Coastal Bend's Innovation Capacity and Competitiveness

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Takeaways

• Innovation is a key driver of economic growth, and the Coastal Bend has a moderate innovation capacity in comparison with other areas in the nation.
• Historical experience underscores the role of human capital alongside financial investments in determining the region’s competitiveness.
• The Coastal Bend is well positioned to develop a hydrogen hub with carbon capture and storage infrastructure as an alternative energy source in the nation’s transition to net zero emissions.
• This is an excerpt from a Lunch and Learn presentation by Jim Lee at the Coastal Bend Innovation Center on October 27, 2022.

Thank you for coming to the Coastal Bend Innovation Center’s fourth Lunch and Learn
event this year. Today, I'll talk about the innovation capacity and competitiveness of the Coastal Bend region.

This topic immediately reminds me of the Innovation Center’s slogan “we foster economic growth.” This is exactly the reason why the Economic Development Administration has funded the Center’s operations for more than 10 years now.

**Innovation Drives Growth**

We all are inspired by the spread of inventions that have continued to improve our quality of life. It is in fact innovation behind those inventions that have been driving a county’s economic growth on a sustainable basis. Innovation refers to something new or a change made to an existing product or idea.

Let's first take a look at some inventions in history. At the beginning of the 20th century, the Wright brothers successfully flew a fixed-wing aircraft that was eventually turned into an airplane. Over time, innovation turned the plane into an airline industry.

Planes also changed how battles were fought in World War I. In the air, the German army and navy also began to deploy airships called Zeppelins to collect information across enemy lines and to bomb British cities. As I’ll talk about later, more than a century later, the hydrogen that was used to propel those blimps is about to transform the world’s energy landscape.

In the United States, the military was responsible for the invention of many household products, from duct tape and super glue (1942) to aerosol spray (1941) and the microwave (1946). A study of the feasibility of the hydrogen bomb gave rise to the first electronic general-purpose digital computer,
ENIAC (Electronic Numerical Integrator and Computer) in 1945. The ENIAC is also known as “the Giant Brian,” which was replaced in 1974 by the first commercial-grade personal computer, MITS Altair 8800.

**Free Lunch**

Now most of you are carrying a smartphone that has more computing power and memory capacity than those machines. Apple’s Steve Jobs and a British product designer, Jony Ive, were awarded in 2007 the patent for the simplistic layout of the iPhone that has become the basic design for most cellphones today. Neither of the two patent holders had an engineering or science degree. Jobs even left college after just one semester.

There seems to be a gender bias in inventions. But many inventions and the resulting commercial products have specifically enhanced women’s quality of life. The introduction of birth control pills has played a key role in raising women’s workforce participation. In addition to the microwave oven, the invention of the domestic automatic washing machine in 1937 has made household work less of a chore, thus speeding up the women’s liberation movement.

As you can see, innovation is a free lunch. In economics, a free lunch is what you get without paying for it. In economics, it is like a spillover effect, or externality, across society. According to the textbook theory, innovation drives a nation’s economic
Like major wars in modern history, the COVID-19 pandemic has triggered or accelerated innovations that continue to affect our lives today. Virtual meetings are now more popular than in-person meetings. The so-called Zoomshock has also made it possible for most of you in the audience to continue to work remotely for at least some time during a typical workday. The flexibility to work from home, or practically anywhere in the world, has not only changed the landscape of the labor market, but also the demand for real estate.

As many companies allow at least some of their staff to work from home permanently, there is an increased demand nationwide for larger homes to accommodate home office space. Also, when employees no longer need to live close to their workplace, housing demand has shifted from cities with more employment concentration to suburbs or other communities that offer more amenities, such as beaches and parks. Such changes in housing preferences have contributed to the Great Migration across the nation.

Other than working from home, Americans have become
more willing to make purchases from home. The share of online purchases, including curbside deliveries, has stayed elevated. The ongoing e-commerce boom is also attributable to the shopping experience with Virtual Reality (VR) or Augmented Reality (AR), along with improvements in transportation logistics, particularly by major online platforms like Amazon.

On the flip side, the pandemic has also created challenges in the economy. The unprecedented disruptions during the pandemic have altered the attitude and mindset of people, young and old. The labor force participation rate of American older than 55 years dropped dramatically in 2020 and 2021.

Scores of young adults, often referred to as the YOLO (You Live Only Once) generation, also left the labor force in the past two years, further tightening up the labor market supply. Labor market shortages prevail across the nation, especially among industries that pay lower wages, such as construction and hospitality. An increasingly tight labor market and the options to work from home have together created the Great Resignation phenomenon.

**The Past**

With the world economy in flux, most of you would probably ask what’s in store for our Coastal Bend region. Before we consider the future, it's helpful that we look at our past.
For the region, I can’t emphasize enough the role that oil and gas play in the economy. A chart about the relative performance of Corpus Christi is very telling. Over the past three decades, the metro area’s unemployment rate relative to the U.S. average has followed nearly in lockstep changes in the crude oil price. Notice the local unemployment rates were indicated in the graph with a 10-month lag, meaning that oil prices today have the most effect on the regional economy about 10 months later.

Other than oil and gas production, the region has remarkably high job concentration in the construction, hospitality, agriculture and government sectors. Their location quotients higher than one means relatively more jobs are generated locally by those sectors than elsewhere in the nation.

Construction is the strongest economic cluster in which the Coastal Bend region specializes. Regional construction activities have been tied largely to industrial growth, including the construction of world-class steel and petrochemical plants other than...
the regular maintenance of oil and gas refineries.

