

The Decoupling of GDP and Steel Demand: Cyclical or Structural?

Dr. Chung Cheol-Ho

Vice President
POSCO Research Institute
chchung@posri.re.kr

Decoupling between GDP and steel demand

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According to worldsteel, if an adjustment is made to the statistical distortion of crude steel production caused by the closure of China's illegal induction furnaces in 2017, global finished steel consumption would decline from 4.7% to 2.4%, which is below global GDP growth (3.0% based on market exchange rates and 3.7% based on PPP exchange rates).

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A correlation coefficient is a measure that identifies the degree to which two variables' movements are associated. The range of values for the correlation coefficient is -1.0 to 1.0, with a correlation of -1.0 indicating a perfect negative correlation and a correlation of 1.0 indicating a perfect positive correlation.

In the 2000s, global steel demand growth consistently surpassed global GDP growth. Since 2012, however, this trend has been reversed as global steel demand growth

dipped significantly below global GDP growth. In 2017, steel demand growth once again overtook GDP growth.¹

However, worldsteel forecast in April 2018 that global steel demand will grow by 1.8% in 2018 and 0.7% in 2019, both below the respective IMF global GDP growth forecasts for these years of 3.9% and 3.9%. Why has global steel demand essentially remained below global GDP growth since 2012? Will this trend persist or simply remain cyclical? These questions are of considerable importance since they provide key information for predicting the future of the steel industry.

High correlation between GDP and steel demand

In general, there is a high correlation between GDP and steel demand. The correlation coefficient² for the two variables during the period spanning 1990

to 2016 is 0.68. Narrowing the period to 2000-2016, the correlation coefficient even rises to 0.77.

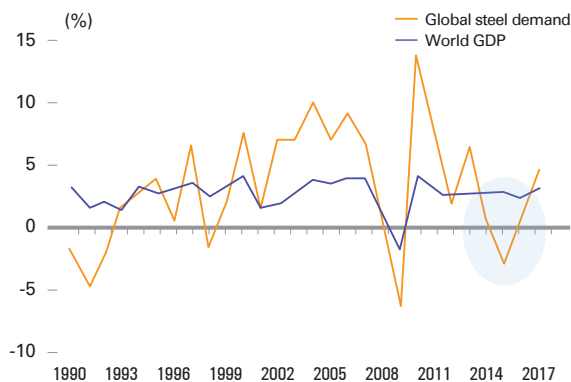
By country, this high correlation between the two variables remains consistent. As Table 1 shows, the coefficient of most countries surpasses 0.6, and in only a few nations can a relatively low correlation of 0.4 be found.

For this reason, the GDP growth outlook has often been used to forecast steel demand. For example, assuming that India's GDP growth outlook is for a compound annual growth rate (CAGR) of 7% through 2030, this 7% rate can be applied to predict India's steel demand for 2030. Calculating global GDP growth and global steel demand between 1990 and 2016, global GDP increased by

Table 1. Country-wise Correlation Coefficient between GDP and Steel Demand

Correlation Coefficient Estimates (1990-2016)	
World	World total (0.68)
Country	Korea (0.88), Mexico (0.87), Brazil (0.84), Japan (0.81), Germany (0.77) Turkey (0.76), Chile (0.74), Italy (0.73), France (0.73), Indonesia (0.71) Taiwan (0.70), India (0.70), Malaysia (0.69), UK (0.68), Thailand (0.66), South Africa (0.61), USA (0.61), Canada (0.60), UAE (0.49), China (0.43), Iran (0.42), Vietnam (0.36), Singapore (0.29), the Philippines (0.25), Egypt (0.24), Saudi Arabia (0.04)

Source: IHS, worldsteel

Figure 1. Global Steel Demand and Global GDP Growth

Source: IMF, worldsteel

a CAGR of 2.7% (based on IHS data; 3.6% by the IMF using PPP exchange rates) and global steel demand grew by 3.3%, showing a minimal discrepancy between the two.³

This pattern holds true for individual countries like India. From 1990 to 2016, India's GDP growth and steel demand growth were 6.6% and 6.3%, showing how the figures are similar within a single country.

