

Houston's Next Boom: Exporting Innovation



GHP

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HSBC 



Houston



The Port of Houston is the foundation for the city's position as a premier global trade hub. Ranked first in U.S. export tonnage – with more than 200 million tons of cargo passing through each year – the Port of Houston is responsible for linking the region to more than 1,000 ports around the world.
Source: Port of Houston Authority

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About the Greater Houston Partnership

Greater Houston Partnership works to make Houston one of the world's best places to live, work and build a business. It represents 10 counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, San Jacinto and Waller. With more than 2,000 member organizations, GHP represents approximately one-fifth of the region's workforce.

About Made For Trade

HSBC Made For Trade is a national conversation with leaders in business, government, industry and academia about the role of global trade in today's economy. This national tour looks at the contribution of international flow of goods, services and capital to the U.S. economy, and the opportunities for American businesses brought about by global trade. HSBC Made For Trade stops in four U.S. cities whose economies have been shaped by global trade, and concludes in Washington, DC, where voices from around the country are brought together with national officials and thought leaders to discuss the policies to further promote the international flow of goods, services and capital.

*Oliver Wyman Global Transaction Banking survey 2012

Contents

Executive Summary	3
Introduction	4
The Coming Booms	4
The First Boom:	
Technological Innovation Is Driving Future Growth	4
Greater Opportunity Lies In LNG And Chemical Exports	5
Innovations In Horizontal Drilling And Hydraulic Fracturing Are Driving Exports	6
The Second Boom:	
Mexico's Policy Change, Houston's Opportunity	7
Mexico's Production Challenge	7
The Rules Of The Game Are Changing	8
Houston's Economic Opportunity	9
What's The Increase In Export Activity Worth To Houston?	9
More Trade And Investment Means 50,000+ New Jobs	9
The Impact Of Trade On Houston's Globally Integrated Economy Today	10
Shifting Trade Patterns	12
FDI Has Supported 19,000 Houstonian Jobs	12
The Bottom Line	13
Appendix	14
References	14-15

EXECUTIVE SUMMARY

Home to one of the most active ports in the United States, Houston's economy was built on trade. In fact, it is sometimes said that Houston is a town that built a port that built a city. Through quantifying the impact of trade and innovation in the chemical and energy sector, on Houston's economy, as well as examining recent trends that are shaping Houston today, it is clear that Houston is poised for another boom propelled by an increase in exports.

Fed by the massive investment in chemical plants and liquid natural gas (LNG) export terminals underway on the Texas Gulf Coast, Houston's engineering, construction, and fabrication firms are already riding a second boom as they design and build those plants. Behind this boom are innovations in exploration, specifically directional drilling and hydraulic fracturing. Another factor to consider in Houston's growth will take place as Mexico opens its doors to foreign investment and foreign operators for the first time in 75 years. Local firms that supply the chemical and energy industries will also see their businesses grow, as their clients demand more of everything they need to expand overseas operations.

- **The combined impact of the massive investment in chemical plants and liquid natural gas export terminals underway on the Texas Gulf Coast and the opening of Mexico's oil production to Houston businesses could add more than 55,000 jobs to the region's economy, even with only a 15 percent increase in exports.** If that proves to be the case, then the export expansion about to occur is worth at least ten months of job growth to the region's economy.
 - **Houston led the nation in exports in 2012, overtaking New York and ranking well ahead of Los Angeles, Detroit, and Seattle.** Overall, Houston's exports have grown from \$41.7 billion in 2005 to \$110.3 billion in 2012, an increase of more than 164 percent.
 - **While the expansion of the Panama Canal is often touted as a "game changer" for container traffic, exports of liquid natural gas and petrochemicals are more likely to drive export growth in the near future.** Driving this growth are innovations in horizontal drilling and hydraulic fracturing that will lead to increased natural gas exports out of Houston.
 - **Since 1986, the number of businesses in Houston engaging in international trade has grown from 1,963 to more than 3,250.** In total, Houston businesses are trading with over 200 countries around the world.
 - **The opening of Mexico's oil and gas industry to foreign investment will allow Houston to export two innovations pioneered here – deepwater drilling and hydraulic fracturing.** Many already attribute Houston's survival in the 1990s and quick economic recovery from the Great Recession to these innovations, but the opening up of Mexico to foreign investment will likely further spur investment and jobs.
 - **Trading patterns for Houston have shifted since 2008 and Latin America is now Houston's largest trading partner.** Driving this change are policy and demographic changes that have better enabled Houston businesses to conduct business with Mexico.
 - **Over the past ten years, 19,000 jobs have been supported by Foreign Direct Investment (FDI) totaling \$7.4 billion.** Most FDI comes from the UK and Europe; however, almost 20 percent comes from Asia, Africa, and South America.
- Houston is an international hub for companies and investors, alike. Innovation, new technologies, and advances in a diverse set of fields make Houston a town with more than energy. The areas of medical innovations, manufacturing growth, and infrastructure investment are other booming sectors. Overall, Houston boasts the busiest U.S. port in foreign tonnage, the fourth busiest customs district, the eighth busiest international airport, the fifth best city for global investment, and the third largest consular corps.
- As Houston continues to pioneer innovations in fields as diverse as medicine, energy, chemicals, and manufacturing, trade and investment will become only more central to its economy. Trade was at the center of the city's development, and recent trends suggest it will be at the center of Houston's future as well.

Houston's Next Boom: Exporting Innovation

By Patrick Jankowski, Vice President, Research, Greater Houston Partnership

INTRODUCTION

Since Houston's founding, global trade and investment have driven growth and shaped the region's economy. In fact, Houston received a jump-start through foreign investment.

