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Klaus-Jürgen Gern, Philipp Hauber and Galina Potjagailo

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After three decades of double digit growth the Chinese economy has become the second largest economy in the world and the most important contributor to global growth. However, in recent years the Chinese economy has slowed substantially. While official numbers for GDP growth report output growth that is still in line with the government's – downwardly adjusted – growth target, alternative indicators of economic activity suggest an even stronger deceleration. In addition, the huge level of debt piled up by households and non-financial corporations in recent years in combination with a correction in property prices and – more recently – equity prices have raised fears of a financial meltdown. Against this backdrop, in this note we discuss the current state of the Chinese economy and the risks for the global economy associated with a "hard landing", a sudden pronounced drop in growth rates.

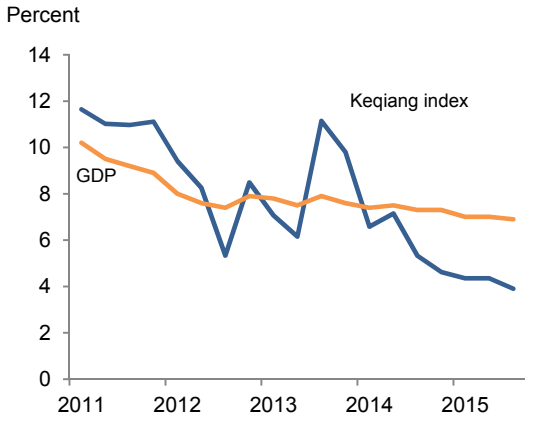
Persistent slowdown of the Chinese economy

The Chinese economy – the most important driver of world economic growth in the years after the Global Financial Crisis – has significantly lost momentum over the past year. To be sure, export driven growth of above 10 percent per year has already been a thing of the past since 2007. But due to massive fiscal and monetary stimulus, the Chinese government initially managed to keep growth high. This, however, has led to an enormous build-up of debt in the private sector (and to a lesser extent among local governments) which was largely financed by the shadow banking sector. In addition, it led to the creation of substantial overcapacities in key industrial sectors as well as soaring property prices indicating the need for consolidation. In 2011 the government started to implement measures to slow down the economy and change the structure of growth towards a more sustainable and socially inclusive direction. As a result, domestic demand began to slow and in 2014 the government reacted with a small fiscal stimulus program and the central bank started to loosen its policy. The resulting re-acceleration of growth, however, proved to be modest and very temporary.

Monthly indicators suggest the economy is slowing further and the current slump may be even stronger than indicated by official GDP data. In the first quarter of 2015, GDP grew only 1.3 percent over the preceding quarter, the slowest rate of growth since the end of 2008. According to official data, quarterly growth accelerated slightly, to 1.8 percent,

in the third quarter. Year-over-year growth stabilized at 6.9 percent, which is in line with the government's current growth target. However, doubts were raised about the most recent figures as they seemed to suggest that the Chinese economy had shaken off the stock market collapse over the summer without a trace. This would be somewhat surprising given that financial intermediation services were one of the key drivers of growth during the start of the year. Similarly, most recent high frequency indicators suggest that the economy remained in the doldrums during the summer months: the Caixin Manufacturing-PMI continued its slide coming in at 47.0 points in September – its lowest reading since 2009 – while growth in industrial production slowed to around 6 percent on the year. Declining car sales and restaurant revenues indicate that domestic demand slowed further. Moreover, there are signs that the GDP figures insufficiently capture the current slowdown of the economy. One reason for doubts over the reliability of the official GDP data is that they are released extremely early, at least three weeks before the release of advance estimates in any other major economy, and are generally not subject to substantial revisions. A second reason for concern is the limited variability of the GDP series, which is not consistent with alternative indicators of economic activity, such as energy consumption or transport volumes. Currently, the so-called Keqiang index – capturing the development of electricity consumption, railway transport and the stock of credit – indicates a significantly stronger deceleration of growth than the official data suggests (Figure 1). Also trade developments point to more subdued economic growth, although a large part of the substantial decline in nominal trade in goods (exports and especially imports) is certainly due to the decline in commodity prices that has taken place over the past year.

Figure 1:
GDP and Keqiang Index



GDP: quarterly data, year-on-year change. Keqiang index: arithmetic mean of electricity consumption, credit growth and railway freight cargo; year-on-year change.

