in the yen exchange rate, we set up an estimation model. Our model assumes two scenarios. Scenario 1 assumes that the estimation coefficient would remain constant over time. Scenario 2 assumes that the estimation coefficient would change over time.

According to Scenario 1, since the 1980s, Japanese manufacturers have raised their yen-based export price (P) by 0.385 percent in response to every one-percent drop in the nominal-effective exchange rate (NEER) of the yen. This translates to a 0.615-percent drop in the foreign currency-based export price of Japanese goods to every one-percent drop in the yen's NEER.

We used the rolling regression technique in our analysis under Scenario 2. The technique involves fragmenting the entire time series of interest into a number of same-length windows and estimating changes for each window. Using this technique, we were able to observe noteworthy changes in Japanese manufacturers' export price strategy in response to yen depreciation over time, particularly since Abenomics was introduced. Until late in 2013, Japanese manufacturers refused to lower the export prices of their goods in the contract currency bases, thereby dramatically raising the yen-based export prices and, in turn, boosting their profitability. By 2014, however, Japanese manufacturers began to be more willing to lower the contract currency-based export prices of their products, thus slowing down the rise in the yen-based export price.

es. This suggests that the main focus of Japanese manufacturers has shifted from improving profitability to enlarging their shares of the international market over the last few years. The protracted yen depreciation, in other words, has turned Japanese manufacturers more conscious of the need to strengthen their presence on the global market rather than improving their immediate profitability.

(3) Japanese manufacturers' export price strategies by industry

① Overview: general trends

Since the introduction of Abenomics, the yen-based export prices of Japan's six major industries—vehicles, electric and electronic devices, general machinery, metals, chemicals, and textiles—have soared, while the contract currency-based export prices have remained more or less the same notwithstanding the yen depreciation. This indicates that most of Japanese manufacturers are still focused upon improving their profitability rather than enhancing and enlarging their presence on the global market.

② Estimating changes in the past-through rate (PTR) under Scenario 1

As part of our survey of Japanese manufacturers' export price strategy, we ran an empirical analysis to assess by what percentage yen-based export prices of Japanese products would increase in response to a one-percent drop in the NEER of the yen. Our analysis shows that prices would rise the most for of electric and electronic

devices (0.522) and the least for general machinery (0.329). In other words, electric and electronic manufacturers are more focused on improving their profitability, while general machinery manufacturers are relatively more focused on maintaining or expanding their global presence.

③ Rolling-regression analysis under Scenario 2

In order to determine how Japanese manufacturers' export price strategies would change over time, we applied the rolling-regression technique. The dramatic yen devaluation since the fourth quarter of 2012 under Abenomics induced little change in the contract currency-based export prices of Japanese goods. During the early days of Abenomics, Japanese companies focused more on profitability than global expansion. Starting in 2014, however, Japanese exporters began to show increasing signs of a shift of focus onto global expansion, particularly in the chemical, metal, vehicle, and general machinery industries, in that order. On the contrary, the Japanese electric and electronics and textile industries are still relatively more focused on profitability.

(4) Exchange rate function of the export prices of Japanese goods

We sought to determine how the export prices of Japanese goods would respond to changes in the NEER of the yen using a shock response function. Our analysis showed that the yen-based export prices kept rising for 11 consecutive quarters on average in response to the drop in the value of the yen, and began to decline

afterward. In other words, it takes 11 quarters or more than two years and a half on average for the pass-through of the effect of yen depreciation onto the contract currency-based prices to occur.

The Japanese vehicle industry was the first and the most willing to lower the contract currency-based export prices of their products in response to yen devaluation. The general machinery industry also showed some willingness to lower the contract currency-based export prices of their products relatively early on. These industries are more focused on global expansion than profitability. On the other hand, the electric and electronic device industry was the most reluctant to lower the contract currency-based export prices of their products, while the yen-based export prices continued to rise. The textile and chemical industries focused on maintaining and enhancing their global presence for two or three quarters following yen depreciation by actively lowering the contract currency-based export prices of their products. However, they shifted to a more profitability-centered price strategy afterward, as suggested by the rise in their yen-based export prices two or three quarters after yen depreciation.