In August 1836, John and August Allen, investors from New York, bought 6,642 acres of land along Buffalo Bayou in the newly independent republic of Texas. The Allens touted Houston as a "global city" and promoted Houston in the Telegraph and Texas Register as "located at a point on the river that must ever command the trade of the largest and richest portion of Texas." To substantiate the Allen's claims, in January 1837, the brothers arranged for the Laura to sail up Buffalo Bayou and dock at Houston. Ships have called on the city ever since.

Today, Houston boasts the:

- Busiest U.S. port in foreign tonnage,
- Third largest consular corps,
- Fourth busiest customs district,
- Eighth busiest international airport, and
- The fifth best city for global investment.

Houston stands on the cusp of export booms, driven by technological innovations and policy shifts that will further connect Houston to the rest of the world, growing businesses and adding jobs.

THE COMING BOOMS

Houston is on the cusp of two booms. The first boom will be fed by the massive investment in chemical plants and liquid natural gas export terminals underway on the Texas Gulf Coast. Houston's

Exports and Imports Combined - \$ billions	
Country	Value - \$B
Mexico	\$28.357
Venezuela	15.167
Brazil	13.892
Saudi Arabia	13.712
China	13.491
Colombia	11.874
Netherlands	9.627
Germany	8.870
Russia	8.285
Republic of Korea	6.314

Source: WISER

engineering, construction, and fabrication firms are already riding that boom as they design and build those plants. Behind this boom are innovations in exploration, specifically directional drilling and hydraulic fracturing.

A second boom will take place as Mexico opens its doors to foreign investment and foreign operators for the first time in 75 years. Several officials from the Mexican government have already visited Houston to explain the proposed regulations and procedures under which foreign firms will operate. Billions will be spent to reverse Mexico's production decline, and much of that money will be spent in Houston. Local firms that supply the chemical and energy industries will see their business grow as well, as their clients demand more of everything they need to expand their overseas operations. Simply put, Houston, the energy capital of the world, will prosper from Mexico's new open door policy.

This section will analyze the technological and political dynamics that are driving these booms.

THE FIRST BOOM:

Technological Innovation Is Driving Future Growth

While innovations, particularly in natural gas, horizontal drilling, and hydraulic fracturing, are spurring investments that are likely to lead to more trade and thus more growth, any analysis of Houston's foreign trade has to begin with the Port of Houston. The Port handles more foreign tonnage than any other U.S. port - more than 7,000 ships each year sail up the Houston Ship Channel to unload or take on cargo. And, the channel links the region to more than 1,000 other ports around the world, with the Panama Canal being the most important.

The Panama Canal and the Houston Ship Channel both opened in 1914. Each now plays a role in the other's future. The Panama Canal expansion, scheduled for completion in December 2015, will provide for a third lane of traffic and additional locks on the Pacific and Atlantic sides of the canal. The \$5.3 billion project is expected to double the volume of cargo passing through the Panama Canal by 2025. (Panama FAQ) A portion of increased Panama Canal traffic will flow to Houston. How much additional traffic there will be remains uncertain - no definitive study has been completed on the impact of expansion on Houston. The media often cites the expansion as a "game changer" for the region, but that tends to overstate the benefit, as the new expansion benefits may lie in exports departing out of Houston.

The Port of Houston handled 920,000 Twenty-foot Equivalent Units (TEUs) in 2013, one-third of all the containerized cargo in the U.S. Gulf of Mexico. Container exports to Asia (not inclusive of India or the Middle East) topped 90,000 TEU's

Global LNG Market

Exporters	Importers
Algeria	Argentina
Angola	Brazil
Australia	Chile
Brunei	China
Egypt	France
Equi. Guinea	India
Indonesia	Italy
Malaysia	Japan
Nigeria	Kuwait
Norway	Malaysia
Oman	Mexico
Peru	South Korea
Qatar	Spain
Russia	Taiwan
Trinidad	Turkey
UAE	U.K.
Yemen	U.S.

Source: World LNG Report - 2014 Edition

in 2013 or less than 9.8 percent of the total. Imports from Asia totaled 175,000 TEUs or 26.7 percent of the total. (PHA) These are the cargos most likely to transit the Panama Canal. Even if Asia-Houston container traffic grew by 50 percent, which is unlikely, the Port's overall TEU volume would grow by less than 10 percent. Furthermore, Houston will have to compete with other ports—notably Savannah, GA, Norfolk, VA, Charleston, SC, and Miami, FL—for any increased traffic through the canal. The expansion will boost Houston's container traffic, but not to the extent everyone hopes.

Greater Opportunity Lies In LNG And Chemical Exports

Greater potential may lie in the export of liquefied natural gas from Houston through the Panama Canal for the following reasons:

- The Asia-Pacific region accounted for 61 percent of all LNG imports in 2013. Japan is the largest market, followed by South Korea and Taiwan. (Ferrier)
- The price of LNG in Japan topped \$16 per one million British thermal units

Addressing Potential Regulatory Risks

The outlook for LNG, chemical and oil field equipment exports remains strong; however, downside risks do remain as coalitions have formed to try and halt the practice of hydraulic fracturing and a few local governments have already enacted laws to ban the practice.

At the request of the U.S. Congress, the Environmental Protection Agency is “conducting a study to better understand any potential impacts of fracturing on drinking water.” (EPA) If the study leads to barriers and overly stringent regulation, drilling and newly released gas supplies could be reduced. The industry is also constrained by insufficient natural gas pipeline capacity. Without substantial investment, gas supplies will remain stranded in the field, as we are seeing in Pennsylvania, which had 1,300 gas wells that had been drilled but not completed at the end of February due to lack of pipelines. (OGJ Editors)

Other nations may boost their LNG exports to keep the U.S. out of the world market, or U.S. gas prices may rise reducing the price competitiveness of U.S. chemical and LNG exports. Opportunities to export energy equipment and expertise to Mexico will depend on the regulations and incentives that are ever evolving.

