

# Changing Oil Market Fundamentals and the Implications for OPEC Strategy

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# Overview

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# Background

Since 1980s, conventional wisdom held **“easy oil”** would be exhausted first and the world would become **increasingly reliant on OPEC oil**.

In this scenario:

- OPEC reserves become increasingly valuable
- OPEC benefits from strategically deferring production

Recent events and developments in oil market have led to a departure from the expected scenario.

Shale Boom: Recoverable production in non-OPEC regions is not as scarce as previously believed.

# Oil Industry: Conventional Wisdom

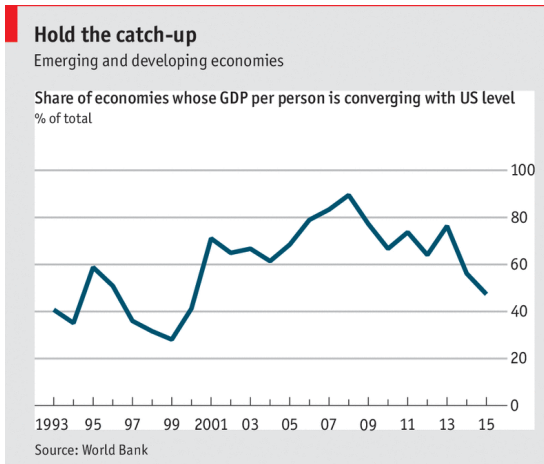
- Crude oil demand growth starting to be questioned
  - Climate Initiatives
    - Paris Climate Agreement
    - Keep it in the Ground
  - Weakening Economic Growth
    - “Risks to the global outlook remain tilted to the downside.” IMF, Jan 2016
    - “Developing economies are catching up ever more slowly.” - Economist, Jun 2016.
  - Advances in efficiency upcoming
    - improvement in fuel economy standards
    - improved logistics

# Methodology: Part One

First, evaluate sensitivity of oil projection to alternative assumptions

- International Energy Agency's Mobility Model (MoMo)
- Some underlying assumption may overstate future oil consumption
- Consider alternative demand-reducing scenarios
- Evaluate variability in projected oil consumption

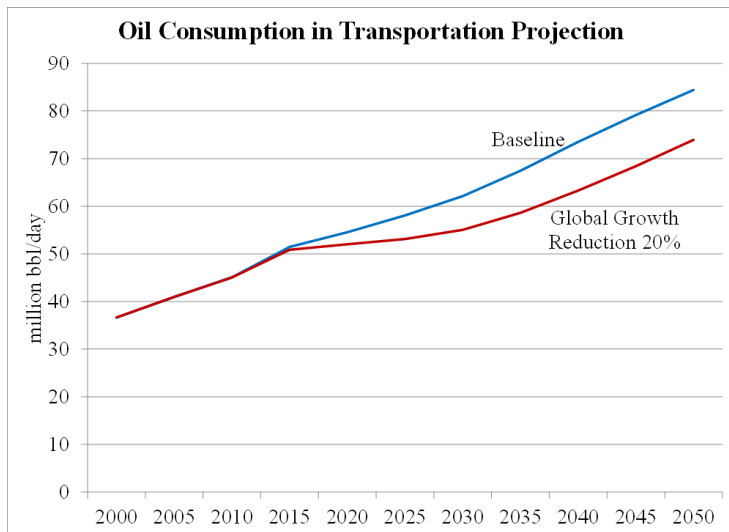
# What events could peak demand?



