PERC DATA POINTS

ISSUE 2, 2023

TEXAS A&M UNIVERSITY
Private Enterprise Research Center

AN OVERVIEW OF THE ECONOMIC PERFORMANCE OF TEXAS MSAs FROM 2010 - 2021

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INTRODUCTION

Texas is the second largest state in land mass and the second largest state in population. Among the fifty states, it also has the second highest level of output, as measured by state Real Gross Domestic Product (or RGDP). RGDP is intended to measure the value, adjusted for inflation, of an economy's production of goods and services for final use, and is often taken as a summary measure, however imperfect, of economic performance.

Texans have also experienced growing income on a per capita basis, as seen in growing levels of RGDP per capita. By all these measures, Texas is a state with a relatively fast-growing economy.

What about the situation within Texas? How are different regions performing? Texas is a geographically large state with a diverse industry mix and quite several population hubs. It contains two of the country's largest metropolitan statistical areas (or MSAs), Dallas-Fort Worth-Arlington, fourth-largest, and Houston-The Woodlands-Sugar Land, fifth-largest. The U.S. contains 384 MSAs, and Texas contains 25 of them.

This study focuses on RGDP, population, and RGDP per capita for MSAs in Texas. We highlight the present situation in terms of these variables, and how these variables have changed over time. As one of the most referenced measures of economic performance, RGDP counts the output of goods and services generated within a specified area. However, interpretations based on RGDP by itself can often be misleading. For instance, growth in RGDP can be due to 1) growth in population or 2) growth in productivity, as proxied by growth in RGDP per capita. Therefore, we will incorporate both population and RGDP per capita trends into our discussion.

We observe trends in Texas over the recent 2010 - 2021 period, a period which followed the Global Financial Crisis and the Great Recession. This period also captures the emergence of the COVID pandemic, and thus we expect to see its effects as well. The primary focus of this paper is examining which areas of Texas grew the most/least and how the state performed as a whole.

METHODOLOGY

We will examine the trends present in the 25 Metro Statistical Areas (MSAs) of Texas. Metro Statistical Areas are areas defined by the United States Office of Management and Budget based on population and connections within the area. An MSA is defined as one or more counties with a city of 50,000 or larger, or a Census Bureau-defined urbanized area with a population of 100,000 or more.

Our analysis is divided into three sections. In the first section, we provide an overview of the year-by-year levels of RGDP, population, and per capita RGDP for the 25 Texas MSAs. Two years are compared, 2010 and 2021, which pertain to the beginning and end of our period of analysis.

In the second section, we analyze trends in the growth across the 2010 to 2021 period for all of Texas and for the four largest Texas MSAs by population. These 4 MSAs are Austin-Round Rock-Georgetown, Dallas-Fort Worth-Arlington, Houston-The Woodlands-Sugar Land, and San Antonio-New Braunfels.

The third section provides an extension of this discussion by examining the annualized growth in all 25 Texas MSAs, with comparisons of their economic performance in relation to each other and to the Texas aggregate level.

To finish our discussion, the fourth section explores the relationship between an MSA's relative output at the beginning of our observed period (2010) and its corresponding growth over subsequent years. This part of our analysis stems from the Solow Growth Model, which predicts that poorer economies will grow faster than richer economies. While this trend has largely been observed on the national level, more micro-level observations have been limited.

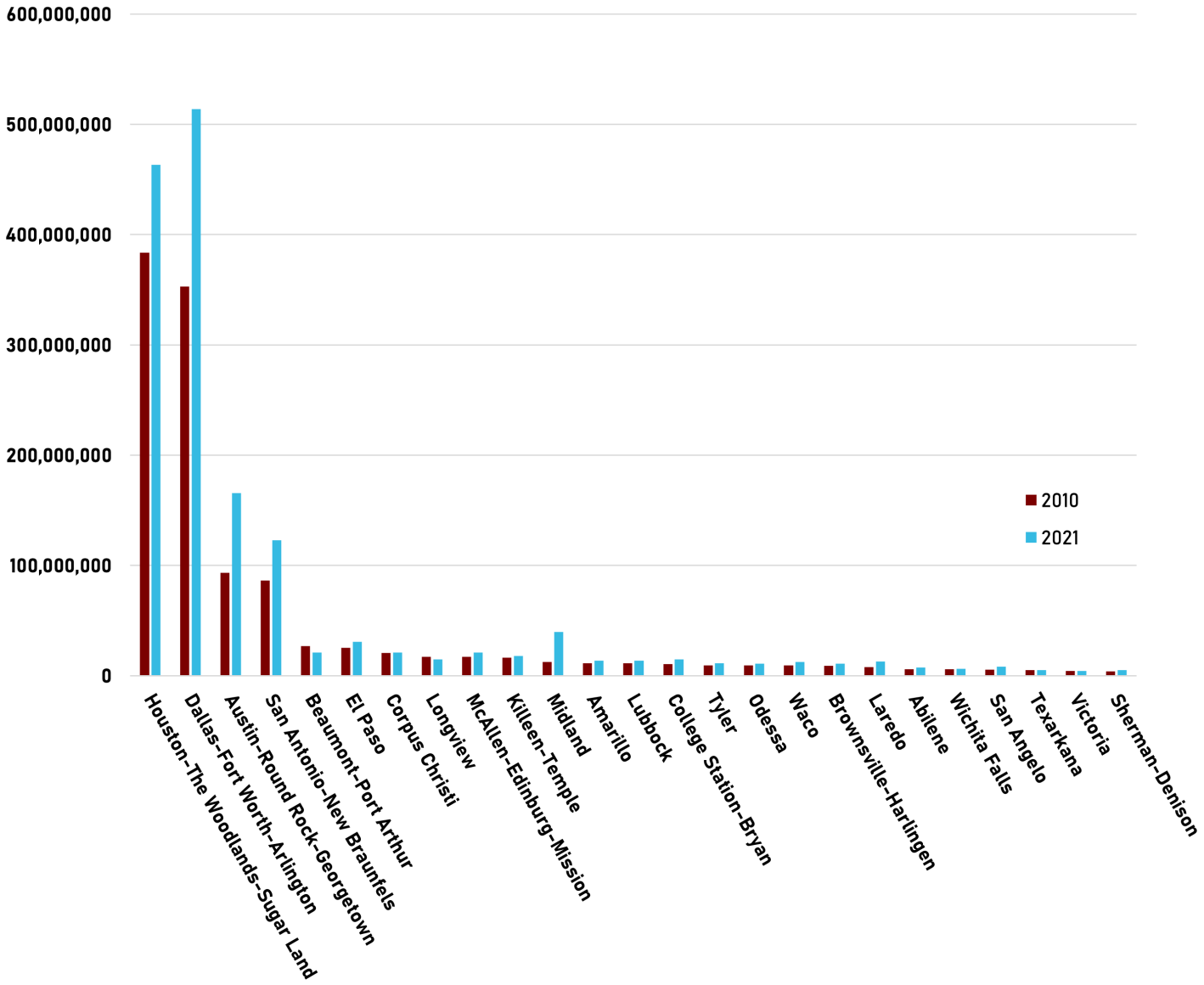
Utilizing data from the Federal Reserve Economic Database (FRED), U.S. Census Bureau, and U.S. Bureau of Economic Analysis, we obtain the RGDP, population, and per capita RGDP from 2010 to 2021. As of July 2023, the data for the year 2022 is not yet available for MSAs. To obtain growth across the 2010 to 2021 period, the measures are annualized and calculated as a percentage.