Causes of decoupling of global GDP and steel demand

If the decoupling between GDP growth and steel demand continues, predictability using correlation coefficient between the two variables will diminish. Therefore, it is necessary to find the causes for the decoupling, if any. Furthermore, identifying the causes would be illuminating in its own right.

How can the changes in the relationship between the two variables that took place around 2012 be explained? The first approach could be examining the characteristics of GDP and steel demand and the relationships between GDP components and steel demand by period. As GDP covers a broad scope and is greater in scale than steel demand, GDP volatility is funda-

If the decoupling between GDP growth and steel demand continues, predictability using

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To calculate global GDP, each country's home-currency-denominated GDP should be converted into US dollars. The weight for each country varies depending on whether market exchange rates or purchasing power parity (PPP) exchange rates are used. As developing countries have a lower marketization level than their advanced counterparts, they receive a much higher weight in aggregations that apply PPP exchange rates compared to with market exchange rates. Generally, developing countries have a higher economic growth rate than do advanced countries, so PPP-based global GDP growth is higher than market-based rates. The IMF releases GDP growth both by PPP and market exchange rates, but it usually suggests PPP-basis rates as an official outlook. Using market-based rates, however, the IHS GDP forecast turns out to be lower than the IMF GDP forecast.

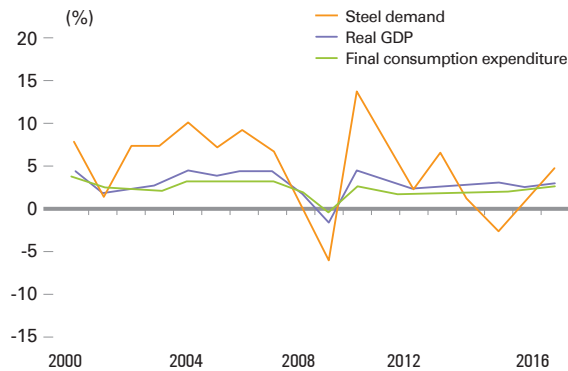


These shifts in China, which accounts for about 45% of global steel demand, became a key driver for changes in global steel demand. Simply put, China is the most important factor for explaining the decoupling between global GDP and global steel demand after 2012.

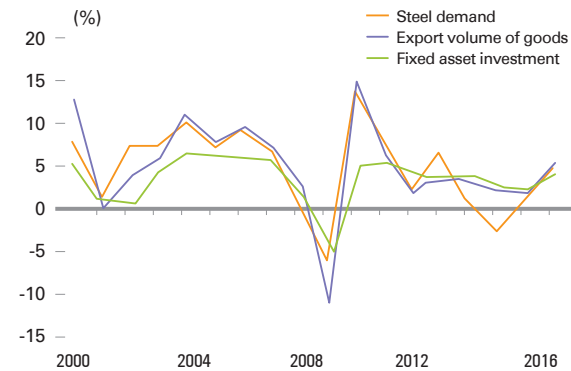
mentally lower than that of steel demand. As a measure of volatility, the standard deviation of global GDP growth for the period of 1980-2017 was 1.3%, while that of global steel demand was 4.7%. This indicates that the standard deviation of global steel demand growth is 3.7 times higher than that of global GDP growth. In other words, steel demand growth moves in the same direction as GDP growth (high correlation coefficient), but it fluctuates more widely. In that case, which GDP component among consumption, investment, and exports would better explain the fluctuations in steel demand?

