



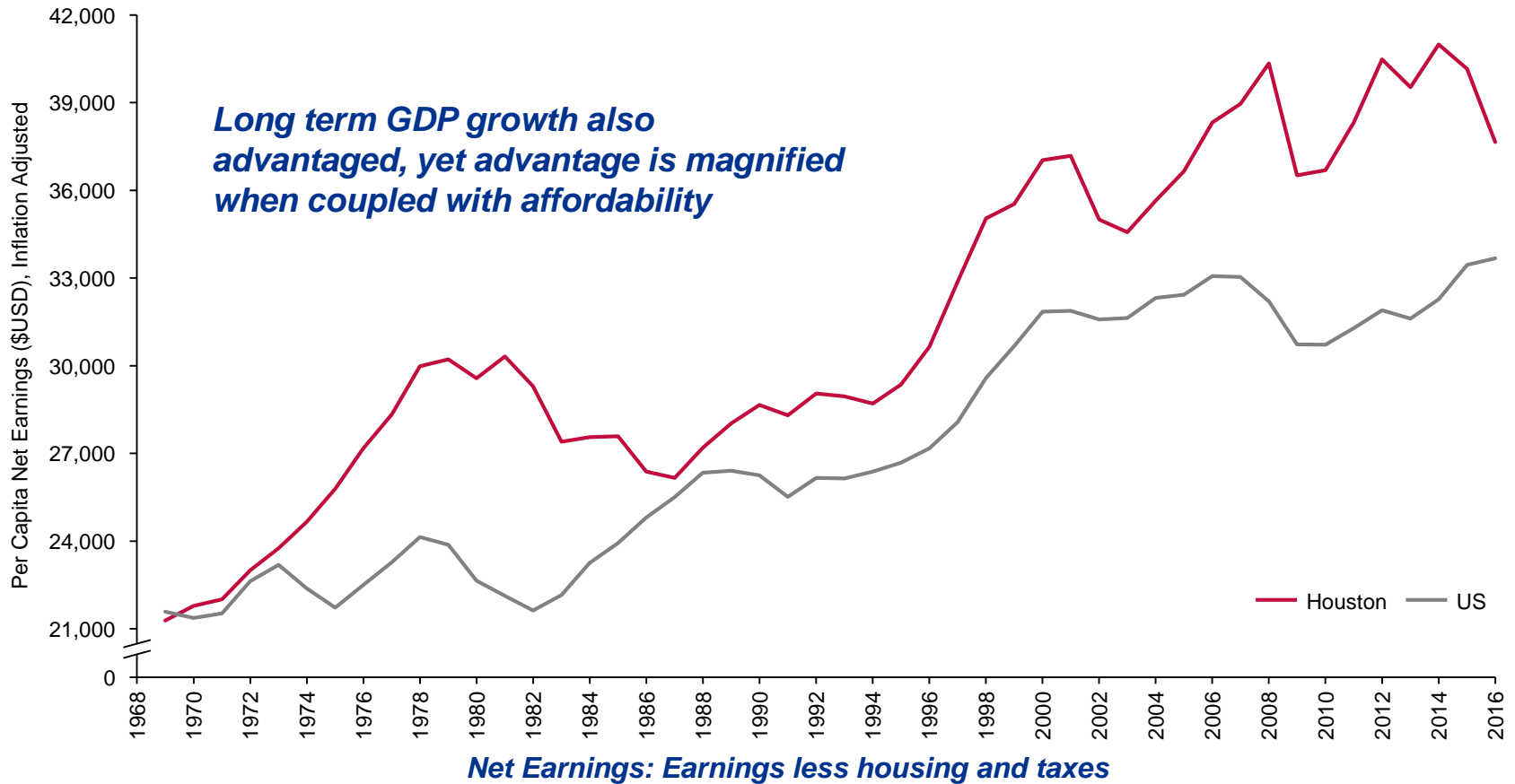
Center for Houston's Future

3/22/2018



Houston MSA has held a long standing economic advantage (especially in terms of discretionary income growth), though recently we've slipped

