Macroeconomic effects of the current crises in Japan and MENA countries

A model-based assessment of the medium term

Anke Mönnig

Kirsten Wiebe

Authors: Anke Mönnig (moennig @gws-os.com)
        Kirsten Wiebe (wiebe @gws-os.com)
Tel.: +49 (541) 40933-210
Fax: +49 (541) 40933-110
Internet: www.gws-os.com

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CONTENT

1 CRISES IN SPRING 2011 – JAPAN'S CALAMITY AND MENA'S REVOLUTION

Two events currently preoccupy global news: the political unrest in the Middle East and North Africa (MENA) and the earthquake, tsunami and nuclear catastrophe in Japan. Both events are very different in its nature and location, but they not only affect economic developments within these countries but also across the world. In the current paper, the macroeconomic effects of both events and of a combination of both crises are analysed.

The recent crisis in the MENA countries, especially in Libya, which is a member of the OPEC and a major oil supplier for some European countries, and the imminent oil supply shortage as well as high energy price fluctuations in the past years show that the scenarios depicted in ZTB (2010) are not farfetched and that energy security becomes increasingly important. The disruptions in Libya are estimated to reduce its oil production by three quarters from 1.6 mbd to 0.4 mbd[1]. The price reactions at the global oil market were instantly and pressure on the oil price is expected to increase further.

The natural disaster in Japan on March 11th has multiplied in its dimensions and cumulated to a calamity of a century. The strongest earthquake in Japan's living memory with a magnitude of 9 on the Richter scale was followed by a tsunami destroying thousands of kilometres of Japanese coast line from Sendai in the North down to Tokyo in the South of Honshu, taking away lives and homes of many people. Industrial plants and agricultural life were damaged and four units of the Fukushima I nuclear plant were severely destroyed (IEA 2011a). First estimates suggest that total damages might range from 122 to 235 billion US-Dollars, cumulating to 2.5 to 4% of GDP (World Bank 2011). Reconstruction of the area is calculated to last up to five years with costs exceeding those from the earthquake in 1995 in Kobe. Then, 38 billion US-Dollars of public expenditures were used for reconstruction purposes.

In 2008/2009, the world experienced a financial shock that began in the US and carried forward to the rest of the world and finally cumulated to a world economic crisis of historical dimension. This experience still in fresh memory stimulates the question, whether the Japanese natural disaster or the political unrest in MENA countries have similar strong effects on the world economy.

2 GLOBAL INTERINDUSTRY FORECASTING SYSTEM

We have chosen to evaluate the impact of the two crises on the world economy by applying a dynamic interindustry model. That not only allows to estimate the impact on other economies in the year of the crisis but also to consider the adjustment process in the preceding years. Furthermore, the trade model explicitly considers first and second round

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[1] Libya, oil production, OPEC responses, Saudi Arabian capabilities and the SPR, Feb 28, 2011, http://www.theoildrum.com/node/7550

effects of a production slow-down in Japan or adjustment processes to an oil price shock. We have chosen to forecast the economic effects until 2020 with reference to a baseline scenario without the crises of spring 2011. The intertemporal effects are shown in reference to the baseline scenario.

2.1 THE MODEL

The **G**lobal **IN**terindustry **FOR**ecasting **S**ystem (GINFORS) combines econometric-statistical analysis with input-output analysis embedded in a complete macroeconomic framework ensuring the accounting identities of the system of national accounts. It explicitly models global economic-environmental interdependencies and can therefore be used as a tool for concrete policy planning (Lutz et al. 2010). As a bilateral world trade model GINFORS links national models for 25 commodity groups and services. All EU-25 countries, all OECD countries and their major trade partners are explicitly modelled. The model is based on time series of international statistics data from 1980 to 2004 and is currently extended to 2007. Behavioural parameters are derived from econometric estimations assuming bounded rationality of agents with myopic foresight. Due to the large number of equations, the simple and robust OLS estimation method is applied. The model ensures global consistency. For instance, energy use anywhere in the world is only possible after extraction of some energy carriers. Imports of one country are exports of another. The whole system is consistently linked and iteratively solved at the global level.

