2008. With full knowledge that several members of the NBER dating committee are participants at this conference, I will close by suggesting that the recession began on that fateful day.

REFERENCES FOR THE BLINDER COMMENT

Blanchard, Olivier J., and Jordi Galí. 2007. "The Macroeconomic Effects of Oil Shocks: Why Are the 2000s So Different from the 1970s?" Working Paper 13368. Cambridge, Mass.: National Bureau of Economic Research (September).

Blinder, Alan S. 1979. *Economic Policy and the Great Stagflation.* New York: Academic Press.

———. 1982. "The Anatomy of Double-Digit Inflation in the 1970s." In *Inflation: Causes and Effects,* edited by Robert E. Hall. University of Chicago Press.

Blinder, Alan S., and Jeremy B. Rudd. 2008. "The Supply-Shock Explanation of the Great Stagflation Revisited." Working Paper 14563. Cambridge, Mass.: National Bureau of Economic Research (December).

Kilian, Lutz. 2008. "The Economic Effects of Energy Price Shocks." *Journal of Economic Literature* 46, no. 4: 871–909.

Nordhaus, William D. 2007. "Who's Afraid of a Big Bad Oil Shock?" *BPEA,* no. 2: 219–38.

COMMENT BY

LUTZ KILIAN James Hamilton has provided an insightful analysis of the latest oil price shock. He makes the case for viewing this episode not merely as a market aberration, but as a systemic and long-term problem that is likely to resurface once the global economy recovers from the current recession. After reviewing time-series plots of the relevant price and quantity data and conventional estimates of the price elasticity of oil demand, he concludes that constraints on the production of crude oil after 2005 and growing demand for crude oil driven by the recent boom in the world economy are the primary explanation of the 2007–08 oil price shock.

Having outlined an explanation based purely on economic fundamentals, Hamilton also gives serious consideration to the view that speculation in oil markets may have worsened the oil price spike of 2007–08. One possible view is that speculators in oil-importing countries, anticipating future oil shortages, caused the spot price to increase; however, the fact that oil inventories did not increase substantially in recent years cautions against that interpretation. Another view is that oil-producing countries were misled by rising oil futures prices into reducing current production. Although the analysis in the paper shows that data on the oil futures spread do not support that view, it is conceivable that oil producers nevertheless withheld

oil supplies in anticipation of even higher oil prices. That conjecture is hard to prove or disprove. Either way, the recent surge in the price of oil was ultimately driven by excess demand for crude oil.

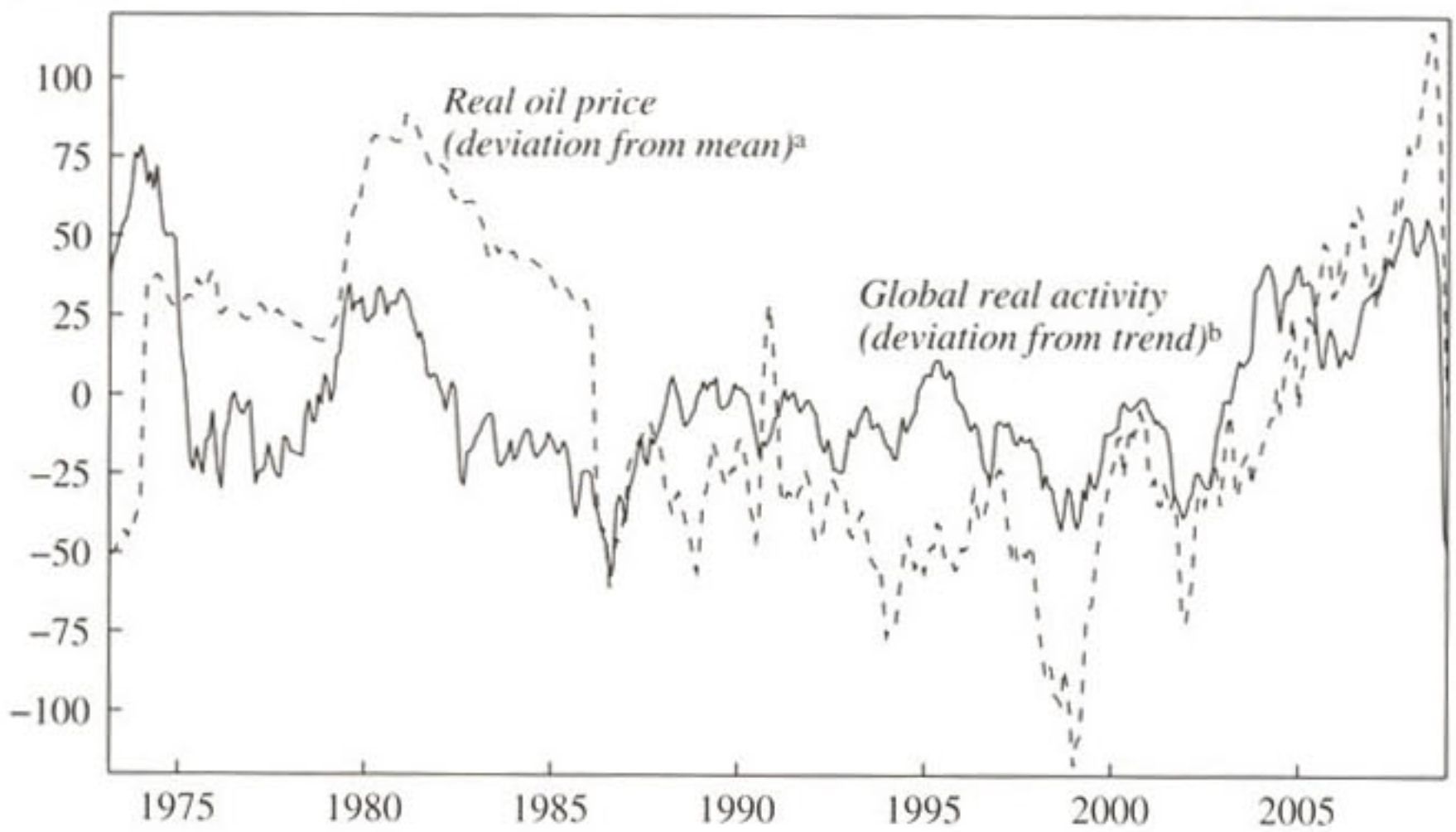
The paper highlights the roles of consumer sentiment, of the automobile sector, and of the housing sector in the transmission of the 2007–08 oil price shock. Evidence is presented that this shock was a major factor in causing the current recession and that its impact was magnified by the rising energy share in expenditure. The paper also includes a discussion of two policy tools that might have been used to slow the surge in the price of oil: one is the release of strategic oil reserves to calm speculators; the other is a slower easing of interest rates in 2008. The paper concludes that it would be wise for policymakers to address the long-run policy challenges of booming oil demand and stagnant global oil production, as the recent economic collapse is likely to prove only a short-run cure for the problem of excess demand.

