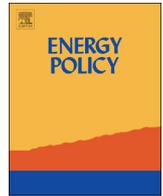




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## The rapid growth of OPEC's domestic oil consumption

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## HIGHLIGHTS

- We analyze rapid growth of OPEC oil consumption (sevenfold since 1971: 5.1% annually).
- Panel co-integration econometric estimate of income elasticity about 1.0.
- Consensus projections (IEA, DOE/EIA) have consistently under projected OPEC consumption.
- Future oil market implications if OPEC consumption grows as fast as income (as in past).

## ARTICLE INFO

## Article history:

Received 24 March 2013

Accepted 6 July 2013

Available online 16 August 2013

## Keywords:

OPEC oil consumption

Income elasticity

IEA DOE/EIA BP projections

## ABSTRACT

OPEC's domestic oil consumption has increased seven-fold in 40 years, to 8.5 million barrels per day (mbd). They consume almost as much oil as China. This constitutes one-fourth of their production. Such rapid growth in consumption (5.1% annually, faster than their income growth of 3.1%) will challenge OPEC's ability to increase their oil exports, which are relied upon in long-term world oil projections by the International Energy Agency (IEA), US Department of Energy (DOE/EIA) and British Petroleum (BP). However, these institutions assume unprecedented slowdowns in OPEC oil consumption – to less than 2% in the future – allowing them to project increases in OPEC oil exports with only modest increases in production. We analyze 1971–2010 data econometrically, with panel co-integration methods. We estimate that the income elasticity of consumption is about 1 for energy and oil. This means that OPEC's energy and oil consumption will grow as rapidly as their income. Hence, continued high growth rates for domestic oil consumption are more likely than the unprecedented slowdowns projected by IEA, DOE/EIA and BP – adding an extra 6 mbd of OPEC consumption in 2030. This will have major implications for OPEC production and export levels, and for world oil prices.

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## 1. Introduction

This paper analyzes the rapid increase in OPEC's domestic oil consumption, from 1.2 in 1971 to 8.5 in 2010, in million barrels per day (mbd). Demand grew an average of 5.1% annually, much faster than the 3.1% rate of income growth. We also analyze the Middle East region, which has substantial overlap with OPEC, in order to analyze projections that are made for this region – but not for OPEC – by IEA, DOE/EIA and others. The countries and groups are as follows:

Total OPEC:

Middle East OPEC: Saudi Arabia, Iran, Iraq, Kuwait, UAE, Qatar;

Other OPEC: Venezuela, Ecuador, Algeria, Libya, Angola, Nigeria.

Middle East:

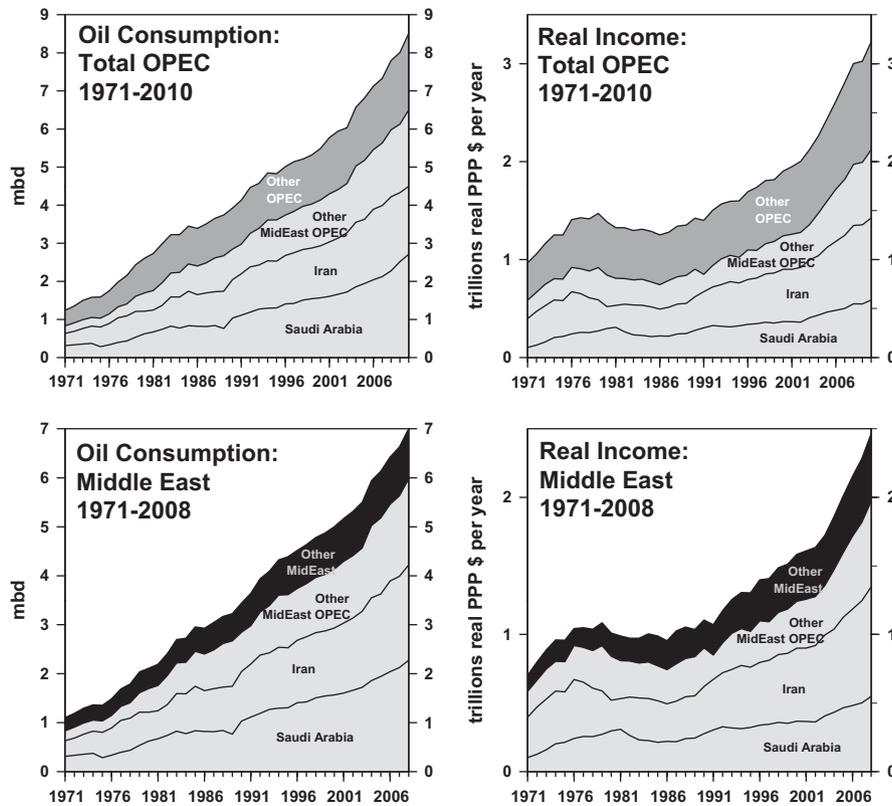
Middle East OPEC: Saudi Arabia, Iran, Iraq, Kuwait, UAE, Qatar;  
Other Middle East (Non-OPEC): Bahrain, Oman, Yemen, Syria, Lebanon, Israel, Jordan.