Economist.com

Source: Economist.com, June 14, 2016

# What events could peak demand?

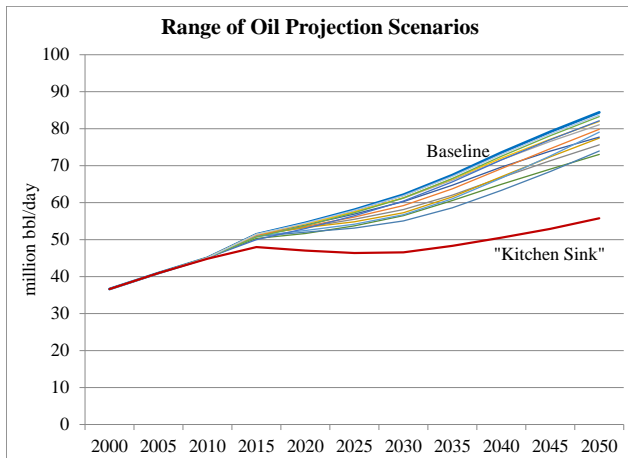


# Projections by scenario

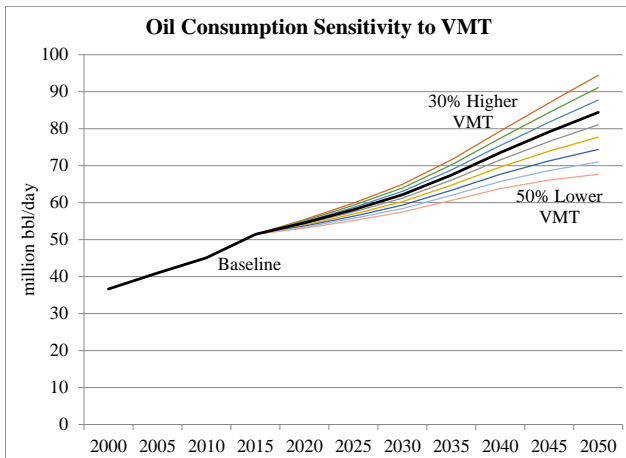
Projected Oil Consumption (million bbl/day)	
Scenario	% Reduction Relative to Baseline 2050
Baseline	
25% Reduced Vehicle Saturation	13.48%
Global Growth Reduction 20%	12.38%
No China-India Growth	10.38%
20% Freight Improvement	8.23%
20% Lower VMT	7.93%
Global Growth Reduction 10%	6.34%
No China Growth	5.41%
10% Lower VMT	3.96%
10% Freight Improvement	2.91%
20% Air Efficiency Improvement	2.70%
10% Air Efficiency Improvement	1.35%
Shipping Efficiency Improvement	0.85%
<b>All Above</b>	<b>33.91%</b>



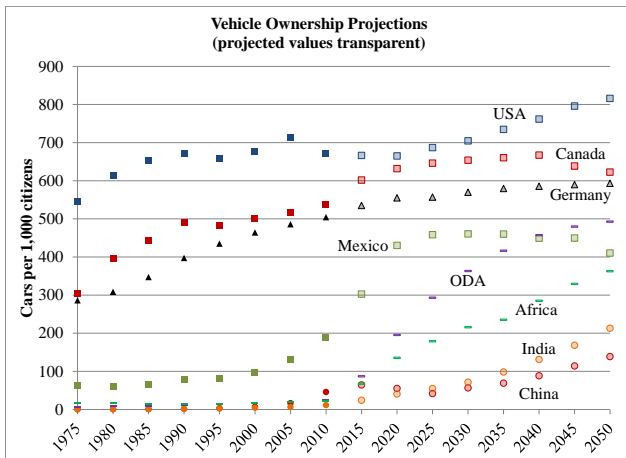
# Oil projections: single scenario and combination



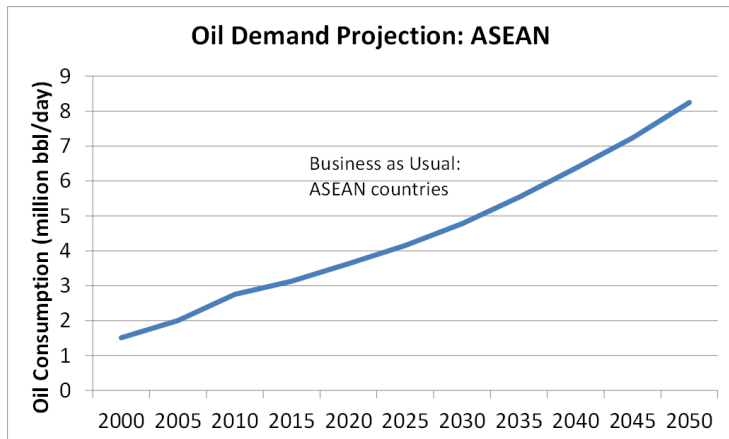
# Oil projections: sensitivity to VMT assumptions