I agree with many of the points in this paper, and in only a few instances would I have favored a more subtle interpretation. At the risk of downplaying the many areas of agreement, in this comment I will focus on two main themes that strike me as especially worthy of discussion.

One of these is that whereas earlier oil price shocks were primarily caused by exogenous physical disruptions of supply, the price run-up of 2007–08 was caused by strong demand confronting stagnating world production. Although I agree with this analysis of 2007–08 and with the proposition that this latest episode has been different from earlier ones, a growing body of evidence argues against the notion that the earlier oil price shocks were driven primarily by unexpected disruptions of the global supply of crude oil.

The paper acknowledges that demand pressures arising from increased global real activity made some contribution to oil price increases during several earlier episodes, but this alternative explanation is never fully investigated. For example, although the paper briefly mentions (and dismisses as implausible) the effect of inflation (and of the devaluation of the dollar) on OPEC supply decisions in 1973, it completely abstracts from shifts in the demand for oil associated with fluctuations in global real activity, except for the analysis of 2007–08. As recent experience has demonstrated, however, such shifts have the potential to cause large fluctuations in the real price of oil. Hence, even if, for the sake of argument, all of the observed oil supply cutbacks in late 1973 or in 1979–80 were exogenous, it would not be self-evident that these supply disruptions, rather than fluctuations in the global business cycle, were the driving force behind the 1973–74 and 1979 increases in the real price of oil.

Figure 1. Global Real Activity and the Real Price of Oil, 1973–2008



Source: Authorís calculations.
a. Price is deflated by the U.S. consumer price index.
b. Update of the measure described in Kilian (2009).

Moreover, there is good reason to be skeptical of the assertion that oil supply shocks were the primary explanation of all oil price shocks before 2007–08. Not only does Hamilton's figure 5 show considerable variation in the time-series patterns across oil price shock episodes, arguing against a common explanation, but no mention is made of the crucial point that commonly used measures of exogenous oil supply disruptions explain at most about 20 percent of the observed increase in the real price of oil in 1973–74. Alternative measures that I have proposed (Kilian 2008) imply even lower estimates of the predictive power of exogenous oil supply shocks. This raises the question of what explains the remaining 80 percent of the observed oil price increase.

By construction, the answer to this question must have to do with shifts in the demand for oil. Arguably the most important driving force behind the demand for oil is global real activity. Figure 1 plots the real price of crude oil and a measure of global real economic activity for 1973 through the end of 2008. As expected, not all movements in the real price of oil were associated with swings in global real activity, but the three major oil price shock episodes of 1973–74, 1979–80, and 2002–08 all coincided with major surges in global real activity. The attentive reader will notice that the increase in real activity in 1973 predated the increase in the real

Table 1. Growth in Inflation-Adjusted Prices of Selected Commodities[a]
Percent

Commodity	*November 1971–February 1974*	*August 1977–February 1980*	*June 2001–June 2008*
Crude oil	125.3	70.7	331.5
Industrial raw materials	92.6	24.2	67.0
Metals	95.9	27.6	235.1

Source: Author's calculations using data from the Commodity Research Bureau and Kilian (2009).
a. Cumulative changes over the indicated period relative to the U.S. consumer price index.

price of oil; in fact, it started in late 1971. The reason for this asynchronicity, as discussed in Robert Barsky and Kilian (2002) and Kilian (2008), is that the price of crude oil before late 1973 was not determined by market forces and remained below its market-clearing level. Had the price of oil been free to move, it would have risen much earlier, in line with other industrial commodity prices. The second major upswing in oil prices coincided with a somewhat smaller surge in global real activity starting in 1978. Finally, it is also evident that the latest oil price shock started in 2003 rather than 2007 and once again coincided with a very large swing in global real activity.