GINFORS has recently been applied to various economic questions, ranging from an European environmental tax reform (Lutz and Meyer 2010, Ekins and Speck 2011) and environmental and economic effects of Post-Kyoto regimes (Lutz and Meyer 2009b) to the impact of higher energy prices through international trade (Lutz and Meyer 2009a). For a more extensive description of the model see Lutz et al. (2010).

2.2 SCENARIOS

The baseline scenario in GINFORS is based on the reference scenario of the IEA's World Energy Outlook from 2009 (IEA 2009)[1]. Even though this mainly emphasises the development of energy related indicators, as energy consumption is highly dependent on economic activity it also gives an indication of the expected long-term economic development. Global economic activity and hence also world energy demand is steadily increasing over the next decade, mainly due to increasing economic activity and corresponding energy demand in the emerging economies.

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[1] The current World Energy Outlook from 2010 assumes slightly different crude oil import costs than in the publication used for the reference scenario in this paper. In the current WEO (2010), oil prices are slightly higher in 2015 and a bit lower in 2020. The differences emerge due to the fact that world economy has recovered from its crisis in 2009 faster than expected. We have chosen not to adapt the updated oil import costs by the IEA because the implementation of the new oil price assumptions would alter the quantitative effects only slightly without changing the qualitative statements.

The stand-alone impact analyses of production slow-down in Japan due to the natural disaster follows the economic implication put forward by the World Bank (2011). In its early estimates, the World Bank assumes that the material damages caused by the earthquake and the tsunami are likely to more than double total damage of the 1995's earthquake in Kobe. They predict in its projection update for the Asian-Pacific region a slow-down of Japan's GDP by 0.25 to 0.5 percentage points in 2011 which encompasses the reconstruction budget already.

In the present scenario, the economic disruption is expected to be caused by a combined decline in private consumption and in gross capital formation and consequently by a decline in exports. Both determinants are likely to slow-down due to an increasing saving propensity of households in the light of devastation and due to production slow-down as a consequence of a loss in capital stock and electricity shortage. In the next year, reconstruction efforts stimulate the economy and boost gross fixed capital formation. In fiscal year 2012, the Japanese government expects to raise 9.5 billion Yen (around 79 million Euro) for reconstruction purposes. In 2013, reconstruction budget declines to 7.75 billion Yen (around 64 million Euro) with a still stimulating effect on investments (FAZ 2011). Alongside, private consumption recovers as well.

Modelling the macroeconomic effects of decreasing oil supply in GINFORS is done via matching global oil demand to global supply by adjusting the oil price (Lehr et al. 2011), which is one of the key driving forces in GINFORS. The stand-alone impact analyses of an oil price peak in 2011 follows the implication taken from the observed price volatilities in the aftermath of the political unrest in the MENA countries starting in December 2010 in Tunisia. The present spot oil price of one barrel of Brent oil is traded for 122.39 USD.[1] In the meantime, all updated economic forecasts at least for Germany have increased their assumptions concerning the oil price development to average 110 USD per barrel (compare Table 1). We follow the assumptions in 2011 by increasing the oil price from 84 USD per barrel in the baseline to 115 USD per barrel in 2011. This will be much higher than the average price in 2008 of below 100 USD/b.

Table 1: Assumptions on oil price in USD/barrel

	2011	2012
IWH	110	113
RWI	115	115
IfW	106	95

*Sources: IWH (2011), RWI (2011), IfW (2011)*

In the following years the oil price decreases, so that from 2014 on it again matches the price given in the IEA World Energy Outlook (2009). This assumption corresponds to the one from IfW (2011, p. 6) and rests on the following observations: First, the OECD oil stock is relatively high compared to high oil price years 2004-2008. Although oil stocks of industrial nations declined in February due to Libya's unrest, forward demand cover is

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[1]   Observation taken from www.bloomberg.com/energy/ on April, 12 2011.