LEVELS OF RGDP, POPULATION AND PER CAPITA RGDP ACROSS TEXAS MSAs

Texas's economy is one of the largest in the U.S. with a RGDP in 2012 dollars measuring at $1.8 trillion in 2021. However, Texas's extensive economic output is not uniformly distributed across the state.

In terms of overall RGDP, there are large differences between the highest and lowest ranked MSAs. This is not unexpected, as MSAs with large populations also tend to have larger RGDPs. As seen on Figure 1, Houston and Dallas MSAs far exceed the rest of the Texas MSAs in RGDP, with 2021 measures of RGDP of about $500 billion. Following these two MSAs, the levels of RGDP decline quite substantially. San Antonio MSA, the third largest MSA by population, had an RGDP of $122 billion in 2021 and Austin MSA, the fourth largest MSA by population, had an RGDP of $165 billion. The lowest ranked MSA in terms of 2021 RGDP output, Victoria, had an RGDP of $4.2 billion.

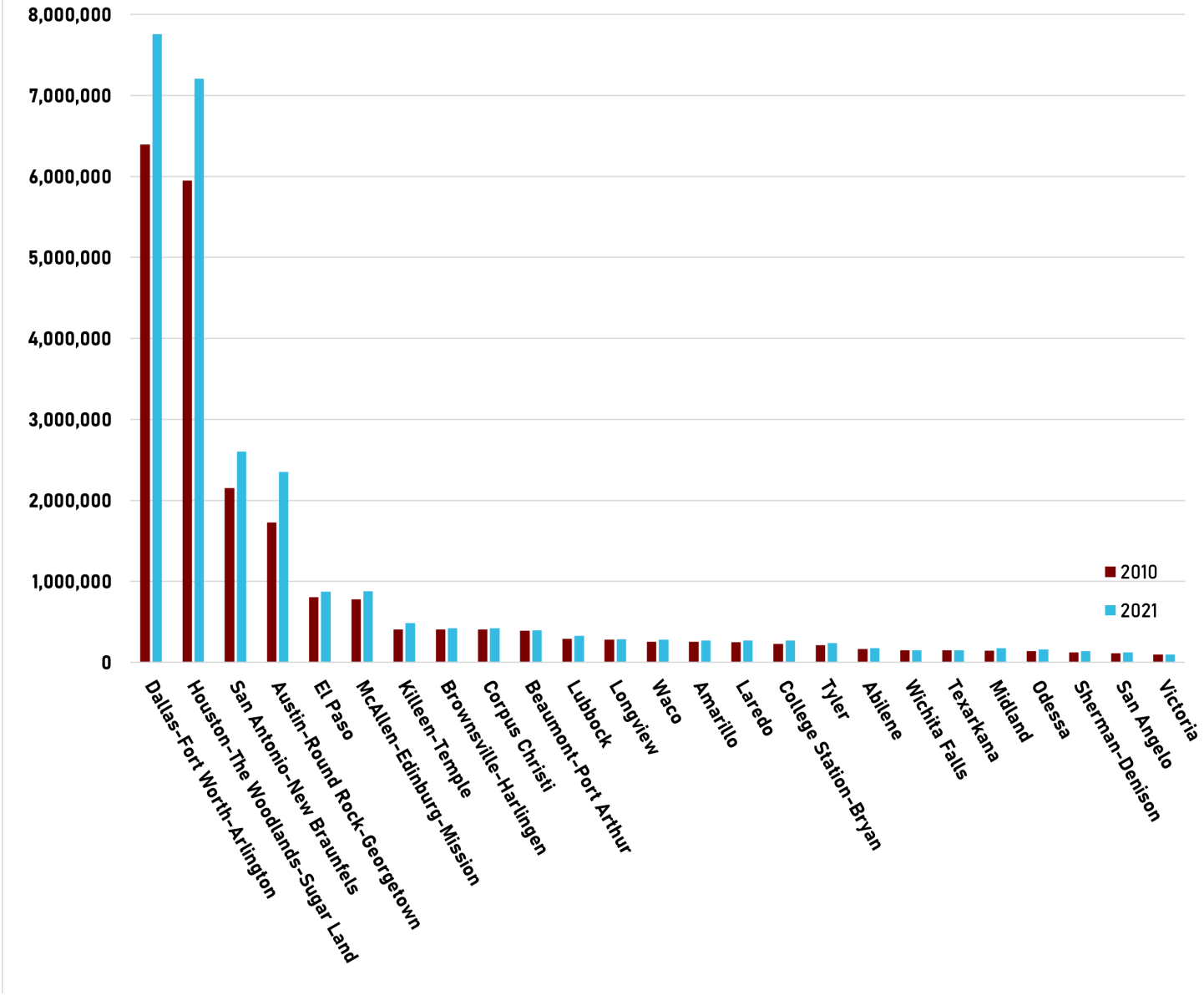
FIGURE 1. TEXAS MSA RGDP 2010 AND 2021 (1,000s OF 2012 DOLLARS)



These substantial differences in RGDP can be attributed in large part to the extensive population differences between the MSAs in Texas. Figure 2 best illustrates this point. Dallas and Houston MSAs have population numbers far exceeding the rest of the Texas MSAs, with their 2021 population numbers of 7.7 million and 7.2 million respectively. The next two MSAs in terms of 2021 population, San Antonio and Austin, have a population of 2.6 million and 2.3 million respectively. That is around a 5 million difference between the top two most populated Texas MSAs and the next two largest Texas MSAs. Victoria MSA, which ranked lowest of the Texas MSAs in terms of its 2021 GDP output, has a population of only 98,000.

One noticeable change seen in the figures is Midland MSA's substantial RGDP growth but relatively unchanging population numbers from 2010 to 2021. This detail is most apparent in Figure 1. Midland MSA's 2010 RGDP seems unimpressive and middle of the pack at $12 billion, but its 2021 RGDP ranks fifth among the Texas MSAs at $39 billion. This substantial change in RGDP occurs without a noticeable shift in population, as its 2010 and 2021 population numbers were relatively modest at 141,783 and 173,180 respectively.

