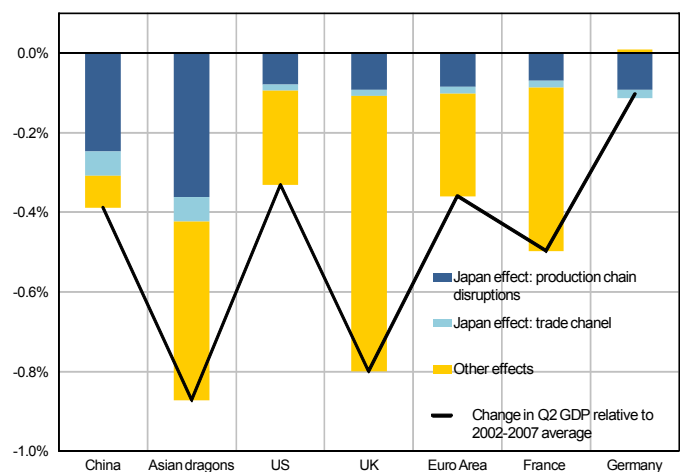


The impact of Japan's earthquake on the global economy

- A year ago, Japan's triple disaster-earthquake, tsunami and nuclear accident-had a very strong impact on the Japanese economy. In addition to its dramatic human cost, the catastrophe destroyed production capacity in the disaster zones and caused a power supply shortfall. It also negatively impacted the national and international economy through disruption of production chains-the factor that ultimately made the largest contribution to the sharp drop in production in Japan and neighboring economies.
- For the full year 2011, Japanese GDP was 0.7% lower than in 2010. The largest decline was in the first two quarters (-1.8% and -0.3%, respectively), followed by a significant rebound in Q3 (+1.7%), before a further fall in Q4 traceable to the global slowdown and flooding in Thailand.
- The disaster's direct impact on the global economy ultimately turns out to be limited. Japan's supply-side shock at the end of Q1 changed little in the demand addressed to its main trading partners. The decline in Japanese demand was partly counterbalanced by higher imports to offset the transient shortfall in domestic supply, notably for energy. All in all, the decline in Japanese imports was very slight, especially in comparison with the decline in exports.
- The indirect effect transmitted through globalized production chains was significantly larger, both in Japan and in the rest of the world. As a quasi-monopoly supplier of key technological products for the electronics and automotive industries, Japan has a strategic position at the heart of global production chains. The disaster caused production chain disruptions in those industries; the impact was particularly visible in the Asian countries, notably because Japan supplies those countries with a higher percentage of their imports of intermediate goods than other parts of the world.
- GDP in the major economies grew at a far lower rate in Q2 2011 than in the past, partly due to the earthquake in Japan; this was especially the case in Asia. The total impact of the disaster in Q2 is found to be 0.4 points of GDP for the Asian dragons, 0.3 points in China, and 0.1 point in Europe and in the US, with the automotive sector particularly affected. The impact is found to be virtually zero over the full year 2011, on the strength of the H2 rebound following restoration of both Japanese production capacity and global production chains, with a subsequent positive impact in 2012 because of public sector reconstruction.

This study was prepared under the authority of the Directorate General of the Treasury (DG Trésor) and does not necessarily reflect the position of the Ministry for the Economy, Finance and Industry.

Impact of Japanese disaster on partners' GDP in Q2 2011



Source: National statistical offices, DG Trésor calculations.

1. The triple disaster in March 2011 had a strong impact on Japan's economy, particularly due to production chain disruptions

1.1 The triple disaster in the Tohoku region weighed heavily on Japanese growth in H1 2011...

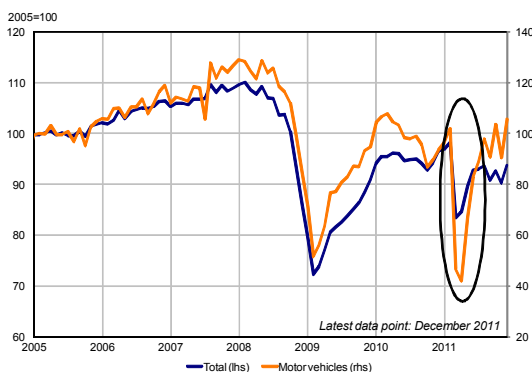
The Great East Japan earthquake on 11 March 2011 off the northeast coast of Honshu Island, Japan, that registered a magnitude of 8.9 on the Richter scale, is considered the largest ever in Japan's history. The epicenter was located 130 km east of the city of Sendai.

The quake was followed by a tsunami that ravaged the Tohoku coastal region, and an accident in the Fukushima nuclear power plant. The material cost of the destruction is still uncertain but was estimated at 3.5 points of GDP by the Japanese government, significantly more than the 7.2 magnitude Kobe earthquake on 17 January 1995, which had a material cost of approximately 2 points of GDP.