(mmBtu) in 2013, more than four times the average Henry Hub natural gas spot price of \$3.73. (Ferrier, STEO) Even with the costs associated with converting gas to LNG and shipping it to overseas markets, **the U.S. has a price advantage.**

- Global demand for natural gas continues to grow and now accounts for one-fourth of global energy consumption. LNG is the fastest growing source of supply, now meeting 10 percent of global gas demand. (Ferrier)
- The Department of Energy expects the U.S. to become a net LNG exporter by 2020. The Potential Gas Committee (PGC) estimates that at the end of 2012, the U.S. had ultimate recoverable reserves of more than 3,914 trillion cubic feet of natural gas: double PGC's reserve estimate back in 1988.
- The Texas Gulf Coast already has a well-connected pipeline network, an abundant supply of natural gas, numerous deep-water ports, and supportive local governments and communities of the energy industry.

LNG is produced by taking natural gas from a production field, removing

impurities such as carbon dioxide, sulfur, mercury, and water, and then liquefying the gas. In the liquefaction process, the gas is cooled to -260 degrees F. Cooling the natural gas reduces it to 1/600th its original volume: the equivalent to taking the air from a beach ball and squeezing it into a ping pong ball. The LNG is either stored in containment vessels or loaded onto double-hulled ships for export. The double hull is necessary for safety and insulation purposes. Once the ship arrives in port, the LNG is off-loaded into insulated storage tanks. Regasification converts the LNG back into its gaseous form, which then enters the pipeline distribution system of the importing country or industrial user. (OFE 2014)

As of March 2014, thirty-seven applications had been filed with the Federal Energy Regulatory Commission (FERC) for licenses to export a total of 38.5 billion cubic feet per day of liquefied natural gas. Only a handful have been approved so far: among them Cheniere's Sabine Pass liquefaction project in Cameron Parish, Louisiana and Freeport LNG's Quintana Island export terminal in Brazoria County, Texas. Both are existing

LNG import terminals that are being upgraded to allow for exports as well. Each will export up to 2.0 billion cubic feet per day. (Bcf/d)

Not all the remaining applications will be approved, nor will all approved terminals be built, as the cost of construction is substantial. Cheniere is able to construct its Sabine Pass facility for \$7.8 billion because much of the required infrastructure is already in place to support its import operations. Even though Freeport LNG has an import facility on Quintana Island, it still expects to invest \$14.0 billion over a five-year design and construction period for its export facility.

Innovations In Horizontal Drilling And Hydraulic Fracturing Are Driving Exports

The expansion of the Panama Canal may be an even greater benefit to the region's chemical plants and refineries. Houston exported \$50.9 billion in fuel products, \$16.8 billion in chemicals, and \$7.5 billion in plastics – respectively one-third, one-sixth, and one-eighth of total U.S. exports for these commodities in 2013. (Wiser) Those shipments will increase substantially with the current wave of refinery and chemical plant expansions. More than \$1 billion is being invested in refinery expansions and \$40 billion in chemical plant expansions and new construction along the Texas Gulf Coast. (Olsen) The announcements read like a “who’s who” in the industry: Celanese, Chevron Phillips, Dow Chemical, Enterprise Products, ExxonMobil Chemical, Idemitsu/Mitsui, INEOS, Kaneka North America, Kuraray America, LyondellBasell, Mitsubishi Chemical, Noltex, and TPC Group have announced construction plans for Houston. Virtually all of their increased output is destined for global markets.

These exports are being driven by one thing—the abundance of crude oil and natural gas produced from shale

Houston Chemical Industry Snapshot

400+ chemical plants
38.6% U.S. base chemical capacity
36,000 local employees
\$3.8 billion in wages annually

formations in the Eagle Ford and Permian Basin in Texas and the Bakken in North Dakota. The U.S. would not enjoy that abundance if not for two innovations—horizontal drilling and hydraulic fracturing.

Horizontal drilling allows producers to drill vertically several thousand feet and then turn 90 degrees and drill horizontally, expanding the amount of shale exposed for extraction, which significantly boosts productivity. A typical well might drill one to two miles beneath the surface and then laterally 2,000 to 9,000 feet. Hydraulic fracturing, also known as “fracking,” involves injecting water, sand, and chemicals into shale formations under extremely high pressure to fracture the rock deep underground. As the water is pumped out and the sand stays behind to hold the cracks open and allow oil or natural gas to flow to the wellhead. The process has tapped an almost unfathomable supply of natural gas. The American Chemistry Council estimates that U.S. natural gas resources at current rates of consumption are large enough to meet over 115 years of demand. (Swift)

American chemical companies use ethane, a natural gas liquid derived from shale gas, as a feedstock in numerous applications. The relatively low price gives U.S. manufacturers an advantage over many competitors around the world that rely on naphtha, a more expensive, oil based feedstock. The production cost to manufacture ethylene in the United States is 35 percent of that in Western Europe, hence the current boom in chemical plant construction. If all 24 expansion and new-build projects identified by Tudor, Holt, and Pickering are completed, U.S. ethylene production will jump by more than 27.6

million pounds per year, an increase in U.S. capacity of 47.3 percent. (Olsen) Renewed competitiveness is not limited to ethylene but encompasses a broad variety of downstream products (plastic resins, synthetic rubber, etc.) and other chemical products, all key exports from the Houston region.

