

Shaken and Stirred: Japan in Numbers

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The Japanese government delivered the official news last week that the Tohoku Earthquake has shaken Japan back into a recession. The economy had already shrunk 0.8% in the fourth quarter of 2010 (the fall is 1.3% when annualized). When the gross domestic product (GDP) fell 0.9% from January to March in 2011, the second consecutive quarter of contraction effectively fits under the definition of an economic recession.

There has been no shortage of analyses of Japan's economy since the earthquake-tsunami-nuclear disaster caused at least 30 trillion yen (US\$309 billion) in damages alone. The disruption to manufacturing, expected to last a few months due to power shortage, will continue to erode the bottom line of many businesses. Some analysts project the economy will continue to shrink in the April–July quarter as supply bottlenecks continue to wreak havoc with output and exports.

For those interested in how the triple disaster has affected the gas industry, it would be difficult to avoid the wave of quarterly/full-year earnings and survey results released in the last few weeks. Although it appears that the top tier gas suppliers have escaped relatively unscathed, reporting extraordinary disaster losses of several to thirty billion yen (against annual revenues of several hundred billion yen) and interruption of gas production at just a handful of facilities, the real impact on the gas market will not be fully realized until the inventories of Japanese intermediate goods for many industries run low and jeopardize manufacturing production that employ all types of industrial and specialty gases. Smaller specialty gas producers were harder hit and interruptions have been more serious.

G&I has been investigating the direct impact of interrupted gas supply and secondary impact of altered gas demand through the convoluted global technology supply chain. In the process, we came across many informative economic reports that have been invaluable to help us understand the supply-and-demand dynamics in Japan and its trading network.

In this issue of the newsletter, we would like to share with our readers some of the information graphics that illustrate the Japanese economy before and after the earthquake. Our series of reports on the repercussions on the gas industry will be available soon. Please contact our office to reserve a copy.

Region	Overall impact	Sector	Impact on gas industry
Japan	Severe	Industrial and specialty gases	Direct supply interruption for bulk gases in disaster region although production at other locations can accommodate short falls; Delivery hampered by traffic and infrastructure (destroyed cylinders, etc.); moderate
			Supply crunch for some electronic gases at hard-hit specialty gas producer; possibly serious
		Refineries	Reduced direct demand; severe
		Petrochemical	Reduced direct demand; serious
		Auto and auto components	Reduced direct demand; severe
		Steel	Reduced direct and secondary demand (from auto, construction, and manufacturing); serious
		Electronics	Reduced direct and secondary demand through semiconductor supply chain; serious but magnitude unclear
		Construction	Reduced direct demand in short-term; severe Increased demand as reconstruction begins; positive
Asia	Serious	Industrial and specialty gases	Increased demand for specialty gases from select producers to supplement production losses in Japan; positive
			Reduced supply of specialty gases at suppliers who import gases from Japan; possibly serious
		Refineries	Increased demand due to urgent Japanese demand for more fuel — oil, liquefied petroleum gas, liquefied natural gas, and coal; positive
		Petrochemical	
		Mining	
		Steel	Reduced direct and secondary demand due to smaller volume of steel and autos available from Japan; serious
		Auto	Reduced direct and secondary demand from manufacturing and assembly plants; serious
Potentially increased demand for more gases as Korean car makers see increased sales in the short-term; positive			
Electronics	Reduced direct and secondary demand in emerging markets; serious		
	Increased demand for gases as Korean and Taiwanese manufacturers increase capacity to gain market share; positive		
US	Moderate	Auto	Reduced direct demand; moderate
		Electronics	Reduced direct and secondary demand; moderate
Europe	Mild	Auto	Reduced direct demand; mild
Rest of the world	Mild	Auto in Mexico	Reduced direct demand; serious

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Table 1 Impact of Tohoku Earthquake on industrial production

Japan: growth scenarios

Projections are hypothetical; official J.P. Morgan Japan forecasts are still under revision

	%q/q, saar				%m/m, sa change				
	1Q 2011	2Q 2011	3Q 2011	4Q 2011	Mar 2011	Apr 2011	May 2011	Jun 2011	Jul-Dec 2011
GDP									
Pre-quake	2.2	2.2	2.5	2.0	...	...	...	...	...
Post-quake									
Bad scenario	1.0	0.0	5.0	3.5	...	...	...	...	...
Worse scenario	-1.0	-2.0	8.0	5.0	...	...	...	...	...
Manufacturing									
Pre-quake	17.4	3.0	1.0	6.0	1.9	-1.0	0.5	0.3	0.5
Post-quake									
Bad scenario	7.0	-5.7	18.7	14.9	-5.0	0.5	1.5	2.0	1.3
Worse scenario	-6.7	-17.1	51.8	26.7	-15.0	2.0	5.0	4.0	2.3

saar = seasonally adjusted annual rate; sa = seasonally adjusted

Source: J. Lupton, D. Hensley, "Global repercussions from the Japanese earthquake," *Global Issues*, J.P.Morgan Economic Research, p. 4 (March 25, 2011). Reproduced with permission of J.P.Morgan Chase & Co.