calculated at 58 days (IEA 2011b, p. 34). Second, effective spare production capacities of OPEC[1] are recorded at 4.08 mb/d which is still higher than the lowest spare capacity of 2 mb/d recorded so far in 2008 (IEA 2011b, p. 23-25). Both factors support the assumption that current oil price volatility is not the result of real scarcity but of higher risk premiums to be paid on international markets (IfW 2011, p. 6-7). As GINFORS is based on annual data, the effects modelled here might only occur with some delay even though we aim at modelling the immediate effect of the oil price increase. We therefore assume a linear adjustment to the oil price in the baseline until 2014, as shown in Figure 1. Note that the oil price in GINFORS is the price for IEA Crude Oil Import Costs by Type of Crude (USD/bbl) – Total Crude Imports, which is an average price of oil traded on all international markets.

The final scenario setting combines both assumptions put forward in the two stand-alone scenarios for Japan and MENA. Both effects are analyzed simultaneously and are referenced to the baseline scenario.

Figure 1: Oil price development
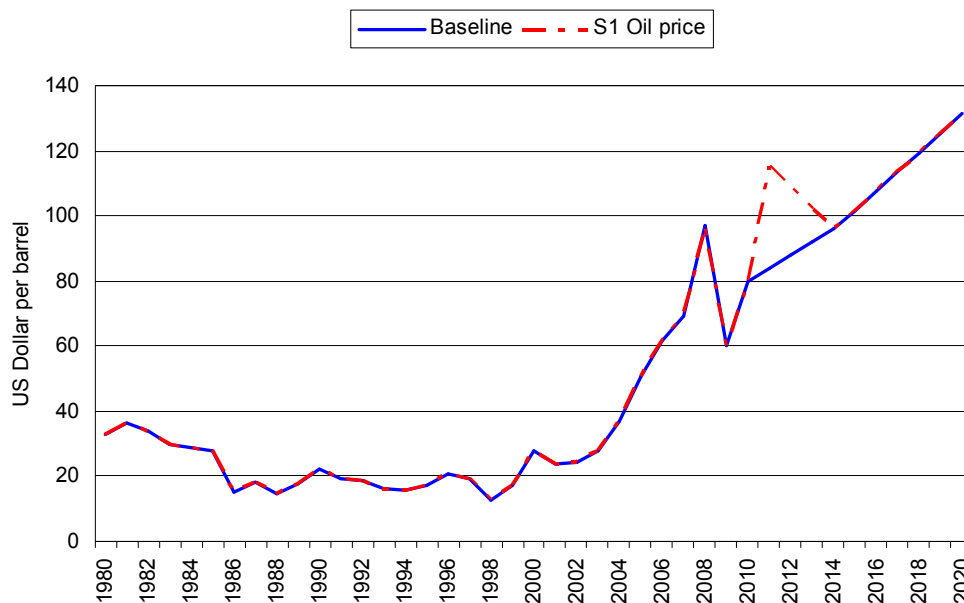
Source: IEA (2009), own calculations

3   EFFECTS OF A REDUCTION IN JAPANESE INVESTMENT AND CONSUMPTION

Shortly after the earthquake and the realization of the dimension of the catastrophe, first impact analyses estimated the effect of a possible breakdown of the supply chain on the German (Prognos 2011, DSGV 2011, HWWI 2011, BDI 2011) and other economies (World Bank 2011). They are all more or less consistent in their observation, that a

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[1]   Effective spare production of OPEC excludes Iraq, Nigeria, Venezuela and Libya.

production shortcut in Japan does affect the world economy but the impact is rather small although differences might exist among countries depending on their degree of trade relations.

3.1 JAPAN'S RELATION TO THE WORLD

Although Japan is suffering for nearly two decades from slow growth and deflation, Japan is still the world's third largest economy measured in terms of GDP. With a positive current account balance, Japan's economy produces many products that are demanded in other parts of the world. But its dependence on world markets is decreasing in time as the export/import ratio is constantly declining. Compared to other economies, exports have a rather small influence on total final demand due to Japan's distinct geography, as Figure 2 proves. Private and non-profit consumption determine nearly 50% of final demand, followed by gross fixed capital formation (including construction) and state consumption.