How much of an increase in the real price of industrial commodities such global demand swings may cause depends on how elastically the commodities in question can be supplied. It is instructive to contrast the increases in selected aggregate commodity price indices during the three episodes of interest. Table 1 shows that between late 1971 and early 1974, both industrial raw materials and metals prices increased by about 95 percent in real terms, despite a secular downward trend in these prices. Since contemporary sources indicate no important supply shocks in these markets at the time, and since most of the increases predate the oil price increase in late 1973, it is reasonably certain that all of these increases were driven by shifts in global demand (also see National Commission on Supplies and Shortages 1976). The observed increase in the real price of oil is only moderately higher, suggesting that stronger global demand is the explanation of the extra 80 percent increase in the real price of oil. Thus, 1973–74 appears much more similar to the current episode than this paper would have us believe.

Likewise, for 1979–80, table 1 suggests that demand pressures seem capable of explaining perhaps a 30 percent increase in the real price of oil. A leading candidate to explain the remainder is rising concern in 1979 about future oil supply shortfalls, since once again exogenous oil

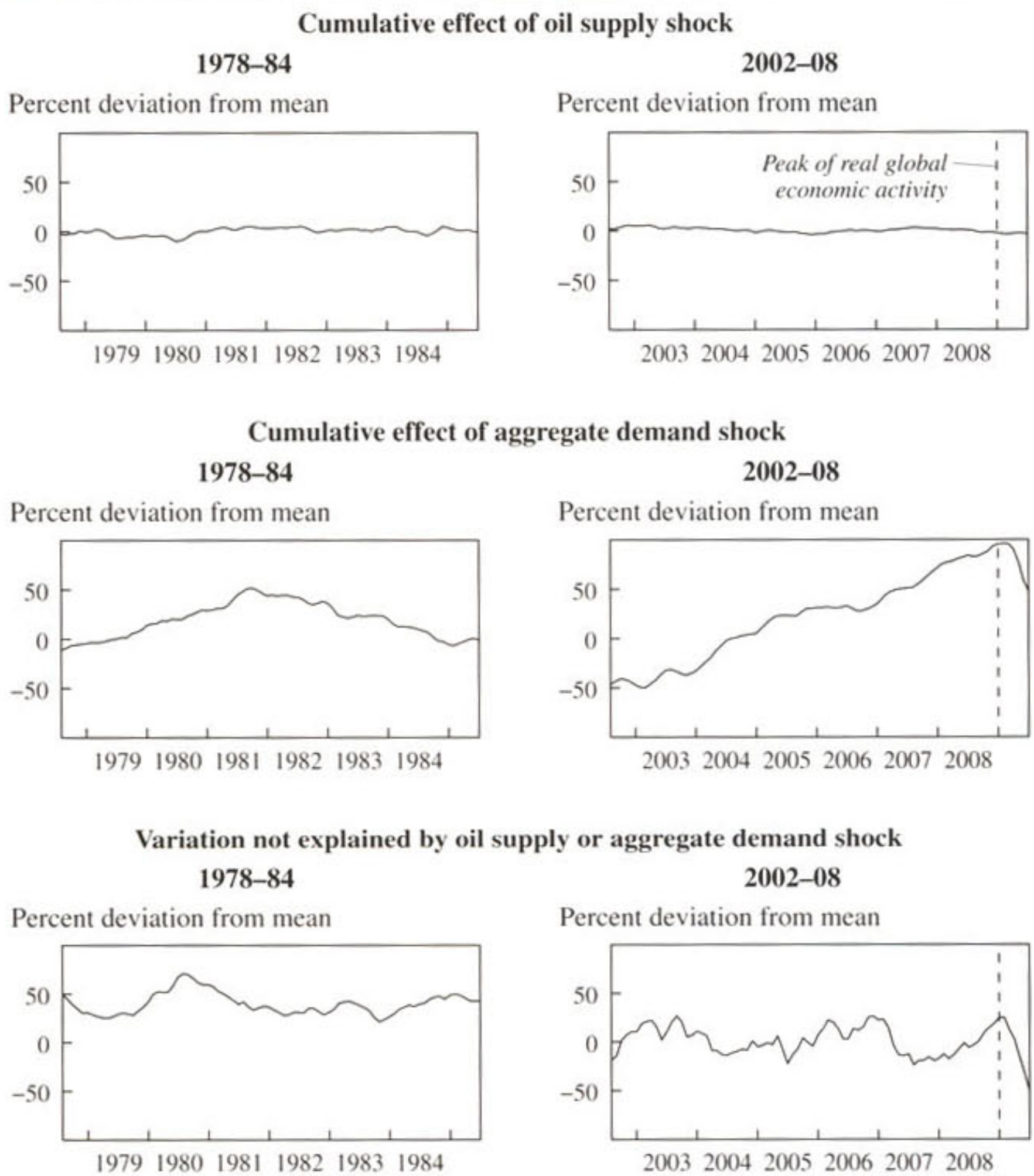
supply shocks fail to explain the timing and magnitude of these oil price increases. For the period between about 2002 and mid-2008, there is evidence that sustained demand pressures were associated with even larger real commodity price increases than in the 1970s. The reason that the real price of crude oil rose even faster than other industrial commodity prices in this episode—and here I fully agree with the points made in the paper—is that the supply of crude oil, having risen substantially between 2002 and 2005 in response to higher prices, stagnated after 2005.

