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Abstract

Movement in China's money supply is shown to drive the movement in world money supply over the last twenty years. Structural shocks to G3 (U.S., Eurozone and Japan) real M2 and to China's real M2 are both large over 1996:1-2011:12. The cumulative impact of real G3 M2 shocks on real oil prices is small and statistically insignificant. In contrast, the cumulative impact of China's real M2 on the real price of crude oil is large and statistically significant. Following a sharp fall in real oil price in the last half of 2008, the cumulative impact of China's real M2 on the real price of crude oil is particularly substantial in the recovery of oil price during 2009 from a low of $41.68 for January 2009. The analysis sheds light on the causes of movement in oil prices over the last twenty five years and in assessing the relative importance of China in the upsurge of the real price of crude oil.

Keywords: Oil Price, China's Global Influence, Oil Price and Liquidity

JEL Codes: E31, E32, Q43

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1. Introduction

The importance of oil price shocks for the functioning of the real economy is well attested. Hamilton's (1983) seminal work connecting oil price shocks with recession and economic slowdown in the U.S. has been substantiated and further investigated by Lee *et al.* (1995), Hamilton (1996; 2003) and Kilian (2008a; 2009) for the U.S., and by Cologni and Manera (2009), Kilian (2008b), Jimenez-Rodriguez and Sanchez (2005) and Cunado and Perez de Garcia (2005) for other countries.[1] In recent years the significance of real oil prices for real activity and the high levels real oil prices have attained has led to increased interest on the determinants of movement in real oil price.

This paper introduces the influence of liquidity in China and in the G3 (U.S., Eurozone and Japan) for changes in the real oil price. In the literature increases in global liquidity have been linked with increases in aggregate demand and with increases in asset and in commodity prices.[2] In parallel with analysis of the effect of rising liquidity, demand from emerging market countries is identified as an important factor influencing oil prices. Hamilton (2011) notes a 6.3% compound annual growth rate for petroleum consumption by China since 1998.[3] Kilian and Hicks (2012) connect real oil price increases with strong growth forecasts in emerging economies over 2003-2008 and the decline in real oil prices after mid 2008 with forecasts of decline in global growth.

This paper examines the effect of liquidity in China and in developed economies on the real oil price by building on the framework of Kilian (2009) which identifies the supply and demand side factors driving oil prices. Barsky and Kilian (2002, 2004) argue that the channels through which monetary policy exerts its impact on commodity prices are expectations of stronger economic

[1] Reviews of the literature on the effect of oil shocks on the aggregate economy are provided by Hamilton (2008) and Kilian (2008c).

[2] See for example Darius and Radde (2010) and Brana et al. (2012). Relaxed U.S. monetary policy conditions have been linked with high levels of global liquidity (Economist, 11 August 2005) and with domestic asset price appreciation (Taylor (2009)).

[3] Hamilton (2011) provides a review of the oil industry and analyses events influencing oil price and identifies 1997-2010 as a "new industrial age" characterized by billions of people making the transition from agricultural to industrial activity with increases in real income beyond subsistence levels. Hamilton (2009) shows that the oil price increases during 2007 and 2008 were due to strong global demand for oil.

growth.[4] The analysis sheds light on the causes of movement in oil prices over the last twenty five years and in assessing the relative importance of China in the upsurge of the real price of crude oil. Positive innovations to U.S., Japanese and Eurozone liquidity have an insignificant effect on the real oil price. In contrast, unanticipated increases in China's liquidity cause large statistically significant increases in real oil prices that persist. Following a sharp fall in the last half of 2008 connected with the Global Financial Crisis, real oil price rose strongly over 2009-2010. This rise is associated with shocks from China's liquidity (especially during 2009) and global demand for all industrial commodities (especially during 2010).

Results are found to be robust to a number of considerations, including whether China's real M2 continues to drive real oil price in the presence of China's real output. Incorporating country-specific industrial production into our system does not change the finding is that the G3 real M2 has a small shock effect on oil prices, while China's real M2 has a much bigger, dominating, effect on oil prices.

Background information on China's real M2 and the real M2 of other major countries is examined in Section 2. The structural vector autoregressive model for analysis of real crude oil prices and liquidity is discussed in Section 3. Data and variables are discussed in Section 4. The empirical results are presented in Section 5. Section 6 concludes.

2. China M2, Global M2

The growing importance of China's money supply for is illustrated in Figure 1. In Figure 1a the M2 money supplies in billions of U.S. dollars (USD) in China, U.S., Eurozone, Japan, the U.K.

[4] Barsky and Kilian (2004) show that the substantial increase in industrial commodity prices that preceded the increase in oil prices in 1973-1974 is consistent with the view that rising demand based on increased global liquidity (measured by money growth in ten industrial economies) drove oil prices higher. Alquist et al. (2010) also discuss this thesis and confirm the Gillman and Nakov (2009) findings that monetary factors Granger cause oil prices in the post-war period up until 1997. Gillman and Nakov (2009) speculate that Chinese real demand caused the real price of oil to increase at that point onwards. Easy monetary policy has been linked to higher commodity prices in Barsky and Kilian (2002) and Frankel (2008), although others find no empirical support for such a relationship; see, Frankel and Rose (2010). The latter find that the oil price is determined by supply and demand for both stocks and flows of oil. The potential role for oil stocks is formally modeled by Alquist and Kilian (201).

and Switzerland over 1996:01-2011:12 are presented. In Figure 1b the global M2 in billions of USD is shown. Global M2 is taken to be the sum of the M2 in China and in the G3. Throughout the paper we take the G3 to be the U.S., Eurozone and Japan. The rise of China's money supply as share of global money supply has been marked. In 1996 China's M2 measured in USD only account for less than 5% of global M2, however by 2011 this share increased to 28%. In terms of growth rate, China's M2 measure in USD account for 75% of the increase in global M2 registered between 1996 and 2011. For this reason, the upward trend in global M2 in Figure 1b is due to the behaviour of China's M2. Chinese M2 growth rate has driven global M2 growth since at least 2000. The behaviour of China's nominal GDP is similar to that of China's nominal M2 and is strongly upward. This pattern is illustrated in Figure 1c. From 1996 to 2011 China's nominal GDP (in USD) increased on average by 15% per year and M2 (in USD) increased on average by 19.5% per year.