Table 2 Economic activity in Japan under two post-earthquake scenarios

After a week of evaluating damages reported and patiently observing the continuing nuclear crisis unfold, analysts began to revise their assessment of the earthquake's impact on the local and global economy. In the March 18 issue of *Global Weekly Economic Monitor*, Nomura Securities lowered its forecast for 2011 real GDP growth rate by 0.4 percentage point (%-pt), from a pre-quake forecast of +1.3% to +0.9%, while raising the projected 2012 real GDP growth rate by 0.3 %-pt from +2.2% to +2.5%. Nomura analysts believe the earthquake will damp real GDP growth by about 0.6 %-pt in 1Q and 2Q 2011. As they expect the earthquake to have a limited immediate impact on the economy, they have revised their projection for when the economy will pick up, from Q2 2011 to Q4 2011 as rebuilding-related demands spur economic growth.¹

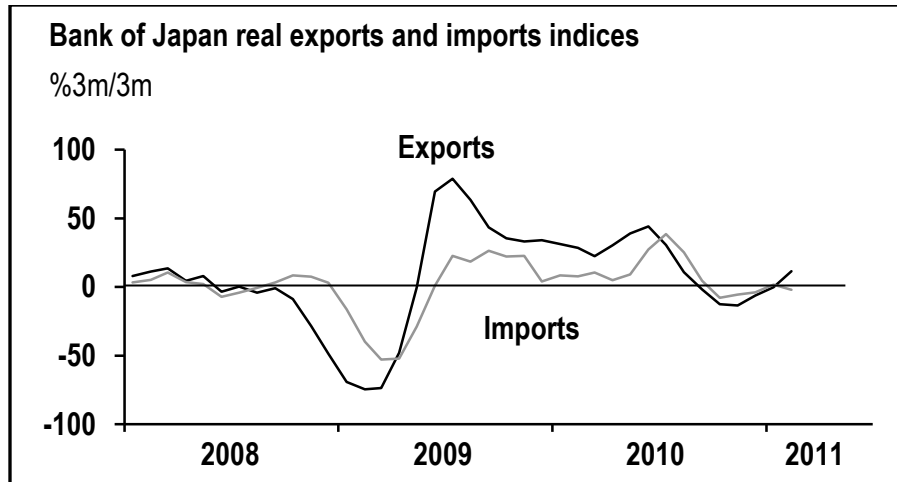
In a March 23 note on the *Morgan Stanley Global Economic Forum*, Morgan Stanley's Tokyo-based economists predicted GDP in 2Q 2011 will fall by 6–12% annualized, a scale likely to exceed the 5.4% quarter-quarter drop in 1Q 2009 after the Lehman Shock. For the year 2011, GDP will decline by 1–3% (shortfall of 3–5% compared to pre-quake forecast of +2%), followed by a modest recovery in 2012, with GDP ranging between –1.0% and +3.0% (compared to pre-quake 2012 forecast of 1.9%).² The numbers were updated on April 4 to –0.5% for GDP in 2011, –0.6% for 1Q 2011, a return to overall growth of +2.9% in 2012, and +3.7% growth in Q1 2013.³

In J.P. Morgan's March 18 issue of *Global Data Watch*, its economists suggested a +1.2% annualized Japanese GDP growth (revised down from a pre-quake forecast of +2.2%) in 1Q 2011, a –1.0% contraction in 2Q (down from +2.2%), a –2% reduction for 1H 2011, and a +3.0% growth on average in 2H 2011 (up from +2.3%). They expected the economy to recover in 3Q and jump in 4Q due to large public works spending. The resulting 2011 GDP forecast was revised down from +1.7% to +0.9% year-year and the 2012 GDP was revised up to +2.8% from +1.8%. Globally, they projected a +3.4% annualized gain in GDP during 1H 2011, down from a projected +4% at the beginning of 2011. Forecasts for 2012 global GDP remained unchanged.⁴

