# Discussion of Lutz Kilian

# Understanding the Estimation of Oil Demand and Oil Supply Elasticities

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# This Paper: Review of Literature on Estimating Oil Market Elasticities

Summary of the Paper: Oil price supply elasticities are small, oil price demand elasticities are large.
Alt.Summary: Every elasticity not estimated by Lutz Kilian is wrong. :-)

Comprehensive paper that covers topics and authors.

Baumeister-Hamilton (supply elasticity: 0.2)
Caldara-Cavallo-Iacoviello (0.09)
Bjørnland (0.1)
Newell-Priest (0.01)
Anderson-Kellogg-Salant (0)
Kilian (0.02)

**Why is this elasticity so important?**
**If supply elasticity is 0, oil prices are mostly driven by demand.**
**If supply elasticity is 0.1, oil prices are mostly driven by supply.**

# Quantities and Prices in Oil Market

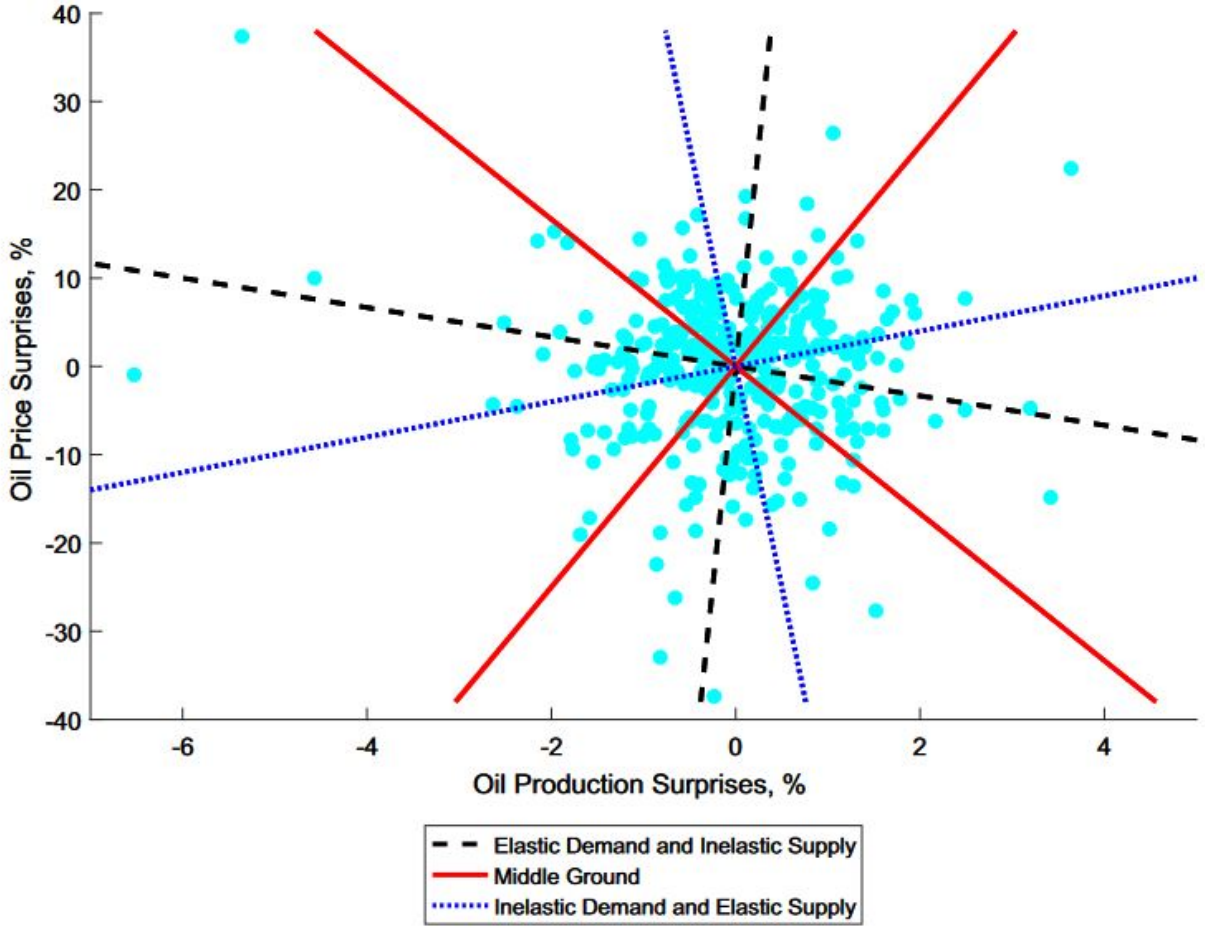


**Fig. 1.** Quantities and Prices in the Oil Market
*Note*: The figure depicts the scatter plot between the residuals from a regression of oil prices and oil production on their own lag and a constant. The solid red, black dashed, and blue dotted lines represent alternative configurations of the oil demand and the oil supply curves that are consistent with the data. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

You can explain the cyan dots with any of the three demand-supply combinations in the chart.