Casual inspection of the data is a good starting point, but more formal regression analysis is required to identify unanticipated movements in global demand and oil supply and to account for their delayed effects on the real price of oil. Kilian (2009) shows that one can incorporate both global oil supply and global real economic activity into a regression framework that allows one to quantify the ability of unexpected physical shortfalls of oil production ("oil supply shocks") and of demand shocks driven by the global business cycle ("aggregate demand shocks") to explain the real price of oil. That model also includes a third shock, which may be viewed alternatively as an oil market–specific demand shock, reflecting, for example, shifts in uncertainty about future oil supply shortfalls, or as a measure of the difference between market expectations and econometric expectations of future oil supplies and global real activity. For the purpose of this discussion, I will focus mainly on the first two shocks to maintain consistency with Hamilton's analysis.

Figure 2 illustrates that the increase in the real price of oil from 2002 until mid-2008 was driven by a series of positive aggregate demand shocks associated with shifts in global economic activity. Oil supply shocks played no role. This analysis is very much consistent with this paper's interpretation of this episode, but it highlights again that this oil price shock really started in 2003 rather than 2007. Figure 2 also shows that the drop in the real price of oil after mid-2008 reflected only in part an unexpected reduction in global real activity. Other factors, presumably associated with the worsening financial crisis, also played some role, as shown in the bottom right panel.

Figure 2 also shows that the 1979–80 oil price shock actually reflected a composite of oil supply shocks (in 1980 rather than 1979), global aggregate demand shocks affecting all industrial commodity markets (starting in 1978), and other shocks, especially in 1979 (see Kilian 2009). This evidence is at odds with the view that all earlier oil shock episodes were driven primarily by oil supply disruptions. Likewise it has been shown that there is no evidence that the 1990–91 oil price shock was driven primarily

Figure 2. Historical Decomposition of Fluctuations in the Real Price of Oil, 1978–84 and 2002–08[a]



Source: Author's estimates.

a. Estimates from the structural VAR model of Kilian (2009) based on data for February 1973–December 2008.