Figure 2: Components of final demand
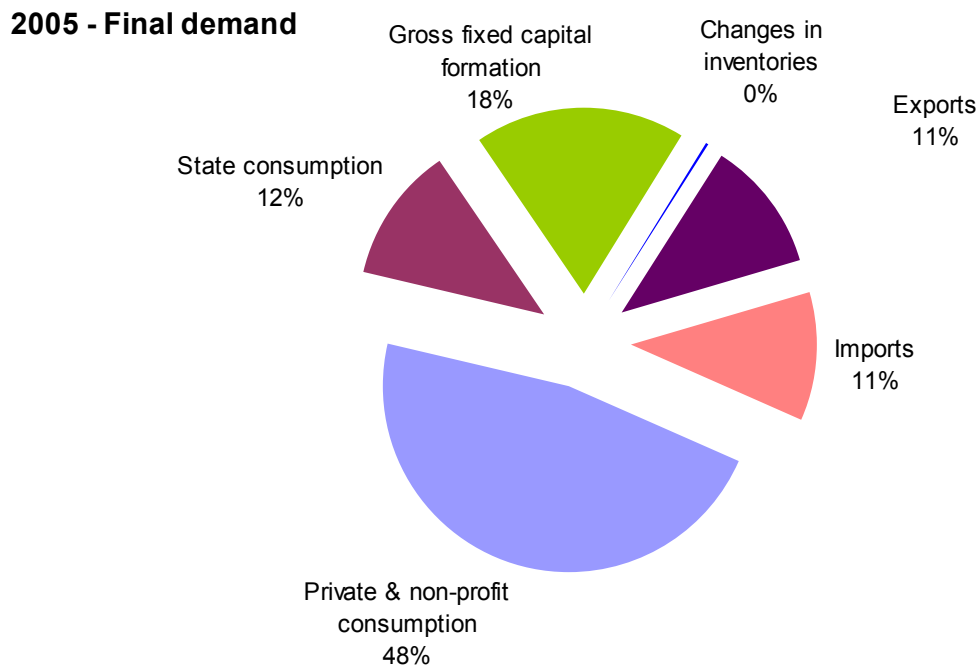
Source: OECD Input-Output-Table for Japan

Around 43% of Japanese exports alone are destined for the three major trading partners US, China and South Korea. Over 90% of Japan's exports are commodities used in industrial processes especially machineries and equipments like office, accounting and computing machineries or radio, television and communication equipments. 20% of manufacturing exports are motor vehicles, trailers and semi-trailers. Accordingly, Japan's possible downswing in 2011 is most likely to effect manufacturing industries the most. Considering the dominance of lean production processes in industries and the tendency for outsourcing and offshoring of processes, a shortage in specific components might effect the production cycle in other industries and countries very quickly. Japan is specialized in producing electronic equipment like semiconductor devices which are used in nearly all

kind of electronic equipment and hardware. Japan produces roughly 20% of world production of semiconductor (DBResearch 2008).

3.2 DOMESTIC IMPACTS

The production slow-down in Japan in 2011 are determined by a decline in private consumption and downswing in gross fixed capital formation. The proceeding years are characterized by a boom in investments due to reconstruction efforts. In total, it is expected that real GDP in Japan is lower by 0.8 percentage points compared to the reference scenario in 2011. In contrast, the following year exceeds the reference growth rate by 1.5 percentage points and even 2 percentage points in 2013. The recovery process leads to an overshooting of the economic path of the reference scenario due to a statistical effect but also because the government funds and pushes the reconstruction process. In consequence, the state budget is stressed even harder which leads to an increase in state deficit and state debt level. Overall, the forecast assumes that Japan is able to recover from the shock within a year. The negative effects of a slow-down in private consumption and gross fixed capital formation in Japan lowers Japan's exports and imports at the same time. The slightly positive effect on the current account in 2011 is the result of a faster decrease of imports which is due to the slow-down in private consumption. The recovery process in the proceeding years are accompanied by a slower development in the current account which is the result of an increasing import demand when reconstruction begins.