# Large variation in car ownership rates



# ASEAN and developing nations large source of growth



## Methodology: Part Two

Second, results of our oil projections inform a model of OPEC strategy

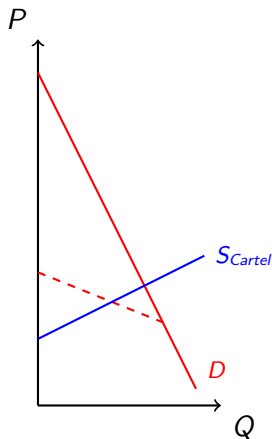
- Solve for optimal OPEC production path in the face of a perfectly competitive fringe
- Adjust parameters to allow for **negative oil demand growth**

# Implications for OPEC

Start with a model Cartel-Fringe (Salant 1976)

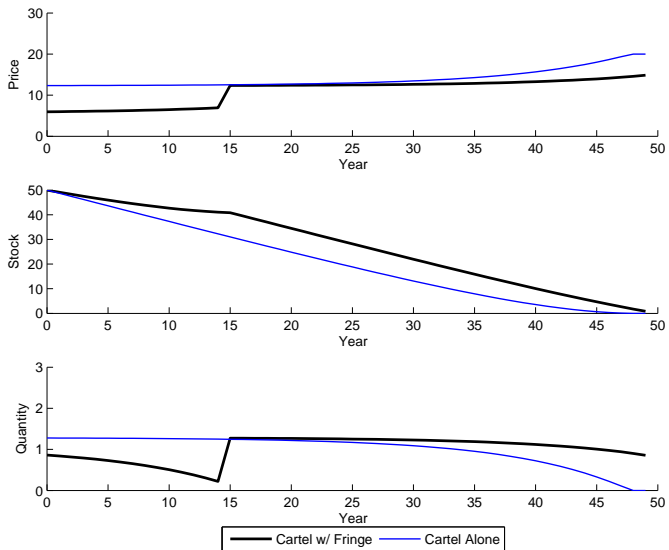
- **OPEC** operating as a perfectly **cohesive cartel**
- A **perfectly competitive fringe** of **non-OPEC** producers
- OPEC reserves  $>$  fringe reserves
- OPEC marginal costs  $<$  fringe marginal costs

# Static model: OPEC vs Fringe



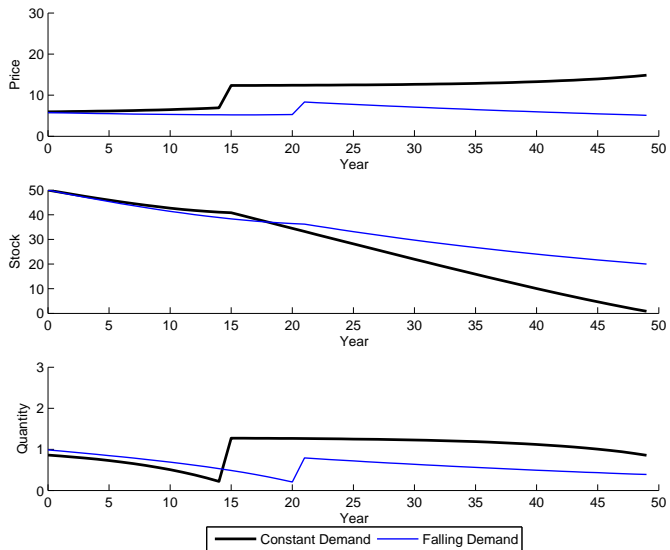
- Cartel faces residual demand curve (dashed) while fringe is active
- Cartel faces entire demand curve (solid) while fringe is absent

# Dynamic Optimization: OPEC vs Fringe





# Dynamic Optimization: Declining consumption outlook



# Conclusion

- Great uncertainty
- Commonly available projections could be overestimating
- Perception of consumption outlook materially affects production today

# Future Work

- How will policy interventions (*i.e.* Paris Agreement) affect our projection
- Extend dynamic model OPEC extraction: How can a decreasing demand outlook impact exploration and investment?

# The End

# Dynamic Optimization: Increased Fringe reserves