The nominal oil price and G3 M2 and China M2 are shown in Figure 1d. In Figure 1d China's M2 is strongly upward and the G3 M2 is much flatter. Nominal China's M2 trends much closer to oil prices than the G3 M2. Given these facts and the argument made by Bodenstein, Guerrieri and Kilian (2012; page 51) "… there is consensus that causality in this relationship (referring to monetary policy and oil prices) run from the event of oil market to monetary policy as well of shifts of monetary policy to the supply of oil and demand of oil in global markets", we believe that a credible hypothesis is the argument that China's expansive money supply is in part responsible for higher oil prices. The sizeable nature of China's M2 expansion relative to that of the G3 is also apparent in real terms. In Figure 1e, China's real M2 has a much stronger upward trend than the G3's real M2 (the deflator is the U.S.CPI). Based on an index of 100 in 1996, by 2011:12 China's real M2 index is 340 and the G3's real M2 index is 150.

3. Methodology

We use the decomposition of oil price movements into structural shocks due to Kilian (2009). In Kilian (2009), changes in the real price of crude oil are decomposed as arising from global oil production shocks, shocks to global demand for industrial commodities and a residual, oil market-specific demand shocks. The latter is associated with precautionary demand shocks specific to the crude oil market due to worries about future oil supplies. In this paper we liquidity into the model. If liquidity is only a veil over real values, then real M2 in the G3 and in China will not significantly influence the real price of oil.

A structural VAR model (SVAR) is expressed in matrix form as (for simplicity the constant term is omitted):

$$B_0 X_t = \sum_{i=1}^{j} B_i X_{t-i} + \varepsilon_t, \tag{1}$$

where j is the optimal lag length, determined by the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), in this case both criterias select four lags. X_t is vector of endogenous variables, and ε_t is the vector of structural changes, which is serially and mutually independent.

The endogenous variables in the model are:

$$X_t = [GO_t, AD_t, RP_t, G3M2_t, CM2_t], \tag{2}$$

where GO_t is percentage change in global oil production, AD_t is global real aggregate demand (from Kilian (2009)), RP_t is percentage change in the real price of oil, the nominal price of oil (WTI) deflated by the U.S. Consumer price index (CPI), $G3M2_t$ is percentage change in G3 M2 in U.S. USD deflated by the CPI, and $CM2_t$ is percentage change in China's M2 in USD deflated by the U.S. CPI.

To identify the model restriction are imposed in the $B_o X_t$ as follows:

$$B_o X_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -b_{20} & 1 & 0 & 0 & 0 \\ -b_{30} & -b_{31} & 1 & 0 & 0 \\ -b_{40} & -b_{41} & -b_{42} & 1 & 0 \\ -b_{50} & -b_{51} & -b_{52} & -b_{53} & 1 \end{bmatrix} \begin{bmatrix} GO_{10,t} \\ AD_{20,t} \\ RP_{30,t} \\ G3M2_{40,t} \\ CM2_{50,t} \end{bmatrix} \quad (3)$$

Model restrictions reflect those in Kilian (2009), while respecting the inclusion of the monetary variables in our model. Restrictions are only imposed in the contemporaneous matrix. These restrictions are placed using Cholesky decomposition lower triangle matrix shown in equation (3) and are motivated as follows.[5] Shocks to oil production are assumed to not respond to the other structural shocks. Oil production only depends on lags of the other variables since it will take some time for oil producer to alter production in response to the other shocks. Oil production is unlikely to respond to the other shocks within the same month.

The global real economic activity indicator responds contemporaneously to oil production shocks, because the world demand for industrial commodities could be affected immediately by, for example, an oil production shortage. However, this indicator is expected to responds with some delay to monetary variables and oil prices. The global aggregate demand for industrial commodities will not respond to money supply shocks in the same month. Innovations to the real price of oil not explained by shocks to oil supply or real aggregate demand will reflect changes in the sector specific demand for oil as opposed to changes in the demand for all industrial commodities.

The identifying restrictions in the system (3) imply that shocks to global oil production and global real aggregate demand, and the real oil price will influence real M2 in the G3 and in China, and not the reverse. In system (3), shocks to real money supply in the G3 and in China will not influence oil supply, real aggregate demand and the real price of oil in the same month. We assume that China's M2 depends contemporaneously on G3 M2. China's M2 is substantially smaller than G3

[5] For more detail about the Cholesky decomposition see Hamilton (1994; page 87).

M2 over most of the sample and China's lenders and monetary authorities are more likely to see (at least in partial data release) contemporaneously global monetary movements (than the opposite).

To test for autocorrelation and heteroskedasticity, the residual serial correlation LM test and the VAR residual heteroskedasticity test are carried out. The null hypothesis of both, no serial correlation and no heteroskedasticity of the joint combinations of all error term products cannot be rejected at the 5% level (respectively). Consequently, the presence of either autocorrelation and/or heteroskedasticity are discarded. An important condition to be satisfied in any VAR model is that the lag structure included also has to be stationary. The inverse roots of AR characteristic polynomial test shows that no root lies outside the unit circle, supporting that our models have stable roots.