We analyze the demand for total oil as well as for three groups of oil products: Transport Oil (gasoline, jet fuel, and light fuel oil including diesel oil); Residual Fuel Oil; and Other Oil (LPG, naphtha, and all other oil products). In addition, we analyze the demand for natural gas and for total energy.

The outline of this paper is as follows. Section 2 summarizes the 1971–2010 historical relationship between oil demand and income, as well as for energy and natural gas, for the OPEC countries and the Middle East. We also summarize the oil demand projections to 2030 for the Middle East that are made regularly by IEA, DOE/EIA, and other institutions. Section 3 summarizes the previous literature on oil demand, especially within the Middle

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**Fig.1.** Oil Consumption and Real Income for Total OPEC and for Middle East, 1971–2010.  
Data Sources: See [Appendix A](#).

East. The econometric analysis in [Section 4](#) utilizes panel co-integration methods, for each of the fuels separately. In [Section 5](#) we compare our projections of oil demand with those of IEA and DOE/EIA, and in [Section 6](#) we summarize our conclusions. Data sources are listed in [Appendix A](#).

## 2. Background

Domestic oil consumption within OPEC has grown rapidly in the past four decades and is now about 10% of total world oil consumption. This is almost as large as the share of China. In per-capita terms, OPEC's oil consumption has grown rapidly, and is twice the average of other developing countries; but it is still only one-third the level of the OECD countries. However, if Nigeria were not included with OPEC, then per-capita levels in OPEC would be comparable to those in the OECD (although the OECD uses much more non-oil energy).

[Fig. 1](#) summarizes Total Oil Consumption and Real Income for OPEC and the Middle East. Middle East OPEC comprises about 80% of oil consumption for both OPEC and the Middle East, and more than two-thirds of income. Saudi Arabia plus Iran represent more than half of oil consumption and income, for both OPEC and the Middle East.

[Table 1](#) summarizes the 1971–2010 levels and growth rates for income and the consumption of oil, natural gas, and energy. See [Appendix A](#) for the sources of data and description of all variables that we used. For all these groups of countries, consumption of both energy and natural gas has grown faster than income since 1971. Consumption of oil has grown faster than income for all country groupings except Other Middle East, where it has grown about as fast as income.

However, the IEA, DOE/EIA, and BP all project that Middle East oil consumption – and, by implication, OPEC consumption – in the next two decades will grow only half as fast as income. Moreover, they project that energy and natural gas consumption will also grow more slowly than income; only BP projects natural gas growing as fast as income.<sup>1</sup> OPEC (2010) projects that their own oil consumption will grow 1.7% annually, which is one-third their rate of the past 40 years and less than half their projected rate of income growth.

[Fig. 2](#) graphs Total OPEC's oil consumption and real income, 1971–2010, for total oil and its three component products: transport oil, residual oil, and other oil. Residual Oil (heavy fuel oil) was a significant part of Total Oil consumption in the early 1970s, but its consumption has not increased much since then. It is used primarily in electricity generation, and it can be replaced by natural gas in some OPEC countries. In contrast, Transport Oil (gasoline, jet fuel, and light fuel oil including diesel oil) has grown faster than income for forty years, as has Other Oil (LPG, naphtha, and all other oil products). The axes in [Fig. 2](#) are logarithmic; the diagonal lines indicate equi-proportional growth of oil consumption and income. Movement parallel to these lines indicates that oil consumption is growing as rapidly as income (income elasticity=1); steeper/less steep movement indicates income elasticity greater than/less than 1. In the upper-left graph of [Fig. 2](#), we see the following changes in Total Oil demand:

- 1971–75: Total Oil grows as fast as income;
- 1975–86: Total Oil increases despite stagnant or declining income;
- 1986–2010: Total Oil grows as fast as income.

<sup>1</sup> Exxon-Mobil (2010) projects that Middle East energy demand will grow only 2% annually to 2030. This is *much* slower than the 5.8% annual growth of the past 40 years.

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