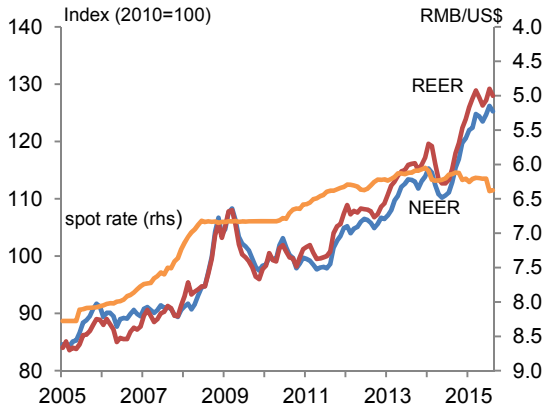
Source: **National Bureau of Statistics, Datastream; IfW calculations.**

The renminbi has depreciated by roughly 3 percent against the dollar since mid-August – and further weakening might be in store. This move came after Chinese authorities decided to allow market forces to play a larger role in determining the value of the currency. On impact, this led to a 3 percent drop in the exchange rate partly reversing the strong effective appreciation the renminbi witnessed in recent months due to its quasi-peg to the dollar (Figure 2). Official statements and massive interventions in the foreign exchange markets to stop a further weakening support the official view that the measure was indeed a one-off and not a classical "competitive devaluation". Decreasing official reserves, however, indicate that capital outflows are persisting and will

only increase amid the most recent devaluation and looser monetary policy.[1] This will add to depreciation pressures and policymakers might be pushed to reconsider and allow for further depreciation in face of a struggling manufacturing sector.

A drastic devaluation of the renminbi would have significant effects on the world economy with growth momentum shifting back to China. Using the structural macroeconometric model NiGEM (see below for more details) we simulate a 30 percent devaluation of the renminbi vis-à-vis the dollar – the magnitude of the intervention roughly corresponds to a devaluation of the renminbi last seen in 1994. The effects are substantial: global GDP would drop by 0.3 and 0.9 in the first and second year, respectively (Table 1). The Chinese economy, conversely, would see a boost of around 1 percent compared to the baseline. The simulations illustrate the sizeable impact of a cheaper renminbi on the world economy and we expect the currency to continue to weaken over the coming months – though to a considerably smaller extent than assumed in our scenario.

Figure 2:
Exchange Rates



Monthly data.

Source: **JP Morgan, Datastream.**

Table 1:
Impact of a 30 percent devaluation of the renminbi (deviation of GDP from baseline in percent)

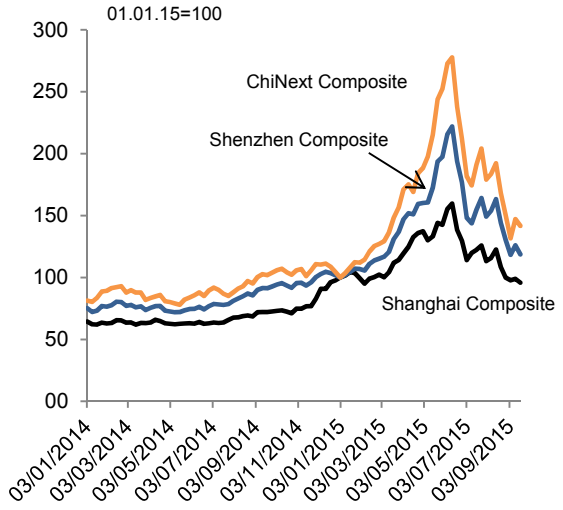
	Year 1	Year 2
World	**-0.3**	**-0.9**
Advanced Economies		
Germany	-0.4	-1.2
Euro area	-0.4	-1.2
Japan	-0.9	-2.3
South Korea	-0.9	-2.7
UK	-0.6	-1.7
USA	-0.4	-0.9
Emerging economies		
Brazil	-0.5	-1.4
China	0.7	1.2
India	-0.6	-2.0
Indonesia	-0.7	-2.5
Mexico	-0.3	-0.9
Russia	-0.6	-1.9

Source: **IfW calculations with NiGEM.**

[1] Changes in the dollar value of foreign exchange reserves are a somewhat imperfect proxy and might overstate actual outflows as they also reflect changes in the valuation of non-dollar denominated assets or portfolio preferences of firms and households.