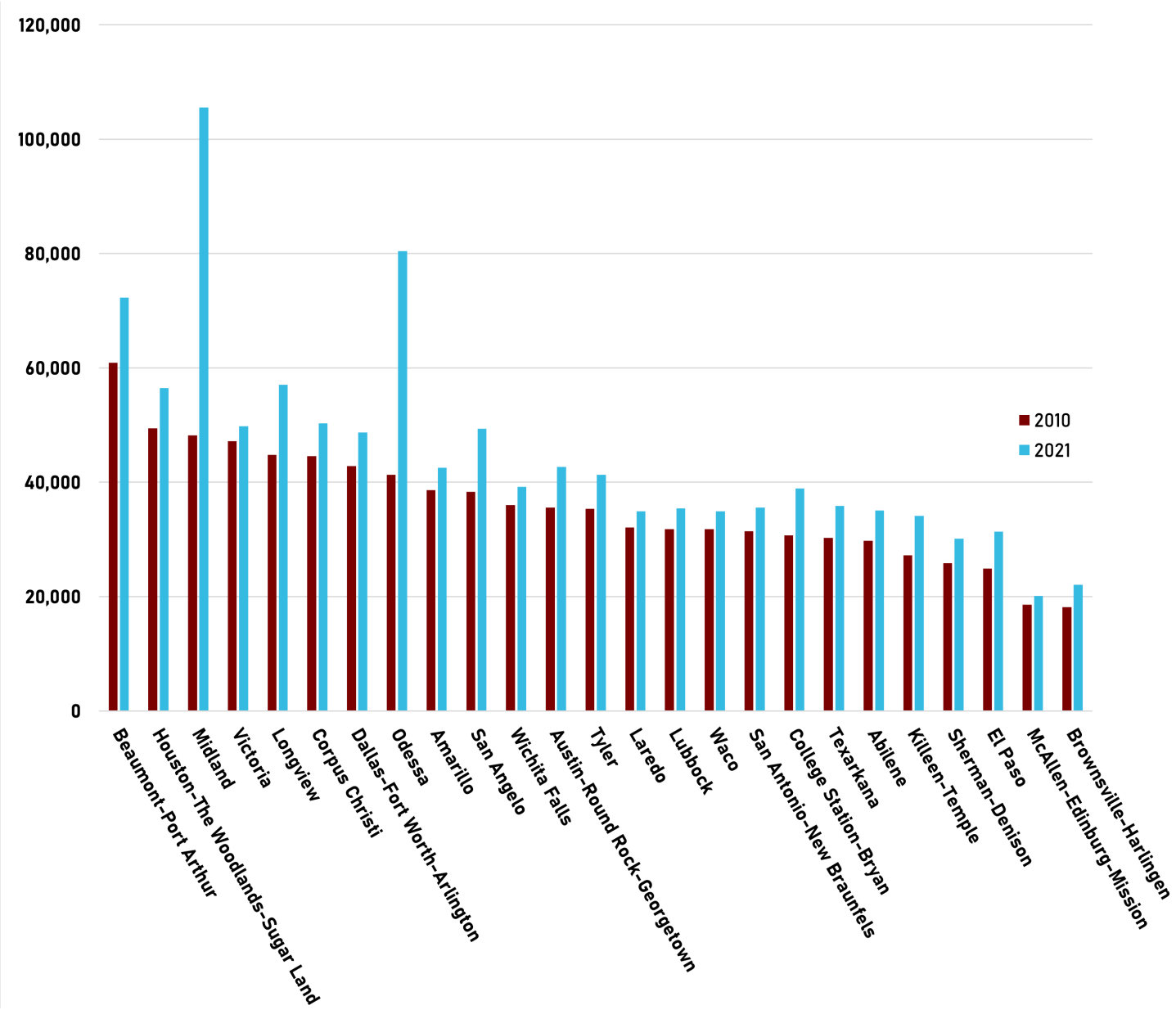
FIGURE 2. TEXAS MSA POPULATION 2010 AND 2021



A look at per capita RGDP provides an important view of the relative economic performance of Texas MSAs. Referencing Figure 3, there is a substantial difference in the per capita level of RGDP across MSAs. A noticeable observation from Figure 3 is that the 4 largest Texas MSAs don't necessarily rank the highest for per capita RGDP. The Dallas MSA, the largest Texas MSA by population, has a per capita 2021 RGDP of $48,694. Houston MSA, the second largest Texas MSA by population, has a higher per capita 2021 RGDP of $56,470. Austin MSA, the fourth largest Texas MSA by population, has a per capita 2021 RGDP of $42,691. San Antonio MSA, the third largest Texas MSA by population, has a substantially smaller per capita 2021 RGDP than the other 3 largest Texas MSAs at $35,581.

When examining the differences between 2010 and 2021 per capita RGDP, there are a few MSAs that stand out from the rest. As referenced earlier, we see that Midland's per capita RGDP grew substantially between 2010 and 2021. The Odessa MSA presents a similarly substantial growth in per capita RGDP. Victoria, which was mentioned earlier in this section as having the lowest RGDP of the Texas MSAs, ranks fairly high in terms of per capita RGDP at $49,771.

FIGURE 3. TEXAS MSA RGDP PER CAPITA 2010 AND 2021, (1,000s OF 2012 DOLLARS)



GROWTH TRENDS ACROSS THE 4 LARGEST TEXAS MSAs

The first topic of discussion is the growth rates seen in the 4 largest Texas MSAs by population and the Texas aggregate level. We consider growth rates with the year 2010 as the base and also the annualized growth rate. It is important to note that annualized growth rates represent the average growth rate across the time period, so it does not reveal the yearly variations and departures from this average growth rate. To obtain an accurate picture of how trends change over time, we look at year-by-year changes as well as annualized growth rates. Specifically, we discuss trends seen in RGDP growth, population growth, and per capita RGDP growth.

RGDP Growth

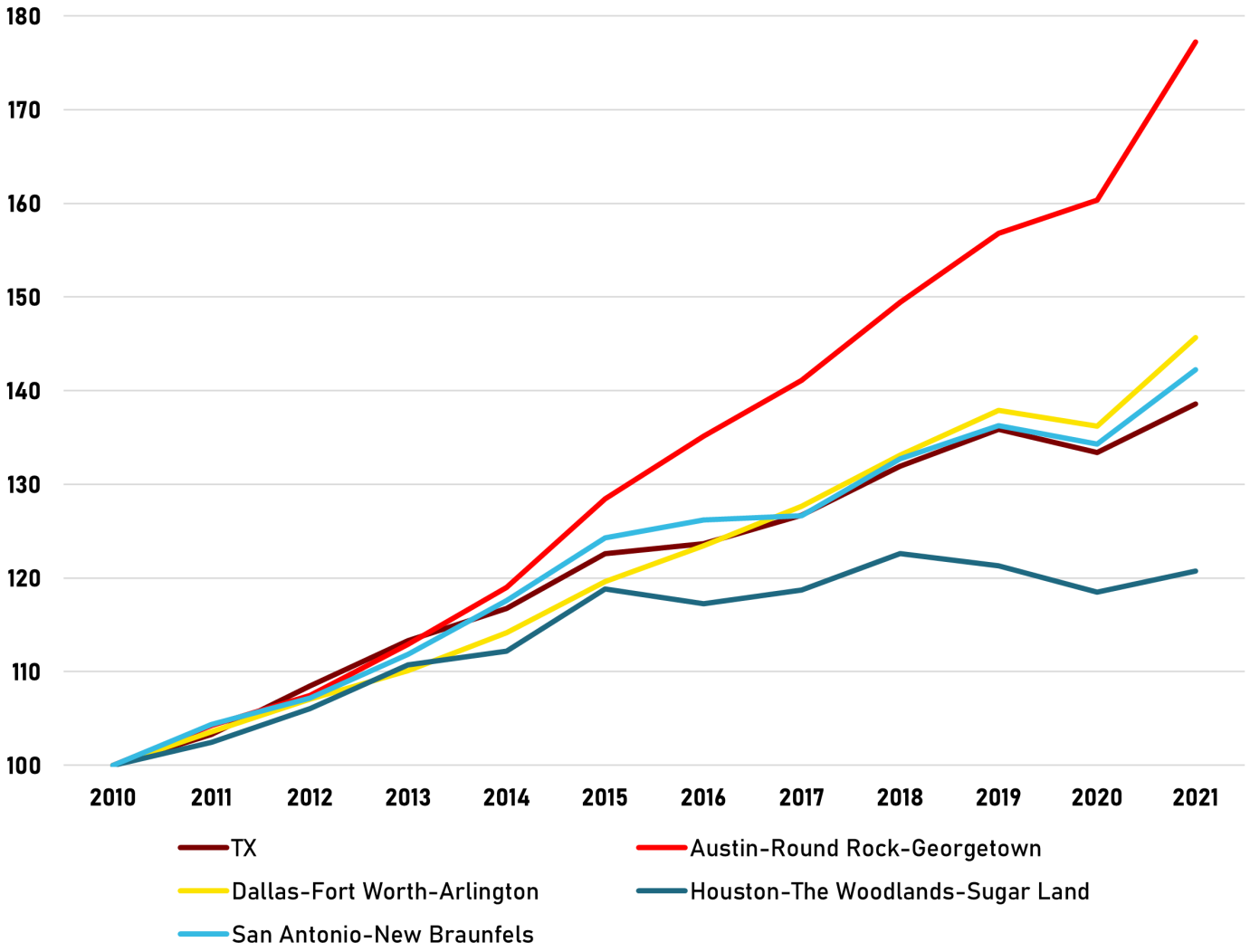
We begin our discussion with trends present in the RGDP growth of the four largest Texas MSAs by population across the years 2010-2021. Figure 4 provides a visual representation of the