A week later, Joseph Lupton and David Hensley, global economists at J.P. Morgan Economic Research released revised forecasts (Table 1) in the March 25 issue of *Global Issues* and *Global Data Watch*. Prior to the earthquake, Japanese GDP growth was on track to expand by +2.2% annualized in 1H 2011. The earthquake occurred when the Japanese macroeconomy was accelerating sharply from a contraction in 4Q 2010: GDP was rising at a 2.0–2.5% annualized pace in 1Q 2011 and industrial production was surging at a 15–20% pace. Lupton and Hensley presented two economic scenarios premised on the radically different assumptions that industrial production in March declined anywhere from –5% (bad scenario) to –15% (worse scenario). The bad scenario envisions near stagnation in 1H 2011 GDP (+1.0% in 1Q, 0.0% in 2Q) while the worse scenario assumes bigger dips in industrial production (–6.7% in 1Q, –17.1% in 2Q) and the economy contracts in both 1Q (–1.0%) and 2Q (–2.0%). For both cases, a sustained rebound in activity began in April as production came back online and reconstruction efforts began, leading to above-trend growth in 2011 and 2012 GDP above last year’s forecast. In other words, the bigger the setback in the near term, the bigger the rebound in 2H 2011.⁵

On April 27, Japan’s Ministry of Economics, Trade, and Industry (METI) released manufacturing statistics for March. It showed that industrial production plunged –15.3% m/m sa, the sharpest monthly decline on record. Export volumes fell 8% m/m and Japanese output is not expected to recover to pre-quake levels until late 3Q 2011. Retail sales also plummeted –8%, while real household spending’s fall was relatively mild at –2%. The unemployment rate did not rise in March.^{6,7}

The 15.3% output decline in March aligns with J.P. Morgan’s worse scenario forecast of –15% in March manufacturing. This suggests that the manufacturing sector is experiencing a severe hit much sooner and more intensely. Due to the larger decline in core capitals goods shipments in METI’s report and softer consumption-related data, J.P.Morgan has revised its 1Q GDP growth forecast to an annualized –1.5% contraction from a 1.0% fall.⁷



Source: M. Adachi, "Data Watch: Japan," Ed. B. Kasman, D. Hensley, J. Lupton, *Global Data Watch*, J.P.Morgan Economic Research, p. 38 (March 25, 2011). Reproduced with permission of J.P.Morgan Chase & Co.

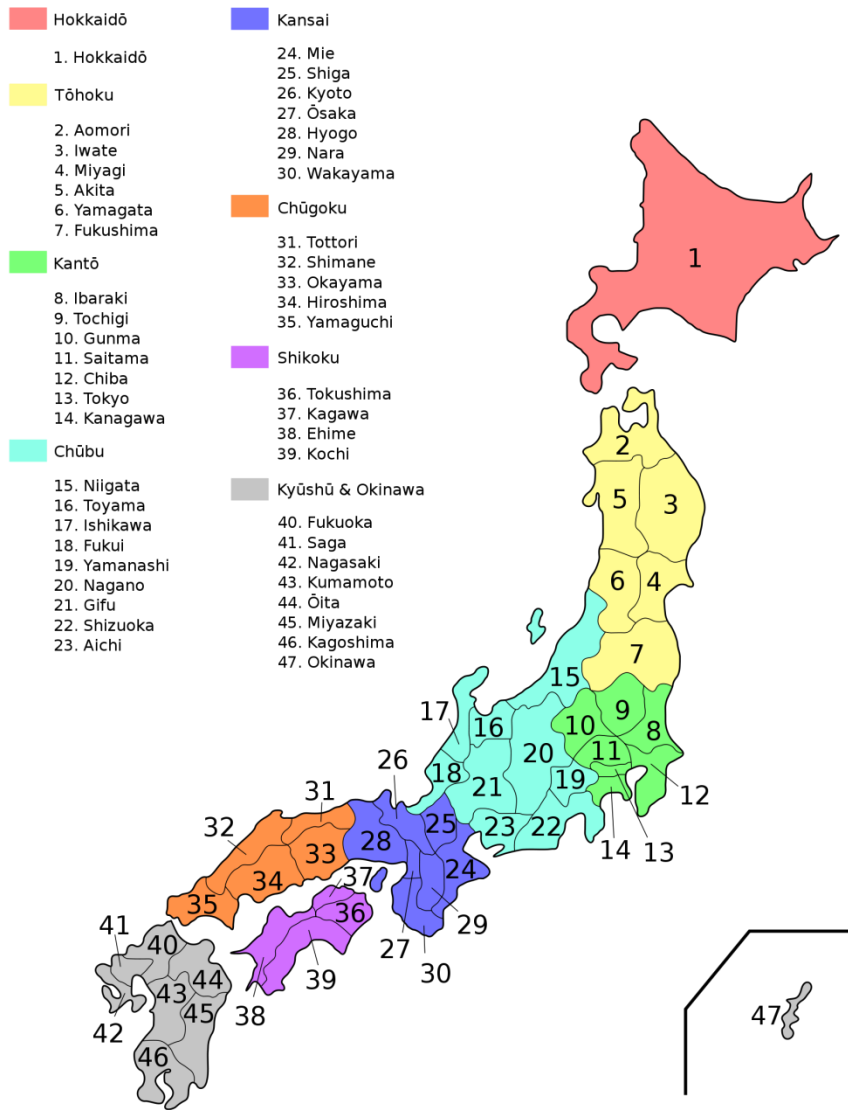
Figure 1 Japanese international trade activities prior to March 11, 2011