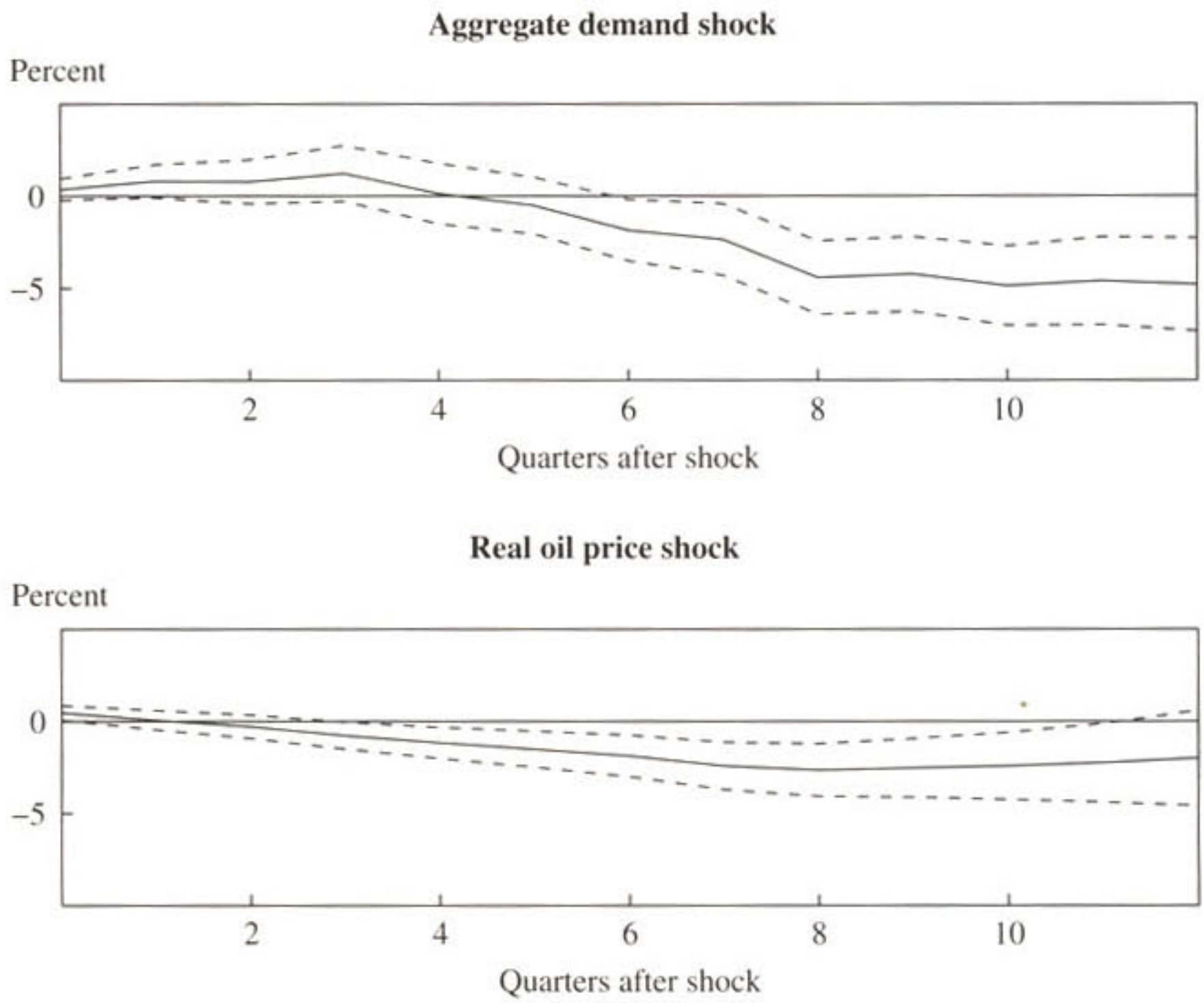
by oil supply shocks, nor did the Venezuelan crisis of late 2002 and the Iraq War of 2003, which jointly triggered an oil supply disruption not unlike those of the 1970s, have much of an effect on the real price of oil (see Kilian 2008, 2009). Thus, none of the major oil price shocks since the 1970s appear primarily supply-driven. What has changed relative to earlier episodes is the composition of demand and supply shocks, with repeated

positive global aggregate demand shocks alone explaining most of the run-up in oil prices since 2003. One may question how market participants could have been surprised again and again over the course of several years by strong global real economic activity. Hicks and Kilian (2009) provide evidence from data on professional GDP forecast revisions that this was indeed the case and that the most persistent forecast errors were associated with unexpectedly rapid growth in Asia. Moreover, estimated responses to such forecast errors show a pattern similar to the estimated response to aggregate demand shocks.

The other main theme of the paper is that the effect of the latest oil price shock on the U.S. economy has been quite similar to that of earlier ones. This argument is based on recursively identified vector autoregressions in which the oil price is ordered prior to the macroeconomic aggregate of interest. The global oil market model of Kilian (2009) takes the analysis a step further and expresses the VAR oil price innovation as a linear combination of oil demand and oil supply shocks, each of which is predetermined with respect to U.S. macroeconomic aggregates. This highlights two implicit assumptions that Hamilton makes in assessing the effects of oil price shocks. One assumption is that oil price innovations are homogeneous over time. This assumption would be innocuous if all oil price shocks were driven by exogenous oil supply disruptions, but, as has already been shown, oil price innovations reflect both oil demand shocks and oil supply shocks, the composition of which differs from one episode to the next, violating that assumption. The other assumption is that an oil price innovation is not associated with contemporaneous movement in any other macroeconomic variable. This presumption is violated if the oil price innovation is driven by global aggregate demand shocks. In that case, not only will the oil price innovation be correlated with innovations to the price of other industrial commodities, but the demand shock will also have a direct effect on the U.S. economy, for example, through the trade and external finance channel (see Kilian, Rebucci, and Spatafora 2009).

This does not mean that one cannot estimate the responses associated with an oil price innovation. Indeed, I have done so in my own work. One does, however, have to be clear that these responses do not represent the *causal* effect of an innovation to the price of oil, because the ceteris paribus condition is violated. Moreover, one has to keep in mind that these estimates represent the response to a shock of average composition over the sample period. They may be misleading when the composition of the oil price shock in question is atypical by historical standards, as is the case for the 2003–08 episode. Figure 3 illustrates this point. Since the latest oil

Figure 3. Responses of U.S. Real GDP to Oil Market Shocks[a]