The regional economic impact of the chemical construction alone will be significant, with Gulf Coast crews earning from \$25 an hour for experienced personnel to \$40 an hour for the 10 percent of the workforce with specialized skills. Machining and fabrication of pipes, fittings, valves, and other specialty components for these facilities could provide more work for U.S. firms. Moreover, these new and revamped facilities will require highly skilled personnel to monitor and maintain plant systems. (Thompson)

In addition to traditional energy, Houston has the potential to export a variety of alternative energy technologies. For example, the National Biodiesel Board has identified ten biodiesel plants in the Houston area, and they account for 17.8 percent of the nation's biodiesel capacity. (NBD) Based in Houston, EDP Renewables develops, constructs, and operates wind farms throughout the nation, and Shell Wind has eight wind projects across the country. (EDP and Shell)

While hydraulic fracturing is a large part of the Houston and Texas economy, alternative energy sources also have their place in the energy market. Texas recently set records for electricity generated through wind generation, and approximately 30 companies in Houston are pursuing wind power opportunities. (ERCOT) The U.S. Department of Energy (DOE) named the City of Houston as one of 25 “Solar America” Cities, with approximately two-dozen Houston companies working in the solar energy field.

THE SECOND BOOM:

Mexico's Policy Change, Houston's Opportunity

Perhaps the greatest opportunity for export growth is south of the Rio Grande. Mexico is one of the ten largest oil producers in the world, the third-largest in the Western Hemisphere, and an important partner in U.S. energy trade. (CAB-Mexico) The country, however, has suffered severe production declines in recent years, a problem that has been exacerbated because the country's oil fields have been closed to foreign operators and investment for over 75 years.

However, the rules of the game are changing; this will provide new growth opportunities for Houston businesses engaged in deepwater drilling and hydraulic fracturing.

Mexico's Production Challenge

While the U.S. and Canada are experiencing production booms, Mexico's oil output has declined for nearly a decade. Production of crude peaked at 3.3 million barrels per day (MBD) in 2005, declining to 2.5 MBD in 2012. By comparison, the U.S. Energy Information Administration forecasts U.S. crude production to increase from an estimated 7.4 MBD in 2013 to 8.4 MBD in 2014 and 9.1 MBD in 2015. (STEO) Typical of Mexico's production decline is the Cantarell Field, once considered to be the world's most prolific field. Cantarell peaked with 2.0 MBD in 2005 but produced only 454.1 thousand barrels per day in 2012. (Morales)

Likewise, Mexico's production of natural gas peaked at 7.0 trillion cubic feet (TCF) in 2009 and slipped to 6.4 TCF in 2012. (Morales) By comparison, EIA's Annual Energy Outlook 2014 projects the United States will be a net exporter of natural gas beginning in 2018. (STEO)

There are many reasons for Mexico's production declines, but they can all be summarized in three buckets—lack of technology, lack of financing, and lack of human capital. PEMEX currently lacks the technology and finances to develop potential deepwater projects in the Gulf of Mexico or shale oil deposits in the north. (CAB-Mexico). But foreign energy firms have the technology, which is why Mexico amended its constitution to allow them into the country.

A Brief History Lesson

In 1938, Mexico seized the assets of all oil companies operating in the country. March 18, the day that Mexico seized the assets, is actually celebrated as a national holiday. Concurrently, Mexico revised its constitution to state that all natural resources under the subsoil belong to the nation, all strategic industries should be run by the state, and that oil and gas exploration are considered strategic industries. Mexico also created *Petróleos Mexicanos*, better known as PEMEX, and enshrined the concept of "resource nationalism" (i.e., that energy resources should be exploited in such a way that all Mexicans benefit) into the national psyche.

Mexico's newly elected President Enrique Peña Nieto spearheaded the recent drive to reform Mexico's energy industry. The day after President Peña Nieto came to power in 2013, he signed—along with the leaders of the two major opposition parties, *Partido de la Revolución Democrática* (Party of the Democratic Revolution - PRD) and centrist *Partido Acción Nacional* (National Action Party - PAN)—a tripartisan *Pacto por México* (Pact for Mexico). The pact specified that the two major opposition parties, along with the president's party, Peña Nieto of the *Partido Revolucionario Institucional* (PRI), would engage in a series of major reforms under the condition that any party sponsoring a bill would consult and negotiate with the others to facilitate its passage. The pact covers a myriad of reforms such as public safety, education, and energy. (Morales) Together PRI and PAN had enough votes to push the energy reforms through Congress in December 2013.

The opening of Mexico's oil and gas industry to foreign investment will allow Houston to export two innovations pioneered here—deep-water drilling and hydraulic fracturing.

The decline in Mexico's energy is not just a concern from a production stand point. Mexico needs revenue from oil exports to fund the federal government. Currently, 35 percent of Mexico's federal budget is

derived from oil exports. The oil monopoly, PEMEX, supplied \$69.4 billion in revenues to the national government in 2012 before taxes.

(Morales). Mexico expects privatization to initially generate an additional \$10 billion in government revenues, with the amount expected to grow over time. (Yost)

The Rules Of The Game Are Changing

Mexico is currently in the process of drafting rules and regulations on foreign operations and investment. The recent reforms stipulate that oil and gas below the surface still belongs to the people of Mexico, but foreign-owned companies can take ownership at the well-head through profit-sharing, license-sharing, and production-sharing agreements. PEMEX will continue as a national oil company. During "Round Zero," PEMEX will tell the Mexican government what part of its current acreage it wishes to keep. Then, the Secretaria de Energia will have 180 days to grant or deny those wishes. PEMEX must demonstrate it has the fiscal and technical capabilities to develop the resources it keeps, and PEMEX must use its acreage within three years or lose it. (Paula) Brazil had a similar arrangement when it ended Petrobras' monopoly in 1997, which proved to be successful.