Beyond its tragic human consequences, the disaster weighed heavily on economic activity via three channels: first, shutdowns by many production sites in the earthquake disaster zone, notably in the automotive sector, caused an immediate drop in output; second, electricity outages caused by the shutdown of eleven nuclear power stations paralyzed a portion of economic activity in the Kanto region (the region with the highest level of production and trade openness in Japan); and third, the shortfall in intermediate goods from the disaster zone and from the Kanto region affected production chains across the country as a whole.

Following the earthquake, all the indicators pointed to sharp deterioration in economic activity: industrial production contracted by 15.8% in March 2011 from February, exports and consumption fell by 8.1% and 4.7% in volume terms, respectively. The automotive industry was the sector most severely affected with output plunging (-55% in March, see chart 1), essentially due to problems with the supply of parts and materials (e.g., microcontrollers, brake system components, and chemicals) and intermittent electricity outages in the just-in-time environment.

Chart 1: Japan's industrial output



Source: Ministry of Economy, Trade and Industry (METI).

All in all, Japanese GDP fell by 1.8% in Q1 2011, rather than rebounding as expected following the slight drop in Q4 2010 (-0.2%) caused by temporary factors (the end of the car scrappage scheme). Apart from public consumption, the other demand components (primarily private consumption, capital investment, and inventories) contributed to the drop in Q1. Japan's GDP continued to fall in Q2 2011, but at a slower rate (-0.3%). The sharp decline in exports was partly offset by higher public demand. The Kobe earthquake had significantly less of an impact on GDP,¹ owing first of all to the smaller size of the shock, and also to the absence of electricity supply problems, rapid reconstruction, and strong monetary expansion.²

1.2 ... notably because of production chain disruptions

Before the earthquake, Japan's industrial output was still running slightly more than 10 percent below the pre-crisis peak in 2008. It had risen by 1.0% in February 2011, and METI was forecasting a further 1.4% increase in March. After the natural disaster, industrial activity plunged 15.8%. The disaster's impact on industrial output can thus be estimated at approximately -17%, corresponding to the difference between the METI forecast-often of high quality at the one-month horizon-and actual output.

Under certain assumptions (Box 1), production chain disruption is found to be the principal channel for transmission of the disaster into economic activity, contributing 11 points to the drop in industrial output in March, with the remainder attributable to electricity outages caused by the shutdown of numerous nuclear power stations (-4 points) and the stoppage of production in the disaster zone (-2 points).

1.3 All told, the impact on Japanese economic activity is found to be of the same magnitude as the destruction caused by the natural disaster, i.e., between 3 and 4 points of GDP

The economic cost of the triple disaster would thus be attributable to indirect effects arising from the reduced supply of strategic products in production chains, and the interactions between production sectors. The impact on economic activity in H1 2011 is found to be roughly equivalent to the direct losses caused by the natural disaster itself (-3.5 points of GDP, see below).³

The impact on Japanese growth in H1 can be estimated by taking the difference between actual growth in H1 2011 and the growth forecast before the disaster. The latter can be approximated by inferring GDP from the industrial output forecast, that is, +0.8%, using the METI forecasts for March. For Q2, in absence of relevant short-term economic data, if the natural disaster had not occurred, the counterfactual growth rate can be inferred from the average growth in the 2002-2007 period, or +0.4%. All told, the impact on economic activity would thus be on the order of -3½ points for the first half of the year.

(1) GDP rose 0.6% in Q1 1995 and 1.4% in Q2.

(2) Horwich G. (2000), "Economic Lessons of the Kobe Earthquake", *Economic Development and Cultural Change*, vol. 48, no. 3

(3) Using a modeling framework based on input-output tables for Louisiana, Hallegatte (2008), "An Adaptive Regional Input-Output Model and its Application to the Assessment of the Economic Cost of Katrina," *Risk analysis*, vol. 28, issue 3, pp. 779-799, estimates that the indirect impact of a natural disaster on growth is a nonlinear function of the direct losses. The two are found to be close when the direct cost is one point of GDP or more. In the case of Hurricane Katrina, the direct and indirect costs are assessed at 0.5 and 0.2 points of GDP respectively, and the indirect-to-direct cost ratio is lower, at 39%.

Box 1: The impact of the disaster on Japan's GDP in March 2011

The impact of the triple disaster (earthquake, tsunami and nuclear accident) on industrial production (IPI) in March can be estimated by dividing the country into three geographical areas:

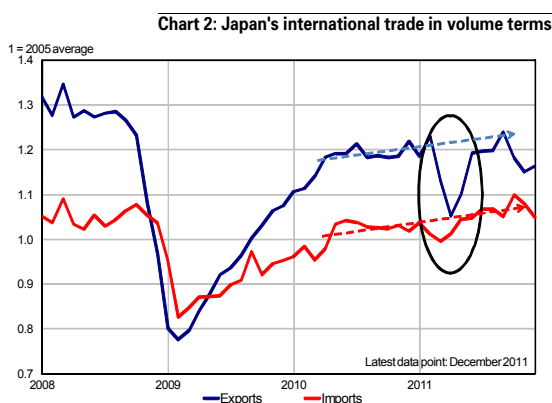
- 1. The immediate disaster zone.** The three prefectures most affected (Iwate, Miyagi and Fukushima) in Tohoku region account for approximately 4 percent of domestic output, but the area completely destroyed is restricted to the coastal areas, which account for only three-fourths of those regions, including the safety perimeter around the Fukushima plant. The initial assumption is the complete stoppage of economic activity in this zone during the last 20 days in March. Under this assumption, industrial production in this zone falls by 50% with an impact of -2% on Japan's output in March.
- 2. A zone affected by electricity outages and the production chain disruptions in the first zone:** the Kanto region (excluding Tokyo), which accounts for approximately 20 percent of output. The electricity shortfall is roughly 10% in March^a and is considered to have reduced output by roughly 20%^b in this zone and by 4% in the country as a whole.
- 3. In the rest of the country** (76 percent of domestic output), the fall in output is linked to production chain disruptions resulting from lower production in zones 1 and 2 and logistics transportation problems. Accordingly, of the 17% decrease in the IPI caused by the disaster in March (see below), 2% would be linked to the stoppage of production in the disaster zone, 4% to electricity outages in the Kanto region, and the remaining 11% primarily linked to production chain disruptions.

- TEPCO, the power utility, reports that electricity production met only three-fourths of demand the day after the disaster, causing rolling blackouts (of approximately three hours a day for businesses). Lower demand due to decreased activity in the days following the disaster made it possible to attenuate the electricity shortfall, and electricity outages had ended by the end of March. The energy shortfall is estimated to be approximately 10% (with the shortfall decreasing from one-fourth of demand the day of the earthquake, to zero at the end of the month)
- The pre-earthquake elasticity of output with respect to electric power in the region was estimated by Barclays at 1.85 using input-output tables ("Economic impacts of earthquake," April 2011). It may however have been higher in March (close to 2) because a three-hour-a-day electricity outage would have caused production to stop for longer, given the time required to restart machines.

2. Most of the earthquake's impact on the global economy comes from supply chain disruptions

2.1 The direct impact of the decline in Japanese demand on global activity is minor

The first channel for transmitting the shock into global activity was the decline in Japanese demand addressed to its trading partners. The direct impact was mitigated by imports to meet reconstruction requirements (Chart 2); Japanese imports thus continued to rise in Q2 2011, albeit at a slower rate (+0.3% compared with an average 1.2% between 2002 and 2007, suggesting that the disaster had a negative 0.9 point impact on imports). In Q3 2011, imports rose significantly (+3.4%), owing to the continued unavailability of domestic production, and energy requirements (primarily oil and natural gas) caused by losses in electricity production capacity.⁴

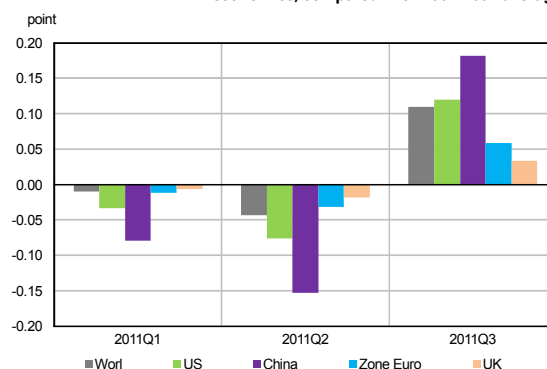


Source: Bank of Japan.

The small impact through trade is attributable to Japan's share in world trade (approximately 5% of global merchandise imports and exports in 2010),⁵ but there are significant geographical differences. The greatest impact was on the Asian countries, particularly China (with close to 10% of its exports to Japan) and South Korea (6%), and the US (6%). Europe was

significantly less affected, as only 1.3% of Europe's exports go to Japan.

Chart 3: Japan's contribution to global demand addressed to leading economies, compared with 2002-2007 average



Source: DG Trésor.

Thus, in Q2 2011, Japan's contribution to world demand addressed to China was 0.15 points lower than the average over the 2002-2007 period; Japan's contribution to world demand addressed to the US was close to 0.1 point lower than the average; and in Europe the impact was negligible (Chart 3). Further, the negative effect in Q2 was counterbalanced in Q3 2011 by a larger-than-average contribution to global demand. These figures are confirmed by the international trade model including feedback effects (Box 2). In Q2 2011, the impact on the economic activity of Japan's partners is found to be -0.1 point of GDP in Asia (China and the Asian dragons, i.e., South Korea, Hong Kong, Singapore and Taiwan), and virtually zero elsewhere, including in the US because trade as a percentage of GDP is low. The negative impact in Q2 was counterbalanced by higher Japanese imports in Q3.

(4) The difference in frequency between eastern (50 Hz) and western Japan (60 Hz) significantly restricts transfers from the West.
 (5) Data from the CEPII CHELEM database.