changing RGDP growth rates using the year 2010 as a base. All the MSAs followed closely with Texas until around 2013, during which the RGDP growth of the MSA diverged. Austin's growth quickly exceeded that of the other largest MSAs and of the state itself. San Antonio and Dallas grew fairly closely to the overall Texas growth rate. Meanwhile, Houston lagged behind in RGDP growth, and its RGDP growth stagnated around 2015. There was also a small dip in RGDP growth around the 2019-2020 COVID period, but the MSAs (except Houston) and the entire state of Texas recovered quickly in 2021. In fact, Austin had an even greater RGDP growth in 2021.

We also calculate the annualized RGDP growth rate of these MSAs across the time period. They are as follows: Texas statewide was 3.01%, Austin 5.34%, Dallas 3.48%, Houston 1.73%, and San Antonio 3.25%.

It is important when interpreting these growth figures to remember the levels discussed earlier. Houston saw slow growth between 2010 and 2022, but Houston's RGDP was still second highest in the state, and its per capita RGDP was still higher than the other three largest MSAs. Meanwhile, Austin showed the highest growth of the big four MSAs in Texas, but in 2022, its per capita RGDP was still below Houston and Dallas.

FIGURE 4. RGDP GROWTH OF TEXAS & 4 LARGEST TEXAS MSAs 2010 AND 2021, (1,000s OF 2012 DOLLARS)

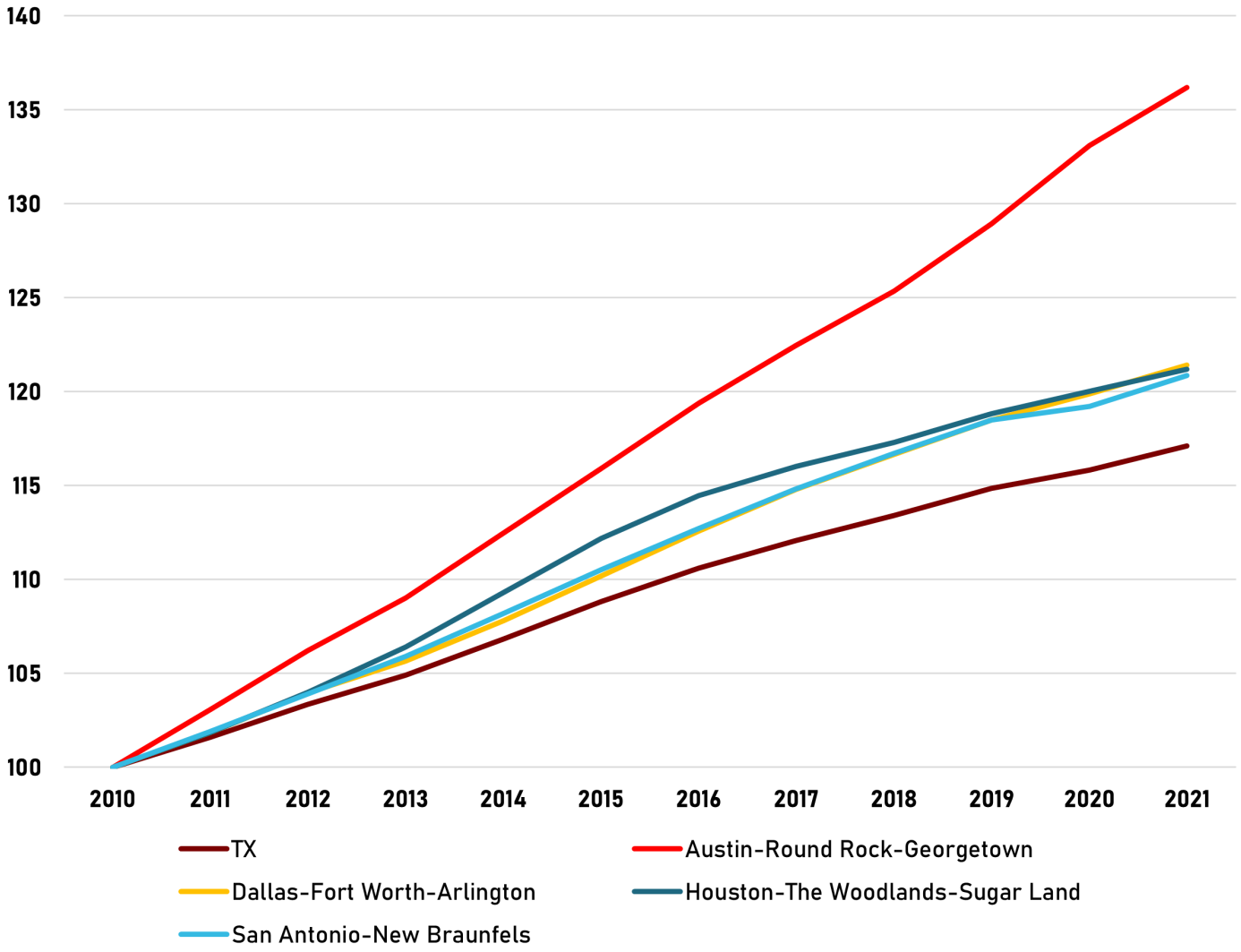


Population Growth

Here we discuss the trends in population growth of the four largest MSAs by population across the years 2010-2021. Figure 5 provides a visual representation of the changing population growth rates using the year 2010 as a base. Austin had the greatest population growth and continued to have faster growth than the other three largest MSAs. Houston, Dallas, and San Antonio had relatively similar population growth rates, with Houston's population growth briefly exceeding the other two MSAs from 2014-2018. Interestingly, all 4 MSAs had population growth that exceeded the overall Texas growth rate, indicating a tendency for population growth to be higher in the largest urban areas.

The annualized population growth rate of these MSAs across the time period are as follows: Texas 1.45%, Austin 2.85%, Dallas 1.78%, Houston 1.76%, and San Antonio 1.74%.