Energy Minister Enrique Ochoa said in a recent interview that foreign crude producers will be allowed to bid on fields for exploration and begin developing infrastructure and operations in late 2015, Deputy. (Williams) Ochoa estimates foreign direct investment to exceed \$10 billion by 2018. (Caruso-Cabrera) To put that in perspective, capital expenditures

for oil and gas exploration, and pipeline projects in the U.S. and Canada were projected to top \$348 billion in 2013. (Xu) Ochoa also projects Mexico's production will rise to 3 million barrels per day by 2018 and to 3.5 million barrels by 2025 and for privatization to create 500,000 new jobs. (Caruso-Cabrera)

The major oil companies, many with offshore operations based in Houston, are expected to show initial interest in the deep waters (1,000 or more feet) of the Gulf of Mexico. PEMEX has been drilling deep water exploratory wells since 2006, and made its first significant find in the Perdido Fold Belt near the U.S. border in August 2012, though the resources have not been commercially developed. (CAB-Mexico) The U.S., on the other hand, produced 367.5 million barrels of oil and 724.9 million cubic feet of natural gas from its territorial deep waters in 2012. (DPSY) Anadarko, Apache, BP, Chevron, ENI, ExxonMobil, Hess, Noble, Repsol, and Shell are all currently operating in U.S. deep waters (CDWA) and are likely to show an interest in Mexico. Some of these firms have been producing oil and gas from the deep waters of the gulf since the early 1980s, so they have the experience and expertise Mexico needs to tap its own deep water resources.

The smaller operators will show greater interest onshore. Mexico has one of the world's largest shale gas resource bases, which could support increased levels of natural gas reserves and production. Currently, Mexico ranks fifth in the world in prospective technically recoverable shale gas resources—545 trillion cubic feet (TCF), according to a survey by the U.S. Department of Energy. (EIA Shale) The Burgos Basin accounts for two-thirds of Mexico's technically recoverable shale gas resources. Burgos includes parts of the Eagle Ford shale play, which is considered to be Mexico's most promising prospect and has been a prolific source of production in Texas. (CAB-Mexico)

Houston's Economic Opportunity

The opening of Mexico's oil and gas industry to foreign investment will allow Houston to export two innovations pioneered here—deepwater drilling and hydraulic fracturing. In the late 1970s, Shell and Exxon—the former headquartered in Houston, the latter with a large presence in the city — drilled the first deep water wells in the Gulf of Mexico. The wells were in water just over 1,000 feet deep, an incredible engineering accomplishment at the time. Now the industry successfully completes wells in water 9,000 feet deep. To put that in perspective, those rigs are floating almost two miles above the ocean floor. Much of the research and development, equipment, decision-making, and logistics for deep-water exploration in the Gulf of Mexico were, and still are, coordinated here. To some extent, deep water exploration kept the industry going through the downturn in on-shore drilling in the mid-1980s.

In the mid-2000s, Houston-area firms embraced hydraulic fracturing. Many attribute Houston's quick recovery from the Great Recession to the drilling boom that hydraulic fracturing released. At their peak, employment in oil field services, oil field equipment manufacturing, and energy exploration grew at annual rates in the double digits. Growth has backed off those rates in recent months but could return if Mexico's Burgos Basin proves as prolific as the Eagle Ford.

WHAT'S THE INCREASE IN EXPORT ACTIVITY WORTH TO HOUSTON?

The combined impact of chemical production expansion for exports and the opening up of Mexico's oil production to Houston businesses could add 55,185 jobs to the region's economy, even with only a 15 percent increase in exports in certain key industries. If that proves to be the case, then the export expansion about to occur is worth ten months job growth to the region's economy.

The impact of innovation and trade opportunities comes at no surprise. As stated above, Houston was founded and built on trade and investment. This section details the quantitative impact of these new developments as well as analyzes the benefits of trade and investment already accrued to the Houston to economy.

More Trade And Investment Means 50,000+ New Jobs

The U.S. International Trade Administration (ITA) has a round assumption of exports and job growth – every one billion dollars in U.S. exports supports approximately 4,900 jobs. ITA breaks down the rule a bit—exporting one billion dollars in goods and commodities supports 5,300 jobs, and one billion in service exports sustains 4,000 jobs. This is a general assumption and presumes that exporting \$1 billion in wheat has the same impact as exporting

Impact Of An Additional \$100 Million In Exports			
Industry	Jobs Created (direct, indirect, and induced)	Additional Household Earnings (millions)	Increase to Gross Regional Product (millions)
Petrochemicals	949	\$48.3	\$93.8
Plastics	954	\$47.5	\$97.0
Iron and Steel	721	\$34.8	\$76.1
Oilfield Equipment	1,020	\$50.4	\$95.3
Engineering	1,876	\$78.9	\$139.7
Oilfield Services	1,382	\$68.7	\$116.3

Source: U.S. Bureau of Economic Analysis Regional Input-Output Modeling System (RIMS-II)

\$1 billion in automobiles; \$1 billion in receipts for a Hollywood movie has the same impact as \$1 billion in receipts for engineering services; or, \$1 billion in exports from Houston has the same impact on the Gulf Coast economy as \$1 billion in exports from Seattle has on the Puget Sound area.

A more accurate measure of the impact exports have on the Houston region can be developed using the Regional Input-Output Modeling System, also known as RIMS-II. The U.S. Bureau of Economic Analysis has developed the model using an input-output table, a method for determining how an increase in output in one sector requires inputs from various

The Port of Houston handled 67.2 million metric tons of cargo (exports and imports combined) in 2013.

other sectors in a region's economy. For instance, in Houston's case, the model would measure how an increase in the manufacturing of drilling rigs would require inputs from steel manufacturers, cable makers, diesel engine firms, paint suppliers, and so forth. The model also estimates the impact on consumer-oriented firms, like grocers, doctors, and dry cleaners that are supported by the workers receiving paychecks in primary industries. In economics parlance, these are referred to as employment, output, and earnings multipliers.

The Greater Houston Partnership uses the RIMS-II model to measure the impact that a company relocating to Houston has on the regional economy. A typical relocation results in additional sale of goods or services outside the region. Thus, the same model can be used to estimate the impact that an increase in exports will have

on the region. The model provides insight into how each \$100 million increase in exports benefits Houston.