Houston MSA and US per capita net earnings



Note(s): Per Capita Net Earnings adjusted using US Bureau of Labor Statistics Inflation Calculator
Source(s): US Bureau of Economic Analysis

Houston MSA's relative economic success has been proven to link back to three key catalysts

Houston MSA Growth Catalysts

US Economic Growth
(35%)

Upstream Oil & Gas Industry Growth
(35%)

Infrastructure & Pro-growth Enablers
(30%)

- Primary generator of high multiplier jobs
- Low housing cost, pro growth
- Immigration across socio economic groups

Dr. Gilmer & the Institute for Regional Forecasting Model

- Provides Houston an independent center of economic and forecasting expertise, conducting bi-annual symposia on Houston's economy since 1984
- Led by Dr. Gilmer, previous VP/senior economist at the Federal Reserve Bank of Dallas
- Work on Texas' economy has been recognized in the Wall Street Journal, The Economist, and Forbes

Model architecture

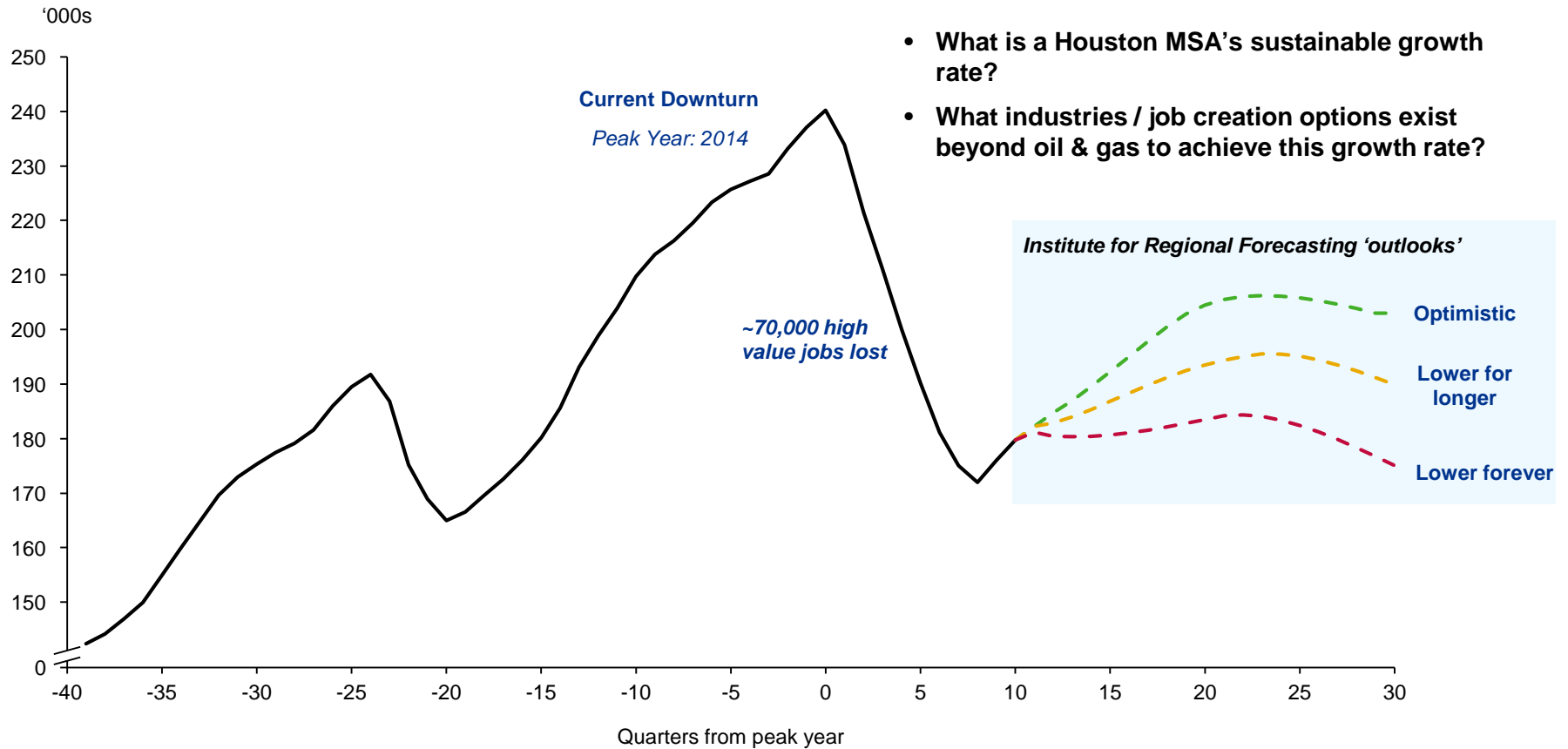
- Isolates US economy vs. Houston specific economic drivers
- Model back-tested over 1996 – 2016 period to ensure validity