Comparing the growth rates of global steel demand and GDP components such as consumption, investment, and exports (Figures 2 and 3), steel demand growth is much more volatile than is consumption growth, but it shows similar volatility with fixed asset investment, and in particular with goods export volume. Therefore, the dip in global steel demand after 2012 can be mostly

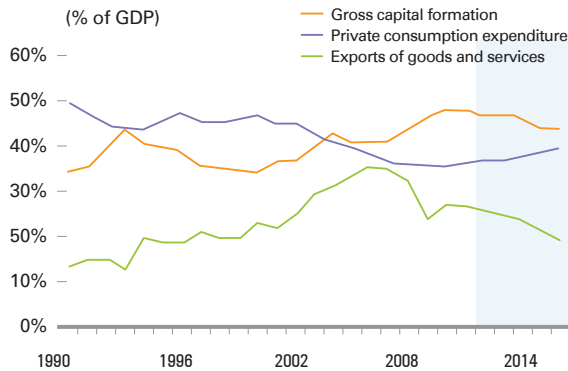
explained by the slowdown in global investment and exports. China provides a representative example. After overcoming the global financial crisis of 2008 through massive government-led investment, China shifted its growth strategy from investment and exports to consumption as President Xi Jinping took power at the 18th Party Congress in November 2012. China's manufacturing-based and export-led growth strategies faced their limitations when the global economy slowed after the financial crisis and excessive investment led to mounting debt and oversupply. With this shift in growth strategy, the shares in GDP of investment and exports plunged while the share of consumption surged (Figure 4). In addition, the contributions of manufacturing and construction decreased, but that of services expanded (Figure 5). These shifts in China, which accounts for about 45% of global steel demand, became a key driver for changes in global steel demand. Simply put, China is the most import-

Figure 2. Global Steel Demand, GDP, and Consumption

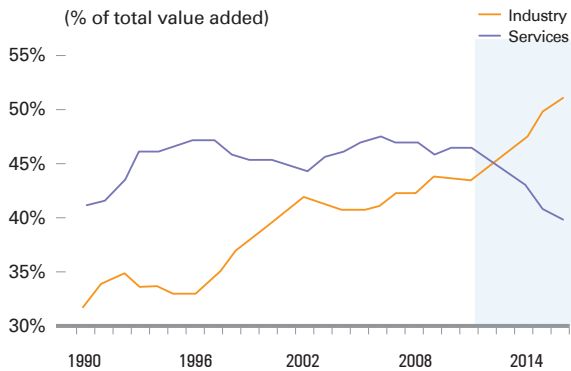
Source: World Bank, worldsteel

Figure 3. Global Steel Demand, Investment, and Exports

Source: IMF, World Bank, worldsteel

Figure 4. Share of GDP Components in China

Source: UNCTAD

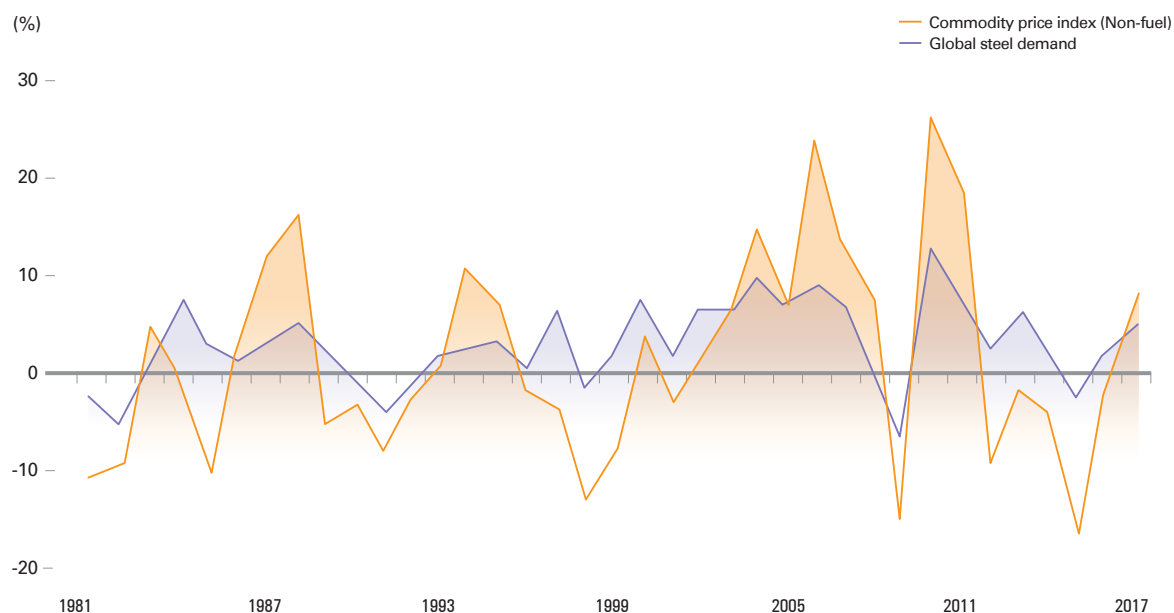
Figure 5. Share of Value Added by Industry in China