The economic slow-down in 2011 in the short-run leads to a decline in government consumption expenditures. In the following years, governmental financing of the reconstruction efforts results in an overshooting development of government consumption expenditures relative to the reference scenario. Up until 2020, government consumption expenditures decline fast in order to approximate the reference level.

3.3 INTERNATIONAL IMPACTS

Table 2 shows the percentage deviation of real GDP to the reference scenario for a selected number of countries. All countries show only minor deviations from the reference which confirms earlier estimates of a low impact of Japan's economic slow-down on the world economy. China is the main trading partner of Japan, buying 19% of Japanese exports and contributing 22% to its imports, which is why China is mostly affected by Japan's economic downturn with a negative deviation of 0.05% to the reference scenario. On the other hand, the US hardly shows any effects. Considering that, the US is the second most important trading partner for Japan (share in Japanese exports 16.4% and in imports 11%) this observation is quite surprising. The reason can be found in the rather low impact on the US current account. In all other countries, the current account deteriorates stronger than in the US. Meanwhile, Korea as a regional neighbour and an also closely related economy shows a comparably strong negative effect of -0.04% to the reference scenario in 2011. Table 2 also shows that all countries are positively affected by the upswing in the years after 2011. As the reconstruction effort boosts Japan's economy more than it has been negatively affect by the damage caused by the natural disaster, all countries under review experience a small positive economic push. In most countries, the positive counter

effect in 2012 is twice as high as the negative effect in the previous year. In 2014, the effects slow down, when Japan's reconstruction budget is exhausted.

The growth path until 2020 slowly approximates the path of the reference scenario in all reviewed countries. Balancing the effects over the whole time period, it becomes evident, that the positive effects after 2012 outweigh the negative effects in 2011. Up until 2020, Japanese economy has a cumulated positive effect of 0.39% relative to the reference scenario. Korea increases its cumulated real GDP within nine years by 0.9%, followed by China with a positive cumulated effect of 0.6%.

Table 2: Real GDP in selected countries

	2010	2011	2012	2013	2014	2020
			deviation in % to reference scenario			
Japan	0	-0,80	1,49	2,01	1,60	0,39
USA	0	-0,01	0,02	0,04	0,05	0,02
China	0	-0,05	0,11	0,19	0,18	0,07
Germany	0	-0,02	0,06	0,10	0,09	0,06
Great Britain	0	-0,01	0,02	0,04	0,04	0,03
France	0	-0,01	0,02	0,04	0,04	0,03
Italy	0	-0,03	0,07	0,12	0,11	0,06
Brazil	0	-0,01	0,03	0,06	0,08	0,06
India	0	-0,00	0,00	0,02	0,04	0,08
Korea	0	-0,04	0,10	0,28	0,29	0,15
OPEC	0	-0,03	0,05	0,11	0,10	0,05

Source: own calculations

4 EFFECTS OF A REDUCTION IN OIL PRODUCTION DUE TO THE POLITICAL DISRUPTIONS IN THE MENA COUNTRIES

Following basic economic principles, the negative oil supply shock should be followed by an increase in the oil price. This effect was clearly visible in the first quarter of 2011, when the oil price increased by about 15 to 20 USD/bbl for the OPEC oil basket (MWV 2011, IEA 2011b). The effects on the economies of different countries though are not easily identified. The extent to which a country is affected by the price impact depends on a number of different factors. Generally, an increase in the oil price is expected to have positive effects on oil producing countries and negative effects on oil importing countries with some time lag. Other factors are the country's stage of industrial development, its energy efficiency and potential to substitute other energy carriers for oil, its trade linkages and geographical factors such as population density and proximity to export markets.