4. Data and variables

Data are monthly data from February 1996 to December 2011 since the M2 series for China is only available from January 1996. This starting date also coincides with Hamilton's (2011) structural break analysis. The real oil price is the change in the log of the spot price of Western Texas Intermediate (WTI) oil divided by the U.S. CPI. Following Kilian (2009), global oil production is an endogenous variable.[6] The spot price of WTI and global oil production are obtained from the U.S. Department of Energy. Global demand for real economic activity is given by Kilian's (2009) global index of dry cargo single voyage freight rates. Some of the advantages of this measure are that it is available at a monthly frequency in contrast to real GDP which is only available quarterly and it reflects global demand for commodities rather demand within one particular country.[7]

G3 M2 is constructed by aggregating M2 in USD for the 3 largest economies, the United States, the Eurozone and Japan. M2 in each of the G3 is far larger than M2 in any other country over

[6] Global oil production may with time respond to the other variables in the VAR as well as to geopolitical events. For example, Kilian (2008a) and Hamilton (2009) identify unrest in Venezuela over December 2002 and January 2003 and the second Persian Gulf War over February and March 2003 as disruptive for oil production.
[7] Monthly global industrial production can be constructed from International Financial Statistics (IMF). However, the aggregation of industrial production and the lack of clarity about how this index is constructed make it quite controversial as discussed by Kilian (2009).

1996-2011 with the exception of China in recent years. China's M2 is in USD. Use of M2 as measure of liquidity is based on the following observations. First, M2 is the only measure of China's money supply going back to 1996. Second, M2 is reported in domestic currency and upon conversion to USD is easily aggregated into a global liquidity indicator (without raising issues about appropriate weights over time that arise in constructing a global liquidity indicator based on interest rates). M2 is deflated by the U.S. CPI. Growth rates in G3 real M2 and China's real M2 appear in the model. Data on M2 are obtained from International Financial Statistics (IMF).

The assumption of the VAR model requires that all variables in the model must be stationary, or that the linear combinations of non-stationary but co-integrated variables must be stationary.[8] The Augmented Dickey Fuller (ADF) unit root test reveals that the logarithm of oil production, G3 M2, Chinese M2 and oil prices are only first difference stationary. The p-values for the null hypothesis of having a unit root are: 0.44, 0.98, 0.99 and 0.77 respectively. The Phillip-Perron (PP) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests also suggest use of log first differences. The null hypothesis of unit root in the real price of oil cannot be rejected at 76% for monthly data over 1996:01-2011:12. Kilian's (2009) indicator of global activity is an index already constructed to be stationary. (It is a business cycle index). Consequently, we take log first differences of the variables oil production, G3M2, CM2 and oil prices to avoid spurious regression results.

5. Results

5.1. The structural shocks

Figure 2 shows the behaviour of the structural shocks to global oil production, global real aggregate demand, G3 real M2, China's real M2 and oil-specific demand, recovered from estimating the SVAR in equation (3). The structural shocks are expressed as annual averages. The structural shocks change over time. An interesting feature of figure 2 is that global oil supply and aggregated

[8] This is not strictly true, the original VARs of Sims were agnostic and wanted the data to decide. This still works if there is sufficient lag structure.

demand shocks in the period 1996-2011 are relatively small compared the other shocks. Monetary shocks and precautionary shocks are large during this period consistent with the unprecedented global monetary expansion observed mainly in China but also observed in Japan and EU. Both the G3 real M2 and China real M2 structural shocks are substantial over the last twenty-five years.

The rapid increase in oil price leading to a peak in June 2008 is associated with positive global real aggregate demand, low spare production capacity and oil specific precautionary demand.[9] Up to June 2008 structural shocks to G3 real M2 are large and structural shocks to China's real M2 are positive, but not as large. The fall in oil price from July 2008 to February 2009 is associated with the global financial crisis during late 2008, recession in the U.S. over December 2007 to June 2009, and weak growth in Europe. This is reflected in Figure 2 in that the structural shocks global real aggregate demand, G3 real M2 and oil specific precautionary demand are negative at the end of 2008. OPEC decreases production target from September 2008 to January

The rise in oil price from January 2009 through April 2011 is associated with large positive structural shocks to G3 real M2 and China's real M2 up through early 2010, positive shocks to global real aggregate demand and oil specific precautionary demand starting at the end of 2009 up through much of 2010, and global supply shock through late and early 2011. External events at this time (2009-2011) include weak recovery from recession in West and strong demand for oil in Asia. During 2011 oil production is disrupted in Libya and there is political turmoil in several Middle Eastern countries.

5.2. The impulse response effects of the structural shocks

Figure 3 shows the responses of the variables in the SVAR to one-standard deviation structural innovations. The dashed lines represent a two standard error confidence band around the estimates of the coefficients of the impulse response functions.[10] The first column shows the

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[9] In the monthly data, spot prices per barrel for WTI are $58.14 in January 2007 and $140 in June 2008. Spot price for WTI is $41.68 in January 2009 and is $133.93 in April 2011.

[10] The confidence bands are obtained using Monte Carlo integration as described by Sims (1980), where 5000 draws were used from the asymptotic distribution of the VAR coefficient.

responses of global oil production, real economic activity, the real price of oil, G3 real M2 and China's real M2 to a structural innovation in global oil production. A supply disruption significantly reduces the production of oil that is only partly offset in the first three months. The effect of an unanticipated supply disruption on global oil production is very persistent and highly significant. An unanticipated negative innovation in global oil production causes real economic activity to fall for an extended period but does not cause a significant effect on the real price of oil. A negative shock global oil production does not significantly affect China's real M2 and is associated with a decline in the real G3 M2.

In the second column of Figure 3 a positive global real activity shock has a persistent positive effect on global oil production that builds up to a level that is statistically significant over a 3 to 10 month window before levelling off. A positive global real activity shock has a persistent effect on real oil prices that builds up for several months before starting to decline and is statistically significant over the first nine months.[11] An unanticipated aggregate demand expansion has a very persistent and highly significant effect on global real economic activity that rises over time and only tends to level off after 20 months. A positive shock to global real activity has a significant negative effect on the G3 real M2 for a few months and a positive effect on China's real M2 that becomes statistically significant after seventeen months.