The chemical industry showed an especially drastic drop in its yen-based export prices beginning in the second half of 2014, at the heyday of Abenomics. This appears to be related to the sudden fall in international energy prices. The metal industry remained intent upon global expansion for the first four quarters of yen depreciation, actively lowering the contract currency-based export prices during this period. Then it began focusing more on improving profitability, but not to the same extent as the electric and electronic, chemical, and textile industries. The metal industry

thus shows a relatively slower response curve than the other three industries. Yen depreciation, however, has radically lowered the estimation coefficient of metal prices since the second half of 2014, most probably in line with the abrupt falls in the prices of raw materials, which had begun to exert a major downward pressure on the contract currency-based export prices of Japanese metal products.

4. Korea-Japan Manufacturing Competition and Cooperation under Abenomics

In this section, we forecast and analyze changes in the competitive and cooperative relations between the Korean and Japanese manufacturing sectors due to Abenomics. In particular, we examine how the Abenomics-induced yen depreciation has affected the state of trade, competition, and division of labor between the two countries, and how the changing won-yen exchange rate would affect the prospects of Korean exports.

(1) Competition and cooperation between Korean and Japanese manufacturing industries

The Abenomics-induced yen depreciation may have compromised the price competitiveness of Korean products relative to Japanese ones, but Korea maintained the strength of its exports worldwide until 2014. Notwithstanding the abrupt drop in the yen, Korea's trade surplus almost doubled from USD 28.3 billion in 2012 to USD 47.2 billion in 2014. The protracted yen depreciation, how-

ever, has led Japanese manufacturers to lower their product prices, exerting more and more impact on the prospects of Korea's exports.

The yen depreciation may have not yet affected Korea's exports to the world at large significantly, but it has definitely wielded some impact on Korea's trade with Japan. The amount of Korea's exports to Japan steadily decreased from USD 38.8 billion in 2012 to USD 32.2 billion by 2014.

Abenomics has indeed improved the competitiveness of the Japanese manufacturing sector, and thereby intensified competition between Korean and Japanese manufacturers. The export similarity index (ESI) between the two countries rose from 45.0 in 2007 to 48.2 by 2012, and has been rising consistently since 2013 amid ongoing yen depreciation.

Korea's exports to Japan may have decreased, but so have Korea's imports from Japan, considerably weakening the trade ties between the two countries. The height of yen depreciation in 2013 critically affected the price competitiveness of Korean products relative to Japanese ones, reducing the share of Korea's exports to Japan in Korea's exports worldwide from 7.1 percent in 2012 to 5.6 percent in 2014. However, thanks to the growth of the Korean parts and materials industries and the decline in investment, Korea's dependency on parts, materials, and capital goods imported from Japan also dropped from 12.4 percent in 2012 to 10.2 percent in 2014.

Nevertheless, our analysis of the structure of division of labor between the Korean and Japanese manufacturing sectors reveals that yen depreciation has not stopped intra-industry trade between

the two countries from growing further. This is in part because the Korean electric and electronic, automobile, and machinery industries have successfully caught up with their Japanese counterparts in terms of technological competitiveness. However, the expansion of horizontal division of labor in each industry, which continued from 2007 and onward, has run into a stall, while vertical division of labor is on rise. The fact that horizontal division of labor has decreased and given way to greater vertical division since 2013 suggests that the competitiveness of Korean industries relative to Japanese industries has been dwindling amid yen depreciation, with the structure of the division of labor between the two countries reverting back to its pre-global financial crisis state.

Yet Korean industries and products remain quite competitive on the entire global market despite the global financial crisis and Abenomics. On the contrary, Japan's share of the global market, an indicator of the country's industrial competitiveness, dropped from 6.7 percent in 2007 to 4.9 percent in 2012, and again to 4.2 percent in 2013, even after Abenomics started. Korea's competitiveness vis-à-vis Japan, as measured by the trade specialization index (TSI), also steadily increased until 2012, and has remained more or less the same ever since.

Why has the Abenomics-induced yen depreciation failed to affect Korea's competitiveness on the global market and also to stop the decline of Japan's competitiveness? There are a number of factors to consider.