4.1 MACROECONOMIC OIL PRICE EFFECTS

There is a large number of studies analyzing macroeconomic impacts of oil price shocks. Extensive summaries can be found in Hamilton (2005), Kilian (2007), or Stern (2009). Jones et al. (2003) stress the importance of using sectorally disaggregated models because an oil price shock has diverse effects on different sectors. Most papers, e.g. OECD

(2004) and Fattouh (2007), estimate price elasticities of (sectoral) oil demand and find that short run elasticities are close to zero (between -0.03 and -0.09), whereas long run elasticities are somewhat (according to Hamilton, 2008, about three times) larger. Additionally, price elasticities seem to be lower in emerging economies with strongly increasing oil demand than in industrialized countries with only slowly increasing or even decreasing demand for oil.

4.2 ECONOMIC IMPACTS OF HIGH OIL PRICES

The economic effects of a sudden rise in world oil price in 2011 as shown in Figure 1 are given in Table 3 for selected countries. The immediate effect of a price increase of 31 USD/barrel for oil producing countries in the OPEC is rather positive. Real GDP growth exceeds the growth path of the reference scenario by 9.5%. Although the price increase cannot be passed on in full, the additional money boosts economic performance of oil supplying economies of the OPEC.

Table 3: Real GDP in selected countries

	2010	2011	2012	2013	2014	2020
		deviation in % to reference scenario				
Japan	0	-1,21	-1,76	-1,61	-1,07	-0,06
USA	0	-1,81	-1,36	-1,14	-0,47	0,01
China	0	-4,62	-4,27	-2,70	-0,68	0,03
Germany	0	-0,70	-0,13	0,01	0,22	0,10
Great Britain	0	-0,14	-0,61	-0,50	-0,22	0,01
France	0	-3,91	-1,80	-0,89	0,32	0,05
Italy	0	-4,51	-2,21	-0,90	0,47	0,05
Brazil	0	-1,21	0,06	0,77	1,16	0,26
India	0	-1,56	-0,88	0,00	0,78	0,47
Korea	0	-0,86	0,87	0,11	-0,06	0,27
OPEC	0	9,45	4,37	1,22	-1,56	-0,01

Source: own calculations

All other economies face a negative deviation from the reference scenario, whereas the negative implications differ widely in their relative volume. The largest negative feedback on its economic development is recorded for China and Italy. In both economies, GDP declines with over 4% relative to the reference closely followed by France with minus 3.9%. Comparably small negative effects are recorded for Germany, Great Britain and Korea with a negative implication of less than -1.0%. Keeping in mind that GINFORS is an annual model, impacts for 2011 have to be interpreted with some caution. Due to time lags incorporated in price wage mechanisms or lagged gas price reactions impacts for 2011 are probably exaggerated and may partly become perceptible in 2012. China may well be able to restrain the negative oil price impacts with part of its enormous currency reserves.

The low impact on the German economy can be explained on the one hand by its high share in total imports of OPEC countries. Around 9% of total OPEC imports are from Germany, which is the highest share among those countries under review. The US closely follows with a share of 8.5%. On the other hand, Germany has improved its energy efficiency and put much effort in the development of high quality products. Energy

intensity has declined in Germany by 2% p.a. between 1990 and 2009. The US decreased its ratio to the same extent as Germany but shows a slightly higher ratio. Among the European economies, only Great Britain managed a faster decline in energy consumption per unit of gross domestic product. With 4.8 GJ/1.000 USD this is also the smallest ratio recorded in Europe (BMWI 2011, Tab. 32). This is closely related to the deindustrialization process in Britain. In 2005, gross value added of manufacturing industries held a portion of 18% on total gross value added which is the lowest among those European countries under review. Italy, in contrast, has hardly improved energy intensity (BMWI 2011, Tab. 32). The relative strong negative impact of a world oil price increase on the Italian economy can be explained with the low improvement in energy consumption per unit of gross domestic product and its relatively high portion of manufacturing industries on gross value added (around 25%).

With 31 GJ/1.000 USD, China shows a very high energy intensity which is one of the reasons of the strong negative impact on its economy. Additionally, China is not able to profit from increasing demand in oil exporting countries although its share of total imports of OPEC exceeds Germany's import share.