While no one knows how much exports will actually increase because of the chemical plant expansions underway or how much additional business will flow to Houston once U.S. firms enter Mexico's oil patch, some rough estimates can be developed.

Houston currently exports \$16.8 billion in chemicals via the Houston-Galveston Customs District. If one assumes the \$40-plus billion expansion in chemical plants in the region produces a 15 percent increase in exports, this would equate to an additional \$2.5 billion in exports. Based on relationships in the model, this would support an additional 23,787 jobs, add \$1.2 billion to household income, and boost Houston's GRP by \$2.3 billion.

Houston currently exports \$19.3 billion in industrial machinery (which includes oil field equipment). If one assumes opening Mexico's interior to U.S. companies exploring for oil will require a significant amount of oil field equipment, a 15 percent increase in exports would equate to an additional \$2.8 billion in equipment exports. Based on relationships in the model, that would support an additional 28,574 jobs, add \$1.4 billion to household income, and boost Houston's GRP by \$2.7 billion.

Houston currently exports \$2.6 billion in iron and steel products – mainly pipes, flanges, and valves, items required for building pipelines to transport oil. If one assumes Mexico will need additional pipelines to transport its increased product to refineries and processing facilities, a 15 percent increase in annual exports would equate to an additional \$390 million in exports. Based on the relationships in the model, the increase would support an additional 2,824 jobs, add \$136.5 million to household income, and boost Houston's GRP by \$298.2 million.

The current expansion along the ship channel and the door to Mexico that will soon open for companies wishing to explore there, will have a significant impact on Houston's growth. The full potential is unknown, but the increase in shipments of commodities, equipment, and services will be measured in the billions. Given the scenarios outlined above, this could add more than 55,000 jobs to the region's economy.

The Impact Of Trade On Houston's Globally Integrated Economy Today

The magnitude of the estimates described is not surprising, especially given Houston's integration into the global economy. Today, Houston's economy has already accrued significant benefits from trade. The region has:

The busiest U.S. port in foreign tonnage:

The Port of Houston handled 67.2 million metric tons of cargo (exports and imports combined) in 2013, well ahead of second-ranked New Orleans (44.2 million) and third-ranked Los Angeles (31.4 million). (Wiser)

The third largest consular corps:

The Houston International Protocol Alliance works with career and honorary consuls from 92 countries. New York ranks first and Los Angeles second. (Protocol)

Top Commodities – Imports And Exports		
Houston Galveston Customs District - 2013		
Commodity	\$ - Billions	% of Total
Crude & Refined Products	118.4	47.0%
Industrial Machinery	28.4	11.3%
Chemicals	30.9	12.3%
Iron and Steel Products	13.1	5.2%
Electrical Machinery	10.4	4.1%
All Others	50.7	20.1%
Total	251.9	100.0%

Source: WISER

The fourth busiest customs district:

More than \$251.1 billion in cargo passed through the Houston-Galveston Customs District in 2013. The Los Angeles district ranked first with \$414.8 billion, New York second with \$378.9 billion, and Laredo third with \$253.2 billion. (Wiser)

The fifth best city for global investment:

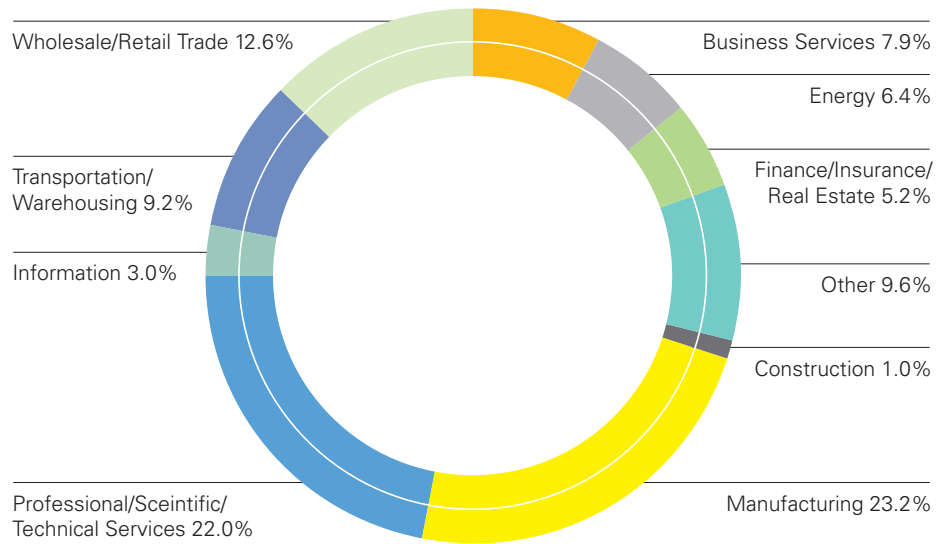
The ranking is based a member survey by Association of Foreign Investors. New York, London, San Francisco, and Washington D.C. were the no. 1 through no. 4 cities, respectively. (AFI) New York, London, San Francisco, and Washington D.C. were the no. 1 through no. 4 cities, respectively. (AFI)

The eighth busiest international air gateway:

The Houston’s Bush Inter-Continental Airport handled 8.9 million international passengers in 2013. (ACI)

The ITA compiles data strictly on exports from U.S. metro areas. This includes exports that are manufactured, consolidated, or expedited in a metro area and is referred to as the “origin of movement series.” ITA reports that Houston led the nation in exports in 2012, overtaking New York and ranking well ahead of Los Angeles, Detroit, and Seattle. Houston’s exports have grown from \$41.7 billion in 2005 to \$110.3 billion in 2012, an increase of more than 164 percent. Exports are at an all-time high. (ITA)

As trade has grown, so has the number of Houston companies doing business globally. The 1986 Houston International Business Directory listed 1,963 foreign and domestic firms in the Houston area involved in some aspect of international business. Working through various sources, the Partnership has identified more than 3,250 Houston companies today doing business in more than 200 countries. Virtually every industry has global trade ties, with manufacturing, professional services, and wholesale and retail trade having the largest shares of the global pie.