First, Korean products have grown more competitive, while Korean manufacturers have also successfully distinguished their products from Japanese ones. Korean semiconductors, smartphones,

display panels, and ships are enjoying growing popularity on the global market, thus countervailing the negative effect of yen depreciation. Moreover, Korean shipbuilders focus on high-value-added ships, while their Japanese counterparts focus on general-purpose ships.

Second, Japan has dramatically expanded its overseas production. The share of overseas production in the Japanese manufacturing sector's total output continues to grow, from 24.6 percent in 2001 to 30.6 percent in 2007, and again to 36.5 percent in 2014. Japanese electric and electronic and vehicle companies now handle more than 40 percent of their production offshore. This limits the effect of yen depreciation.

Third, Japanese manufacturers have used the low yen more to improve their profitability than to lower the prices of their products overseas. Individual companies may have generated significantly more profits as a result, but their products have failed to expand their shares of the global market, at least not to the extent of competing with Korean products.

Finally, the recent economic situation in China has altered the structure of trade for Japan. The advancement of the electronics industry in China has conspired with the decline of the Japanese electronics industry, ultimately benefitting Korean exporters more than Japanese ones amid yen depreciation.

(2) Impact of yen depreciation on the prospects of Korean exports

We analyzed how the changes in the won-yen exchange rate would affect Korean exports using the dynamic multiplier effect

of an autoregressive distributed lag (ARDL) model. Our analysis shows that every one-percent drop in the won-yen exchange rate would decrease Korean exports by 0.18 to 0.25 percent. The won-yen exchange rate exerted significant effects on Korean exports until the mid-2000s or so, but not as much ever since. The significance of the influence of the exchange rate can be explained by the growing similarity of exports from both countries. As Japan began to produce overseas and increase its trade with China in the mid-2000s, changes in the won-yen exchange rate have come to exert less and less impact on Korean exports.

However, Korean exports now respond to changes in the won-yen exchange rate with greater speed than they did in the past. We discovered this after estimating the adjustment factor of the speed at which Korean exports increase in the long run when the exchange rate and exports converge.

We set out to identify the cause of this phenomenon by applying a non-linear ARDL model to the analysis of responses of Korean exports to the fluctuations in the won-yen exchange rate. The apparent increase in Korean exports, resembling an early-stage J-curve, when the won-yen exchange rate drops, turned out to bear little correlation to the exchange rate. In fact, the drop in the won-yen exchange rate ultimately led to gradual, but significant, decreases in Korean exports. The promptness with which Korean exports respond to changes in the won-yen exchange rate is nothing unusual compared to the promptness with which Korean exports respond to rises in the won-dollar exchange rate or drops in the yen-dollar exchange rate.

Furthermore, our analysis of the asymmetric effect revealed that

every one-percent drop in the won-yen exchange rate could reduce Korean exports by 0.5 percent in the long run. The same pattern was confirmed in our industry-by-industry analysis, although individual industries may show different paces or patterns of response in the short run. The general machinery industry emerged as the most likely to be affected (with exports decreasing by as much as 1.2 percent), followed by steel (1.0 percent), automobile (1.0 percent), automotive parts (0.9 percent), and textile (0.7 percent) industries.

5. Policy Implications

First, Korean businesses should not stop their efforts to rationalize and streamline their activities in anticipation of the increase in the price competitiveness of Japanese products under yen depreciation and Abenomics. The Korean government should also develop and implement diverse policy measures.

As the significant rise in the yen-based export prices of Japanese products and the dramatic increase in the amounts of operating income in major industries suggest, Japanese manufacturers have focused more on improving their profitability rather than enhancing their global presence since the yen has begun to depreciate. Due to their reluctance to lower the contract currency-based export prices of their products, the quantity of exports from Japan has not increased dramatically in the recent years. Japanese companies' expansion of production overseas has also countervailed the positive effect of yen depreciation on the price competitiveness of Japanese exports. Japanese manufacturers, however, have

been showing increasing willingness to lower the contract currency-based export prices of their products since the second half of 2014. This is evident in the slower pace of rise in the yen-based export prices. In most major industries, including vehicles, electric and electronic devices, general machinery, chemicals, textiles, and metals, the increase in yen-based export prices has been slowing down somewhat over the last several quarters. Having recovered much of their profitability, Japanese manufacturers show greater confidence in their ability to strengthen and expand their presence on the global market.