Box 2: Estimating the impact via the trade channel of the Japanese disaster on main trading partners

International feedback effects are taken into account using an international model that computes the impact of a decline in GDP in country j (Japan here) on country i . The direct impact on the GDP of country i is decomposed as follows:

- (1) The initial shock on country j 's GDP causes a change in country j 's imports (as a function of elasticity β_j). In the present case, this effect is not taken into account because the impact on imports is available directly (-0.9 point, *see above*). Taking the shock on Japanese GDP into account would bias the analysis because of failure to take account of the rise in Japan's imports following the country's supply-side shock;
- (2) Country i 's exports to country j are then affected as a function of its export structure (X_{ij}/X_i) and the fall in exports impacts country i 's GDP in accordance with the ratio of exports to the country's GDP (X_i/PIB_i);
- (3) A domestic multiplier effect combining two opposing trends is taken into account:
 - The fall in domestic demand (a negative effect, a function of c_i the sensitivity of domestic demand to changes in GDP).
 - The fall in imports (a positive effect, a function of β_i and the ratio of imports to GDP).

The direct impact of country j on country i is therefore:

$$\frac{d PIB}{PIB}_i = \left[\frac{1}{\underbrace{(1 + \beta_i \frac{M_i}{PIB_i} - c_i)}_{(3)}} \times \frac{X_i}{PIB_i} \times \frac{X_{ij}}{X_i} \right] * \left[\underbrace{\beta_j \frac{d PIB}{PIB}_j}_{(1)} \right]$$

The direct impact is obtained for all 40 countries in the model (accounting for 90% of world trade); but there is also an indirect impact: the decline in imports by each country leads to a further contraction of international trade. By an echo effect, each country's growth is then further reduced, in the same way as by the direct impact. The total impact is obtained by successive iterations of the echo effects, until an equilibrium is achieved.

Whereas the direct impact depends essentially on the geographical structure of Japan's trade, the indirect impact involves the propagation of the initial shock via other countries, and the full range of trade relations across the various countries. The total impact is approximately twice as strong as the direct impact for countries "close" to Japan (China, South Korea, Taiwan, and the US) and over five times stronger on average in Europe..

2.2 The indirect impact via supply chain disruptions is significantly greater, particularly in Asia

Japan is a key player in global production chains, particularly in high-technology sectors. Japanese firms account for over 70% of global production in at least 30 technological sectors, including 100% of protective films for flat screen displays, 92% of thin film transistors, 73% of automobile navigation systems, and 81% of semiconductor components. Japan also produces close to 20% of the world's electronic components, which are strategic inputs for the automotive industry,⁶ and 40% of flash memories. It is also a leading supplier of hard disks, batteries, and liquid crystal displays that are essential for manufacturing numerous high-technology products. The triple disaster, which led to a nearly 8% reduction in Japanese products exports in Q2,⁷ also caused disruptions to global supply in some sectors, particularly in electronics and the automotive industry.

Japan also plays a key role in Asian trade where production chains are highly integrated. Schematically, Japan supplies sophisticated intermediate goods to and buys final goods from its Asian partners including China, the pivot of the new international division of labor, which performs assembly and transformation of the semifinished products. Given the network structure of production processes, a shock affecting an upstream producer can cause strong fluctuations in the economy as a whole, through cascade effects from one firm to another.⁸ As noted by the IMF, Japan is clearly upstream in the global supply chain and is an important source of foreign value added in the gross exports of other Asian countries.⁹

The impact of production chain disruptions is quantified using a model (Box 3) that shows that the Asian countries are most affected by the decline in Japanese exports (-0.1 point of GDP in China and -0.2 points for the Asian dragons in Q2 2011), while the impact is very low elsewhere. The differential impact across countries can be attributed primarily to three factors:

- **Japanese exports as a percentage of each country's imports of intermediate goods:** the percentage is significantly higher for the Asian countries (approximately 20%) and, to a lesser extent, for the US (11%), than for Europe (approximately 3%); this is especially the case for automotive parts (close to 40% in Asia compared with 18% in the US and 2.5% in the euro area);
- **The percentage of imported intermediate goods used as intermediate inputs,** which is higher in Europe (close to 40%) and the Asian dragons (50%) than in the US (22%) and China (18%);
- **Manufacturing as a percentage of each country's GDP:** this is higher in Asia, notably China (close to 50%), than in the US (20%) and the euro area (25%).

While supply chain disruptions accordingly have the biggest impact on Asian countries, the smaller impacts on the euro area and the US are of roughly the same magnitude. This is explained as follows: whereas the euro area imports a smaller percentage of intermediate goods from Japan than the US, it uses a greater portion of them as intermediate inputs, and euro area manufacturing accounts for a larger share of GDP (Figure 1).

(6) Particularly for Renesas Electronics, which holds 30% of the global market in microcontrollers for automotive applications and 60% of the market for chips for navigation systems, and supplies some 50 essential components for a standard automobile.

