2015

The Economy of Oaxaca Decomposed

Albert Codina Sala
Georgia Southern University

The Economy of Oaxaca Decomposed

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in *Department of Finance and Economics.*

By
Albert Codina Sala

Under the mentorship of *Dr. Gregory Brock*

ABSTRACT

We analyze the internal economy of Oaxaca State in southern Mexico across regions, districts and municipalities from 1999 to 2009. Using the concept of economic convergence, we find mixed evidence for poorer areas catching up with richer areas during a single decade of economic growth. Indeed, some poorer regions thanks to negative growth have actually diverged away from wealthier areas.

Keywords: Oaxaca, Mexico, Beta Convergence, Sigma Convergence

Thesis Mentor: _____
Dr. Gregory Brock

Honors Director: _____
Dr. Steven Engel

April 2015
College of Business Administration
University Honors Program
Georgia Southern University

Acknowledgements

The first person I would like to thank is my research mentor Dr. Gregory Brock. Without his assistance, dedication and involvement in every step of this Honors Thesis, this paper would have never been accomplished. Thank you very much for all the support, patience and everything you have taught me outside the classroom.

My sincere thanks also go to Dr. Trey Denton. While taking his two research classes in the College of Business Administration, I was able to better understand the fundamentals that are required to start writing an Honors Thesis. Furthermore, thanks to his classes, I was able to start developing a vision of the professional that I really want to become in the future. I would like to thank you very much for helping me during the initial steps of this Honors Thesis as well as guiding me through the right mentality.

I would also like to show my gratitude to the Honors Program at Georgia Southern University. The opportunity that has been given to me is something that I will never forget. Thank you very much for making me a better student and teaching me how to become a better person.

Most importantly, none of this could have ever happened without the support received from my family and girlfriend. You have been always there cheering me up during the good times and the bad. This Honors Thesis stands as a testament of your unconditional love and encouragement.

I. Introduction

Economic differences do exist across regions, districts and municipalities pretty much in all countries. This doesn't come as a surprise to anyone and it is, in fact, one of the main issues that governments attempt to correct on a daily basis. However, the two main questions to be asked here are the following. Are relatively poor economies destined to remain poor forever? Will relatively poorer regions, districts and municipalities be able to catch up to richer ones in the future? In the field of economics, when we talk about economic convergence we are making reference to the catch-up effect. The theory of the catch-up effect states that relatively poorer economies' per capita incomes will grow at a faster rate than richer economies' per capita incomes. According to the idea of convergence economics, the catch-up effect should take place due to the following two reasons. First, poorer economies should be able to copy the same structure, plans, and methods that richer economies use without having to spend that much money in research and design. Second, richer economies tend to suffer from stronger diminishing returns than poorer economies.

This research study focuses on Oaxaca's (Mexico) economy and analyzes if the regions, districts and municipalities of this Mexican state converged from 1999 to 2009. Furthermore, I go on to analyze some of the relatively poorer economies' per capita incomes used in this research study as samples and provide reasons for their excessive index of marginality since 1999. The formulated reasons are focused on explaining why these economies didn't grow at a faster pace as it was expected by the catch-up effect.

Using β-convergence as the primary research methodology, I have divided my analysis into three stages while using the same time period of 1999 to 2009 for all of them. The first stage is solely focused on regions, the second on districts and the third on municipalities. σ-convergence is also used across the three stages of this research study as a measure of dispersion with the aim to check data disparities along time. This research study concludes by putting together the results obtained in all three stages and making conclusions on why Oaxaca's economy didn't converge as it was supposed by the catch-up theory.

II. Literature Review

Studying the economy of Oaxaca has been a major attraction by numerous economists because of the actual state's socio-economic situation. It is one of the poorest states of Mexico and the second with the highest number of indigenous people; 48% of its total population (CDI, 2010). Having such a large percentage of indigenous people inside one single state is considered a problem in order to grow the economy. Because of this reason, the Mexican Government should focus on economically developing Oaxaca uniformly and spending a considerable amount of money on infrastructure inside this single state. If not, major economic and social differences may arise inside Oaxaca in the near future. These economic and social differences can create conflicts and instability among the indigenous population and many other people who believe that the government money is not being spent fairly across all parts of Oaxaca.