# What the Paper Does

- Review of the Identification Problem
- Review of the Micro Evidence (Newell-Priest and Bjornland)
- Review of Kilian and Murphy and the 0.0258 elasticity
- Review of Caldara, Cavallo, Iacoviello (CCI)
- Review of VAR models
- Review of the Importance of Inventories

Paper could benefit from better organization. Some sections go after the authors, some sections go after the topic. Hard to follow for someone who is not already familiar with literature.

I will comment on some of the claims in the paper that I mostly disagree with.

# Five Topics in my Discussion

1. The UAE production cut of August 1990 was not a response to higher prices.
2. Micro Estimates of zero supply elasticity are tenuous.
3. Some of the CCI estimates may be flagged by the F-stat police, but are grounded in economic logic.
4. Review of demand elasticities could be better aligned with review of supply elasticities.
5. Criticizing CCI because CCI's toy model lacks inventories is nonsense.

# 1. The case of the United Arab Emirates: The UAE production drop was not in response to higher prices

- KM: In August 1990, oil producers other than Iraq and Kuwait increased world production by 1.17 percent in response to a price rise of 45.3 percent, hence $\eta_D = 0.026$.
- CCI: In August 1990, oil producers other than Iraq and Kuwait **and UAE** increased world production by 1.97 percent, hence $\eta_S = 0.045$.

  CCI: UAE reduced production by 20 percent in Aug.90. Its production cut is **not** part of the world response because Saddam threatened UAE.

  Author: Saddam could not threaten UAE because UAE had no border with Iraq and was protected by the United States.

  CCI: The evidence is overwhelmingly in favor of the fact that UAE felt threatened and did/could not to respond to higher to oil prices.

# "A larger air force than Great Britain's"

THE NEW YORK TIMES, SUNDAY, JULY 1, 1990

## Iraq Menaces OPEC Neighbors

Iraq President Saddam Hussein

President Saddam Hussein of Iraq is emerging as the bully boy of the Middle East, and higher oil prices are bound to result. He warned Kuwait and the United Arab Emirates last week to quit busting production quotas set by the Organization of Petroleum Exporting Countries. Implicit in his warnings was a military threat. With 42 armed divisions, chemical weapons and a larger air force than Great Britain's, Iraq "clearly

# "Openly threatened to use force"

WEDNESDAY, JULY 18, 1990

The New York Times

## Iraq Threatens Emirates And Kuwait on Oil Glut

By YOUSSEF M. IBRAHIM

Special to The New York Times

CAIRO, July 17 — President Saddam Hussein of Iraq today openly threatened to use force against Arab oil-exporting nations if they did not curb their excess production, which he said had weakened oil prices and hurt the Iraqi economy.

The Iraqi leader did not mention particular countries by name in his nationally broadcast address today, but his warning was clearly aimed at Kuwait and the United Arab Emirates.

# "Actions of UAE a military aggression"

Chicago Tribune, Thursday, July 19, 1990

## Iraq threatens OPEC neighbors on quotas

BAGHDAD (AP)—Iraq warned other OPEC members Wednesday that it viewed violations of the cartel's production quotas as virtual acts of war and accused neighboring Kuwait of stealing Iraq's oil for the last decade.

After meeting in emergency session, Kuwait's National Council, or parliament, issued a statement rejecting what it called the Iraqi "policy of violence, threats and blackmail."

The Iraqi foreign minister renewed Iraq's accusations of overproduction by Kuwait and the United Arab Emirates and said such actions were tantamount to "military aggression against Iraq." Iraqi President Saddam Hussein threatened Tuesday to retaliate against Kuwait and the U.A.E. with force for quota violations.

# "Threatened Kuwait and UAE with military action"

**U.S. Weighs Sanc**

**By PHILIP SHENON**
Special to The New York Times

WASHINGTON, July 26 — The Bush Administration has started a wide-ranging review of American policy toward Iraq and will consider new economic sanctions and export controls as a result of Iraq's threats against two oil-producing neighbors on the Persian Gulf, Administration officials said today.