Although Japan's domestic market has been shrinking since 1990, its manufacturers have continued investing to maintain market share, despite slim profit margins by international standards. While domestic demand for automobiles is only 5 million cars per year, there are eight car manufacturers, eleven producers of refrigerators, and many more brands of other electronics and home appliances (e.g., flat screen televisions, cell phones, photocopiers, washing machines).⁸ A large fraction of these products are destined for export, as are intermediate components for outsourced manufacturing and packaging in emerging markets.

Japan's exports were regaining momentum before the earthquake, after a -1.3% annualized fall in GDP in 4Q 2011. Total machinery orders jumped close to 20% m/m sa in January, the largest gain since December 1998, due to orders from overseas. Machinery is the largest group of goods that Japan exports (see Table 5). The surge in foreign orders, +71.4% month-month, seasonally adjusted (m/m sa), is the largest rise since 1962, and included big orders for chemical machinery. Excluding the chemical machinery, foreign machinery orders rose +55.6% over the year before, after a +22.4% gain in the 4Q average.⁹

The indication that producers of machinery were more willing to purchase equipment suggest they are anticipating increased demand for capital goods. Orders from the industrial machinery, IT/communication equipment, electric machinery, and auto/auto parts sectors have been rising solidly. The Bank of Japan import index fell in February after the surprisingly strong January figure.¹⁰ Shipments from Japan will decline sharply in March and April but exports should recover in 2Q and 3Q. Receipt of foreign goods will also go down in March and April.

Regions and Prefectures of Japan



Source: Wikipedia commons

http://en.wikipedia.org/wiki/File:Regions_and_Prefectures_of_Japan.svg

Figure 2 **Regions and Prefectures of Japan**

Real GDP produced in earthquake-impacted prefectures					
FY 2008 yen trillion for GDP, thousands for population					
	Iwate	Miyagi	Fukushima	Total	Nation
Overall	4.9	9.0	9.0	22.9	554.1
Agriculture, forestry & fishing	0.2	0.1	0.2	0.6	9.0
Mining & manufacturing	1.0	1.4	2.8	5.2	130.6
Private services	2.8	6.0	4.9	13.7	339.5
Other	1.1	1.7	1.3	4.1	91.2
Population	1352	2340	2052	5744	127692

Note: GDP for the nation is the total of all prefectures.

Source: M. Kanno, M. Adachi, M. Nakamura, "Japan to recover from the disaster, but will take time," Ed. B. Kasman, D. Hensley, J. Lupton, *Global Data Watch*, J.P.Morgan Economic Research, p. 21 (March 18, 2011).
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Table 3 Contribution to gross national production from three prefectures in northeastern Japan that are most affected by the Tohoku Earthquake

The area struck by the Tohoku Earthquake ranged from Hokkaido to the Tokyo metropolitan area, although most of the damage was concentrated in three prefectures: Iwate, Miyagi, and Fukushima. Their combined manufacturing output is approximately 4% of the nation's while the output from the area's agriculture, forestry, and fishing industries is about 6%. The port city of Sendai is in the Miyagi Prefecture, about 300 km northeast of Tokyo. The Miyagi Prefecture and its surrounding areas include major manufacturing and industrial zones, with many chemical and electronic plants.¹¹

Shortage of some goods can be filled by an increase in production in other regions not affected by the earthquake.