Types Of Companies In Houston With Foreign Trade Ties

Source: Greater Houston Partnership Database, 2014; Uniworld Business, 2014

Top Metro Exporters - 2012		
Origin of Movement Series		
Rank	Metro Area	\$ Billions
1	Houston	110.298
2	New York	102.298
3	Los Angeles	75.008
4	Detroit	55.387
5	Seattle	50.302

Source: U.S. International Trade Administration

As Houston’s business ties have grown, so have its diplomatic ties. The 1980 issue of *Houston Facts* noted the region hosted 50 honorary and career consuls - today, there are 92. In addition, 16 foreign governments maintain trade and commercial offices. Foreign governments have established diplomatic missions in Houston for a number of reasons: to promote trade between Houston and their home country, to monitor economic and business trends in the most vibrant U.S. region, and to provide

visa and consular services to Houstonians planning to visit their countries. The consuls serve a large ex-pat community in Houston. According to the 2012 American Community Survey, nearly 1.4 million Houstonians, 22.3 percent of all residents, were born outside the United States. Only New York, Los Angeles, and Miami have larger foreign-born populations. Approximately 890,000 Houstonians are foreign nationals. Between 2007 and 2012, Houston’s foreign-born population grew by more than 170,000 residents.

Many of the ex-pats living in Houston came here at the behest of their employers. Those Houstonians arrived here on L-1 visas issued by the U.S. Citizenship and Immigration Service. L-1 visas are issued to employees of international companies with offices in both the U.S. and abroad. The visa allows such foreign workers to relocate

temporarily to the corporation's U.S. office after having worked abroad for the company. In 2012, Houston ranked second only to New York as a port of entry for L-1 visa holders.

Air service also plays a greater role in Houston's international reach. Thirty years ago, one in 15 passengers flying through Houston travelled internationally. Today, the ratio is one in five. Fourteen foreign flag carriers and one U.S. carrier now offer service to nearly 70 overseas markets. In recent years, Air China, Emirates, Korean Air, Qatar Airways, Scandinavian Airlines, Singapore Airlines, and Turkish Airlines have added international service out of Houston, strengthening Houston's ties to East Asia and the Middle East. If not for Houston's air connectivity, local businesses couldn't as easily do business globally.

International travel will get easier in the near future. In July 2014, the Houston Airport System will begin a complete overhaul of Houston Bush Inter-Continental Airport's International Airlines Building. Meanwhile, Southwest Airlines is investing \$156 million to expand terminals at Houston Hobby Airport. Houston will have

a second international airport in late 2015 when Southwest begins offering service to Latin America, the Caribbean, and Mexico. The expansion of service should offer significant opportunities for Houston companies doing business overseas.

Shifting Trade Patterns

Houston is already positioned as a global trade center, but Mexico's opening to foreign oil companies only reinforces the trend of Houston shifting its international focus away from Europe and toward Latin America. Mexico is Houston's largest trading partner, accounting for 11.2 percent of all Houston-Galveston Customs district traffic. Houston's \$28.4 billion in total trade with Mexico exceeds the combined total of the second and third ranked partners, Brazil (\$13.9 billion) and China (\$13.4 billion). Trade with Latin America now accounts 39.9 percent of Houston's total, while Europe accounts for 17.8 percent.

The fact that Houston has closer ties to Latin America than Europe comes as no surprise, given that proximity tends to strengthen a relationship. For example, Canada accounts for 42.5 percent of New

England's total trade and Asia for 72.5 percent of California's. New York is an exception, however as trade with China accounts for 38.1 percent and Europe for 32.3 percent. But this may be an artifice of New York, with 19.9 million residents, being the nation's largest metro area and therefore the largest U.S. market for Chinese consumer goods.

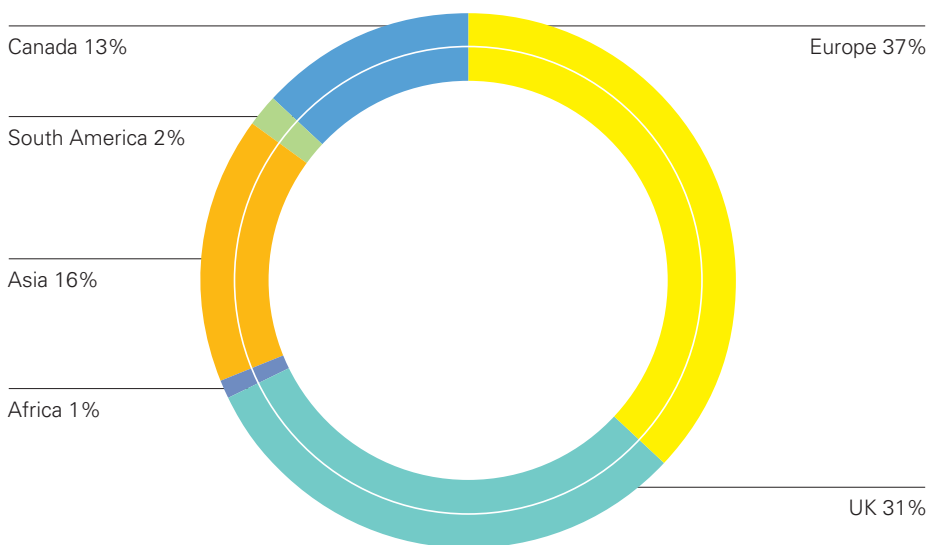
Cultural changes inside Houston reinforced the shift in trade patterns.