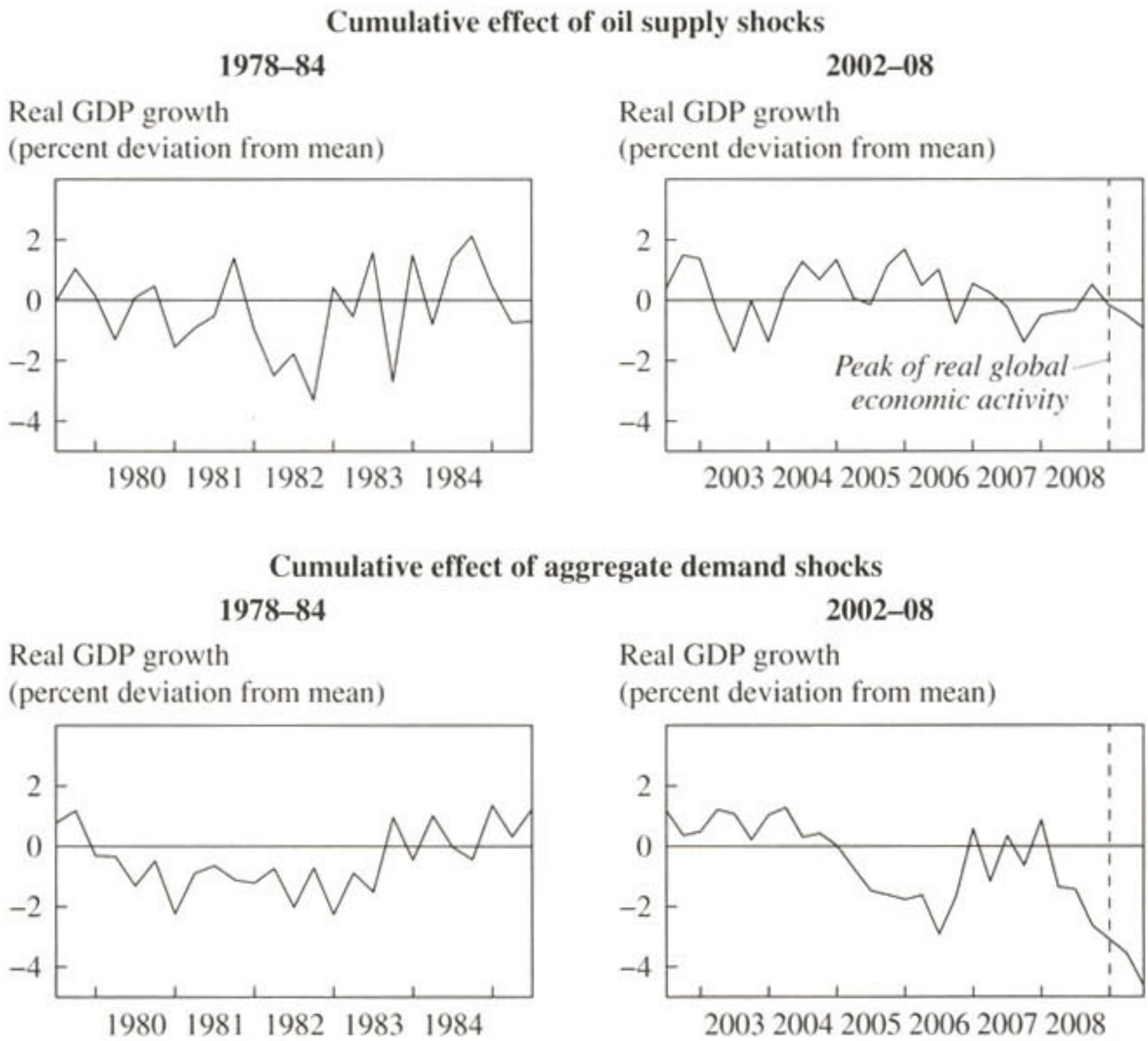


Source: Author's estimates.

a. The top panel is based on the methodology of Kilian (2009), and the bottom panel on a VAR in the real price of oil and real GDP growth for the same sample period of 1975Q1–2008Q4. Responses are to a 1-standard-deviation shock and are expressed as cumulative quarterly annualized growth rates. Dashed lines are 1-standard-error bands.

price surge was driven primarily by global aggregate demand shocks (as opposed to a more typical mixture of demand and supply shocks), the upper panel focuses on the response of U.S. real GDP to a positive aggregate demand shock. The lower panel shows the response of U.S. real GDP to a real oil price innovation estimated on the same sample. That response reflects the average composition of demand and supply shocks over the entire sample period. Although broadly similar, the exact timing, the magnitude, and at times even the sign of the response estimates differ. A positive global aggregate demand shock has positive, if statistically insignificant, effects on real GDP within the first year, reflecting the sluggish response of industrial commodity and oil prices and the economic stimulus from abroad. Only starting in the second year does the response turn negative, as the stimulus fades and higher oil and industrial commodity prices stifle

Figure 4. Historical Decomposition of U.S. Real GDP Growth, 1978–84 and 2002–08[a]



Source: Author's estimates.

a. Estimates based on the methodology of Kilian (2009) using data for February 1973–December 2008. Data are cumulative quarterly annualized growth rates.

economic growth. A shock of average composition implies a decline in real GDP starting in the second quarter, in contrast. The response is significant in the second and third years. An immediate implication is that the effects associated with the 2007–08 oil price increase could not possibly be the same as those associated with earlier oil price shocks, even if it were the case that the earlier shocks were driven by oil supply disruptions. Just how different the implied effects on real GDP are is documented below.