It remains for us to find out how Japanese manufacturers will change their export price strategy in the coming years. Now that the real effective exchange rate (REER) of the yen has drastically plummeted in comparison to that of the won, Korean exporters will face increasing competition and threat from their Japanese counterparts on the global market. Whether they decide to expand their shares of the global market or to maintain their focus on profitability, Japanese manufacturers' strategy will inevitably affect Korean manufacturers.

Once Japanese manufacturers begin to lower the contract currency-based prices of their products, Korean products will see a significant drop in their price competitiveness worldwide. Even if Japanese companies were to slow down the pace of price discounts, yen depreciation still poses a significant possible threat to the prospects of Korean exports. For the increased profitability of Japanese companies will enable them to invest more in research and development and innovation, which will then strengthen the technological competitiveness of Japanese products and thereby

weaken Korean products' relative position in the intermediate to long run. The accumulation of Korea's trade surplus is exerting increasing upward pressure on the value of the won. Facing growing threats from their Japanese rivals and the likely appreciation of the won, Korean manufacturers will have to make diverse efforts to counter and manage these risks.

Considering the extent to which Korean and Japanese companies compete over the same product categories and markets worldwide, it is critical for Korean policymakers and businesses alike to thoroughly research the recent policy and business developments in Japan and tailor their counter-strategies accordingly. Korea is, however, no longer as interested in Japan as it used to be. The Korean government as well as Korean business and research communities ought to invest more time and resources into researching Japan's policies and business strategies, particularly with the Korean government increasing support for Japan researchers and research projects.

Second, the protracted yen depreciation increases the need for Korean manufacturers to anticipate and counter the likely decreases in the export prices of Japanese products. As Korean manufacturers have begun to differentiate themselves from their Japanese counterparts on the global market, we increasingly question the strength of the correlation between the yen and won exchange rates, on the one hand, and the prospects of Korean and Japanese exports, on the other. This study demonstrates, however, that the seeming weakness of the correlation between the changing exchange rates and exports is more rooted in the strategic choice made by Japanese companies. Japanese manufacturers chose to

focus on profitability rather than expanding their shares of the global market in the early days of yen depreciation, but there is no guarantee that they will keep prioritizing profitability in the coming years. Japanese manufacturers' increasing output overseas, the increasing competitiveness of Korean products, and the structural transformation of the Chinese market may also have limited the extent to which the low yen value could affect Korean exports.

Nevertheless, Japanese manufacturers have begun to lower the export prices of their products, thus increasing their shares of the global market. The new market orientation of Japanese exporters will ultimately affect Korean exports in the long run. Our empirical analysis indeed suggests that the shock of the drop in the won-yen exchange rate would cause incremental, yet irreversible, losses to Korean exports. More importantly, the increasing income of Japanese manufacturers thanks to yen depreciation would lead them to invest more and more in R&D and innovation, which would add to the technological competitiveness of their products. Japanese companies are already ahead of their Korean counterparts technology-wise, and the gap between the two countries might grow farther apart as Japanese manufacturers find new products and technologies to ensure future growth.

Therefore, before drawing a final conclusion on how the changing won-yen exchange rate would affect Korean exports in the future on the basis of patterns observed so far, we need to consider, in depth, the implications of Japanese manufacturers' active turn to market orientation. Given the fact that the value of the yen has stayed low for years already, it may eventually begin to exert negative impact on Korean exports in the near future. As worries

over the stagnation of the Korean economy continue to mount, Korean policymakers and businesses need to find and pursue active counter-strategies.

Third, the public-private partnership on enhancing the competitiveness of Korean businesses should be strengthened, with as much support from the Korean government as possible. The Korean government may set up a national organization for discussing and deciding matters of business competitiveness, such as a presidential committee on enhancing national competitiveness toward realizing a creative economy. The Japanese government has enacted competitiveness-enhancing statutes and abolished cumbersome regulations, showing a government-wide commitment to creating a business-friendly environment. The INCJ also provides a public fund to support the restructuring and streamlining of underperforming businesses and sectors.