They said the State Department and the Pentagon were alarmed by the tactics of President Saddam Hussein, who this month threatened Kuwait and the United Arab Emirates with military action to force them to reduce oil pro-

Many countries did not produce more because they were afraid of acting in isolation –> Not the typical price increase.

The Guardian (1959-2003); London (UK) [London (UK)]. 21 Aug 1990: 7.

# Venezuela threatens oil increase

Financial staff

VENEZUELA will increase its oil production without Opec approval if the cartel fails to organise a meeting to discuss output increases, President Carlos Andres Perez said yesterday.

In a move which allies Venezuela with Saudi Arabia, Mr Perez said Opec should call a meeting on Saturday to discuss the current oil situation in the light of the Gulf crisis.

However, he added: "Only in the case that . . . the Opec was unable to meet, then we would be obliged to comply, without Opec approval, with our international obligations." His comments came after Opec had yesterday ruled out calling an extraordinary meeting.

Both Venezuela and Saudi Arabia requested an urgent meeting of the organisation to discuss increases in oil output to make up for the four million barrels per day which has been lost through the United Nations embargo placed on oil from Iraq and Iraq-occupied Kuwait.

The Saudis indicated at the same time that they would increase production unilaterally. Prince Bandar Bin Sultan, Saudi Arabia's ambassador to the United States, said his country would take "appropriate action" to stop the the Gulf crisis from affecting world oil supplies. Mr Perez said production increases were vital to keep world oil prices relatively stable and prevent them from shooting up as they did during the Iran-Iraq war. This had hurt developing nations with no large oil inventories.

"Venezuela has offered its cooperation to insure world oil supplies with an additional production of 500,000 barrels per day," he said.

Asked about Saudi Arabia's announcement on output increases, Mr Perez said: "Saudi Arabia has not made any unilateral decisions on increases. It is acting with Venezuela."

Venezuelan energy minister Celestino Armas said the lack of support by Opec to call an extraordinary meeting, which prompted the Saudi announcement on output increases, may have been overcome.

He said Ecuador, United Arab Emirates, Qatar, Gabon, Saudi Arabia and Venezuela are in favour of the meeting, while only Iraq is categorically opposed. According to Opec statutes, seven of the 13 members must be in favour in order to call a meeting.

However, the Opec News Agency (Opecna) said Saudi Arabia had not received sufficient support to call the meeting. Ecuador's energy minister has said his country opposes the Opec meeting and consumer nations should use some of their oil inventories before Opec raises output.

# D-day as bankruptcy looms for Trump

Iraq had no border with UAE or Israel, yet that did not stop it from threatening Israel too.

Los Angeles Times

MONDAY, SEPTEMBER 24, 1990

# Iraq Threatens to Avenge Blockade

■ **Gulf crisis:** Hussein says he would strike Israel and cripple region's oil fields if economic sanctions begin to strangle his nation. He warns forces to retreat or face a 'ghastly fire.'

## Iraqis Spent Years Plotting Kuwait Strike

By DOUGLAS JEHL
TIMES STAFF WRITER

DHAHRAN, Saudi Ara-

People in Israel thought the threat was real, even if Israel had no border with Iraq.

L MONDAY, OCTOBER 8, 1990

# ISRAEL'S CITIZENS RECEIVE GAS MASKS

## Families Gathering in Schools Also Get Hoods, Syringes, Baby Tents, Filters

By SABRA CHARTRAND

Special to The New York Times

OFAKIM, Israel, Oct. 7 — The Israeli

# Iraq had its own non-glorious precedents.

and Manchester

**Kurds fleeing 'gas and extermination'**

David Hirst reports from Yuksekova, south-east Turkey, on the refugees from chemical attacks

THERE are, it seems, only two words — gas | The refugees claim that fighting is still going on in the Sidey- | for treatment." Sherif Sandalish said. "The Turks only have | ter bombs, the napalm and the phosphorous they would have tried to stand their ground against the might of the Iraqi army and they would probably have succeeded. | The ceasefire with Iran has | in a village of about a thousand." | Another refugee, Hari Hamarwi, said he had buried "with my own hands" a fellow-guerrilla and his wife and child, killed by cyanide in the village | away. They also thought the attack on Halabja was an isolated punishment for the help the population had given Iran in capturing the town. | No one has any precise idea of the numbers dying inside,




**Kurds Tell Of Mass Gassings**

**Refugees Describe Defeat by Iraqis as Most Sweeping Ever**

# Summary: Contrary to what author argues, there was an immediate military threat to UAE.

- Definitely at the time more than one analyst must have felt that UAE felt the military pressure.
- Perhaps other producers also felt political and non-market pressure not to increase production. — should one include them or not include them in the calculation of the relevant elasticity?
- In the best-case scenario, looking at each individual case would invalidate completely the logic of looking at August 1990 to calculate oil supply elasticity in the first place, since the price increase was not really indicative of an exogenous price shock.

