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Analysis of Saudi Arabia's behavior within OPEC and the world oil market

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ABSTRACT

We analyze oil export behavior by Saudi Arabia and the Rest of OPEC since 1973. In the literature there has been a wide range of estimates of their correlation: from positive, to zero, to negative. We find that the correlation has varied over time, from moderately high (0.7) in normal periods, to negative during each of five interruptions; the average correlation has been 0.19. Saudi Arabia's oil market behavior depends upon circumstances, but its primary goal is the stability of OPEC and the world oil market. It will coordinate export reductions with the Rest of OPEC when faced with declining demand, but it will increase exports when faced with interruptions elsewhere in OPEC. Allowing for such differences provides evidence of intelligent, context-dependent consistency. But ignoring context – by wrongly assuming the same Saudi response in Normal periods and Interruptions – can lead to a conclusion of Saudi "inconsistency" because the difference in the responses has been obscured.

1. Introduction

OPEC quadrupled crude oil prices nearly 40 years ago, and since then we have witnessed a large literature about how OPEC and its key producers have acted within the world oil market. A substantial part of this literature stems from the analysis by Griffin (1985).[1] Yet there has been surprisingly little agreement about some of the most important questions, such as the role of Saudi Arabia and whether it coordinates its production decisions with its partners in OPEC. Smith (2005, p. 75) does not find clearly discernible consistency in the actions of Saudi Arabia, while Kaufmann et al. (2008, p. 348) find no clear relationship between Saudi production and that from the Rest of OPEC.

This article re-examines these questions, with a special focus on Saudi Arabia's decisions about its levels of oil production and exports.[2] Although others have used a single model for Saudi Arabia over time, we believe that Saudi behavior has varied, depending upon the circumstances.[3] In many years Saudi Arabia has acted together with the Rest of OPEC, restricting its exports together with its OPEC partners as demand declined, and expanding its exports when demand increased. The most notable examples of proportional restriction in exports during recessions are 1974–1975, 1998, 2002, and in 2008–2009. At other times, however, the Saudis have acted independently from the Rest of OPEC, most notably at those times of supply interruption elsewhere in OPEC: 1978 in Iran, 1980–1981 in Iraq and Iran, 1990 in Kuwait and Iraq, 2003 in Iraq, 2011 in Libya. On these occasions, rather than matching the export cutbacks elsewhere in OPEC, the Saudis increased their exports to offset the interruptions.[4]

This variation in Saudi export behavior over time is evident in the correlation between the changes in Saudi oil exports and changes in exports from the Rest of OPEC. In most "normal" periods (excluding interruptions and recoveries), the correlation is relatively high, at about 0.7. But during interruptions the correlation becomes negative. Although the *average* correlation since 1973 is 0.19, this masks the wide variation over time:

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[1] Surveys of the broader literature on OPEC can be found in Gately (1984), Cremer and Salehi-Isfahani (1991), and Al-Yousef (2012).

[2] Although previous articles have analyzed OPEC oil production, we focus on OPEC oil *exports* because only OPEC exports affect the world oil market. OPEC domestic consumption has grown from less than 5% of production in the early 1970s to 25% currently. OPEC now consumes as much oil as China. Although OPEC oil production is slightly higher now than in 1973, OPEC oil exports are 20% lower. OPEC exports' share of Non-OPEC consumption has fallen from 52% in 1973 to 34% now. See Gately et al. (2012, 2013) for analyses of domestic oil consumption in Saudi Arabia and OPEC, respectively.

[3] Our view that OPEC behavior has varied over time depending upon circumstances is shared by Adelman (1982), Geroski et al. (1987) and Kaufmann et al. (2008), among others.

[4] At other times, Saudi export behavior has been designed to enforce discipline within OPEC, to encourage the honoring of production quotas and discourage over-shipment (as in 1988)—via tit-for-tat behavior that demonstrated Saudi willingness to match the behavior of its partners: over-shipping quotas when other OPEC producers do so, and honoring its quota when others do so.

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strongly positive during "normal" periods but negative during and after supply interruptions.

We analyze these different periods separately, distinguishing between normal periods and interruptions, and between increases and decreases in Saudi exports. Within this complexity, we find consistent behavior by Saudi Arabia.

The outline of the paper is as follows. In Section 2 we summarize OPEC export behavior since 1973 and the varying relationship between Saudi exports and those from the Rest of OPEC. In Section 3 we review some of the disagreements in the literature, and discuss how our analysis can help to clarify the issues. We focus especially of the asymmetric responsiveness of Saudi exports to increases and decreases in Rest-of-OPEC exports, within normal periods and during interruptions. Section 4 presents the methodology we employ, which is similar to that adopted by most authors following Griffin (1985). Section 5 presents our econometric results. Section 6 summarizes our conclusions. Data sources and details are presented in Appendix A, statistical test results in Appendix B, summary results using OPEC production (rather than exports) in Appendix C, and summary results using the DOLS method in Appendix D.