Note: In addition to the above factors, foreign trade has been key to Houston's long-term growth. Furthermore, the recent petrochemical boom has helped bolster Houston's economy over the past several years

Source(s): Dr. Bill Gilmer from the U of H Institute for Regional Forecasting

Though differences in views exist, relying primarily on an O&G upcycle to drive high quality job growth appears increasingly problematic

Houston MSA oil and gas related jobs versus peak quarter

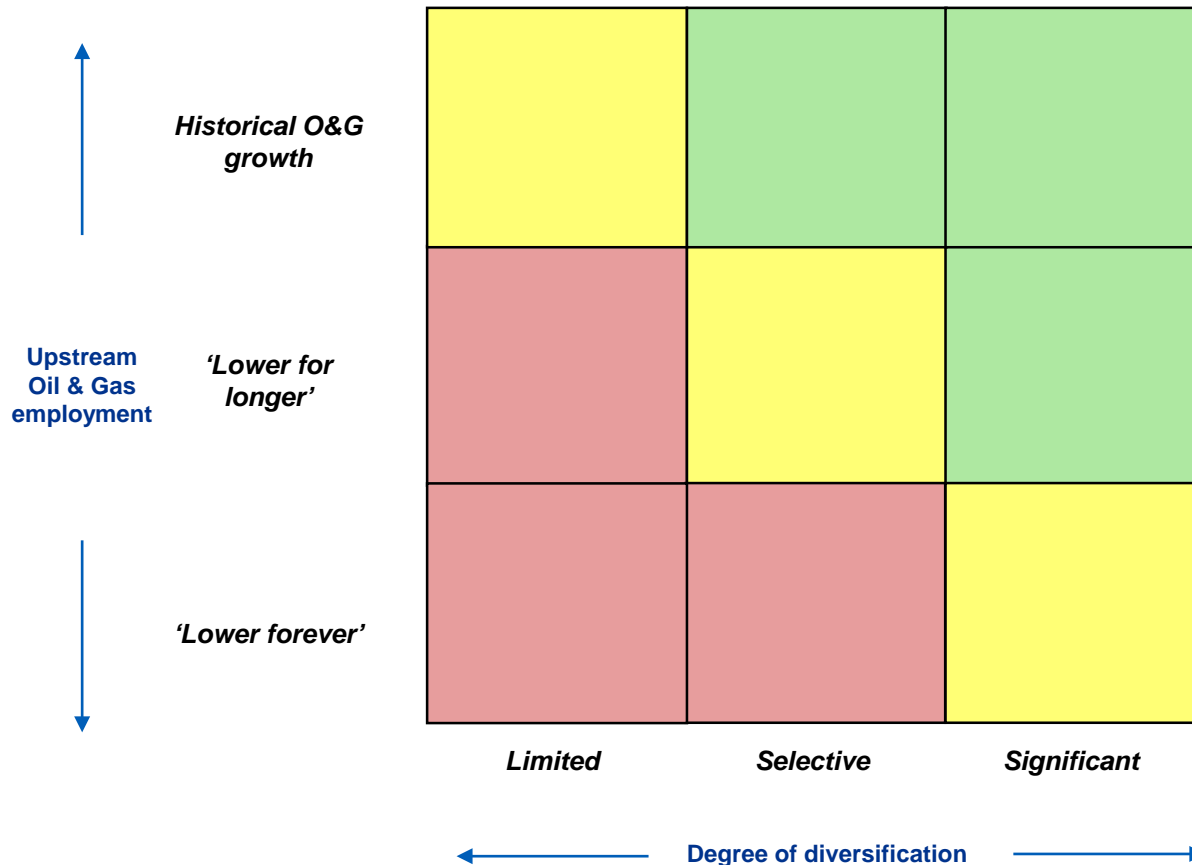


- What is a Houston MSA's sustainable growth rate?
- What industries / job creation options exist beyond oil & gas to achieve this growth rate?

Note(s): Jobs consist of oil production, oil services, machinery, and fabricated metals – change from SIC to NAICS coding results in classification change
 Source(s): US Bureau of Labor Statistics; The Institute for Regional Forecasting

Job growth modeling

Modeling was conducted to answer the key question: to what extent does Houston need to diversify to maintain an outperforming economy?



Modeling Approach





- Used IMPLAN economic development model
- Selected key sectors for job diversification through a multi-screening process
- Set target of outperforming peer city average annual growth rate **(2.1%)^(a)**
- Modeled extent of diversification beyond oil and gas required

Note: (a) Average employment CAGR from 1990 – 2016 of key peer cities outperforming US employment growth: Austin, Atlanta, Dallas, Denver, Oklahoma City, Phoenix