# 2. Micro Estimates of zero supply elasticity are tenuous.

- Author cites work by Anderson, Kellogg and Salant as supportive of the idea that supply price elasticity is zero.

  "Anderson, Kellogg and Salant show that in equilibrium oil producers do not respond to oil price fluctuations caused by oil demand shocks in the short run; all the adjustment works through investment..."

  "AKS in recent work estimated the price elasticity of supply to be zero to the second decimal place...."

- Just because one can write a model where producers do not respond to prices, does not mean that they do not.
- AKS estimates should be taken with a grain of salt.

# AKS estimates of zero supply elasticity are dubious

In column (1), the sum of the coefficients on the current and lagged difference in log(front month price) yields an insignificant elasticity of oil production with respect to front month price of 0.0009 (with a standard error of 0.034). The sum of the coefficients on the current

**Table 1:** First-differenced regressions of Texas production and

| | Δ log(Production) | |
|---|---|---|
| VARIABLES | (1) | (2) |
| Δ log(Front-month price) | 0.083 | 0.094 |
| | (0.036) | (0.036) |
| Lagged Δ log(Front-month price) | -0.083 | -0.075 |
| | (0.036) | (0.037) |
| 2nd lagged Δ log(Front-month price) | | |

AKS estimate of zero is the odd outcome of a 0.083 elasticity in the first month and of a $-0.083$ elasticity in the second. Why should one average them out and not take the first? Not clear to me (was not clear to Baumeister and Hamilton 2020 either)

# 3. Some of our estimates may be flagged by the F-stat police, but are grounded in economic logic.

- Author argues that depending on how frames and specifies the first-stage regression, the F-test for the first stage is 9 instead of 10, thus suggesting a weak instrument problem.
- He then argues that one should pick the elasticity implied by regressions with first-stage F>10.
- Our argument is different: we pick the elasticity that best generalizes the idea behind our preferred approach to estimate the elasticity in the first place.

  If one is comfortable using Kilian-Murphy logic to argue that suggests that the elasticity is 0.026 based on two data points, why not buying the logic that the elasticity is 0.08 based on all available observations, even if the F is 9 instead of 10?

# 4. Review of papers finding large demand elasticities could be better aligned with the supply elasticity part.

- Author: Major advances in estimating price elasticity of gasoline make that a better approach to estimate the oil demand elasticity.

  State-of-the-art approaches yield an oil demand elasticity of $-0.36/2 = -0.18$, after Hamilton's gasoline-to-oil adjustment.

  State-of-the-art approaches have small standard errors: "Knittel and Tanaka report a [demand elasticity of -0.37 and] s.e. of only 0.03."
- KT: "data come from a company that collects on-road fuel consumption through a unique mobile phone application. Drivers can use the app to learn both about their on-road fuel economy relative to that of other drivers driving the same configuration of vehicles and tips to improve driving behavior to save fuel costs."
- I would argue that, if there exists such a thing as an upper bound, the KT elasticity is a good one.

# 5. CCI VARs are correctly specified

- Author argues that his 2012 VAR with Murphy jointly estimates supply and demand elasticities of 0.01 and $-0.26$.

  Setting a prior on the supply elasticity between 0 and 0.03 and finding 0.01 is not surprising to me.

- Author argues that others do not have inventories or do not measure the correct elasticity once inventories are added to the VAR.

  Both claims sound absurd. CCI have a 5-page appendix showing that adding inventories does not change the results. (And we did calculate the correct elasticity, check equation A.6 on page A.8).

- Author criticizes CCI analysis of inventories because "their global market clearing condition equates production with consumption every period, ignoring that oil is storable."

  Of course we ignored inventories in the toy model of Sec.3.1. We were purposely writing an illustrative model!

# My Final Comments

I have written two papers on oil.

As I was writing them, I fell in love with the careful analysis done in Lutz's papers. For instance, Lutz's Restat paper on estimating oil supply shocks is a gem.

This paper is a useful read —with too much inside baseball material, perhaps— and could become a useful survey for new entrants in the oil-macro field.

Too often, I felt that the paper read more like a harsh rebuttal —that I mostly disagree with— against whoever argues that oil supply elasticity is low.