Major partners in Japan's international trade											
Japan exports goods to the following countries: % of total Japanese nominal exports						Japan imports goods from the following countries: % of total Japanese nominal imports					
	2000	2005	2008	2009	2010		2000	2005	2008	2009	2010
1 China	6.3	13.5	16.0	18.9	19.4	1 China	14.5	21.0	18.8	22.3	22.1
2 United States	29.7	22.5	17.5	16.1	15.4	2 United States	19.0	12.4	10.2	10.7	9.7
3 Korea	6.4	7.8	7.6	8.1	8.1	3 Saudi Arabia	3.7	5.6	6.7	5.3	5.2
4 Taiwan	7.5	7.3	5.9	6.3	6.8	4 UAE	3.9	4.9	6.2	4.1	4.2
5 Hong Kong	5.7	6.0	5.2	5.5	5.5	5 Korea	5.4	4.7	3.9	4.0	4.1
6 Thailand	2.8	3.8	3.8	3.8	4.4	6 Indonesia	4.3	4.0	4.3	3.9	3.3
7 Singapore	4.3	3.1	3.4	3.6	3.3	7 Taiwan	4.7	3.5	2.9	3.3	3.3
8 Germany	4.2	3.1	3.1	2.9	2.7	8 Malaysia	3.8	2.8	3.0	3.0	3.0
- Rest	33.0	32.8	37.6	34.8	34.4	- Rest	40.6	41.0	44.1	43.3	44.9
- Aggregate Asia	41.1	48.4	49.3	54.2	56.1	- Aggregate Asia	41.7	44.4	40.6	44.7	45.3
- ASEAN	14.3	12.7	13.2	13.8	14.7	- ASEAN	15.7	14.1	14.0	14.1	14.5
- NIES	23.9	24.3	22.1	23.5	23.7	- NIES	12.2	9.8	8.0	8.6	8.9

ASEAN = Association of Southeast Asian Nations, NIES = Newly Industrializing Economies

Source: M. Kanno, M. Adachi, M. Nakamura, "Japan to recover from the disaster, but will take time," Ed. B. Kasman, D. Hensley, J. Lupton, *Global Data Watch*, J.P.Morgan Economic Research, p. 24 (March 18, 2011).
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Table 4 Import and export between Japan and trading partners

Japan's manufacturing output accounts for over 11% of global "value-added" intermediate goods and materials and is an essential player in many industries, including automotive and high technology. The near-term disruption to Japanese production will affect the supply of materials, components, and finished goods across the globe. These disruptions will be most acute in emerging markets in Asia because of their extensive trade and production ties to Japan and the region's high manufacturing intensity.¹²

Japanese manufacturers have been increasing overseas production to avoid the risk of yen appreciation and to take advantage of growth rates in emerging markets in Asia. Exports to Asia, particularly China, has been rising. While they accounted for approximately 25% of Japan's total exports in the mid-1980s, they accounted for 56.1% of the total in 2010. This trend will likely continue as the region grows.¹³ Japanese affiliates overseas depend relatively heavily on the import of parts and machines from Japan. Supply constraints on the goods will restrain operating rates of these affiliates.

J.P. Morgan noted that Emerging Market Asia's total trade exposure to Japan has been declining, falling to 10.2% of total trade (exports + imports) in 2010 from 15.4% in 2000.¹⁴ ASEAN imports from Japan in 2009 was just over 10%, compared to 24% of the total in 1994.

Major traded goods in Japan's international trade (2010)					
Goods Exported from Japan			Goods Imported into Japan		
% of total Japanese nominal exports			% of total Japanese nominal imports		
1	Transport machinery	22.6	1	Mineral fuels	28.6
2	Industrial machinery	19.8	2	Electric machinery	13.3
3	Electric machinery	18.8	3	Chemicals	8.9
4	Manufactured goods	13.0	4	Manufactured goods	8.9
5	Chemicals	10.3	5	Food	8.6
6	Mineral fuels	1.6	6	Industrial machinery	7.9
7	Raw materials	1.4	7	Raw materials	7.8
8	Food	0.6	8	Transport machinery	2.8
-	Rest	11.9	-	Rest	13.2

Source: M. Kanno, M. Adachi, M. Nakamura, "Japan to recover from the disaster, but will take time," Ed. B. Kasman, D. Hensley, J. Lupton, *Global Data Watch*, J.P.Morgan Economic Research, p. 24 (March 18, 2011). Reproduced with permission of J.P.Morgan Chase & Co.