(7) Merchandise exports in volume terms fell by 5.3% in Q2 2011. Given the 2.6% average growth for 2002-2007, the impact on exports in volume terms was approximately -7.9%.

(8) See Acemoglu, Ozdaglar and Tahbaz-Salehi (2010): "Cascades in Networks and Aggregate Volatility", NBER, Working paper 16516.

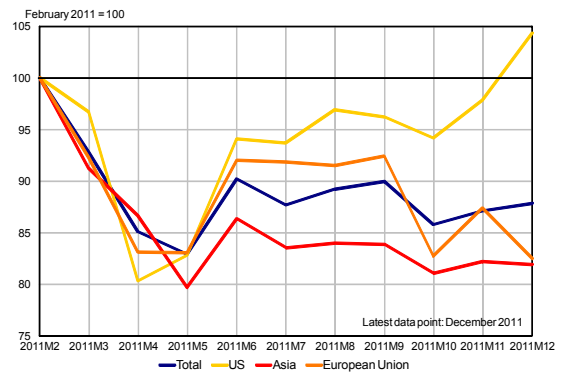
(9) Japan: Spillover Report for the 2011 Article IV Consultation and Selected Issues, IMF.

The estimated impact is uncertain. Although the assumption non-substitutability of Japanese products appears relatively mild, and verified¹⁰ in light of those products' complexity,¹¹ two other assumptions are more heroic:

- The decline in Japanese merchandise exports is assumed to be identical for all products. A more disaggregated study distinguishing between high-technology products - where Japan is a leader - and other products would likely lead to a higher estimate of the economic impact of the disaster. In fact, because high-technology exports fell more than the overall decline in Japanese exports,¹² and the import content of intermediate consumption in high-tech goods is also greater than in manufactured goods overall. While this is visible in all countries, it is particularly strong in the US, where the import content of intermediate inputs in high-technology goods is 2.3 times higher than in manufactured goods overall (compared with 1.6 times in the euro area); and high-tech sector output as a percentage of total output is close to 40% higher in the US than in Europe.¹³
- The decline in Japanese exports of intermediate goods in volume terms is the same across all countries. In value

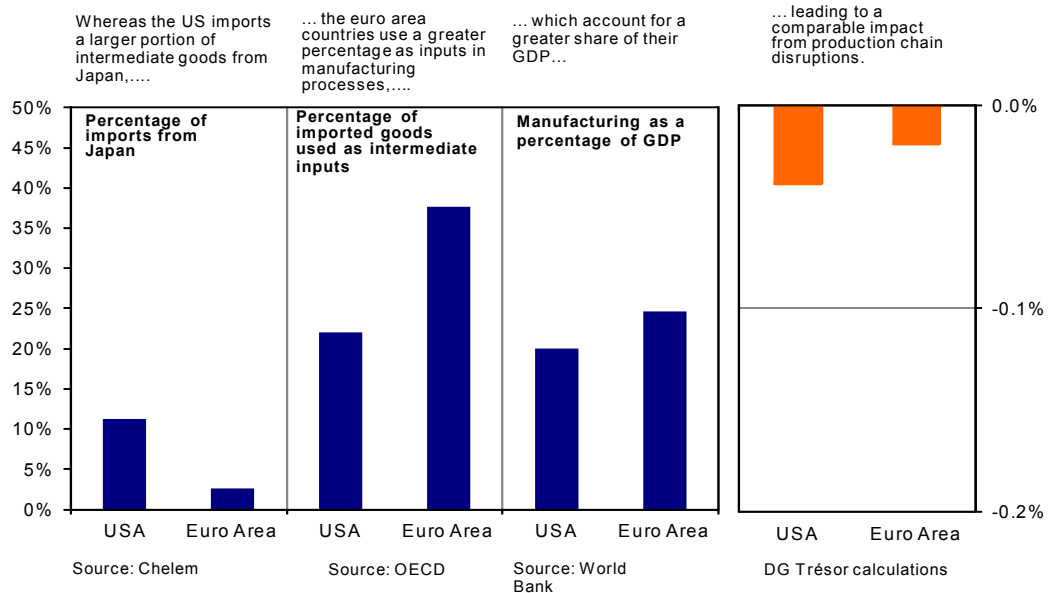
terms, however, the actual decline was very heterogeneous both at the global level (Chart 4) and across various EU countries (-21% in France and Italy between February and May, compared with -3% in Germany and -11% in the UK).

Chart 4: Level of Japanese exports by destination, compared to February 2011



Source: Japanese Ministry of Finance.

Figure 1: Comparison of the impact of production chain disruptions in the US and in Europe



2.3 The impact on manufacturing output in France is negligible

France appears to have had relatively low exposure to the risk of supply chain disruptions, due to the low percentage of its imports from Japan (2%). Nevertheless, customs data show that nearly three-fourths of imports are goods produced by the sectors most severely affected by the disruptions (electronic and electrical equipment, and transportation equipment including parts and accessories).