Source: UNCTAD

ant factor for explaining the decoupling between global GDP and global steel demand after 2012.

However, the question remains of why the decline in global steel demand growth in the period 2014-2016 is deeper than that of investment or export volume. One cause could be the plunge in the prices of raw materials, including oil, during this period. A decline in oil or other raw materials prices has a neutral effect on the global economy overall. The positive impact on countries that are net raw materials importers offsets the negative impact on net raw materials exporting countries. But a decline in oil or other raw materials prices

has a negative impact on global steel demand, because the plunge of oil and raw materials prices reduces outlays of infrastructure and plants, etc., especially for developing countries. Net raw materials exporting countries are also developing countries which account for a certain proportion of global steel consumption. For this reason, global steel consumption growth falls below global GDP growth. In 2017, developing countries accounted for 39.4% of global real GDP, but 74.1% of global steel demand, two times the share of GDP. In a comparison of commodity prices and global steel demand (Figure 6), changes in com-

Figure 6. Commodity Price Index and Global Steel Demand

Note: A commodity price index includes the prices of food, beverages, and industrial raw materials
 Source: IMF, worldsteel

modity prices well explain the fluctuations in global steel demand.

With respect to countries where steel demand plunged after 2012, those that led this decline are mainly developing countries. Table 2 compares steel demand growth by country between the periods of 2000-2012 and 2012-2016.

It indicates that China's steel demand fell the most, followed by Brazil, Saudi Arabia, UAE, Argentina, Indonesia, and Russia. This suggests that developing countries with a high proportion of raw materials exports are prone to a decline in steel demand growth.

On the other hand, advanced countries including the USA, Japan, and Germany only show a minimal decline. In particular, the GDP growth decline in developing countries with a high steel

demand decline is relatively smaller than their steel demand decline. Therefore, the significant dip in steel demand among major developing countries, particularly raw materials exporting countries, can be another major cause for the decoupling.

The decoupling will likely linger

Will this decoupling persist or remain cyclical? To state the conclusion first, the decoupling between the global economy and global steel demand is likely to keep the status quo for a considerable time. The causes of the decoupling after 2012—weak investment, exports and raw material prices—are likely to linger for

Table 2. Country-wise GDP Growth and Steel Demand Growth (CAGR) by Period

	Real GDP Growth			Steel Demand Growth		
	'00-'12 (A)	'12-'16 (B)	A-B (%p)	'00-'12 (C)	'12-'16 (D)	C-D (%p)
China	10.2%	7.2%	3.0	14.9%	0.8%	14.1
Brazil	3.6%	-0.9%	4.5	4.4%	-9.0%	13.5
Saudi Arabia	4.1%	3.0%	1.0	10.3%	-0.7%	11.0
UAE	4.2%	4.0%	0.2	12.0%	2.7%	9.3
Argentina	2.9%	0.0%	2.9	4.3%	-3.8%	8.0
Indonesia	5.4%	5.1%	0.3	8.2%	0.3%	7.8
Russia	4.6%	-0.2%	4.8	4.8%	-2.8%	7.6
Thailand	4.5%	2.5%	2.0	8.2%	3.2%	4.9
India	7.2%	7.3%	-0.1	8.4%	3.6%	4.7
Australia	3.1%	2.5%	0.6	0.8%	-2.4%	3.2
Turkey	4.7%	5.7%	-1.1	6.9%	4.6%	2.3
South Korea	4.2%	3.0%	1.2	2.9%	1.4%	1.6
Malaysia	4.7%	5.0%	-0.3	3.1%	3.5%	-0.5
United States	1.7%	2.1%	-0.5	-1.8%	-1.2%	-0.7
Japan	0.6%	1.2%	-0.5	-1.4%	-0.7%	-0.7
Mexico	1.8%	2.6%	-0.8	3.3%	5.0%	-1.7
Germany	1.1%	1.5%	-0.4	-0.3%	1.9%	-2.3