Table 5 Products traded between Japan and other countries

Due to a lack of natural energy resources, Japan relies on its nuclear (29.2%) and hydroelectric (8.1%) power facilities to supply over a third of electricity. The rest is generated by coal (24.7%), petroleum (7.6%), liquefied natural gas (LNG, 29.4%), and new alternative power (1.1%). All of the liquefied petroleum and liquefied natural gas, and most of the coal is imported. Due to the nuclear disaster at Fukushima and damages at refineries, Japan will be even more reliant on mineral fuels imported from southeast Asia in the next few months.¹⁵

There has also been a shift in the breakdown of exported goods. Producer goods are defined as intermediate goods and materials (e.g., chemical products, metal and fabricated metal products, semiconductors and electronic parts). Producer goods used to make up around 40% of items exported by Japan in 1980 but they accounted for 53% of total exports last year. In particular, the proportion for consumer goods among final exports has dropped sharply.¹³

Table 6 Asian exports to Japan				
	% of total exports	% of GDP	Largest item	% of total exports
Malaysia	10.4	8.7	Gas*	3.7
Singapore	4.7	7.4	Electric machinery**	1.6
Vietnam	10.8	7.3	Petroleum***	2.2
Thailand	10.4	6.4	Electric machinery**	1.9
Taiwan	6.6	4.2	Electronic machinery**	2.9
Philippines	15.2	4.1	Electric machinery**	4.7
Indonesia	16.3	3.6	Gas*	4.0
Korea	6.0	2.8	Electronics****	1.6
China	7.7	2.1	Electronics****	1.5
India	1.9	0.3	Petroleum***	0.5

Note: According to Standard International Trade Classification (SITC) codes, gas* = gas, natural and manufactured; electric machinery** = electric machinery, apparatus and appliances and parts; petroleum*** = petroleum, petroleum products and related materials; petroleum**** = petroleum, petroleum products and related materials. The two LHS columns are 2010 data; the two RHS columns are 2009 data. Source: UN Comtrade; CEIC, and Nomura Global Economics.

Table 7 Asian imports from Japan				
	% of total exports	% of GDP	Largest item	% of total exports
Taiwan	20.7	12.1	n.a.	n.a.
Thailand	20.7	12.0	Capital goods	7.7
Singapore	7.9	11.0	Capital goods	3.6
Malaysia	12.6	8.7	Capital goods	6.1
Vietnam	10.8	8.5	Industrial supplies	4.3
Korea	15.1	6.4	Industrial supplies	8.2
Philippines	12.3	3.6	Capital goods	7.2
China	12.7	3.0	Capital goods	6.1
Indonesia	12.5	2.4	Capital goods & industrial supplies	3.7 each
India	2.5	0.5	Capital goods	1.1

Note: The two LHS columns are 2010 data; the two RHS columns are 2009 data. Source: UN Comtrade; CEIC, and Nomura Global Economics.

Source: T. Kinoshita, R. Subbaraman, E. Paracuelles, Y. Khatri, "Potential impact of Japan's earthquake on Asia," *Global Weekly Economic Monitor*, Nomura Global Economics (March 18, 2011). Reproduced with permission of Nomura Securities International Inc.

Table 6 Asian exports to Japan
Table 7 Asian imports from Japan

Japan is no longer embracing the old manufacturing model where raw materials and parts are imported, processed into final products, and assembled before being exported as finished goods. Today, a large portion of Japan's exports to Asia is producer goods, i.e., intermediate goods and materials. Together with the increase in total exports to Asia, producer goods will continue to dominate Japanese exports.¹³

With labor-intensive manufacturing as well as test and assembly outsourced by Japanese companies to many developing economies with lower labor costs, ASEAN countries are the most affected by disruptions in Japanese industrial production, followed by Korea and Taiwan. China is more insulated but it is not immune to the effects.¹³

Impact of Tohoku earthquake on manufacturing
 %-pt (q/q, saar) impact from Japan shock implied by regression model

	BAD SCENARIO				WORSE SCENARIO			
	1Q 2011	2Q 2011	3Q 2011	4Q 2011	1Q 2011	2Q 2011	3Q 2011	4Q 2011
Japan, assumed impact:	-10.4	-8.7	17.7	8.9	-24.1	-20.1	50.8	8.9
EM Asia	-3.8	-3.2	6.4	3.2	-8.8	-7.3	18.4	7.5
China	-2.9	-2.4	4.9	2.5	-6.7	-5.6	14.1	5.7
India	-0.2	-0.2	0.4	0.2	-0.5	-0.4	1.1	0.4
Korea	-6.5	-5.5	11.2	5.6	-15.2	-12.7	32.0	13.0
Taiwan	-3.0	-2.5	5.1	2.6	-7.0	-5.8	14.7	6.0
ASEAN	-6.3	-5.3	10.9	5.4	-14.8	-12.3	31.1	12.7
USA	-0.2	-0.2	0.3	0.2	-0.4	-0.4	0.9	0.4
EMU	-0.8	-0.7	1.4	0.7	-2.0	-1.6	4.1	1.7
Germany	-1.3	-1.1	2.2	1.1	-3.0	-2.5	6.4	2.6
Brazil	-4.4	-3.7	7.5	3.8	-10.2	-8.5	21.4	8.7
Memo:								
Global	-2.3	-1.9	4.0	2.0	-5.4	-4.5	11.4	3.2
Global excl. Japan	-1.2	-1.0	2.1	1.0	-2.8	-2.3	5.9	2.4