The effects of an oil market–specific demand shock are shown in column 3 of Figure 3. A positive oil market-specific demand shock has a large and persistent positive effect on the real price of oil. This effect is highly statistically significant and rises in magnitude over the first three months and then falls only very slowly. Alquist and Kilian (2010) take this overshooting to be consistent with models of precautionary demand for oil in which inventories are pre-set and will not adjust

[11] This result is different from the finding by Kilian (2009) for 1973:1-2007:12 in that a positive shock to aggregate demand for all industrial commodities resulted in a significant oil price increase that builds up over the first year and then is sustained at a large value. The finding that aggregate demand for all industrial commodities has a lesser effect over 1996:1-2011:12 is not due to the inclusion of M2 variables in the SVAR. For a 3 variable SVAR along the lines of Kilian's (2009) model estimated over 1996:1-2011:12 results in a significant effect of a positive shock to aggregate demand for all industrial commodities on real oil price only over the first three months (after which the effect gradually erodes).

completely to an increase in uncertainty immediately. An oil market–specific demand shock is associated with significant positive effects on global real economic activity and global oil production. A positive oil market–specific demand shock is linked with a significant decline in G3 real M2 for about four months and a decline China's real M2 over an extended period. These findings of monetary contraction are consistent with those by Kilian and Lewis (2011) that in response to positive innovations in aggregate demand shock and oil market-specific demand there are significant and sustained increase in the federal funds rate.[12]

In the fifth (fourth) column are shown the responses of global oil production, real economic activity, the real price of oil, G3 real M2 and China's real M2 to a structural innovation in China's (G3) real M2. In response to an unanticipated increase in China's real M2, there are statistically significant and persistent increases in global oil production, global real economic activity and in real oil prices. G3 real M2 is not significantly affected by innovations to China's real M2. An unanticipated increase in G3 real M2 does significantly raise global real economic activity and China's real M2. These results underline the fact that for effects on real oil prices it matters where the innovation in money is originating. In contrast to the effect of innovations in China's real M2, an unanticipated increase in G3 real M2 does not significantly affect global oil production or real oil price. Over 1996:01-2011:12 an innovation in China's real M2 has significant effects on real oil price whereas an innovation in real M2 in the G3 does not.

5.3. Cumulative effect of structural shocks on real price of oil

The cumulative contribution to the real price of oil of the structural shocks to global oil production, global real aggregate demand, oil-specific demand, G3 real M2 and China's real M2 are reported in Figure 4 over 1996:01-2011:12. Figure 4 indicates that the largest cumulative contributions to real oil price movement over time are structural shocks to global real aggregate

[12]Kilian and Lewis (2011) obtain these findings by adding the federal funds rate as a fourth variable to a Kilian (2009) SVAR model for the sample period is 1973.2–2008.6. Kilian and Lewis (2011) find that in response to oil supply disruption is a reduction in the federal funds rate. Fan et al. (2011) observe that the central bank of China maintains that the money supply is the main monetary tool in China, a view confirmed by the analysis in their paper.

demand, China's real M2 and oil market-specific demand shocks. The global oil production shocks are small in Figure 2 during this period. In Figure 4 the cumulative contribution of oil supply to real oil prices is also small during 1996:01-2011:12. Even though the global real aggregate demand shocks are also relatively small in figure 2, the cumulative contribution of aggregate demand shocks on the real price of crude oil are sometimes large. This maybe because most of the aggregate demand shock come from developing economies.

Monetary shocks are large for both G3 real M2 and China's real M2 in figure 2. The cumulative impact of real G3 M2 shocks on real oil prices in Figure 4 is small. In contrast, the cumulative effect of China's real M2 on the real price of crude oil is large. The cumulative impact of China's real M2 on the real price of crude oil is particularly substantial in the recovery of oil price during 2009 and early 2010 from a low of $41.68 for January 2009. The precautionary oil-specific demand shocks are very large in Figure 2 and the cumulative impact of oil-specific demand shocks on the real oil prices are very large in Figure 4. Oil-specific demand shocks played a role in the rise in oil price up to mid-2008 and in the fall in oil price up until January 2009. With oil price rising strongly during most of 2009, the effect of oil-specific demand shocks working to lower real oil price were overwhelmed by strong effects boosting oil price from China's real M2 and global real aggregate demand shocks.

5.4. Robustness checks

Several checks of the robustness of the finding that China's M2 strongly influences oil price whereas shocks to the G3 countries' M2 do not are reported in this section.

5.4.1. Measures of global activity

The Kilian (2009) measure of global real activity is an indicator of global demand for shipping commodities. Global industrial production is available as a monthly indicator of global real activity.[13] Replacing Kilian's indicator of global real activity by global industrial production does not affect our main results. An attractive characteristic of Kilian's (2009) measure of global real activity (and of global industrial production) is availability at a monthly frequency. This is the advantage over the use of global GDP. However, Global GDP is a much broader measure of real activity than the global demand for commodities. As an alternative specification of real activity we convert quarterly GDP for the largest four economies, the U.S., Eurozone, China and Japan into monthly GDP by interpolation of the quarterly data. Global GDP is not available on a quarterly basis, but that for the four largest economies is available at a quarterly frequency.[14] For simplicity and to be consistence with our study we aggregate and interpolate the real GDP measured in USD of the U.S., Eurozone, China and Japan, to proxy for the global real GDP. These economies account for around 65% of global GDP in the period studied. We substitute the interpolated real GDP of the four largest economies for Kilian's measure of global real activity. In results not reported the impulse response on oil price of one standard deviation shocks to G3 real M2 and China real M2 (with GDP of the four largest economies measuring real activity) confirm our previous finding that shocks to China's real M2 has statistically significant and persistent effects on real oil price, whereas shocks to real M2 expansion in the U.S., Eurozone and Japan do not.

5.4.2. Country-specific measures of economic activity

Another potential shortcoming of our model is the absence of country-specific measures of economic activity. China's economic activity could be captured by Chinese M2 and bias our results. Does Chinese real M2 continue to drive real oil price in the presence of China's real output? To overcome this issue, we included in our model separately the industrial production of U.S., Euro

[13] This indicator was not our first preference since as discussed by Kilian (2009) there is a lack of clarity about how the global industrial production index is constructed.