When looking at the results of financial marginality inside Oaxaca, one can notice that, being Oaxaca a state with over 2.4 million people in adult population, it is also the state with the least amount of financial services (Velazques-Sanchez, Solana, Galan, 2013). Oaxaca has been suffering from the Mexican Government's bad planning in expanding the state's financial services and giving people inside the work force opportunities to grow professionally and make a living. These are very sad news especially because they may trigger what has been already discussed in the paragraph above. Besides, people who pay higher taxes in richer states inside Mexico may be wondering where their money goes. If tax money is not reinvested into the poorest states of the country, what is the Mexican Government doing with it? According to Cruz and Salas, Oaxaca is one of the Mexican states, together with Guerrero and Chiapas that account for the lowest water and drainage services (2012). Hence, not only is Oaxaca missing funds to expand its economy but also to cover its most basic needs. These facts proof how Oaxaca is suffering economically at the same time that suggest a very bad financial planning from the Mexican Government.

In a recent study by Gonzalez Rivas, Oaxaca was at least 50 percent below the mean state level of income for almost the entire period of 1940 to 2000 (2011). These revealing facts show the urgency that this state has in growing its economy uniformly and follow up with the catch-up theory. By taking care of the poorest regions, districts and municipalities, Oaxaca should be able to come out of this negative economic trend that has been following during the last decades to at least become a state in which everybody could have access to basic needs.

Even though Chiapas is the Mexican state with the highest poverty rate, Oaxaca is considered to have lower chances of escaping out of poverty than Chiapas. According to Becerril & Abdulai, the poverty gap is much higher in Oaxaca than Chiapas, indicating that for the same income gains, households in Chiapas are more likely to escape out of poverty than their counterparts in Oaxaca (2010). These results are, once again, showing the immediate need of capital and investment that Oaxaca requires in order to close out the poverty gap that Becerril & Abdulai mention. The more time it takes for the Mexican Government to fix this situation, the harder it will become to permanently fix it.

As we have seen, Oaxaca's overall economy has been very well studied in the past by numerous economists. This research study attempts to analyze Oaxaca's economy dissecting it by regions, districts and municipalities. In order to accomplish that, β-convergence and σ-convergence approaches will be used to better understand how Oaxaca's economy has converged from 1999 to 2009.

The primary research method used in this research project will be based on β-convergence. This type of convergence makes reference to a process in which poor regions are expected to grow faster than richer ones and therefore catch up on them (Monfort, 2008). This type of empirical testing popularized by Barro and Sala-i-Martin (1991, 1992) allows the growth rate of income per capita between two points in time to be related to some initial level of income (Pfitzner & Lang, 2014). This type of convergence is the one that has been used in this research paper across regions, districts and municipalities inside the region of Oaxaca from 1999 to 2009.

The concept of σ-convergence can be defined as follows: a group of economies are converging in the sense of σ if the dispersion of their real per capita GDP levels tends to decrease over time (Sala-i-Martin, 1996). Hence, σ-convergence makes reference to data disparities across time. This specific type of convergence is directly linked to β-convergence. In order to obtain the normalized measure of dispersion of a probability distribution, the coefficient of variation (CV) has to be calculated. The coefficient of variation is calculated by taking the ratio of the standard deviation for each district, region or municipality over the mean of each respective sample.

According to the catch-up effect, poorer economies' per capita incomes should grow at a faster rate than richer economies. Hence, β-convergence is said to be absolute when all economies converge towards the same steady-state. We consider β-convergence conditional when several factors can vary the results for the same point in the long run (Monfort, 2008).

Being Oaxaca one of the poorest states of Mexico, it is very important for its economy to grow uniformly across regions, districts and municipalities. Oaxaca has an immediate need in providing indigenous groups with major incentives and opportunities to develop. At this point in time, the Mexican Government shouldn't allow having a single state inside the country in which not everybody had, at least, the basic needs covered. Analyzing the economy of Oaxaca in a very detailed way gives us the perspective that we need in order to better understand what happened to Oaxaca's economy from 1999 to 2009.

III. Methods and Data

This research study aims to answer a wide assortment of questions. First, regions, districts and municipalities are analyzed to see how they converged from 1999 to 2009. Second, I provide potential reasons of why regions, districts and municipalities below the average line posted negative growth from 1999 to 2004. Finally, this research study strives to uncover additional reasons that have left the overall economy of Oaxaca behind in terms of economic growth since 1999.