The stock market correction is not a major concern – property prices are more important. Chinese stock prices have suffered a pronounced drop since mid-June, reversing most of the gains leading indices had made since the start of the year (Figure 3). However, we believe that the direct impact of the correction in stock prices on the real economy should be limited: total market capitalization is relatively small compared to GDP and the exposure of households to the stock market – though increasing – is still modest. More important are developments in the property market. Estimates suggest that, directly or indirectly, nearly half of all outstanding credit is linked to the real estate sector (Dobbs et al. 2015). Currently there are tentative signs of the market stabilizing, but should prices continue to fall, firms' and households' balance sheet would come under renewed pressure.

Figure 3:
Stock Markets



Weekly data.

Source: **Datastream.**

High private sector debt remains a risk. While more expansionary monetary and fiscal policies could arrest the decline in growth in the short term, there are also considerable risks involved given the high levels of debt in the economy. Private sector debt alone already stands at nearly 200 percent of GDP so that a return to the rapid credit growth of previous years would ultimately further destabilize the financial system. This in turn could be one of the triggers for a "hard landing" (see below).

Growth is expected to remain muted despite increasing policy stimulus. The PBoC has already cut rates and lowered the reserve requirement ratio (RRR) several times since the end of last year. With both policy instruments still at relatively high levels, room for further stimulus remains. Increasing capital flight, however, might dampen the effect of these interventions by draining liquidity from the markets and adding to depreciation pressures on the renminbi. With a budgeted 2 percent public deficit this year, fiscal policy should also become more expansive. Nevertheless, given the disappointing performance of high frequency indicators at the current edge there is no imminent acceleration of growth in sight.

Hard landing in China: What it means for the world economy

As an alternative to the devaluation scenario discussed above, mounting concerns about the state of the Chinese economy have moved a scenario of an abrupt collapse of economic activity in China center stage.[2] In view of the current slowdown and the financial fragility of the Chinese economy, the probability of a severe downturn – a so-called hard landing – has increased. In such a case, the rest of the world can be expected to be significantly affected given China's economic size and its share in global growth in the recent past. In the following, we aim to quantify the impact of a hard landing on global growth.

We define a hard landing of the Chinese economy as a 3 percentage point reduction of GDP growth, which roughly corresponds to a halving of the growth rate implied in current consensus forecasts, and use two different models to simulate the impact on global growth. In our simulations, we use two conceptually different models, GVAR and NiGEM, in order to test for the robustness of results. GVAR is a primarily data-driven model, which describes the joint dynamics among macroeconomic variables of a large set of countries via vector error-correction (VEC) models that include domestic variables as well as trade-weighted foreign variables (Dees et al. 2007).[3] NiGEM, a large-scale macroeconometric model of the world economy developed by the National Institute for Economic and Social Research (NIESR), is more grounded in theory and features New-Keynesian elements such as price rigidities and rational expectations.[4] Common to both models is the explicit treatment of linkages between countries via international trade. In both models, we implement the hard landing as a reduction of real GDP by 3 percent below the baseline during the first year after the shock. In GVAR, we calculate generalized impulse responses of all variables to a 3 percent negative shock which is isolated from the residuals of the Chinese GDP equation.[5] During the first years after the shock, Chinese GDP declines further because of cross-country feedback effects that operate via trade links so thatthe shock reduces Chinese GDP by 3.5 percent in the long run. In NiGEM, the shock is implemented via an exogenous reduction of domestic demand, calibrated to generate a 3 percent drop in Chinese GDP in the first year. After that it slowly returns to baseline by assumption which

[2] See for example *Financial Times* (2015).

[3] We use the GVAR Toolbox 2.0 by Smith and Galesi (2014) for the estimation. As endogenous variables, we include for each country (and as far as data are available) real GDP, CPI, short- and long-term interest rates, real exchange rates and equity prices. The analysis covers 33 countries, including both advanced and emerging economies. Among the advanced economies, we include the eight largest Euro area member states. The US is modeled as dominant unit, following Chudik and Pesaran (2013). All other countries are modeled as small open economies to which foreign variables are weakly exogenous.