In the years to follow, the oil price approximates IEA price forecasts, which lowers both positive and negative effects on the economies. Moreover, some countries are able to profit from the oil crises. Brazil and Korea and with a year time lag also Germany reach a slightly higher growth path than in the baseline. In contrast, the economic boost in oil producing economies slows down and even turns negative relative to the baseline scenario in 2014.

5   GLOBAL EFFECTS OF BOTH CRISES

The last and final scenario combines both main global crises of these days: Japan's calamity in the aftermath of the earthquake and the political unrest in Middle East and North Africa. As Table 4 proves and chapters 3 and 4 indicate, the oil price shock increases the effect of a production slow-down in Japan in 2011. All countries, except oil producing nations, face a stronger negative downturn relative to the reference scenario than in each stand-alone scenario. The economic upswing in OPEC countries followed by the steep oil price increase is only marginally lower due to Japan's production downturn.

Table 4: Real GDP in selected countries

	2010	2011	2012	2013	2014	2020
			deviation in % to reference scenario			
Japan	0	-2,00	-0,29	0,39	0,54	0,33
USA	0	-1,82	-1,35	-1,10	-0,43	0,03
China	0	-4,66	-4,17	-2,52	-0,50	0,11
Germany	0	-0,72	-0,07	0,11	0,31	0,15
Great Britain	0	-0,15	-0,59	-0,46	-0,18	0,03
France	0	-3,92	-1,78	-0,85	0,35	0,08
Italy	0	-4,54	-2,14	-0,79	0,58	0,11
Brazil	0	-1,23	0,08	0,83	1,23	0,32
India	0	-1,56	-0,87	0,03	0,82	0,55
Korea	0	-0,90	0,96	0,38	0,22	0,42
OPEC	0	9,42	4,42	1,33	-1,46	0,04

Source: own calculations

In 2012, the impact of the oil price shock still exceeds Japan's reconstruction efforts. The negative implication of the oil price shock is outweighing the positive effect of the huge reconstruction budget initiated by the Japanese government. Only in 2013, when the oil price shock is further declining, the reconstruction boom leads Japan to a higher growth path relative to the reference scenario. The same is true also for other economies that profit from Japan's reconstruction effort. Different to the stand-alone scenario of Japan's production shortage, the combination of both effects does not lead to an overall surplus in gross domestic product. Only those countries that are less vulnerable to oil price increases like OPEC, Brazil or Korea are able to increase their level of real GDP compared to the baseline.

6 CONCLUSION

Overall, the analysis has shown that Japan's natural disaster is likely to have hardly any effects on the world economy in general and its major trading partners in particular. Moreover, the long-run effects function like a stimulation package to the economy. Due to reconstruction efforts, Japan's economy enters a growth path which is more dynamic than the one of the reference scenario. In 2020, real GDP reaches a volume which is 0.4% higher than in the reference scenario. For all countries under review the same observation holds although to a lower extent. The negative implication for the Japanese economy is transmitted to other economies via trade. But the relative deviation to the reference scenario is small. GDP growth rates decline by two digit decimal numbers only. Until 2020, the economic upswing in Japan results to a positive economic growth in trading partner economies as well. Korea and China both profit the most from Japan's reconstruction effort, followed by two European economies: Italy and Germany.

The valuation of total damages due to earthquake, tsunami and nuclear emergency is so far only tentative. Higher or lower damage costs would alter the effects on Japan's economy. The same is true for the reconstruction effort so far announced by the government. But although the underlying assumptions might differ in detail, the qualitative effects of Japan's 2011 drama remain the same.

The macroeconomic effects of a reduction in oil production due to the political disruption in the MENA countries are considerable. An increase of world oil price to 115 USD/barrel decreases economic growth in all countries except for oil producing economies. The degree to which a country is affected differs greatly. It depends mostly on country specifics concerning energy intensity, trade relations or degree of industrialization and energy efficiency. Generally, it can be observed that those countries with low energy intensity, low industrialization degree and good trading relations with oil producing economies are less negatively affected from the oil price increase than others.

In conclusion, the analysis shows that the world economy heavily reacts on sudden world oil price changes but is less vulnerable to ad-hoc production shortages of leading industrial economies.

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