The decreased supply of Japanese products, all else being equal, would have an impact of roughly -0.1% on the manu-

facture of electrical and electronic equipment, and somewhere between -0.1% and -0.2% on the production of transportation equipment. The impact on production by the other manufacturing sectors would be negligible (see Table 1 for the breakdown by sector).

Overall, taking the aggregate of the sectoral effects (see Box 3 for a description of the model and the assumptions used), the direct impact of supply chain disruptions from Japan on France's manufacturing output is found to be roughly -0.1%. This impact is small, and is the same as that obtained using the international trade model in Box 2.

(10) No significant effect of substitution by South Korean or Taiwanese goods was observed just after the disaster.
 (11) Japan ranks highest in the Economic Complexity Index with the world's most complex products, according to the classification in Hausmann, Hidalgo et al. (2010), "The Atlas of Economic Complexity: Mapping Paths to Prosperity", <http://atlas.media.mit.edu/>
 (12) Compared with the pre-earthquake peak, May exports were down 22% for integrated circuits and electronic devices, and down 30% for automotive parts and accessories, compared with the 17% overall average decline in merchandise exports.
 (13) Source: European Commission (2011) "Innovation Union Competitiveness Report 2011".

Table 1: Direct impact on output of the decline in intermediate inputs from Japan, by industry sector

Sector	Impact of supply chain disruptions...		
	...if the Japanese goods are used in the same proportion as the total available s	... if the Japanese goods are used exclusively as intermediate goods	CGrowth observed in Q2
Foods industries	-0.01%	-0.01%	0.3%
Coking-refining	-0.01%	-0.01%	-7.5%
Electrical and electronic equipment	-0.06%	-0.12%	-0.4%
Transportation equipment t	-0.07%	-0.18%	-1.2%
Other industries	-0.03%	-0.05%	-0.4%
Total manufacturing	-0.03%	-0.08%	-0.8%
GDP	-0.01%	-0.02%	0.0%

Sources: Insee (annual national accounts, quarterly national accounts), Customs. DG Trésor calculations.

Box 3: Estimating the impact of the Japanese disaster on main partners via output chains

1. Global model

To determine the impact of output chain disruptions caused by decreased supply from Japan on GDP in country i , two preliminary assumptions are made: no substitution by intermediate goods from other countries; and no change in country i 's inventories to adjust to the lower imports from Japan.

$$\frac{\Delta M_{BI}^i}{M_{BI}^i} = \frac{M_{BI}^{j \rightarrow i}}{M_{BI}^i} \frac{\Delta M_{BI}^{j \rightarrow i}}{M_{BI}^{j \rightarrow i}} \quad \text{where} \quad \frac{\Delta M_{BI}^i}{M_{BI}^i} \text{ is the change in imports of intermediate goods in volume terms by country } i;$$

$\frac{M_{BI}^{j \rightarrow i}}{M_{BI}^i}$ the ratio of imports of intermediate goods from country j (Japan) to total imports of intermediate goods by country i ;

$\frac{\Delta M_{BI}^{j \rightarrow i}}{M_{BI}^{j \rightarrow i}}$ the change in country i 's imports of intermediate goods from Japan in volume terms.

Given that the latter series are not available in volume terms for each country, they are approximated by the change in Japan's goods exports in volume terms (estimated at -7.9% in Q2 2011, see above: $\frac{\Delta X_{BI}^j}{X_{BI}^j}$)

The impact on the change in intermediate consumption by country i (CI_{BI}^i) was approximated using the import content of intermediate consumption (α_{BI}^i , source OECD^a). Next, the impact on industrial output in country i Y^i is obtained by assuming that output varies in the same way as intermediate inputs in manufacturing (i.e., technical coefficients equal to one):

$$\frac{\Delta Y^i}{Y^i} = \frac{\Delta CI_{BI}^i}{CI_{BI}^i} = \frac{\Delta M_{BI}^i}{M_{BI}^i} \alpha_{BI}^i$$

Au final, on obtient l'impact sur le PIB grâce au poids de l'industrie dans le PIB : $\frac{\Delta PIB^i}{PIB^i} = \frac{Y^i}{PIB^i} \alpha_{BI}^i \frac{M_{BI}^{j \rightarrow i}}{M_{BI}^i} \frac{\Delta X_{BI}^j}{X_{BI}^j}$

2. Estimation for French manufacturing sectors

To quantify the impact of the Japanese shock on output in a sector i^b , in addition to the assumptions made in the international model (Box 2), it is necessary to determine the sector's intermediate consumption of Japanese products. The intermediate consumption by sector i of Japanese product k CI_{ki}^{Jap} is: $CI_{ki}^{Jap} = \alpha_{ki}^{Jap} \times M_k^{Jap}$

Because the customs data do not permit determination of the portion of Japanese product k imported from Japan M_k^{Jap} used as an intermediate input by sector i , written as (α_{ki}^{Jap}), two alternative assumptions are made:

- Assumption 1: For any product k , Japanese products are used as intermediate inputs by sector i in the same proportion as total available supply of product k^c : $\alpha_{ki}^{Jap} = \frac{CI_{ki}^{Jap}}{Y_k + M_k}$
- Assumption 2: Japanese products are used exclusively as intermediate inputs and are apportioned across the five sectors of manufacturing according to their relative share of intermediate consumption of the product: $\alpha_{ki}^{Jap} = \frac{CI_{ki}^{Jap}}{CI_k}$

Thus, the supply of each Japanese product falls by $\Delta X^{Jap} / X^{Jap}$, and the impact of the earthquake on sector i 's output is:

$$\frac{\Delta Y_i}{Y_i} = \frac{\Delta CI_i}{CI_i} = \sum_{k=1}^5 \frac{\Delta CI_{ki}^{Jap}}{CI_i} = \sum_{k=1}^5 \frac{\alpha_{ki}^{Jap} \times \Delta M_k^{Jap}}{CI_i} = \frac{\Delta X^{Jap}}{X^{Jap}} \times \sum_{k=1}^5 \frac{\alpha_{ki}^{Jap} \times M_k^{Jap}}{CI_i}$$

The direct impact on GDP is obtained by aggregating the change in each sector, weighted by their share in manufacturing output (α_k), multiplied by the elasticity of GDP to changes in output (ε^d): $\frac{\Delta PIB}{PIB} = \varepsilon \times \sum_{k=1}^5 \alpha_k \frac{\Delta Y_k}{Y_k}$

- Ratio of imported intermediate goods to demand for intermediate goods in the industry, obtained from 2005 input-output tables.
- This analysis examines five sectors of manufacturing (Level 17 of NAF rev. 2, for quarterly accounts).
- Total imports (M_k) and domestic production (Y_k).
- Calibrated at 0.2, based on estimates using the DG Trésor short-term macro-sectoral forecasting model.

3. The impact of Japan's earthquake explains only part of the global slowdown in Q2 2011

3.1 The total impact is high in Asia and virtually zero in Europe and the US

The Japanese disaster affected global economic activity essentially via the trade channel and production chain disruptions, notably after taking international feedback effects into account (Table 2).¹⁴ The financial channel played only a very marginal role because the decline in world stock markets was limited in size and very short-lived, while the appreciation of the yen¹⁵ was halted by concerted intervention by the G7 central banks on 18 March 2011.

In any case, the indirect impact (taking feedback effects into account) transmitted via production chain disruption exceeds the "direct" impact of the trade channel (i.e. the impact of the

decline in Japanese demand). The total short-term impact in Q2 2011 would thus be approximately -0.4 points of GDP for the Asian dragons, -0.3 points in China, and 0.1 point in the US, the UK, and the euro area.

The impact on the full year 2011 is less, with the effects of reconstruction lifting activity in H2, as virtually all the production chains are reestablished in autumn 2011. This was the case, as GDP rose by 1.7% in Q3 and industrial output by 3.9% . Total demand addressed to all countries rebounded in Q3 (Chart 3), before pulling back again in Q4 (-0.2%), due to the global slowdown and flooding in Thailand (which also caused production chain disruptions in Asia).

Table 2: Decomposition of the impact of the Japanese disaster on Q2 2011 GDP in major economies

	USA	China	Asian Dragons	Euro Area	France	Germany	UK
Trade channel effect (1)	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%
Production chain disruptions effect (2)	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.02%	0.0%
Production chain disruptions effect, incl. feedback (3)	-0.1%	-0.2%	-0.4%	-0.1%	-0.1%	-0.1%	-0.1%
Total Japanese impact = (1)+(3)	-0.1%	-0.3%	-0.4%	-0.1%	-0.1%	-0.1%	-0.1%

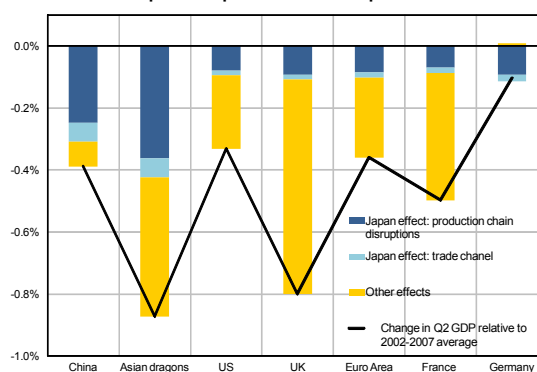
Source: DG Trésor.