The Korean government should similarly find and implement measures to enhance the efficiency and productivity of businesses and sectors. The Korean legislature should consider adopting legislation akin to Japan's ICEA. A draft for a pertinent legislation, entitled the Special Act for Boosting Business Vitality (the so-called "One-Shot Act"), proposed by Assemblyman Lee Heon-jae (Sae-neuri), is pending in the National Assembly.

We should note that there is fierce competition worldwide on innovating and strengthening domestic manufacturing bases. Germany's Industry 4.0 Program has certainly inspired numerous governments to promote the digitalization of manufacturing processes. A good example, aside from the standardization-oriented Industry 4.0, is the United States' Industrial Internet Consortium (IIC), which

repeats empirical tests. The Japanese government and businesses, in the meantime, have been studying Industry 4.0 in depth, with respect to how the program utilizes big data, the Internet of Things (IoT) and other technological innovations to transform and digitalize manufacturing.

The Korean government should emulate these examples and invest in developing the needed industrial and policy infrastructure. Consider smart factories, for example, that are emerging as beacons of manufacturing innovation. Korean policymakers should support the localization and standardization of core technologies involved in such factories. The Korean Agency for Technology and Standards (KATS) has launched the process for developing national standards and certification criteria on smart factories (KIET, 2015), but more governmental support and attention are needed to overcome the gap with other advanced economies. The Korean government should also support the re-training of skilled workforces and the development of programs for training new workforces to offset the possible drop in the employment rate resulting caused by adopting smart factories.

The Korean government should promote the competitiveness of industries and strengthen public-private partnership with the same urgency it felt in overcoming the Asian Financial Crisis of 1998 and the global financial crisis of 2008.

Korean businesses, for their part, should invest in and expedite voluntary restructuring and streamlining and also in improving labor-management relations in order to maximize their core capabilities and productivity. Restructuring has emerged as an important trend in Korea, with Hanhwa and Samsung recently merging

their defense and general chemical businesses, and Lotte acquiring the chemical division of Samsung. Of course, such inter-company restructuring should take place as a result of autonomous decision-making by the involved companies. The government should limit itself to playing indirect roles, such as providing fiscal funds and financial/tax-related incentives. Labor and management should also work together toward maximizing productivity through innovation. Businesses, in addition, should make more active efforts to pioneer new markets abroad in their competition with other global exporters. We need to analyze thoroughly Japan's policy developments to support prospective and emerging industries, and to benchmark relevant practices. Korean businesses have much to learn from the thoroughgoing efforts in rationalization and innovation that labor and management made together in Japan when the yen was strong.

Fourth, the Korean government needs to find and strike the right balance between, on the one hand, encouraging Korean companies to globalize, and, on the other hand, also retain their mother factories inside the country. There are lessons to be learned from Japan's example of compensating for the trade deficits, and even realizing current surpluses, with the basic surpluses of capital. The recent yen depreciation has rapidly improved the business environment in Japan, causing Japanese manufacturers to reshore, restore their mother factories, and expand their production in Japan. Mother factories often serve as the central bases of R&D and innovation. Their relocation abroad has so far been taken as a loss of innovative resources for a given country, and perceived to lower the country's employment rate.

Due to this prevailing perception, Korean policymakers have so far favored foreign investment and discouraged Korean companies' expansion abroad. They now need to change the public opinion by emphasizing that Korean companies' expansion and investment abroad do not threaten industries back at home, but could in fact create greater synergy effect through more effective partnership with domestic industries. As Korean SMEs have great need for information on possible investment opportunities overseas, Korea Trade Promotion Corporation (KOTRA) and other such agencies should provide more information by establishing partnerships with policy research institutes such as the Korea Institute for Industrial Economics and Trade (KIET), the Export-Import Bank, and the Korea Institute for International Economic Policy (KIEP).