Source: IMF, worldsteel

several structural reasons.

First, investment and exports will likely not to sustain their robust growth momentum of the past as developing countries' manufacturing-based and export-led growth strategies face difficulty due to the weak demand in advanced countries and as trade conflicts between China and the USA will likely be extended.

Moreover, advanced countries, which had been implementing extraordinary monetary policies called quantitative easing, have shifted to tight monetary policies through interest rate increases.

Therefore, developing countries with increasing debts will suffer from mounting economic burdens and instability.



Most forecasts predict that the ongoing modest increase in oil prices will become a persistent trend. Furthermore, aging populations and megatrends such as the sharing economy and the Fourth Industrial Revolution are also expected to bear negative effects on steel demand in the long term.

Oil and other raw materials prices could possibly rise temporarily due to the base effect of low prices and geopolitical supply disruptions, but they have a slim likelihood of surging in the long run. For instance, most forecasts predict that the ongoing modest increase in oil prices will become a persistent trend.

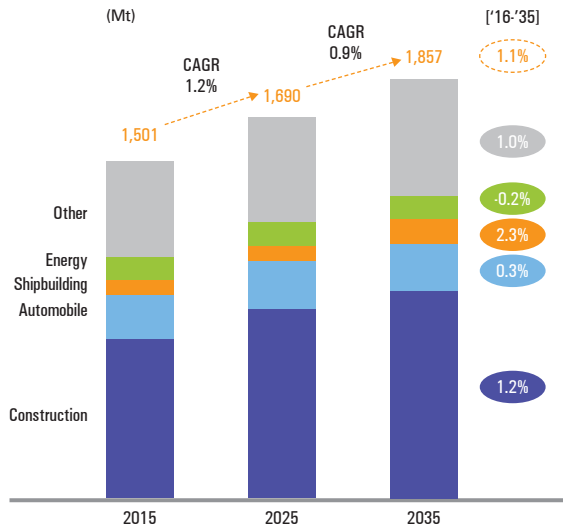
Furthermore, aging populations and megatrends such as the sharing economy and the Fourth Industrial Revolution are also expected to bear negative effects on steel demand in the long term. The aging populations in Korea, China, Japan, the USA, and Western Europe will drive down demand for construction and automobiles, leading to a slowdown in steel demand.

In addition, the Fourth Industrial Revolution will also work against steel demand in terms of steel intensity, including through the potential commercialization of autonomous vehicles and its impact on the automotive industry; the reduced size of shopping malls or offices due to the

prospering of e-commerce enterprises such as Amazon; the rise of the sharing economy represented by Airbnb (housing-sharing services) and Uber (ride-sharing services); and the emergence of the circular economy to address environmental concerns. Further analysis should be performed to more fully examine the impact of these factors on steel demand, but their impact will likely to be negative.

Global steel demand hovering below global GDP through 2035

How large a gap will the decoupling create? IHS Markit's mid- to long-term global economic outlook predicts that global GDP growth will show a CAGR of 2.9% through 2035. Meanwhile, POSRI's mid- to long-range outlook presented at the Board Meeting of worldsteel in April 2017 and described in *Asian Steel Watch* Vol. 3 suggests that global steel