3.2 The short-term data confirm that Asian countries were most severely damaged by the Japanese disaster ...

In Q2 2011, economic activity slowed in Europe (from $+0.2\%$ in Q1 to -0.1% in the UK, and from $+0.7\%$ to $+0.1\%$ in the euro area) but the slowdown was most pronounced in Asia.¹⁶ GDP growth was significantly lower in Q2 than the average pre-crisis growth rate (for 2002-2007), at -0.9 points on average for the Asian dragons, -0.4 points in China,¹⁷ -0.8 points in the UK, -0.3 points in the US, and -0.4 points in the euro area. The Japanese disaster explains the essential part of the slowdown in both China and Germany (Chart 5), but only half the slowdown for the Asian dragons and less than half for the other countries examined (only one-eighth in the UK). Other one-off shocks also appear to have dragged down economic activity in the quarter, including the rise in general commodity prices, and more specifically in each country, the royal wedding in the UK (with an additional day off), the termination of many stimulus programs in the euro area, restrictive monetary policy in China, and the process of private deleveraging in the US.

Ultimately, two-thirds of the stagnation of world trade in Q2 2011 could be attributed to the slowdown in Asia caused mainly by the earthquake in Japan (with Asia contributing -1 point to the 1.5 point decline in global trade relative to the 2000-2007 average).

Chart 5: Impact of Japanese disaster on partners' GDP in Q2 2011



Source: National statistical offices, DG Trésor calculations.

3.3 ... and that the impact was transmitted significantly through the automotive sector

The automotive industry was particularly affected. Between February and April, Japanese exports of motor vehicles and automotive parts and accessories to South East Asia fell by 85% , and exports to the US and Europe were about 70% lower. Automobile production thus fell by an average 5% in Q2 2011, in the countries examined (Chart 6). The drop started in March in Europe (-4.2% in France and in Italy, -2.8% in Germany) but only in April in the US (-6.6%) and China (-9.9%).

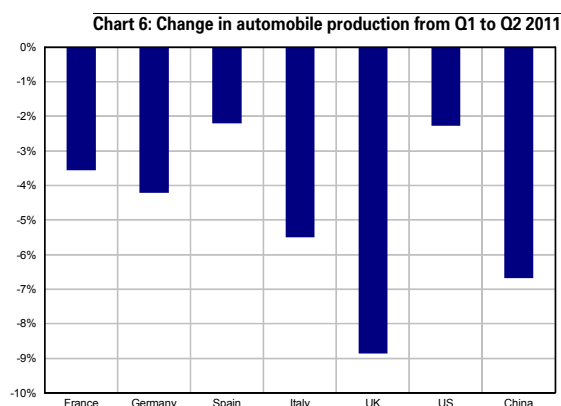
(14) The impact through the trade channel after taking international feedback effects into account is estimated using the model in Box 2.

(15) Owing to expectations of capital repatriation.

(16) $+0.2\%$ after $+2.4\%$ in Taiwan; $+0.0\%$ after $+2.3\%$ in Hong Kong; -0.8% after $+2.5\%$ in Singapore, and $+0.8\%$ after $+1.3\%$ in South Korea.

(17) In the absence of Chinese quarterly accounts before 2011, the average growth for 2002-2007 was obtained by dividing annual growth rates by 4. Growth in Q2 2011 was officially estimated at $+2.4\%$ but was reported lower by major banks (the average of the estimates by Goldman Sachs, JP Morgan and Natixis was $+1.9\%$). The negative impact in Q2, relative to the 2002-2007 average, could have exceeded 0.4 points of GDP.

In France, production of transportation equipment fell by 1.2% in Q2, essentially reflecting the sharp decline in automobile production (-3.6%). Changes in the sector contributed 0.2 points¹⁸ to the slowdown in GDP; this includes indirect effects on the rest of the economy via the decline in demand for intermediate goods.



Source: National statistical offices, DG Trésor calculations.

The decline in output, however, cannot be attributed only to the Japanese shock, because it coincided with the end of the lagged effects of France's car scrappage scheme. The sharp fall in automobile sales had already begun in March (-2.1%) before gaining momentum in April (-10.0%).

In the final analysis, the decline in French automobile production in Q2 appears to be attributable more to changes in household consumption (-11.1%) than to supply chain disruptions.

*
* *

The negative impact of the triple disaster on Japanese and global growth in the first half of 2011 should be partly counterbalanced by a rebound in 2012 and subsequent years due to publicly financed reconstruction (under the stimulus programs enacted after the disaster, which total 4.5 points of GDP in 2011-2015) and private reconstruction. The impact of a natural disaster is not necessarily negative for GDP growth at a one- or two-year horizon,¹⁹ particularly for developed countries like Japan.²⁰ Accordingly, after GDP contracted by 0.7% in 2011, Japan could have one of the highest growth rates among the developed countries in 2012 (with the April 2012 *Consensus Forecast* at 2.0%) and could stimulate the global economy by a rebound in imports.

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(18) Estimated using the method set out in Bouabdallah O., Gilquin G., Pincon M-O. (2008), "How the French car industry is facing globalisation", Trésor Economics no. 43, September.

(19)) See Cavallo and Noy, (2010), "The Economics of Natural Disasters: A Survey", *Inter-American Development Bank, working paper series* 124. The authors summarize the economic literature on the impact of natural disasters in the world.

(20) See Noy (2009), "The Macroeconomic Consequences of Disasters", *Journal of Development Economics*.

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