 Source(s): Bureau of Economic Analysis, Bureau of Labor Statistics

Sectors for diversification were selected based on connectedness to Houston, economic value add, and growth potential





Selective Diversification

Existing presence

	<p>Healthcare manufacturing 5 year CAGR: 7.1% 2017 jobs: 2,631</p>
	<p>Healthcare R&D^(a) 3 year CAGR: 1.7% 2017 jobs: 27,407</p>
	<p>Plastics manufacturing 5 year CAGR: 1.3% 2017 jobs: 6,525</p>
	<p>Chemical manufacturing 5 year CAGR: 1.7% 2017 jobs: 14,428</p>

Significant Diversification

Existing capabilities and/or high applicability

	<p>Data Science & Programming 5 year CAGR: 2.9% 2017 jobs: 30,885</p>
	<p>Computer systems & engineering 5 year CAGR: 2.8% 2017 jobs: 37,813</p>
	<p>Power transmission^(a) 5 year CAGR: 2.0% 2017 jobs: 9,539</p>
	<p>Utility scale renewables 5 year CAGR: 3.2% 2017 jobs: 706</p>

Note: (a) CAGR from 2013 – 2016 due to availability of data
 Source(s): US Bureau of Labor Statistics, IMPLAN

Overall, significant job diversification will be required to maintain outperformance in the event of low to modest oil and gas expansion

Back to the future

A 1980's or 2014 rebound in the oil and gas cycle in theory could return Houston MSA to outperforming growth rates, however there is decreasing likelihood of this occurring

High risk

If an oil and gas rebound does not occur and Houston MSA does not diversify, economic performance will lag the general economy and peer cities