[14] Miller and Ni (2011) obtained annual global GDP data from Angus Maddison's historical statistics [Maddison (2010)] for 1971–2008 and used quarterly OECD GDP to interpolate global GDP at a quarterly frequency. The aggregation of the four largest economies can be obtained quarterly improving significantly the number of original observations in the interpolating procedure.

Area, Japan and China as strictly exogenous variables in our system.[15] Results of this exercise of incorporating country-specific industrial production in our system do not show significant change from our previous result. The finding is that shocks to the G3 real M2 have a small shock effect on oil prices, while shocks to China's M2 have a much bigger, dominating, effect on oil prices.

5.4.3. Identification restrictions

Finally, we test different identification restrictions. We switch the order of the fourth and fifth variables in our SVAR system by allowing G3 monetary aggregates to depend contemporaneously of Chinese monetary aggregates. Another possible restriction scheme is to use real oil prices as the fifth variables in the system allowing monetary aggregates to affect real oil prices contemporaneously. Both specifications yielded almost identical results with respect of our original model. The results from the robustness checks in this section are available from the authors.

6. Conclusion

The movement in China's money supply drives the movement in world money supply over the last twenty years. Liquidity in China and in other major countries is introduced into the Kilian (2009) model identifying the supply and demand side factors driving real oil price changes. It is found that structural shocks to both G3 real M2 and China's real M2 are large over 1996:1-2011:12. However, the cumulative impact of real G3 M2 shocks on real oil prices is small in contrast to a large cumulative effect of China's real M2 on the real price of crude oil. Following unanticipated increases in China's real M2 growth there are statistically significant increases in real oil prices that build up over five months and then persist. In contrast, innovations to U.S., Japanese and Eurozone real M2 do not significantly affect real oil price.

The results show that increased liquidity in China relative to that in the U.S., Eurozone and Japan significantly raises real oil prices over 1996:1-2011:12. Following a sharp fall in the real oil

[15] Meaning that these four variables enter only in the right-hand-side all equations. The variables are also expressed in log-first difference form as there are first-difference stationary.

price in the last half of 2008, the cumulative impact of China's real M2 on the real price of crude oil is particularly substantial in the recovery of oil price during 2009 from a low of $41.68 for January 2009. Results are robust to a number of considerations. The incorporation of country-specific industrial production into our system does not change the finding is that China's real M2 has a large bigger, dominating, influence on real oil prices. The analysis sheds light on the causes of movement in oil prices over the last twenty five years and in assessing the relative importance of China in the upsurge of the real price of crude oil.

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Figure 1a. Money supplies (Billions of USD) in China, U.S., Eurozone, Japan, U.K. and Switzerland: 1996:01-2011:12

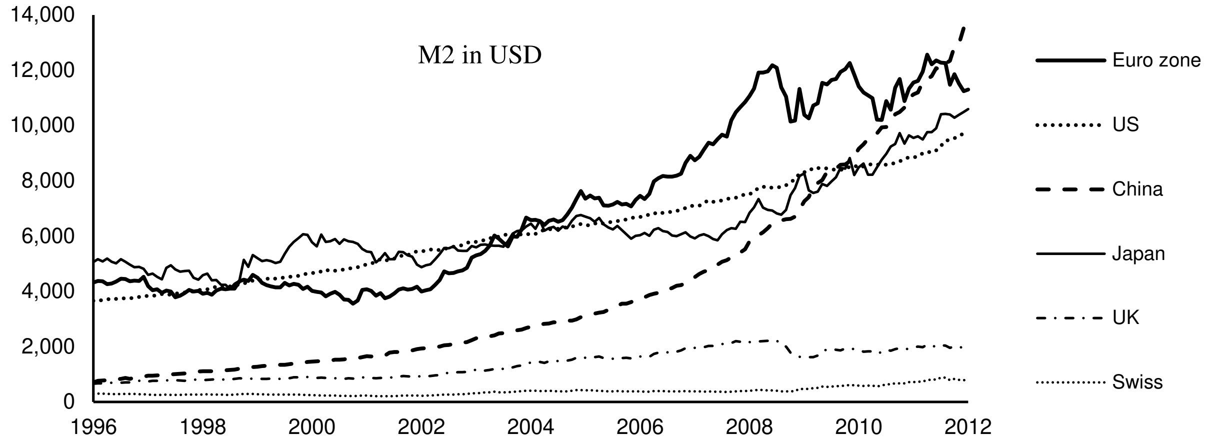


Figure 1b. Global (G3 plus China) money supply in billions of USD: 1996:01-2011:12

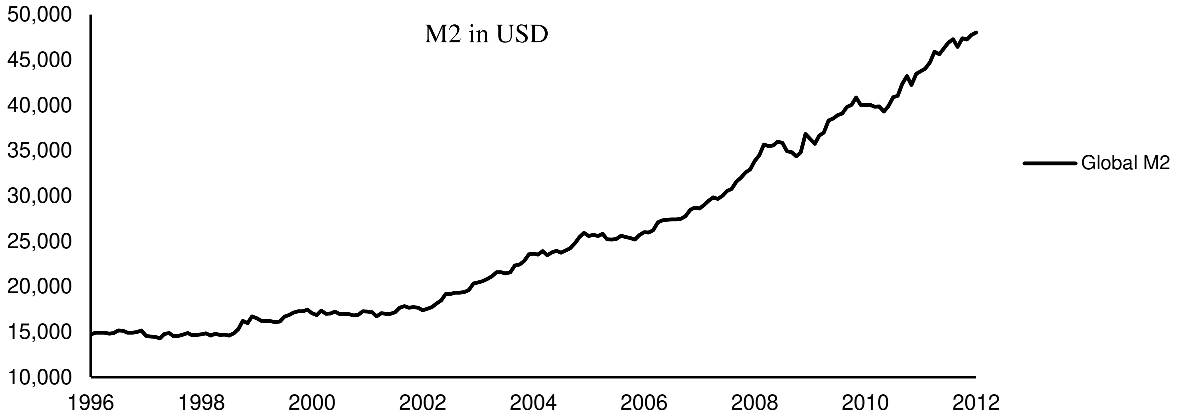


Figure 1c. China's nominal GDP (billions) and money supply (billions of USD): 1996:01-2011:12