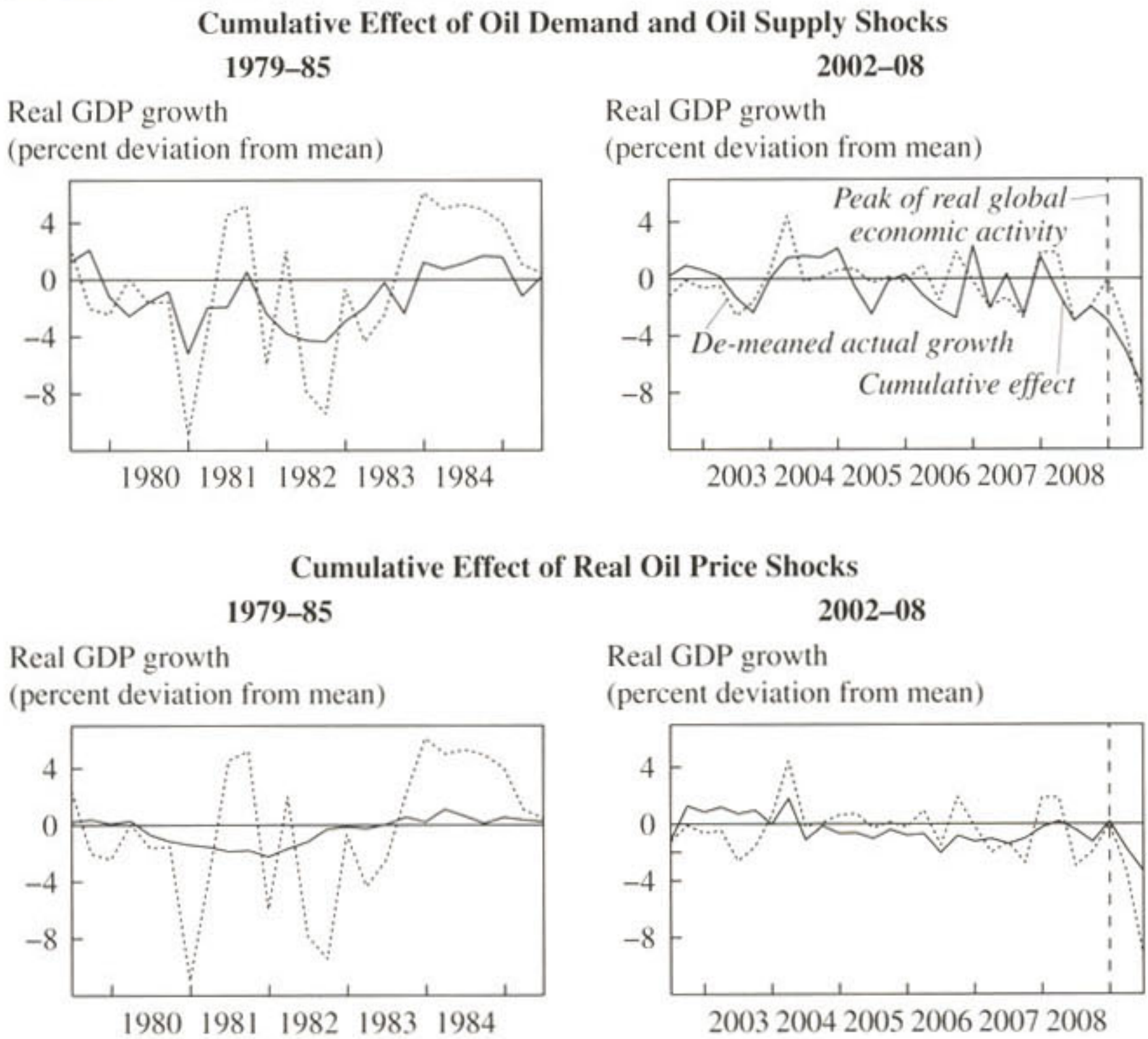
In discussing the impact of oil demand and oil supply shocks over extended periods, it is essential to consider the cumulative effect of all of these shocks over time rather than the response to a one-time shock. Figure 4 shows the contribution of aggregate demand and oil supply shocks to the observed variation in U.S. real GDP growth, relative to average growth,

for selected periods. All of the results are based on the methodology of Kilian (2009). Compared with previous estimates from similar models but shorter time spans, figure 4 reveals a somewhat larger impact of oil supply disruptions on U.S. growth in the early 1980s, coupled with a persistent reduction in growth associated with aggregate demand shocks. In contrast, the primary explanation of below-average U.S. real GDP growth after 2004 is the unexpected increase in global real economic activity that started in 2002. Consistent with the impulse response estimate in figure 3, the initial effect of positive aggregate demand shocks on U.S. real GDP growth was largely positive (see figure 4). Only in 2004 do industrial commodity price and oil price increases start taking their toll. The top panel of figure 4 also suggests that these effects were offset—for some time—by the growth-enhancing effect of positive oil supply shocks. Given the unprecedented drop in global real activity of close to 95 percent from the peak in June 2008, shown in figure 1, the fact that the estimated effect is increasing sharply at the end of the sample does not come as a complete surprise.