FIGURE 5. POPULATION GROWTH OF TEXAS & 4 LARGEST TEXAS MSAs 2010 AND 2021

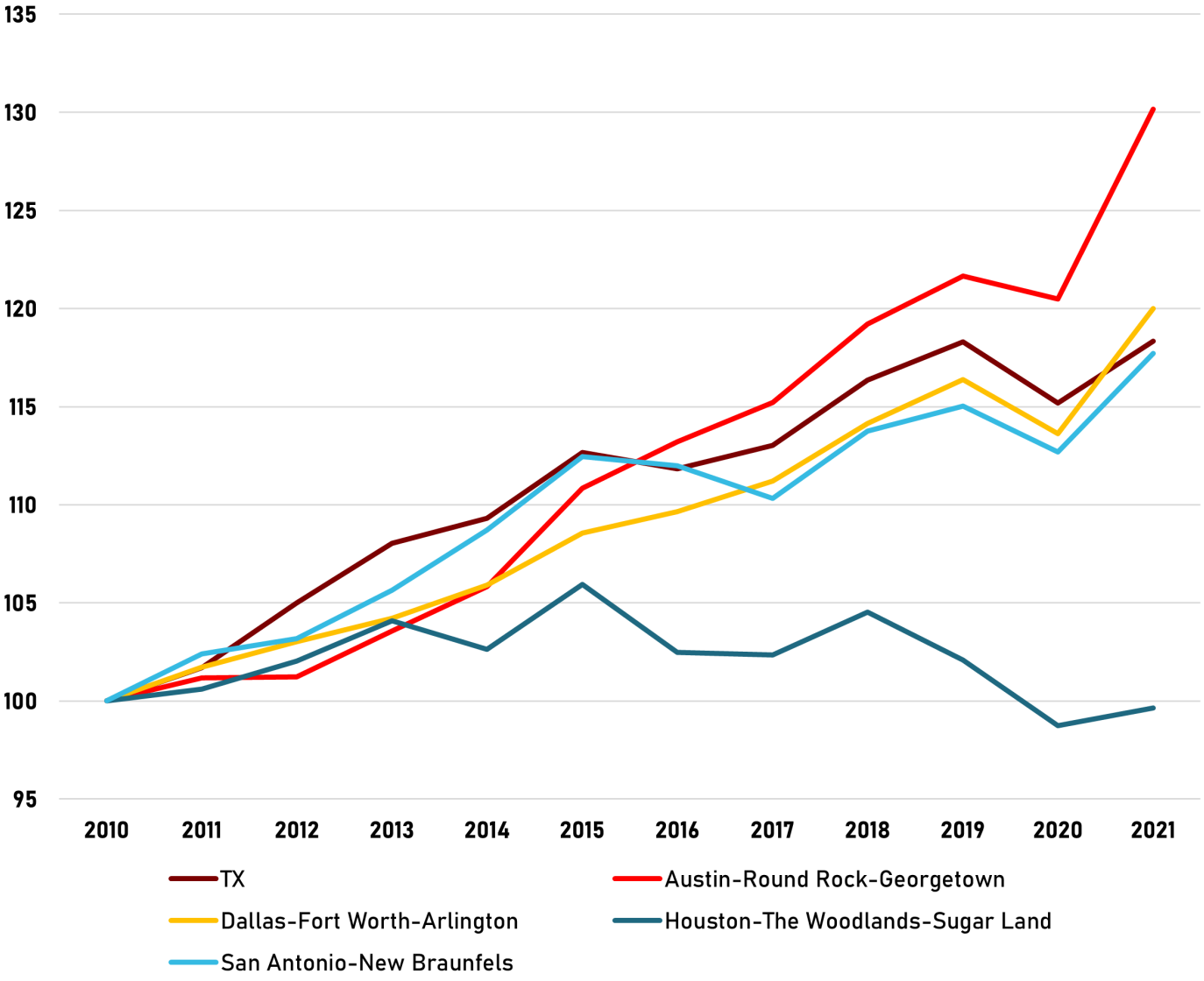


Per Capita RGDP Growth

Finally, in Figure 6 we examine the trends present in the per capita RGDP growth of the four largest MSAs by population across the years 2010-2021, using 2010 as the base year. Austin's per capita RGDP growth was well below the Texas level until 2015-2016, after which Austin's per

capita RGDP growth rate exceeded the state rate, and it was the fastest growing MSA in terms of per capita RGDP for the entire period. San Antonio and Dallas had per capita RGDP growth rates that were slightly below the Texas average, with San Antonio briefly matching the Texas level from 2014-2016 but fell back to the Dallas level for the rest of the period. Houston remained far lower than the rest of the MSAs in terms of per capita RGDP growth over this entire period. For all measures, there is a noticeable dip around the 2019-2020 COVID period, but Texas and three of the four largest MSAs recovered quickly. In fact, Dallas' per capita RGDP growth exceeded Texas in the post-COVID period.

FIGURE 6. PER CAPITA RGDP GROWTH OF TEXAS & 4 LARGEST TEXAS MSAs 2010 - 2021



Annualized per capita RGDP growth rate of these MSAs across the time period is also considered. They are as follows: Texas 1.54%, Austin 2.43%, Dallas 1.67%, Houston - 0.03%, and San Antonio 1.49%. Houston's low value shows that RGDP per capita in Houston, while high, had been stagnant over this time period.

Altogether, we see that the Austin-Round Rock-Georgetown was the fastest growing Texas MSA of the 4 largest MSAs by population, as it ranked the highest in terms of RGDP growth, population growth, and per capita RGDP growth. Dallas and San Antonio were the middle of the pack of Texas MSAs in terms of their rankings in RGDP growth, population growth, and per capita RGDP growth. Houston was the slowest growing Texas MSA of the 4 largest MSAs by population, as it ranked among the lowest in terms of RGDP growth, population growth, and it even had very slightly negative per capita RGDP growth.

It bears repeating that this discussion about growth rates should be interpreted in light of the relative levels of the variables. Houston had slow growth rates in per capita RGDP, but still had higher levels or RGDP per person than the other three largest MSAs. And Austin, with all of its fast growth, still had per person RGDP levels that ranked third among the largest MSAs.