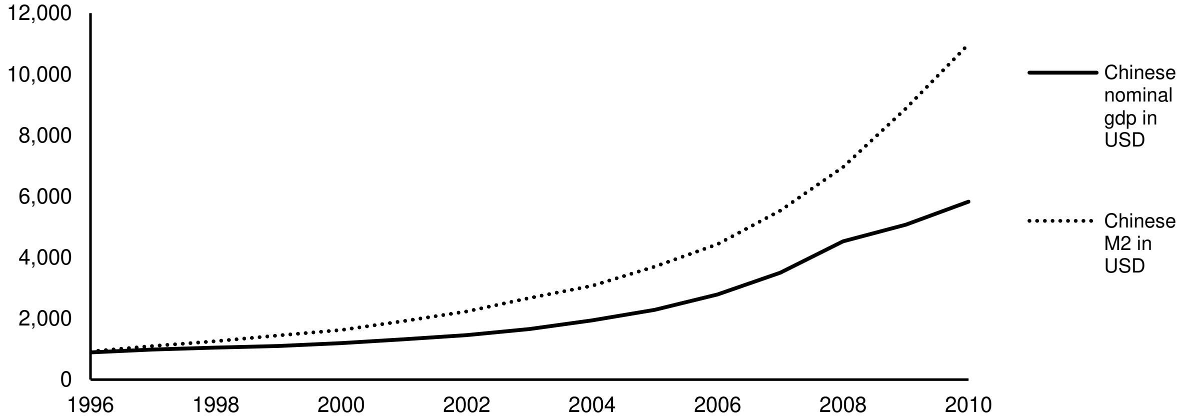


Figure 1d. Price of oil and G3 and China's money supplies (billions of USD): 1996:01-2011:12

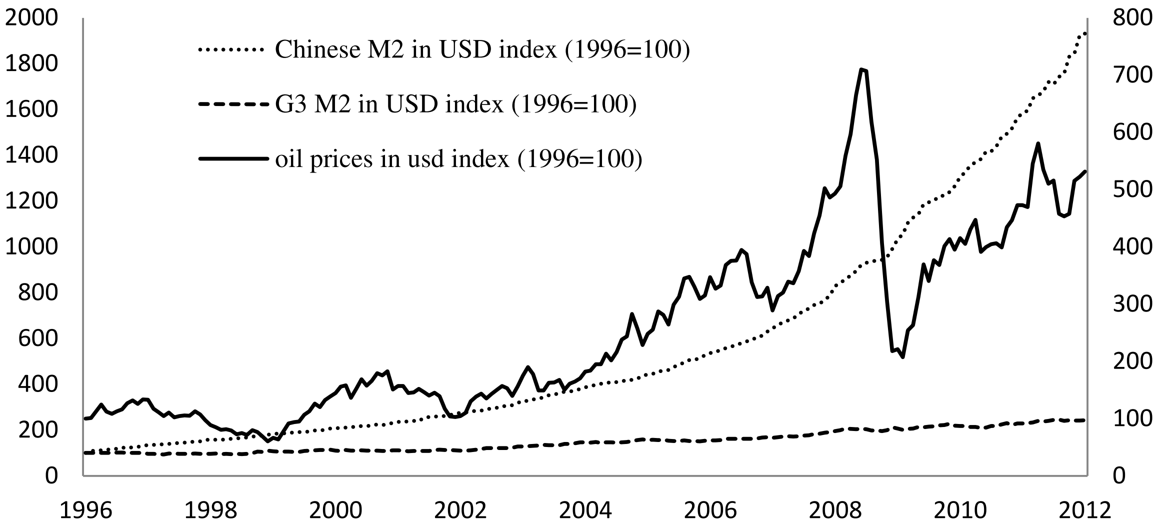
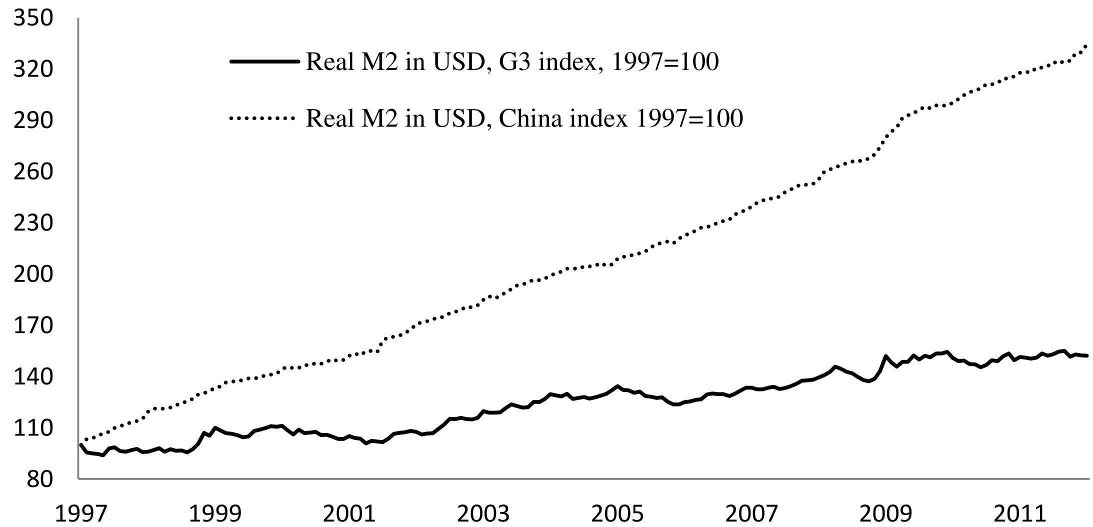
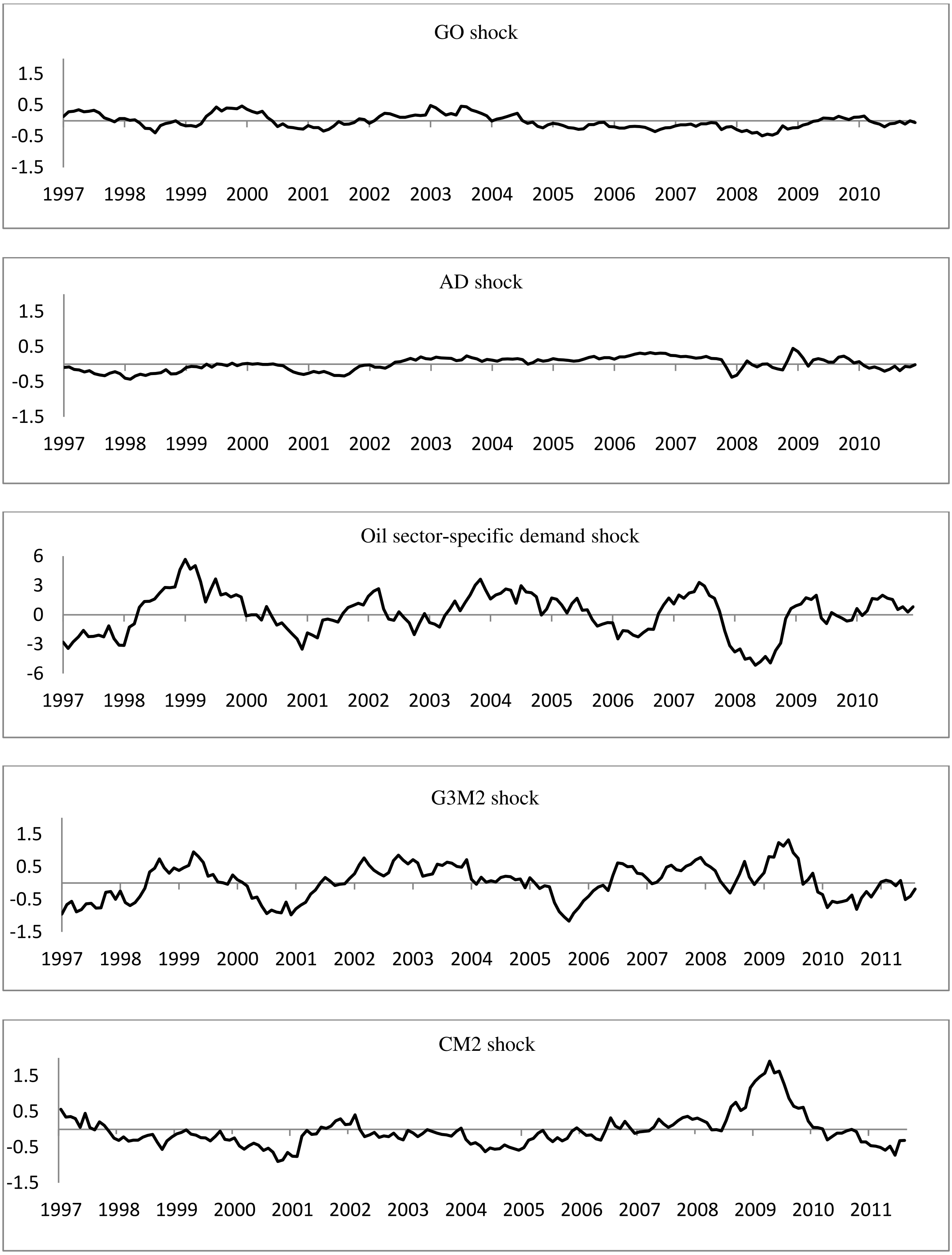