ASEAN = Association of Southeast Asian Nations, EM = Emerging markets, EMU = European Economic and Monetary Union

Note: The assumed shock to Japan IP is the difference between the post- and pre-quake estimated. The impact shows the product of the Japan shock with the estimated IP model impulse coefficient.

Source: J. Lupton, D. Hensley, "Global repercussions from the Japanese earthquake," *Global Issues*, J.P.Morgan Economic Research, p. 10 (March 25, 2011). Reproduced with permission of J.P.Morgan Chase & Co.

Table 8 Implied Impact of Tohoku earthquake on global manufacturing using regression model

While Japan is experiencing both a demand and a supply shock, only the latter will have significant impact on the economic activity in the rest of the world. Although Japanese merchandise imports and Japanese tourism abroad have decreased, the magnitude of these shortfalls is small compared to the size of the global economy. A more pressing issue is the way in which the supply shock ripples through the global supply chain for industrial production (IP). Japan is home to major manufacturers in a range of industries from autos to high technology, as well as a host of specialty producer parts manufacturers. Many businesses have already encountered problems obtaining specialized parts that are produced only in Japan.

The impact on the rest of the world will manifest itself primarily in the flow of international trade and global industrial production. In particular, the reduction in Japanese output in 2Q will curtail exports. This, in turn, is widely expected to disrupt production in the rest of the world. At the same time, inventories and substitutions will buffer the shock to some extent.

To gauge the potential scope and magnitude of production spillovers, Lupton et. al. examined the relationship between movements in IP growth in Japan and the response of production in other countries around the world. The average historical relationship is estimated over the period 1994 through 2010, including useful variation from the Kobe earthquake (January 1995), the Asian financial crisis (1998), the 2001 recession, the SARS epidemic (2003), and the 2008 recession.¹⁶

To study the impact of the shock to Japanese IP on global IP, Lupton et. al. first calculated the assumed shock by subtracting the pre-quake forecast for growth in each quarter from the post-quake projected growth under the bad and worse scenarios in Table 1. In the bad scenario, this amounts to a huge negative 10.4% [= (7.0% post-quake) minus (17.4% prequake)] annualized shock in 1Q11 and a similarly large shock of negative 8.7% [= (-5.7% post-quake) minus (3.0% pre-quake)] in 2Q11. This is then offset by large rebounds in 2H11. The worse scenario envisions a massive negative shock and rebound that is more than double that of the bad scenario.¹⁷

Using a regression model, Lupton et.al. estimate that the growth of global manufacturing output could be reduced by anywhere from 2% (-2.3% in 1Q, -1.9% in 2Q) to 5% (-5.4% in 1Q, -4.5% in 2Q) in 1H 2011. In 2H 2011, global industrial production will accelerate significantly as Japanese manufacturing output and exports return to pre-quake levels. Output growth in 2H 2011 could be on average 3% (+4.0% in 3Q, +2.0% in 4Q, bad scenario) to 7% (+11.4% in 3Q, +3.2% in 4Q, worse scenario) higher. The regressions imply that a shock to Japan IP growth will have significant reverberations throughout Asia, with an especially big effect on production growth in the ASEAN bloc and, to a lesser degree, Korea and Taiwan. This is expected given the region's manufacturing intensity along with its proximity to Japan: EM Asian trade shares with Japan are the largest in the world. Moreover, relative to GDP, no other country or region has as high a trade intensity with Japan as does the ASEAN region. The impact on production growth in China and India is smaller but still statistically significant. By contrast, the regressions imply that production shocks in the RoW do not impact EM Asian IP growth as long as output growth in Japan is assumed constant.¹⁷

A direct translation of these shocks based on J.P.Morgan's model estimates provides the "contemporaneous" impacts (the shock is transferred immediately in the same quarter). The results imply that the bad shock to Japan IP growth in 1Q11 will reduce IP growth in EM Asia by 3.8%-pts (i.e., 10.4×0.36 , with rounding, where 0.36 is the IP regression model impulse coefficient for EM Asia), while the 8.7%-pt negative shock in 2Q11 will damp EM Asian IP by 3.2%-pts. These impacts are then reversed in 2H11, with EM Asian IP growth getting a strong lift of 6.4%-pts in 3Q11 and 3.2%-pts in 4Q11.¹⁷