Figure 7. POSRI's Global Steel Demand Forecast

Source: POSCO Research Institute

Note: 1) Shipbuilding sector includes other transportation,

2) Demand for other sectors is forecast using industrial production index

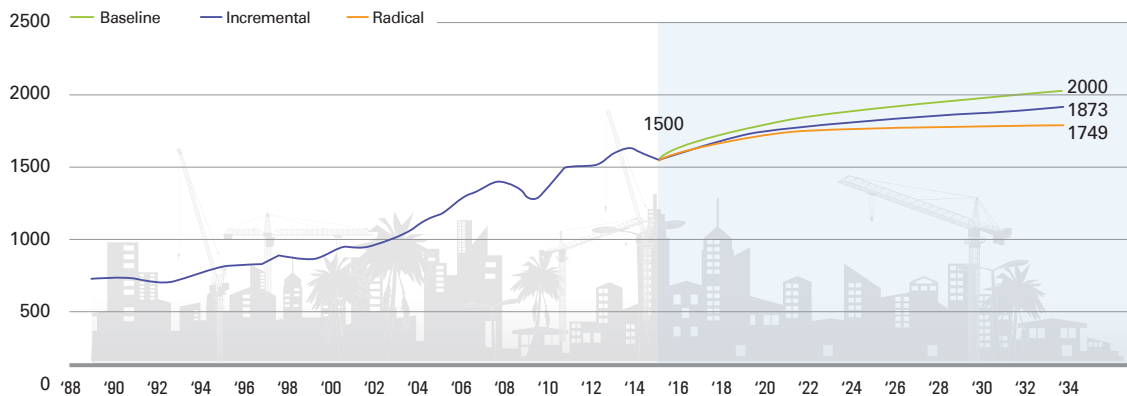
demand is expected to grow at a CAGR of 1.1% through 2035. The global GDP will grow almost three times the rate of global steel demand. Accenture's global steel demand outlook is quite similar

to POSRI's. According to Accenture's global steel demand outlook released at the OECD meeting in September 2017, global steel demand in the baseline forecast is expected to grow by a CAGR of 1.4%. To be sure, it is questionable whether such predictions will be perfectly realized, but these forecasts indicate that major institutions believe that the decoupling between global economic growth and global steel demand will persist for a while. Dividing the long-term outlook by region, three main characteristics are evident.

First, steel demand in Northeast Asia (China, Japan, and Korea) will decline. Second, steel demand in the USA and the EU will slow to below a CAGR of 1%. Third, other emerging countries will lead global steel demand. Overall, the decline in steel demand in China, Japan, and Korea, which together accounted for 54% of global steel demand in 2017, seems to be a decisive factor causing a slowdown in global steel demand. Fur-

Figure 8. Accenture's Global Steel Demand Outlook (2015-2035)

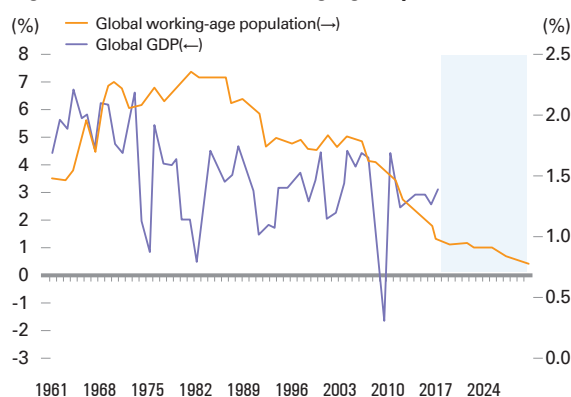
(Mt, crude steel equivalent)



Source : Accenture

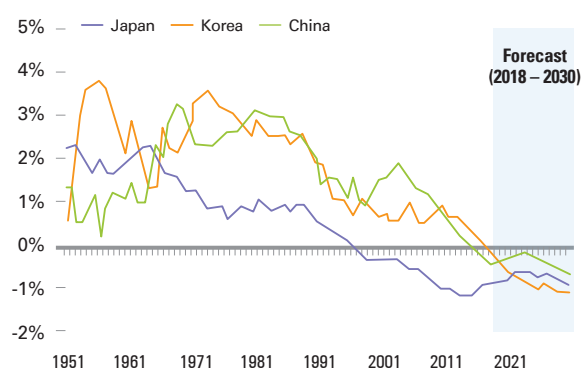
The improvement seems to continue for the time being. However, there are still concerns that the decoupling of global steel demand and global GDP will continue in the long term.