GROWTH ACROSS ALL MSAs

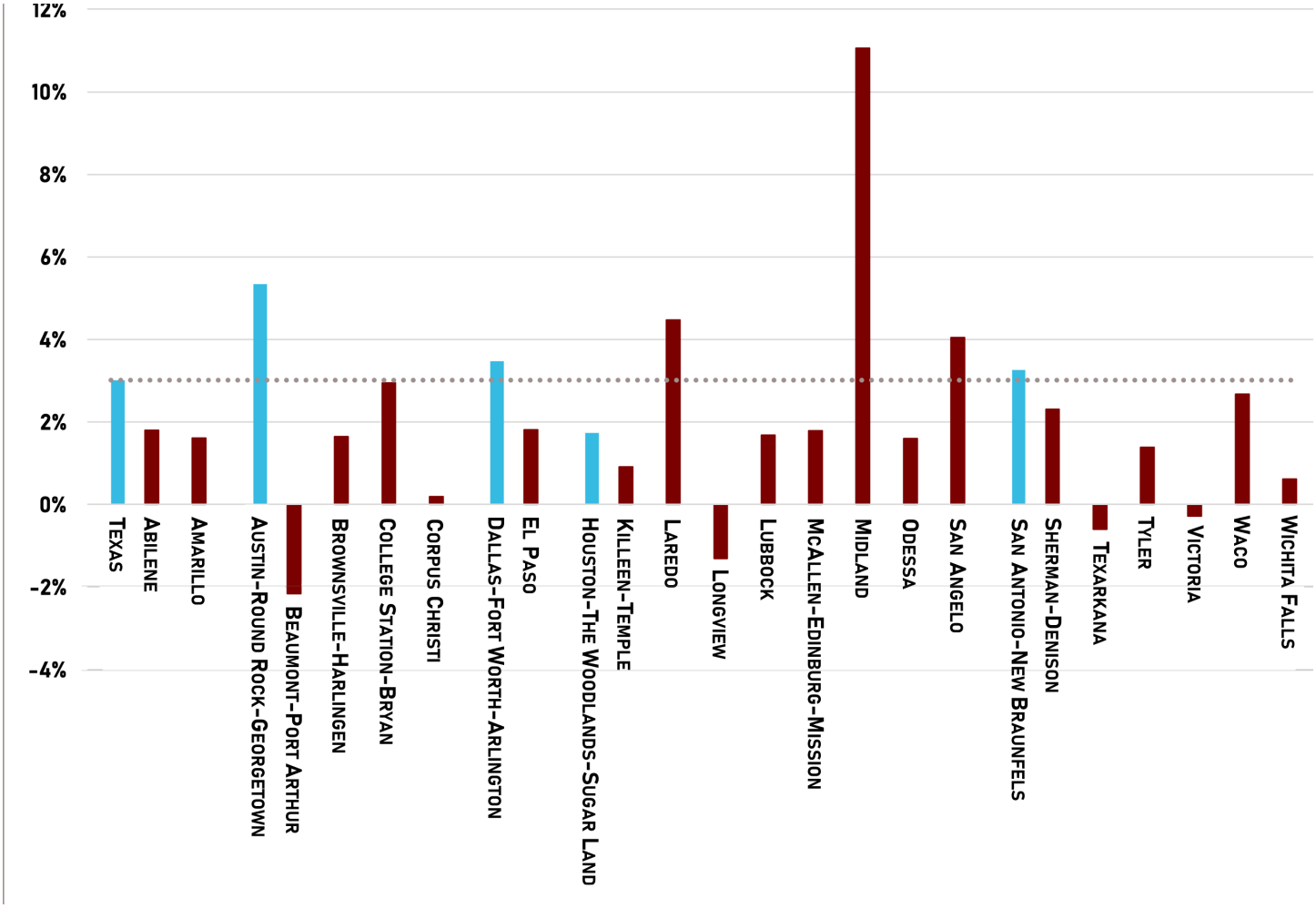
We now expand our discussion to encompass all 25 Texas MSAs. To succinctly represent the growth of the MSAs across the time period, we look at the annualized growth rate of the MSAs over the time period. As stated in the previous section, the annualized growth rate is an average of the growth experienced by a MSA across a time period, so it may not reflect year-by-year trends. However, it provides a good overview of how each MSA performed over the time period. We also discuss the annualized growth rates of RGDP, population, and per capita RGDP.

RGDP Growth

Our discussion begins with the topic of annualized RGDP growth from 2010-2021. Figure 7 depicts the annualized RGDP growth across Texas and its 25 MSAs. The four largest MSAs by population and Texas are represented by the blue bars. The dotted dashed lines represent the annualized RGDP growth of the entire state.

There are a few notable trends seen in Figure 7. Austin and especially Midland experienced very high annualized RGDP growth rates relative to the rest of the MSAs. Corpus-Christi and Wichita Falls experienced fairly low levels of annualized RGDP growth. There were also a few MSAs with negative annualized RGDP growth rates, including Beaumont, Longview, Texarkana, and Victoria.

FIGURE 7. TEXAS MSA RGDP ANNUALIZED GROWTH 2010 - 2021

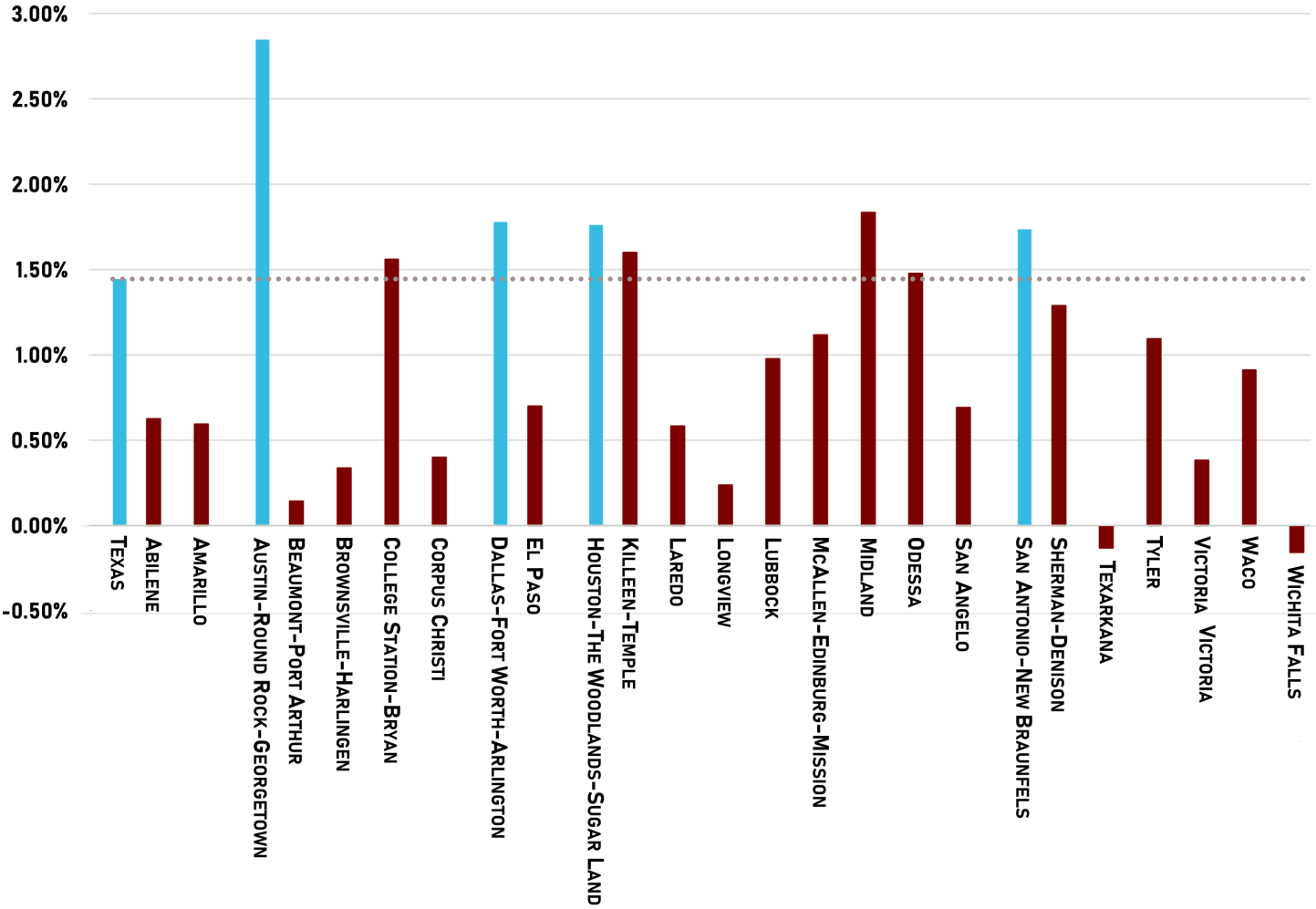


Population Growth

Figure 8 depicts the annualized population growth across Texas and its 25 MSAs for 2010-2021. Once again, the four largest MSAs by population and Texas are represented by the blue bars. The dashed lines represent the annualized population growth of Texas.

There are a few notable trends seen in Figure 8. Austin, Dallas, Houston, Midland, and San Antonio experienced very high annualized population growth rates relative to the rest of the MSAs. Beaumont and Longview experienced fairly low levels of population growth. There were also two MSAs with negative annualized population growth rates, Texarkana and Wichita Falls.