[4] For a detailed description see Hurst et al. (2014) or www. http://nimodel.niesr.ac.uk/.

[5] Generalized impulse responses do not require restrictive assumptions on the contemporaneous relations among the endogenous variables, which would be difficult to justify within a large cross-country model. However, the method does not identify economically interpretable, structural shocks. The decline in GDP can thus be the result of various underlying structural shocks such as demand, supply or monetary policy shocks.

leads to decreasing deviations from baseline. GVAR, on the other hand, allows for permanent effects of the shock via the long-run relationships of the endogenous variables.

The impact of a hard landing on the world economy is substantial: in both models, global GDP decreases by about 1 percent compared to the baseline. Given the currently observed moderate growth rates of global GDP, this implies the world economy enter a "growth recession", i.e. an expansion of global GDP by less than 3 percent. Part of this reduction, however, is directly attributable to China itself. But also in the rest of the world, the impact is sizeable with production declining by roughly 0.5 percent compared to the baseline. In NiGEM, the impact is stronger in the first two years after the shock, but the world economy also recovers more quickly afterwards (Table 2 which shows the percentage deviation from baseline for each variable). World trade contracts disproportionally to global activity and drops by nearly 3 percent in the first year. The reaction of oil prices to lower demand from China (and other commodity prices), by contrast, turns out to be surprisingly small: in neither of the models does it deviate by more than 3 percent from baseline. This might be related to the fact that in reduced form equations, structural shocks of opposite signs could cancel each other out and thus lead to an underestimation of the price elasticity with respect to demand.

Table 2:
Impact of a 3 percent drop in Chinese GDP (deviations from baseline in percent)

	GVAR			NiGEM		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
World						
GDP	-0.7	-0.9	-1.0	-0.9	-1.1	-0.7
World trade	-	-	-	-2.7	-2.0	-0.3
Oil price	-1.3	-2.7	-3.0	-0.4	-1.0	-1.2
World ex. China						
GDP	-0.3	-0.4	-0.5	-0.5	-0.5	-0.3
Advanced Economies (GDP)						
Germany	-0.4	-0.5	-0.5	-0.4	-0.3	0.0
France	-0.1	-0.2	-0.2	-0.3	-0.2	0.0
Japan	-0.5	-0.7	-0.7	-0.9	-1.1	-0.8
South Korea	-0.6	-0.9	-1.0	-1.3	-1.9	-1.7
UK	-0.2	-0.3	-0.3	-0.3	-0.2	-0.1
USA	-0.3	-0.5	-0.5	-0.1	0.3	0.5
Emerging Economies (GDP)						
Brazil	-0.1	-0.2	-0.2	-0.8	-0.8	-0.2
China	**-3.0**	**-3.3**	**-3.4**	**-3.0**	**-3.8**	**-2.7**
India	0.2	0.2	0.2	-0.6	-1.1	-1.1
Indonesia	-0.3	-0.7	-0.8	-1.1	-2.1	-1.9
Mexico	0.0	0.3	0.4	-0.2	-0.1	-0.1
Russia	-	-	-	-0.7	-1.0	-0.5
Regional Aggregates (GDP)						
Euro area	-0.2	-0.4	-0.4	-0.4	-0.2	0.1
Rest of Asia	-0.4	-0.7	-0.8	-	-	-
Latin America	-0.1	-0.1	-0.1	-	-	-

Notes: The figures are percentage deviation from baseline for each respective variable. Global and regional variables are PPP-weighted aggregates of the countries included in the analysis.