Heavy industry in the region also leverages the infrastructure surrounding the Port of Corpus Christi, which has emerged as the third-largest U.S. port by tonnage and the leader in exporting crude oil. The relative size of water transportation reflects such maritime activities.

Other than heavy industry, the region’s blue economy is associated with its waterfront and beaches. The abundance of marine resources in South Texas Gulf Coast has boosted not only the tourism cluster that includes performing arts and recreational services, but also a specialization in environmental services, ranging from oil spill cleanup to oyster farming. As most of you know, growth at Texas A&M University-Corpus Christi has revolved around these clusters. For instance, researchers at the Hart Research Institute are involved mostly with the Gulf of Mexico environment. The Conrad Blucher Institute focuses on surveying the Texas coastline.
Innovation Capacity

Like other higher-education institutions, the University has been instrumental in developing the region’s innovation capacity. Still, given the small size of this university relative to the regional population, the metro area’s innovation capacity is moderate, according to StatsAmerica’s rankings based on a wide variety of data sources, which include the number of patents and their diversity, and educational attainment.

Compared to human capital measured by college degree holders and spillovers from TAMUCC, the region’s relative ranking improves in its business dynamics and financial capacity. These rankings reflect Corpus Christi as one of the best cities for Hispanic entrepreneurs to do business as well as the nation’s top recipient of foreign direct investments. FDIs have contributed to the construction of such industrial facilities as steel and plastic plants in San Patricio County.

Rapid industrial development in the past decade has lifted the region’s overall labor productivity. The high capital intensity of those newly constructed industrial manufacturers boosts labor productivity. Manufacturing remains the metro area’s
smallest economic sector in terms of jobs, making up 5 percent of the overall employment. But those employers of mostly primary (export) jobs together account for 8 percent of the region’s value-added, or gross regional product.

Harvard University’s ClusterMapping website provides similar conclusions about the Coastal Bend’s economic competitiveness. Again, a relatively low level of educational attainment is holding back regional growth in the long run. While the expansion of capital-intensive industry has mitigated the role that a quality workforce plays in regional competitiveness, falling labor force participation has continued to thwart economic growth across South Texas.

As I mentioned earlier, in addition to early retirement among baby boomers, a recent drop in labor force participation in Corpus Christi is attributable to an abundance of “disconnected youth.” According to Census data, about one in seven adults in the area between the ages of 16-24 years are disconnected youth as they are neither working nor in school.

**Human Capital**
How critical is human capital in determining a region’s competitiveness and growth? As explained in a recent newsletter, a comparison of the growth paths between Austin and Corpus Christi underscores the role of human capital development. With nearly 30% of the adult population holding a bachelor’s degree, Austin’s remarkably high level of educational attainment, a key component of innovation capacity, is conducive to the development of technology-oriented industries.

Despite a proliferation of industrial facilities supported by more than $50 billion in capital investments, Corpus Christi’s population and employment growth remain behind Austin and the state average. In other words, without a skilled workforce, capital investments alone are insufficient to drive the region’s economic growth in the long run.

I hope you now have a better understanding of what’s been holding back the region’s growth over probably the past half a century, despite periodic booms and busts related to impacts of oil and gas production. Going forward, this region’s economic fortune will probably get a facelift, depending on how the community will leverage its strengths and overcome its weaknesses.
Road to Net Zero

The nation has accelerated its energy transition to net zero emissions by 2050. One of the widely accepted strategies to lower carbon dioxide (CO2) emissions from industrial and power plants is the carbon capture and storage (CCS) process. Hydrogen can also be produced with CCS that produces near-zero greenhouse gas emissions.

Hydrogen, the most abundant element on earth, is considered an alternative fuel that has a very high energy content by weight. It can be produced from diverse resources, including fossil fuels, and water electrolysis with wind or solar energy. The environmental impact of hydrogen production depends on how it is produced, giving rise to grey, blue and green hydrogen.

H2 Hubs

Today, only about 1% of hydrogen production from fossil fuels includes CCS. But this is about to change. In September, the Biden administration announced a set of federal funding opportunities totaling about $5 billion to bolster investments in the carbon management industry.

The Inflation Reduction Act passed earlier in August provided tax credits for carbon capture and storage investment and “green” hydrogen production. The Infrastructure Investment and Jobs Act passed in November 2021 provided $8 billion to develop at least four clean hydrogen hubs in the nation by
2026, and an additional $1 billion for improving hydrogen technologies. Such massive investments to transition the nation’s exposure away from fossil fuels have potential consequences for the Coastal Bend economy.

**Hydrogen Coming to Town?**

According to RBN Energy, an energy analytics group, Corpus Christi has all the qualities for the development of a hydrogen hub. The region has access to abundant natural gas and renewable wind and solar power sources, scores of potential sites for underground carbon or hydrogen storage, and a well-developed pipeline network for transporting hydrogen. Also, the Port district not only boasts a high concentration of industrial and power plants for carbon capture and hydrogen consumption, but also the infrastructure of marine terminals for exporting hydrogen-packed ammonia overseas.

While Corpus Christi is well positioned for developing a hydrogen hub, so are other areas along the Gulf Coast like Houston and Baton Rouge. As RBN Energy indicated, beyond physical infrastructure, the decision for the federal government's decision to build at least one hydrogen hub rests on the region's human capital that will reap the most
economic benefits from the project.

As we have learned, more human capital in the form of a more skilled workforce will likely better capture the impact of new investments on the regional economy. From this perspective, I believe you all have a stake in the region’s future. I also hope you can join us in the Carbon Interactive Workshop organized by the Department of Energy on November 10.

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