How do these estimates compare with conventional estimates based on VAR models for real GDP growth and the real price of oil? Figure 5 shows that the fully structural VAR model predicts somewhat larger economic contractions in the early 1980s and in 2008 than the VAR model involving real oil price innovations. Interestingly, the overall effect of the demand and supply shocks on U.S. real GDP growth in 2005 through 2007 proved small by the standards of the early 1980s. The negative effect of earlier aggregate demand shocks was initially offset in part by the positive effects of other shocks, including positive oil supply shocks in 2004–06. Thus, only in late 2007 and in 2008 did the full effect of the continued unexpected global expansion make itself felt. This result corroborates the interpretation of the 2007–08 data in the paper. It is also consistent with the observation that the higher oil and industrial commodity prices triggered by repeated positive aggregate demand shocks, as in earlier episodes, caused a reduction in consumer spending, mainly in the residential housing sector and in the automobile sector. What is interesting about the results in figure 4 is that they suggest a somewhat smaller role for the financial crisis in late 2008 than one might have suspected. In that sense I agree with Hamilton that developments in global oil and other commodity markets appear to have played an important role in the latest U.S. recession.

In closing, although this paper presents an impressive body of evidence that sheds light on the mechanics of how oil price shocks are propagated, and although I agree with many of its substantive conclusions, my concern is that the narrow causal interpretation of oil price shocks in this paper is

Figure 5. Explanatory Power of Oil Demand and Supply Shocks Combined and of Real Oil Price Shocks, 1979–85 and 2002–08[a]



Source: Author's estimates.

a. Estimates based on the methodology of Kilian (2009) using data for February 1973–December 2008. Data are cumulative quarterly annualized growth rates.

misleading. This is not merely an issue of how to interpret the resulting responses, but one that affects the magnitude of the estimates. For example, although the direction of the estimated effects is broadly similar, the evidence in figure 5 above suggests that the aggregate demand shocks driving the 2007–08 oil price increase may have had greater effects on U.S. real GDP than suggested by models that ignore changes in the composition of oil price shocks.

I have also provided evidence that, contrary to the assertion in this paper, demand shocks have always played an important role in oil markets. What is different about the latest episode is that the oil price increase was driven almost exclusively by one specific type of demand shock, reflecting continued unexpected increases in global real activity during 2002–08, primarily

associated with unexpected growth in emerging Asia (see Hicks and Kilian 2009). From a policy point of view the central question is how much of that unexpected growth reflected an exogenous economic transformation in emerging Asia. An alternative explanation is that the Federal Reserve sustained growth in the United States longer than appropriate, easing monetary policy too early and too much, thus enabling the export-based Chinese economy and the world economy more generally to thrive, and fueling the commodity and oil price boom that contributed to the current collapse of the real economy. I agree with the author that this possibility deserves careful study. A third explanation is that the sustained prosperity in the United States between 2002 and mid-2008 was not directly linked to monetary policy, but to the failure of the Federal Reserve and other regulators to rein in financial and housing markets. It seems unlikely that one could unravel the relative contribution of each explanation without the help of a fully specified multicountry open-economy model.

REFERENCES FOR THE KILIAN COMMENT

Barsky, Robert B., and Lutz Kilian. 2002. "Do We Really Know That Oil Caused the Great Stagflation?" *NBER Macroeconomics Annual*, vol. 16, pp. 137–83.

Hicks, Bruce, and Lutz Kilian. 2009. "Did Unexpectedly Strong Economic Growth Cause the Oil Price Shock of 2003–2008?" Discussion Paper DP7265. London: Centre for Economic Policy Research.

Kilian, Lutz. 2008. "Exogenous Oil Supply Shocks: How Big Are They and How Much Do They Matter for the U.S. Economy?" *Review of Economics and Statistics* 90, no. 2: 216–40.

_____. 2009. "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market." *American Economic Review* 99, no. 3: 1053–69.

Kilian, Lutz, Alessandro Rebucci, and Nikola Spatafora. 2009. "Oil Shocks and External Balances." *Journal of International Economics* 77, no. 2: 181–94.

National Commission on Supplies and Shortages. 1976. *The Commodity Shortages of 1973–1974: Case Studies*. Washington: U.S. Government Printing Office.

GENERAL DISCUSSION Robert Gordon pointed out what he saw as four omissions in the paper. The first was the lack of a systematic macroeconomic theory of commodity supply shocks, such as that developed by Edmund Phelps and himself in the mid-1970s. A low price elasticity of demand for oil means that the energy share in GDP must rise, with the nonenergy share falling by the same amount. A complete theory would