The effect is biggest in the ASEAN group. Whereas output had been expected to grow prior to the earthquake at an 11.4% annual rate in 2Q11, the model implies the realized gain could be as low as 6.1% annualized, a negative shock of 5.3%-pts. Outside Asia, the impacts are more limited but noticeable, with US IP growth being slowed by about 1/4%-pt annualized in 1H11. Excluding Japan, the model-implied spillover to manufacturing growth outside Japan subtracts roughly 1%-pt annualized in 1H11 but this is offset in 2H11. Under the worse scenario, the impacts are roughly doubled on the downside in 1H11 and more than doubled on the upside.¹⁷

Impact of Tohoku earthquake on GDP
 %-pt (q/q, saar) impact from Japan shock implied by regression model

	BAD SCENARIO				WORSE SCENARIO			
	1Q 2011	2Q 2011	3Q 2011	4Q 2011	1Q 2011	2Q 2011	3Q 2011	4Q 2011
Japan, assumed impact:	-1.2	-2.2	2.5	1.5	-3.2	-4.2	5.5	3.0
EM Asia	-0.9	-0.7	2.4	1.4	-3.2	-2.7	5.9	2.2
China	-0.9	-0.7	2.4	1.3	-3.1	-2.6	5.7	2.2
India	0.3	0.3	0.4	0.3	-0.3	-0.3	-0.1	-0.2
Korea	-1.6	-1.3	3.6	1.9	-4.7	-3.9	9.1	3.5
Taiwan	-0.6	-0.4	1.8	1.1	-2.3	-1.9	4.0	1.5
ASEAN	-1.3	-1.1	3.1	1.7	-4.0	-3.4	7.7	3.0
USA	-0.0	-0.0	0.0	0.0	-0.1	-0.0	0.1	0.0
EMU	-0.1	-0.1	0.2	0.1	-0.3	-0.3	0.7	0.3
Germany	-0.3	-0.2	0.5	0.3	-0.7	-0.6	1.4	0.6
Brazil	-0.7	-0.6	1.2	0.6	-1.6	-1.3	3.4	1.4
Memo:								
Global	-0.4	-0.4	0.8	0.5	-1.2	-1.2	1.9	0.8
Global excl. Japan	-0.3	-0.2	0.6	0.3	-0.9	-0.8	1.4	0.5

ASEAN = Association of Southeast Asian Nations, EM = Emerging markets, EMU = European Economic and Monetary Union

Note: The assumed shock to Japan GDP is the difference between the post- and pre-quake estimated. The other impacts show the product of the Japan shock with the estimated IP model impulse coefficient, scaled by that country or region's valued-added in manufacturing.

Source: J. Lupton, D. Hensley, "Global repercussions from the Japanese earthquake," *Global Issues*, J.P.Morgan Economic Research, p. 11 (March 25, 2011). Reproduced with permission of J.P.Morgan Chase & Co.

Table 9 Implied Impact of Tohoku earthquake on GDP worldwide using regression model

The model-based impacts on industrial production were translated to GDP based on the assumption that service sector activity is unaffected by the disruption to the manufacturing sector. In this case, the hit to GDP is simply the reduction in manufacturing output growth scaled by the share of manufacturing in total value-added, as shown in Table 8 above.

On May 19, the Cabinet Office reported that real GDP fell 0.9% in 1Q, almost twice as much as a median market forecast for a 0.5% contraction. This translates to an annualized decline of 3.7% against a forecast of a 2.0% fall. Effectively, the Tohoku Earthquake has knocked Japan back into recession. While some economists believe the grim figures suggest that the pace of recovery will be slower than anticipated, some argue that the economy had just bottomed out in March, rather than in April as they had expected. To the latter group, recovery will arrive sooner.^{6,7}

The impact on world economy and industrial output is deeper and wider than can be simply described in terms of GDPs. As a country, Japan is vertically integrated in several industries. Its exports contribute to multiple processes in the production of many industries – both intermediate component or enduser consumer product. Shortage in any component will interrupt the entire supply chain.

G&I has prepared a report on the earthquake's related damages and interruption to gas production. Disruption in Japanese supply of any gas will affect the cost and output of many industries. Any imbalance in the supply and demand of goods traded within and outside of Japan

will also affect the amount of gases each sector will actually demand for manufacturing that can proceed. We are also working on a report on this secondary impact on the gas industry. Please contact our office to reserve copies of these reports.

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