Keeping up

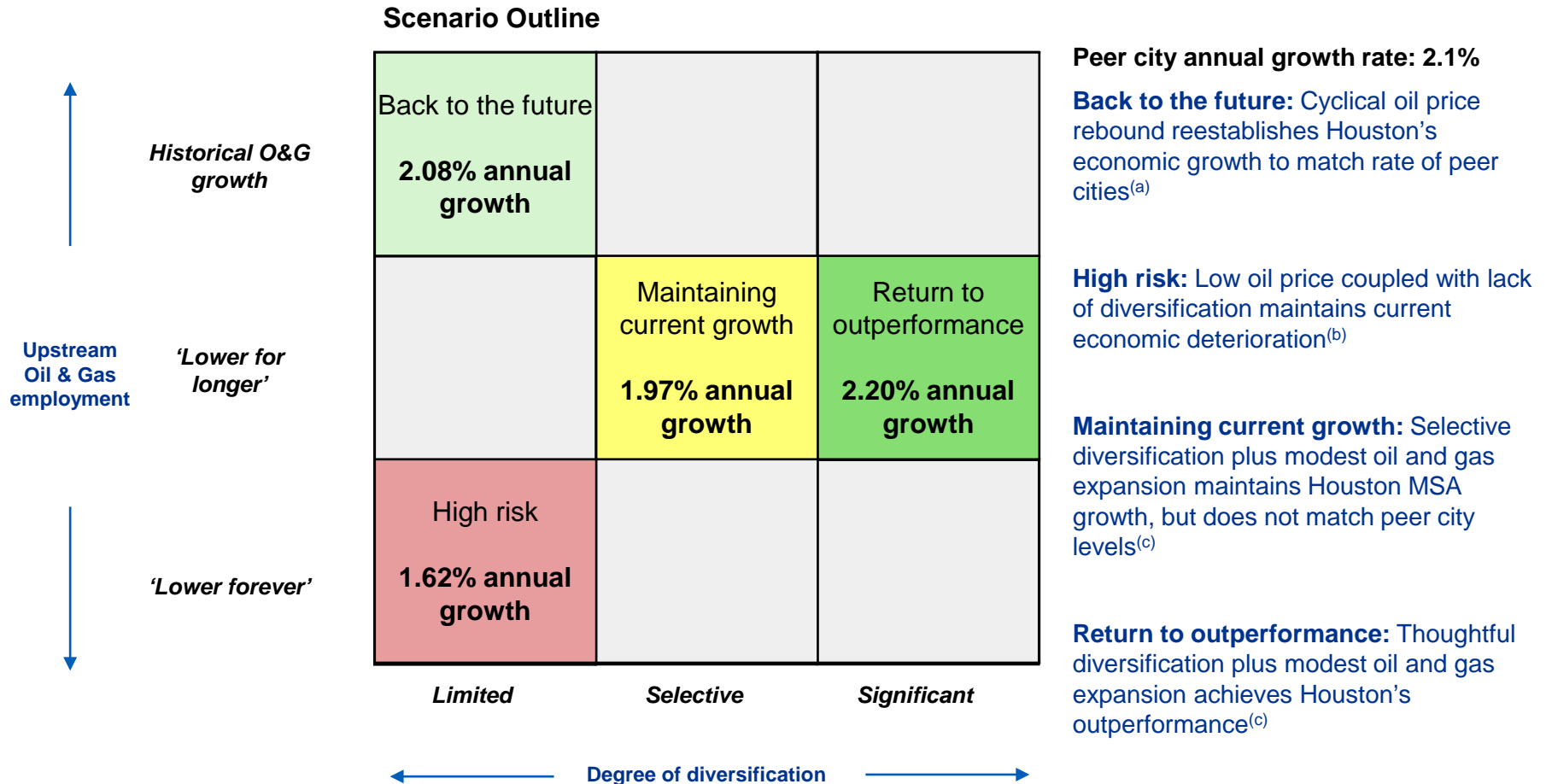
Even in a modest oil and gas sector recovery scenario, Houston MSA will require at least selective diversification in order to sustain the current level of economic growth

Return to outperformance

Lacking high oil and gas cyclical upside, more significant business diversification will be required to return to economic outperformance as witnessed through 2014

Job growth modeling

The scenario modeling considers a combination of oil & gas sector employment growth and diversification across selected sectors



Note: (a) Employment CAGRs are based on Houston MSA historical data from 1990 – 2014. O&G sector employment CAGR is 2.77%, All other Houston MSA employment CAGR is 2.03%; (b) High risk scenario includes 2.03% CAGR across non O&G employment - no incremental growth across chosen diversification sectors and no growth in the O&G sector is included; (c) Incremental growth across each chosen diversification sector is determined by analyzing how much faster the sector is currently growing over the overall employment CAGR of 2.03%. 'Lower for longer' O&G sector growth is approximately 1.3% (matches 1990 – 2014 CAGR). 'Significant' diversification includes sectors from the 'selective' category. Source(s): US Bureau of Labor Statistics, IMPLAN