2. Background

Between 1965 and 1973 (when pricing and output decisions were controlled by the international oil companies), Saudi Arabia exports quadrupled, from 2 to 8 mbd (million barrels/day), doubling its share of OPEC oil exports to 28%. When OPEC quadrupled the price in 1973–1974 and the OPEC countries nationalized their oil reserves, it was a shock to the oil market and the world economy.[5] The price quadrupling halted the surge in demand for OPEC oil (which had been growing 10% annually for a decade), and for three years OPEC successfully managed the changes in demand that it faced. Its quarterly exports fell from 29.6 mbd in 1973q3 to 23.5 in 1975q1, but recovered quickly, to 30.5 in 1976q4. Then in late 1978 the Iranian Revolution shut down production in Iran; the Saudis increased their own exports, which partially offset this loss, but a second price shock in 1979–1980 doubled the oil price. Not long after that, Iraq invaded Iran and their war shut down a combined total of 6 mbd production. In the face of these disruptions, Saudi Arabia maintained it exports at capacity, nearly 10 mbd through 1981, which by now represented 50% of OPEC exports. Some of the background data is presented in Fig. 1.

However, in just a few years after 1981, the demand for OPEC oil collapsed, falling to only half its 1979 level. This demand collapse was largely due to the unwise decision to defend the 1979–1980 price doubling, which exacerbated the world economic recession, the shift away from oil used in electricity generation and space heating,[6] and the continuing growth of Non-OPEC supply. By 1985, Saudi Arabia had to cut its oil exports 70% from their 1981 level, to below 3 mbd (only 21% of OPEC exports). This was almost back to 1965 levels.

[5] There were two basic explanations of these events, as discussed in Gately (1984). A majority view was that OPEC had effectively cartelized the world oil market. However, others such as MacAvoy had argued that cartelization was not the primary explanation for 1973–1974, because much higher prices were inevitable and OPEC controlled only the timing of the price increases: "the 10% annual growth rate in OPEC production from 1960 through 1973 was unsustainable, even with OPEC's large oil reserves. By mid-1973, months before the Arab–Israeli War and subsequent price quadrupling, the market was already very tight: OPEC's official prices were well below those in the spot market … As Paul MacAvoy … has argued '… there was no avoiding the substantial price increases necessary to clear the market of annual increases in oil demand." (Gately, 1984, p. 1101).

[6] See Dargay and Gately (2010).

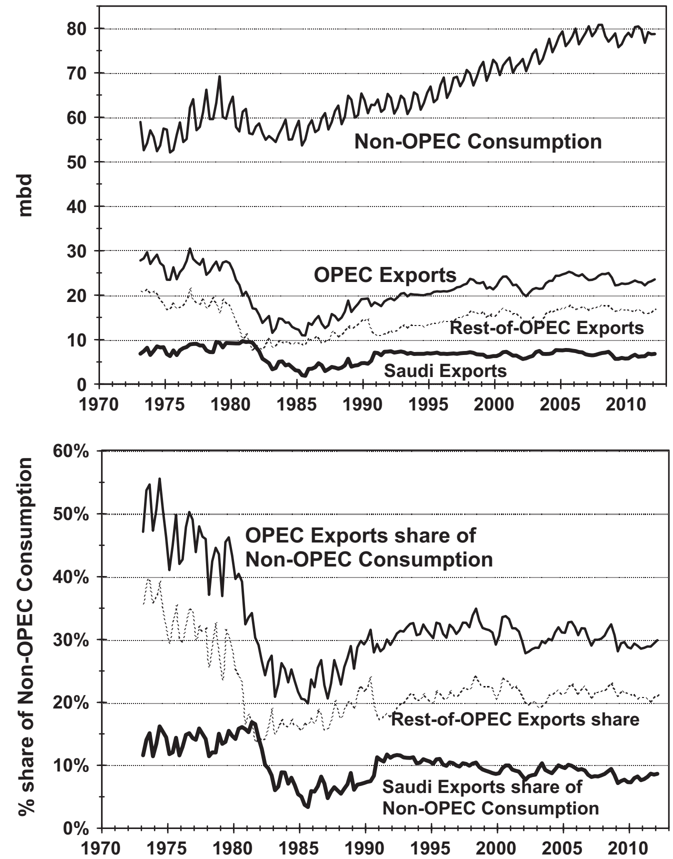

Fig. 1. OPEC oil exports (mbd) and % shares of Non-OPEC Consumption, 1973q1–2012q1.

Starting in late 1985, Saudi Arabia abandoned OPEC's price-setting, output-restricting policy, and doubled their exports within two quarters; price fell sharply, to below its 1974 level. Soon there followed *rapprochement* within OPEC, as they adopted production quotas to manage their gradual increases in exports and recovery of market share. On several occasions the Saudis encouraged discipline in honoring production quota agreements using a "tit-for-tat" strategy: match quota over-shipments by its OPEC partners and reciprocate when quotas were respected.[7]

OPEC's recovery was interrupted in August 1990 when Iraq invaded Kuwait, and exports from both countries stopped. Again, the Saudis responded, by doubling their exports within two quarters. They maintained those export levels almost unchanged for nearly a decade, while the Rest of OPEC gradually increased their exports. Prices stayed relatively low, in the $25 range.

Starting in 1998, after the Asian Financial Crisis, Saudi Arabia resumed a more active role, adjusting its export levels in response to the market. OPEC's exports continued increasing until 2005, when price began to surge as world demand grew faster than Non-OPEC and OPEC suppliers could respond. By the middle of 2008, oil prices peaked, at levels not seen since 1980, possibly exacerbated by speculative activity. This peak was soon followed by sharp declines in price, which OPEC did not attempt to prevent (unlike in the early 1980s), although Saudi Arabia and the Rest of OPEC cut their exports to lessen the extent of the price collapse. Price recovered modestly, as strong demand from the developing

[7] This strategy is discussed below, as well as in Geroski et al. (1987), Gately (1989), and Griffin and Neilson (1994).