Figure 1e. G3 (U.S., Eurozone, Japan) and China Real M2: 1996:01-2011:12



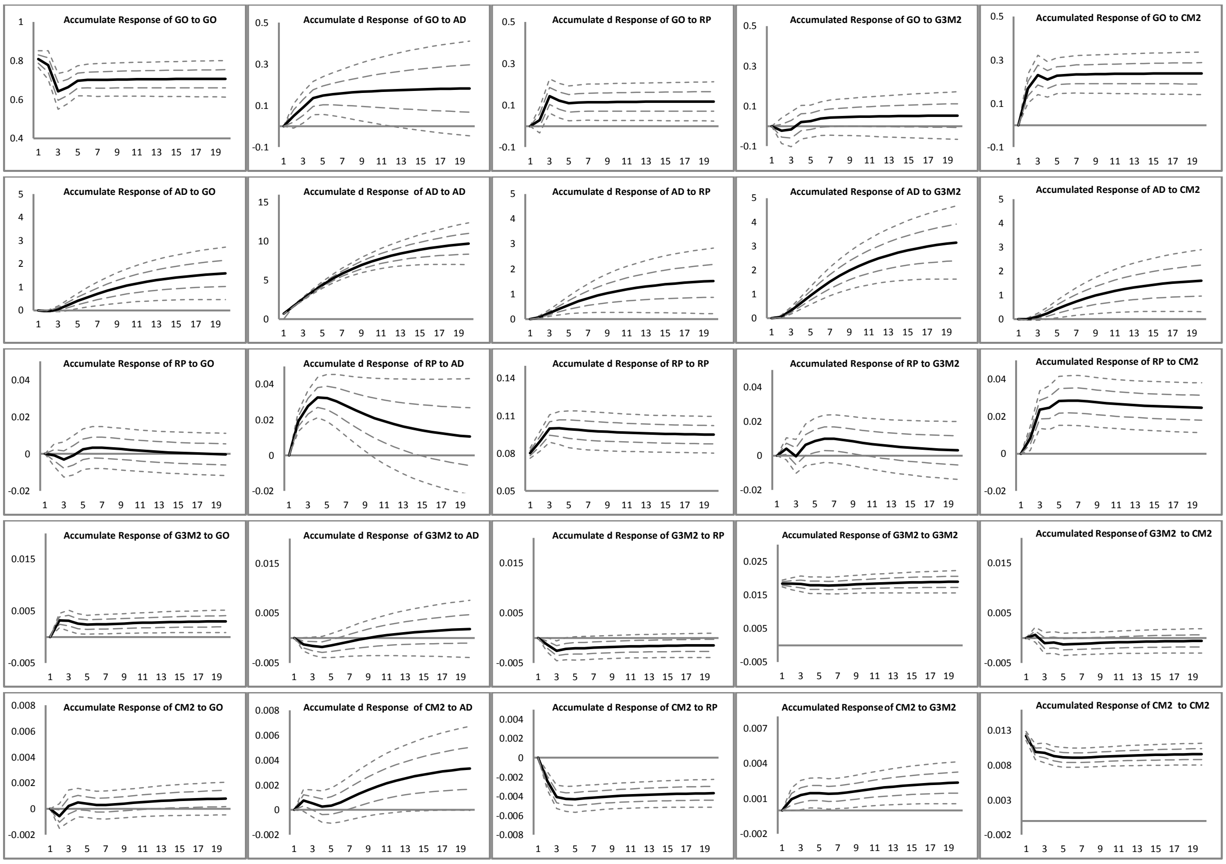
Notes: Global M2 is taken to be the sum of the M2 in China and in the G3. The G3 is taken to be the U.S., Eurozone and Japan.