Figure 9. Global GDP and Working-Age Population



Source: World Bank, UN

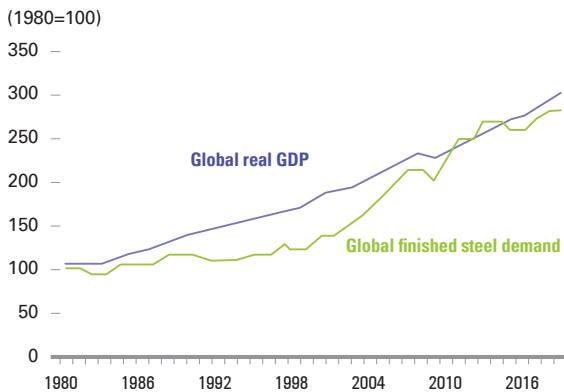
Figure 10. Working-Age Population in China, Japan, and Korea



Source: UN

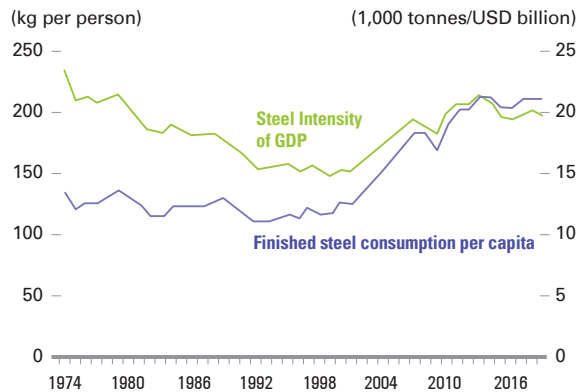
thermore, based on IHS's global GDP growth projections, the respective GDPs of China, Korea, and Japan are expected to grow by CAGRs of 5.2%, 2.0%, and 0.9%, respectively, through 2035, showing a significant discrepancy with steel demand growth. The major cause of the decline in steel demand in China, Korea, and Japan is closely related to changing demographic structures. These countries are aging rather rapidly and their working-age populations are declining. Such a demographic shift is directly connected to steel demand for construction, automobiles, and home appliances. With aging populations and saturated economies, the USA and the EU have entered a stage of stagnation in industrialization and urbanization, two key drivers for steel demand.

In other emerging countries, there is considerable room for increase in steel demand due to population growth and urbanization and industrialization. However, the global working-age population growth will continue to decline and this will put downward pressure on global steel demand in the mid-to-long term.

Figure 11. Global GDP and Global Steel Demand

Note: The figure for 2018-2019 is estimated by forecast by worldsteel and World Bank

Source: World Bank, worldsteel, IHS Global

Figure 12. Global Steel Consumption Per Capita and Steel Intensity of GDP

Prepare for a possible repeat of the low growth period

It is difficult to precisely predict how the discrepancy will unfold in the future, but past experience can be a good reference.

The global steel industry suffered a prolonged depression in demand from the early 1980s to the early 2000s. After the second oil shock, global steel demand stagnated, decoupling from global GDP for a number of years, and both global steel consumption per capita and steel intensity of GDP continued to decline. This means that the decoupling of global GDP and steel demand persisted until China emerged as a new growth engine for steel demand after the early 2000s.

Steel companies must grasp the prolonged structural changes in the global economy and steel demand in order to prepare for the future. Understanding the paradigm shift is critical for formulating mid- and long-term investment and growth strategies, which will in turn determine



future performance and competitiveness. Fortunately, as the Chinese steel industry has been taking the lead in restructuring, global overcapacity has been reduced considerably over the last three years and steel market conditions have improved. The improvement seems to continue for the time being. However, there are still concerns that the decoupling of global steel demand and global GDP will continue in the long term. 📢