- Today, one-in-three Houstonians are Hispanic, growing quickly as the Hispanic population made up one-in-five Houstonians in 1990. (Census) Texas State Data Center projects that ratio to be one-in-two by 2034. (TSDC)
- Over the past decade and a half, Houston became a magnet for migrants from Latin America. Houston's foreign-born population approaches 1.4 million, of which 900,000 originated in Latin America. One in ten Houston residents were born in Mexico. (Census)
- Twenty years ago, there were only a few of Spanish language media outlets. Today, several dozen exist. (Houston Facts)

A similar but less dramatic shift has taken place with Houston's Asian trading partners. Houston's Asian population exceeds 400,000 and that population will double over the next 20 years. (TSDC) The best opportunities for export growth for Houston lie with markets that match its population - Latin America and Asia.

FDI Has Supported 19,000 Houstonian Jobs

Houston is now recognized as a "gateway" city, on par with New York, Chicago, Boston, and San Francisco as a preferred location for foreign investors seeking to acquire investment-grade real estate in the U.S. Information on foreign real estate buyers remains sparse, however. Foreign buyers prefer to operate through investment managers making it difficult to find the foreign ownership in property records.



FDI In Houston by Region, 2003-2013

Source: New Business Announcements database, Greater Houston Partnership, 2014-2014

As trade patterns have shifted south, Europe still accounts for the bulk of foreign direct investment in Houston. The Greater Houston Partnership has identified 313 foreign direct investments from European companies valued at nearly \$7.4 billion in Houston over the past ten years. This includes office operations, manufacturing plants, and distribution facilities. It does not include real estate purchases. Those investments employed nearly 19,000 workers. Europe, excluding the U.K., accounted for 37 percent of all FDI deals. The U.K. accounted for 31 percent of all deals.

Lack of European economic growth has fueled much of this growth as firms seek investment opportunities elsewhere.

Houston's booming economy offers more options and potentially higher rates of return. Houston has a pro-business and secure investment climate. Latin America's emerging economies have their own capital needs and are thus less likely to invest in Houston. Houston's economy is also significantly larger than many Latin American economies thus offers more opportunities. Foreign investors are showing increasing interest in passive investments, acquiring office, retail and industrial properties.

Taking into account both the past and present growth in energy alongside medical innovations, manufacturing growth, infrastructure investment, Houston is poised for, yet, another boom.

The Bottom Line

Throughout its history, Houston has grown due to its central role in global trade and investment. After examining two recent developments in trade and investment, including – massive investment in chemical plants and liquid natural gas export terminals and the opening up of Mexico's energy sector to foreign companies, it was found that the Houston economy could benefit to the tune of more than 50,000 jobs. It's clear from both Houston's past and future that engaging in and supporting policies that promote global trade and investment will help ensure Houston's economy, businesses, and people can prosper.

2009-2013 Largest Deals From Foreign Direct Investment To The Houston Area

Company	Industry	Country	Details
LyondellBasell Industries	Basic chemicals	Netherlands	Manufacturing
Linde	Basic chemicals	Germany	Manufacturing
Sekisui House	Residential building construction	Japan	Construction
Borusan	Steel products	Turkey	Manufacturing
BP	Oil & gas extraction	UK	Internet Infrastructure
Marquard & Bahls	Petroleum bulk terminals	Germany	Distribution & Logistics
United Metallurgical	Steel products	Russia	Manufacturing
Weatherford	General purpose machinery	Switzerland	Manufacturing
Nippon Shokubai	Paints, coatings, additives	Japan	Manufacturing
Skanska	Commercial construction	Sweden	Construction
Zeon	Other rubber products	Japan	Manufacturing
Kuraray	Other rubber products	Japan	Manufacturing
Zeon	Other rubber products	Japan	Manufacturing
Genan	Tyres	Denmark	Manufacturing
Total	Other rubber products	France	Manufacturing
Lonza	Pharmaceutical preparations	Switzerland	Manufacturing
Servcorp	Rental & leasing services	Australia	Business Services
Regus	Rental & leasing services	Luxembourg	Business Services
Clariant	Basic chemicals	Switzerland	Manufacturing
AkzoNobel	Basic chemicals	Netherlands	Manufacturing
Songwon Industrial	Paints, coatings, additives	South Korea	Manufacturing
LyondellBasell	Basic chemicals	Netherlands	Manufacturing
AkzoNobel	Basic chemicals	Netherlands	Manufacturing

Source: Greater Houston Partnership New Business Announcements Database

The Economic Impact Of Houston's Port

The Center for Transportation Research at the University of Texas has reviewed the Port of Texas City as well. The studies found that port activity supports nearly 250,000 local jobs—75,000 direct, 89,000 indirect, and 85,000 induced. Even allowing for the possibility of double counting, the employment impact is significant for a region with 2.8 million jobs.

Edith Chambers, Josh Davis, Deanna Morrow, Deborah Mostert, Jenny Phillip and Roel Martinez contributed to the preparation of this report

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About RIMS II

The Regional Input-Output Modeling System (RIMS II) is an economic model produced by the U.S. Bureau of Economic Analysis (BEA) and used by investors, planners, and elected officials to objectively assess the potential economic impact of various projects and activities, e.g., the opening of a manufacturing plant, the closing or a military base, the relocation of a corporate headquarters, an increase in shipments from a warehouse and distribution center, etc.

The idea behind the model is that a change in economic activity in one industry results in new rounds of spending across various industries in that region. For example, building a new chemical

plant will lead to increased production of pipes and valves. The increased production of pipes and valves will lead to more iron and steel production. Workers benefiting from these increases will spend more, perhaps eating at nicer restaurants, upgrading their home furnishings, or splurging on more entertainment. The RIMS-II model estimates the combined impact these activities will have on the region. The model also takes into account that some goods and services will be sourced from outside the region, thus reducing the full impact. The increased output is often referred to as the multiplier effect, and this can be expressed in terms of increased output (sales), value added (GDP), earnings, or employment.

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