FIGURE 8. TEXAS MSA POPULATION ANNUALIZED GROWTH 2010 - 2021

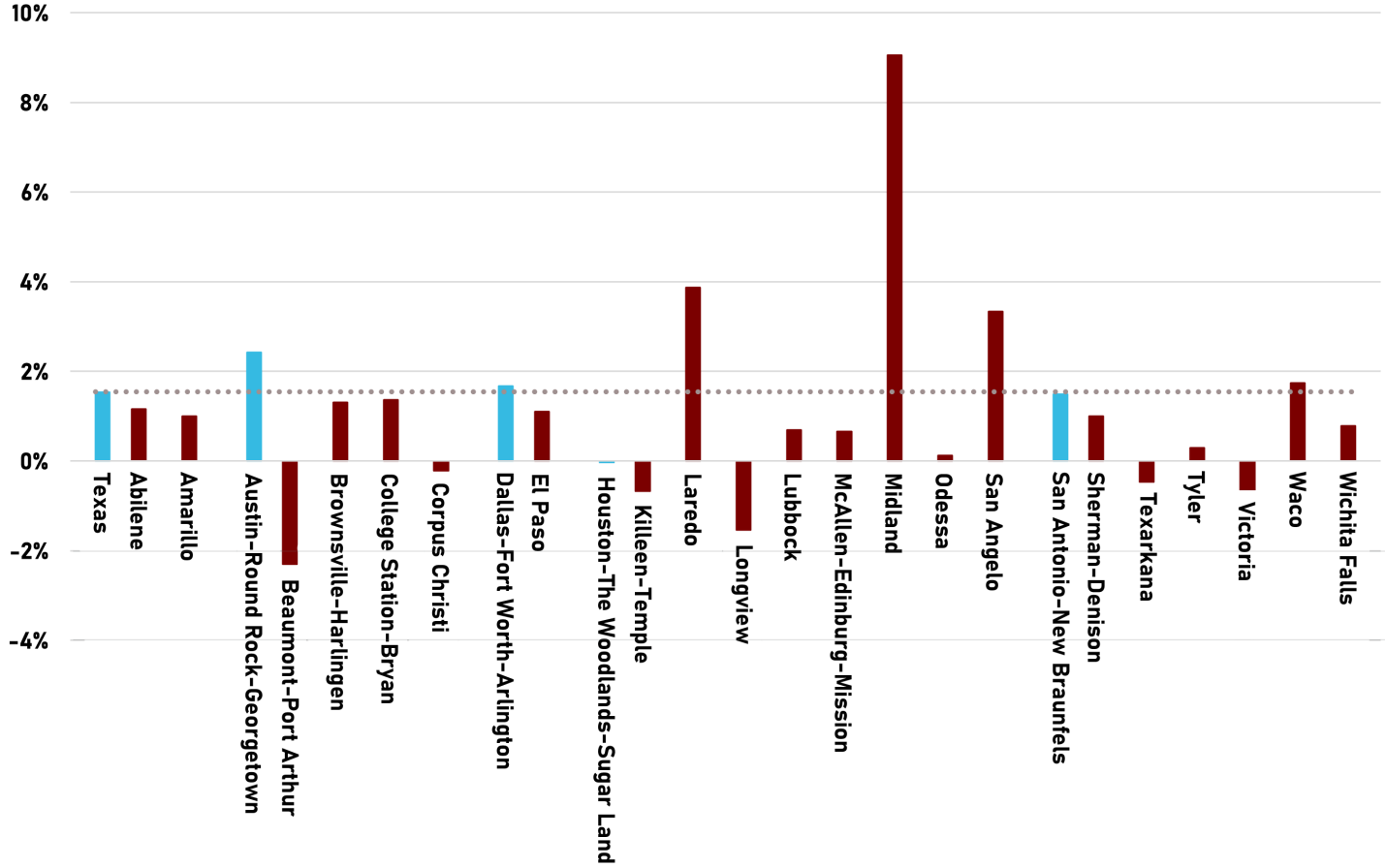


Per Capita RGDP Growth

Lastly, we discuss annualized per capita RGDP growth from 2010-2021. Figure 9 depicts the annualized population growth across Texas and its 25 MSAs. Once again, the four largest MSAs by population and Texas are represented by the blue bars. The dashed lines represent the annualized population growth of Texas.

Laredo, Midland, and San Angelo experienced very high annualized per capita RGDP growth rates relative to the rest of the MSAs. The MSAs of Lubbock, McAllen, Odessa, Tyler, and Wichita Falls experienced fairly low levels of per capita RGDP growth. There were also a few MSAs with negative growth rates, including Beaumont, Corpus Christi, Houston, Killeen, Longview, Texarkana, and Victoria.

FIGURE 9. TEXAS MSA PER CAPITA ANNUALIZED GROWTH 2010 - 2021



COMPARISONS OF GROWTH IN RGDP PER CAPITA ACROSS MSAs

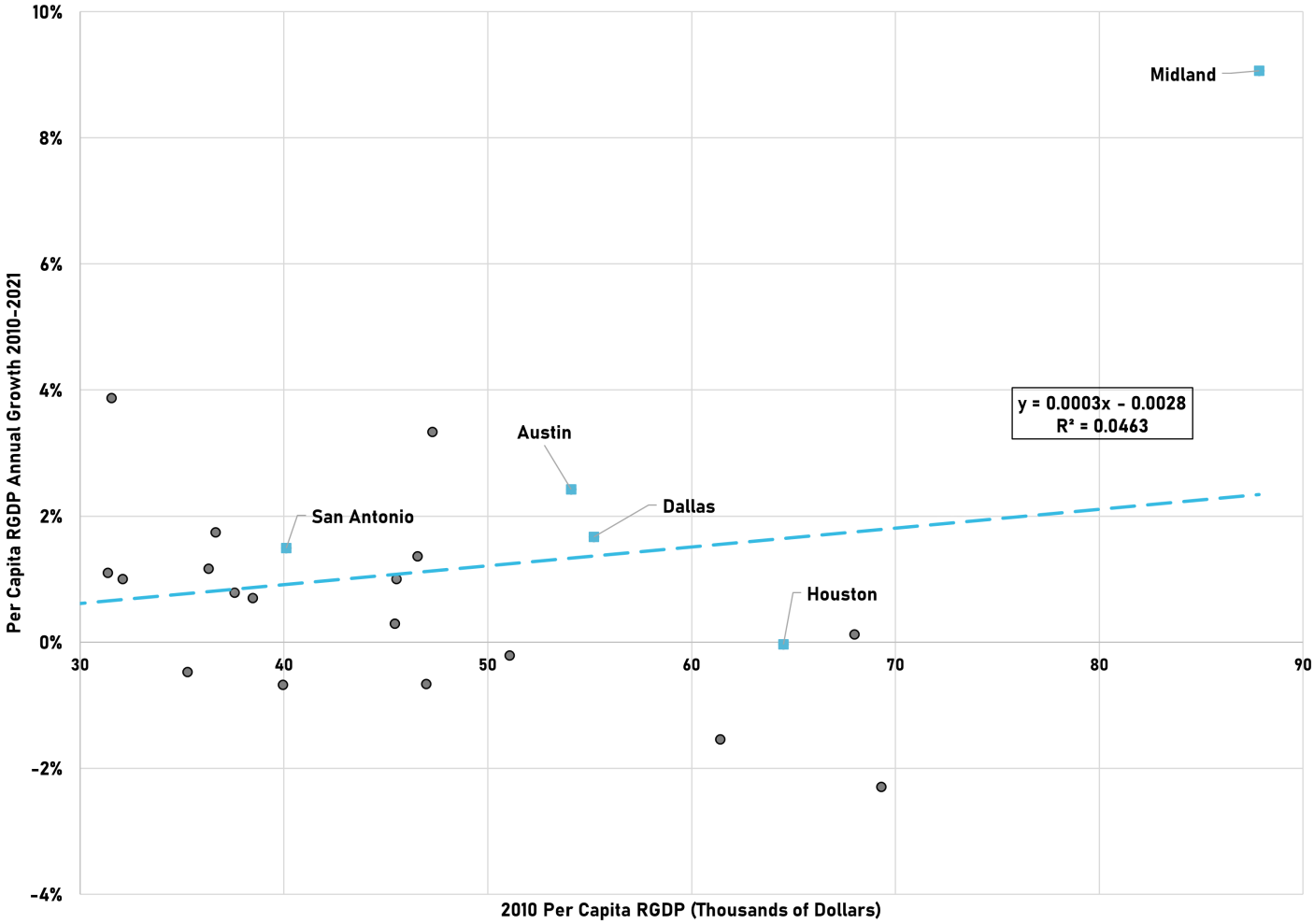
As stated previously, the Solow Growth Model predicts that lower-income economies will grow faster than higher-income economies. We examine our Texas data to see if this holds among Texas MSAs.