Figure 2. The Evolution of the Structural Shocks: 1996:01-2011:12



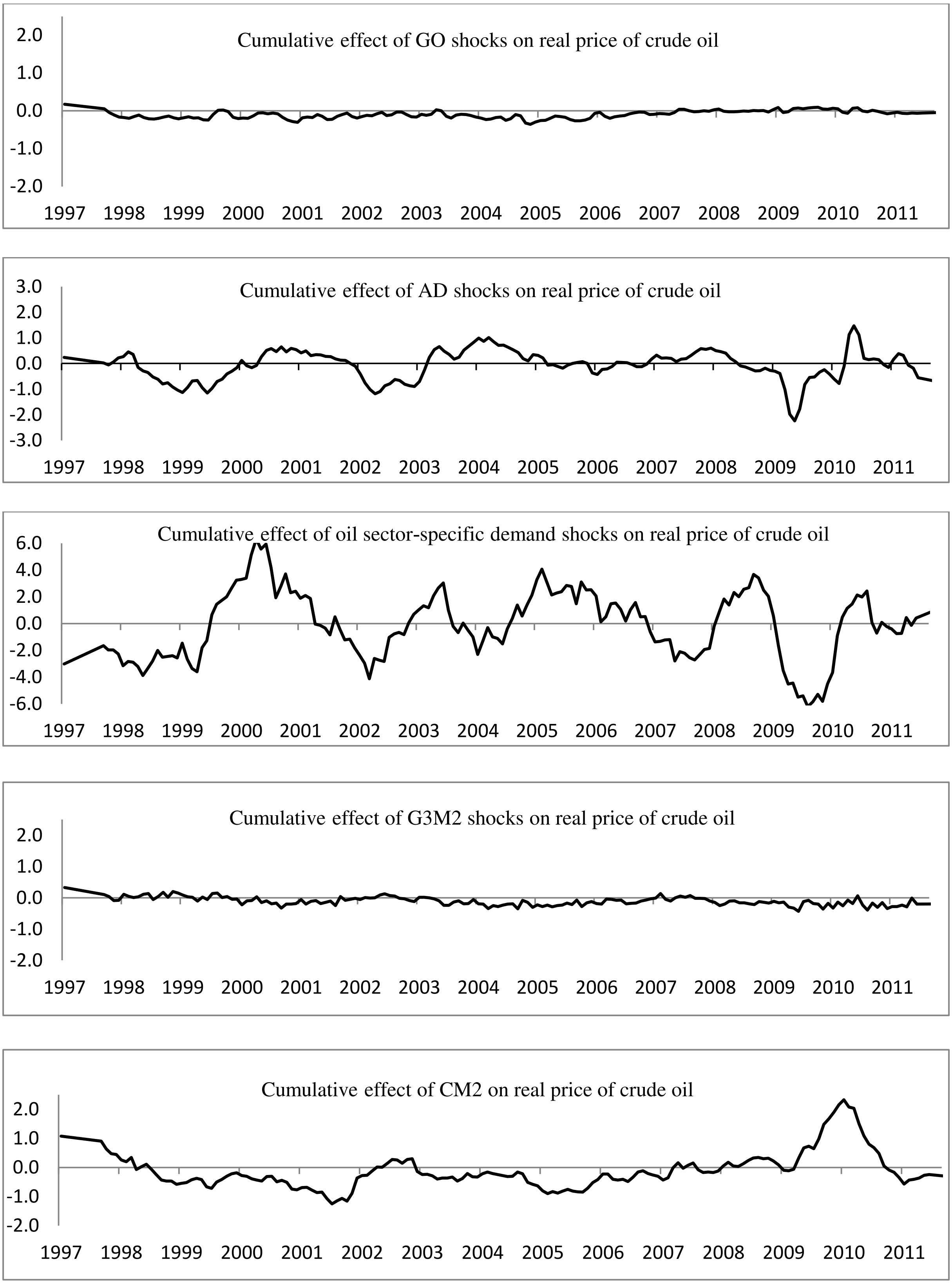
Notes: *GO* is global oil production, *AD* is aggregate demand shock, *RP* is real oil price, *G3M2* is M2 of G3 countries, and *CM2* is China's M2.

Figure 3. The impulse response effects of the structural shocks: 1996:01-2011:12



Notes: *GO* is global oil production, *AD* is aggregate demand shock, *RP* is real oil price, *G3M2* is M2 of G3 countries, and *CM2* is China's M2.

Figure 4. Cumulative effect of structural shocks on real price of oil (annual averages)



Notes: *GO* is global oil production, *AD* is aggregate demand shock, *RP* is real oil price, *G3M2* is M2 of G3 countries, and *CM2* is China's M2.