Source: **IfW calculations with GVAR/NiGEM.**

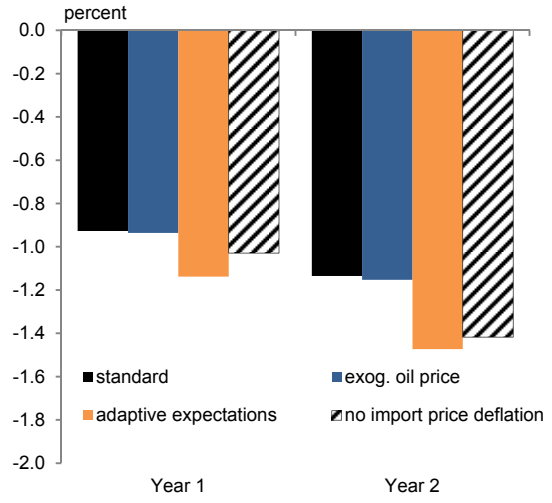
There is a significant degree of heterogeneity with respect to the impact of the hard landing across countries. With the exception of Japan and South Korea (reflecting especially close economic ties given the geographical proximity), advanced economies are much less affected than emerging markets in both models. In relative terms, deviations from the baseline are remarkably robust across both models: Germany sees its GDP drop by more than France or the United Kingdom. This can be explained by the bigger role China plays in German trade. Differences between the models arise with respect to the impact on emerging markets. In general, these economies are more severely affected in NiGEM than in GVAR. The most remarkable difference, however, concerns the world's largest economy. In GVAR, the effect on US GDP is comparable to that of other advanced economies like Germany, whereas in NiGEM there is initially virtually no impact. Going forward, the US economy would even benefit from a hard landing in China with production rising above baseline. This at first sight somewhat counter-intuitive finding is driven by the stimulating effect of deflation in China on US consumption. In NiGEM, lower domestic demand leads to falling prices in China. This deflation feeds through to import prices in advanced economies, thus raising disposable income and boosting private consumption. While this effect is present in all developed economies its importance is especially large in the US due to the relatively high share of consumption in GDP. While this mechanism is economically plausible, the contrast to the GVAR results would suggest that its practical importance might be overstated (see also the sensitivity analysis below).

The impact could be underestimated due to the neglect of financial linkages. In a nutshell, our simulations indicate that a hard landing in China would knock the global economic expansion off track, with Asian economies being particularly severely affected. While our results are broadly robust across models, it is important to bear in mind that both GVAR and NiGEM do not explicitly account for financial linkages and transmission channels. In the case of China, however, we expect financial contagion to be of secondary importance as China's financial system is relatively isolated from the rest of the world (Buttiglione et al. 2014). Recent volatility in international financial markets triggered by developments in China nevertheless suggests that indirect effects via confidence might be present and could aggravate the impact on the world economy. Compared to other studies, the weak reaction of oil and other commodity prices is also remarkable.[6] Should prices react more sensitively to the weaker demand from China than is implied in the models, this would amplify the impact for commodity-exporting emerging economies and tend to stabilize advanced economies, with the global impact undetermined.

[6] World Bank (2015) analyses a slowdown in Chinese growth with a structural vector autoregression. According to their model, a 1 percent decrease in Chinese production leads to a drop in commodity prices by around 5 percent.

The ability of monetary policy to stimulate the economy and offset the adverse consequences of the shock might be overestimated. Despite the zero lower bound, central banks in NiGEM can influence the real economy by delaying expected rate hikes, which feed into households' and firms' decisions right away due to the rational, forward-looking expectations in the model. It can, however, be questioned whether monetary policy is that effective, particularly when it is used repeatedly and at a time when most economies are still recovering from the financial and Eurozone crises (Jannsen et al. 2015). Comparing the results of the same shock under adaptive, i.e. backward-looking, expectations which imply a much weaker monetary policy channel, world GDP drops by an additional 0.2 and 0.4 percentage points in the first two years, respectively (Figure 4).[7] We applied a similar robustness check with respect to the question of the pronounced impact of falling import prices in the US which boost consumption and actually raises output in the US in response to a hard landing in China. After shutting off this transmission channel by holding constant import prices, GDP in the US also falls below baseline in the first two years. In this case, other advanced economies would also have a stronger negative impact on output, albeit to a lesser extent than the US. Global GDP would decline by a similar amount as in the scenario with adaptive expectations.

Figure 4:
NiGEM Sensitivity Analysis



Deviations from baseline.

Source: **IfW calculations with NiGEM.**

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[7] It should, however, be noted that the much stronger negative impact on global GDP can in part also be explained by the fact that when solving the model under adaptive expectations, exchange rates are assumed to be fixed.

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Phone +49 (431) 8814–1
Fax +49 (431) 8814–500

Editorial team: Margitta Führmann
Helga Huss
Prof. Dr. Henning Klodt (responsible for content, pursuant to § 6 MDStV)
Dr. Klaus Schrader

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