Deregulation is also required as part of efforts to form a favorable environment for businesses in Korea. Regulatory reform is key to winning in the increasing international competition over providing business-friendly environments. Japan, for its part, has begun to develop six National Strategic Special Zones around major urban centers, and plans to install similar zones nationwide in the future while also abolishing or reducing regulations. The Korean government has also been experimenting with deregulation in various special zones and industrial clusters, but has yet to establish metropolitan and comprehensive special zones akin to those in development in Japan. The Korean President and Cabinet ministers are making diverse efforts for deregulation. But they still need to work harder to mitigate the anti-business sentiment in Korea and achieve more effective and efficient deregulation with better public relations and marketing. Companies themselves should engage

more actively in corporate social responsibility (CSR) campaigns and improve their images in the public opinion.

Fifth, Korean companies need to increase and strengthen their value chain through merger and acquisition of Japanese companies (equity investment). Increasing investment in Japan is crucial to enhancing the stability of the supply chains of Korean companies. Korea's investment in Japan has always lagged far behind Japan's investment in Korea. In 2014, Japan reportedly invested USD 2.49 billion in Korea according to the Korean Ministry of Trade, Industry and Energy (MOTIE), while Korea reportedly invested USD 580 million in Japan according to the Korea Export-Import Bank in the same year. We need to make greater efforts to overcome this asymmetry of M&A and investment between the two countries.

Yen depreciation and the improved performances of Japanese companies offer opportune moments for increasing investment in the equities of Japanese companies. Korean companies, in other words, should take advantage of Japanese companies' recovery in order to strengthen their supply and value chains and also to find new business opportunities. It will be impossible, in reality, for Korean companies to take over Japanese companies through hostile M&A. It is much more feasible for Korean companies to begin by making small and incremental investment in the equities of Japanese companies and thereby strengthen their business relations. While Korean companies may purchase shares of Japanese companies on the open stock exchanges, they are advised to first consult Japanese agencies like RECOF or Nihon M&A Center to ensure mutual trust and goodwill. Korean funds have not made much return on their investments in Japan so far. The Korean government

should also improve the public perception of M&A between the two countries based on negotiations with its Japanese counterpart, while actively supporting M&A by enhancing the support system.

The findings and remaining tasks of this study can be summarized as follows.

The analysis of the Abenomics policies and strategies for enhancing Japan's manufacturing sector that this study provides is timely and relevant, considering the similarity and overlap between Korean and Japanese manufacturing industries on the global market. As Korean legislators have begun to introduce laws similar to Japan's ICEA, such as the so-called One-Shot Act, they have much to gain by studying and analyzing the policy developments in Japan toward enhancing industrial competitiveness.

This study analyzes the changes in the price competitiveness of Japanese products under yen depreciation, and how the effect of yen depreciation differs from industry to industry. The main achievement of this study is in revealing the likelihood of Japanese manufacturers re-investing the greater profits they have made under yen depreciation into product and technological innovations, which could seriously alter the terms of competition between Korea and Japan.

The empirical analyses and findings we provide in this study will form useful guidelines to which Korean industries may refer in developing their counter-strategies.

Our wide-ranging analysis of the likely changes in Korea-Japan competition resulting from Abenomics, and of how yen depreciation would affect the prospects of Korean exports, also provides useful information upon which Korean policymakers could draw

to predict the changes in Korea-Japan relations and devise their strategies accordingly.

Korean companies should especially consider investing in M&A with their Japanese counterparts in order to strengthen their value chains and the vulnerable material and parts aspects of Korean industries. Increasing investment in Japan can be especially beneficial now that the yen is valued so low.

This study is a very timely and significant report on the recent and likely changes in the Japanese manufacturing sector, and on how the Korean manufacturing sector could respond to such changes, in line with the Korean government's emphasis on achieving a creative economy. The empirical analyses making up this study provide useful guidelines and information for Korean policymakers, academics, researchers, and businesses alike.

This study, nonetheless, has not exhausted the very broad scope of its topic and implications. This study does not provide and recommend specific policy solutions for enhancing the competitiveness of each and every manufacturing industry in Korea. That is where more detailed research will be needed in the future.