In Figure 10 we examine how annualized growth rates of per capita RGDP over the 2010 to 2021 period are related to the level of per capita RGDP in 2010, the start of our sample. Data points pertaining to the four largest MSAs by population and Midland MSA are in blue.

The figure reveals a slight positive correlation between 2010 per capita RGDP and annualized per capita RGDP growth rates over 2010 to 2021, a result opposite from the prediction of the Solow Growth Model.

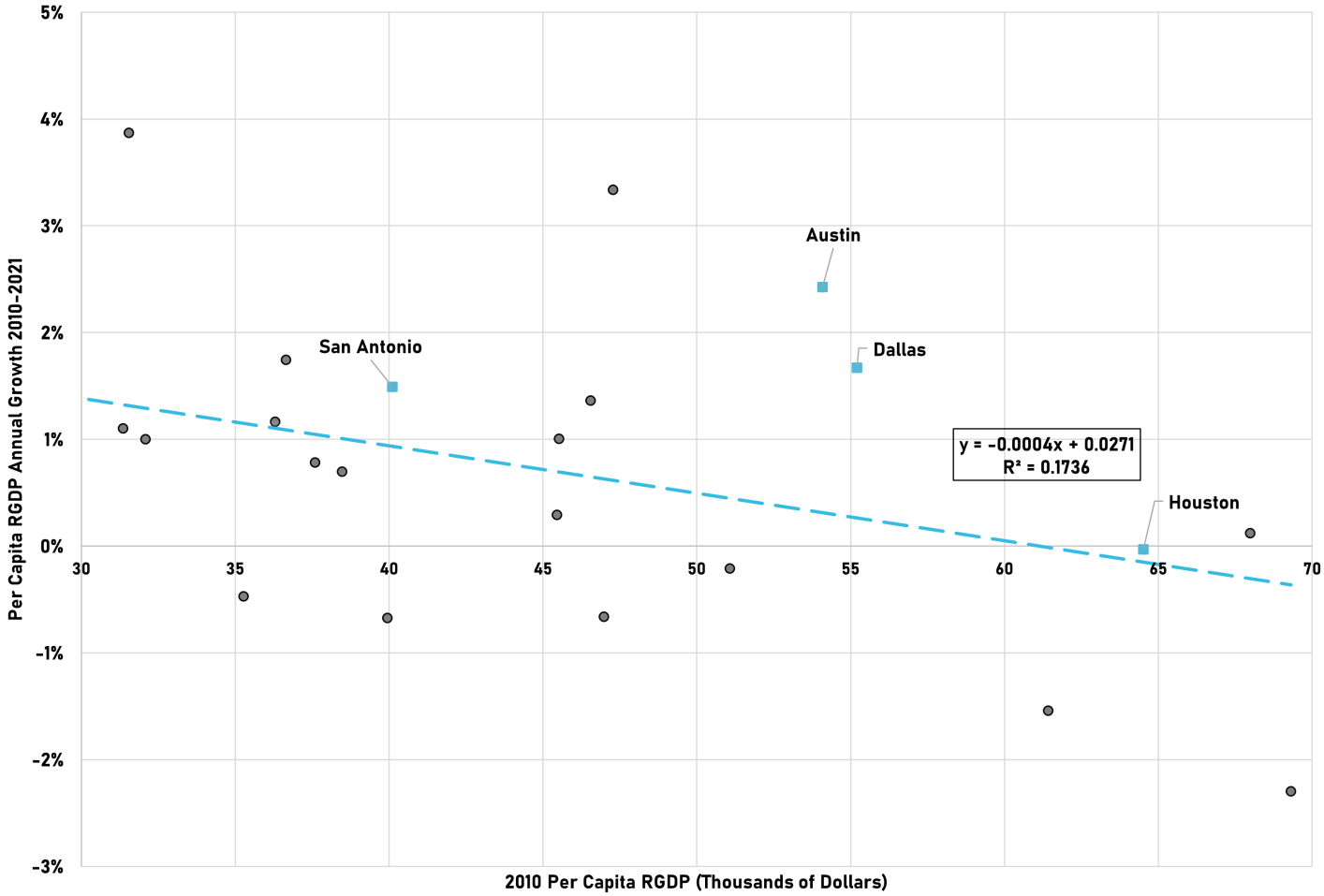
However, an important outlier that has been discussed in previous sections, Midland MSA, seems to have a large impact on the overall trends. Midland has both an unusually high 2010 per capita RGDP and an unusually high per capita RGDP growth rate. The point that pertains to Midland is seen in the top right corner of Figure 10.

FIGURE 10. TEXAS MSA 2010 PER CAPITA GDP vs PER CAPITA RGDP GROWTH 2010 - 2021



Midland is an outlier due to its heavy reliance on the energy industry and to its small size. Figure 11 redoes the analysis from Figure 10 but without the Midland MSA in the dataset. In this case, there is a clear negative correlation between 2010 per capita RGDP and annualized per capita RGDP growth over 2010 to 2021. In other words, Texas MSAs who were better off in 2010 per capita RGDP were more likely to have a lower annualized growth rate of per capita RGDP over 2010 to 2021 compared to Texas MSAs that had lower 2010 per capita RGDP. These findings are largely consistent with the predictions of the Solow Growth Model.

FIGURE 11. TEXAS MSA 2010 PER CAPITA GDP vs PER CAPITA RGDP GROWTH (EXCLUDING MIDLAND)



CONCLUSION

Of the Texas MSAs, Midland's economy has been the fastest growing, as it far exceeded the other MSAs in terms of RGDP growth and per capita RGDP growth, and it was above average in terms of population growth. Austin MSA had a relatively high level of RGDP growth and a high level of population growth, and it also had per capita RGDP growth above the rate for Texas as a whole. The MSAs with declining or stagnating economic growth either had low/negative population growth, such as Wichita Falls, or low/negative per capita RGDP growth, such as Beaumont. Overall, the economic performance of the 25 Texas MSAs varies widely, as seen with the wide variation in the performance of these MSAs across the 3 metrics.

Additionally, we find that the levels of per capita RGDP play an important role in determining the growth of per capita RGDP in the following years. Texas MSAs with higher initial levels of RGDP per capita generally grew at a lower rate compared to MSAs with lower initial levels of per capita RGDP. There is a tendency for MSAs to converge over time, even if at a slow rate, and even with notable deviations from that tendency.