The first step in this research project was obtaining the data to be analyzed from INEGI. Gross industrial GDP for all the 570 municipalities of Oaxaca during years 1999, 2004 and 2009 was downloaded from INEGI's website. With the gross industrial GDP data obtained from INEGI, I adjusted each year for inflation by converting each year's amounts to 1993 Pesos. To do this, I divided each current year's real industrial GDP in 1993 Pesos by the correspondent amount in 1993 Pesos in year 1993. The same process was followed for years 1999 and 2004 respectively. However, as I didn't have the current year's real industrial GDP in 1993 Pesos for 2009, the 2006 real industrial GDP in 1993 Pesos had to be used (which was the last year that had real industrial GDP in 1993 Pesos). Later on, the 2006 real industrial GDP in 1993 Pesos was divided by the real overall GDP of the whole region of Oaxaca. By doing this, I obtained the percentage of industrial GDP for the year 2006 inside Oaxaca. What had to be done afterwards was to multiply this percentage by the 2009 real overall GDP of the whole region of Oaxaca. By following these steps, I was able to determine the 2009 real industrial GDP in 1993 Pesos.

Because INEGI didn't have the gross industrial GDP for all of the 570 municipalities across years 1999, 2004 and 2009, the following process had to be undertaken in order to account for the missing values. First, if the values missing were from 1999; I calculated the share of the 2004 industrial GDP of that specific municipality and multiplied each share by the total industrial GDP during 1999. If the values missing were solely from 2004; I calculated the average share of the other two years and use it as the share value for 2004. However, if the values missing were from 2009; I calculated the share of industrial GDP for year 2004 and multiplied each share by the total amount of industrial GDP in 2009. This approach was followed in order to obtain the municipalities' missing values assuming the closest year of data available for that same municipality. If the year missing was 2004, using the average between 1999 and 2009 gave us the closest approximation to the real share. By following this process, I was able to account for the municipalities that were only missing one year of data.

In the case of some municipalities, data was missing for two years. Hence, if data from 1999 and 2004 was missing, I calculated the share of that specific municipality during 2009 and multiplied it by the total industrial GDP in 2004 first; just as if the 2004 data was the only one missing. Then, I used the share of 2004 to calculate the one in 1999. If municipalities missed data from 2004 and 2009, the same process was undertaken in the following way. I first calculated the share of industrial GDP during 1999 and multiplied it by the total in 2004. Later one, the same share obtained in 2004 was used to calculate the one missing in 2009. This process gave me the closer approximation to the real shares missing.

On the one side, INEGI didn't provide data for 11 municipalities during any of the three years. On the other side, I knew that this couldn't be true because the online website www.microrregiones.gob.mx claimed that there had been workers employed in the industry sector for each of these same 11 missing municipalities during years 1999, 2004 and 2009. In order to account for the industrial GDP values during the three years, the following process had to be undertaken. The first step was finding a municipality with a similar population in the same district in which the municipality with the three years of missing data was located. I assumed that, in each year, the GDP over population ratio found in a similar municipality of the same district held for the municipality with the missing values as well. Hence, by accurately following this assumption process, I was able to impute the values across the 11 municipalities that were missing their industrial GDP data across the three years.

Table 1

Municipality Key	Municipality Missing 3 Years of Data	Municipality Key	Similar Municipality Inside District Used
20142	San Francisco Huehuetlán	20374	Santa Cruz Acatepec
20155	San Ildefonso Sola	20149	San Francisco Sola
20205	San Juan Lalana	20468	Santiago Jocotepec
20217	San Juan Tamazola	20511	Santo Domingo Nuxaá
20292	San Pablo Cuatro Venados	20388	Santa Inés del Monte
20408	Santa María del Rosario	20444	Santa María Yolotepec
20448	Santa María Zaniza	20429	Santa María Sola
20514	Santo Domingo Roayaga	20432	Santa María Temaxcalapa
20521	Santo Domingo Tonaltepec	20556	La Trinidad Vista Hermosa
20529	Santos Reyes Yucuná	20400	Santa María Camotlán
20532	Santo Tomás Ocotepec	20269	San Miguel El Grande

Table 1 above shows the municipalities with similar population located inside the same district used to calculate the shares of industrial GDP for the 11 municipalities that were missing values across the three years.

Right after obtaining all values across the three years for every single municipality, I closely analyzed every municipality to see if all the industrial GDP results were close to one another. Based on that analysis, I determined that there were two municipalities that had a much larger industrial GDP than its peers. Hence, these two specific municipalities had to be considered as outliers in order for the final results not to be skewed. Table 2 below shows the names of the two municipalities considered outliers.

Table 2

Municipality Key	Name of the Municipality
20079	Salina Cruz
20262	San Miguel Amatlán

After having taken out the two outliers, I used the 568 municipalities' industrial GDPs and divided them by their respective population during years 1999, 2004 and 2009. I ended up with the industrial GDP per capita of these 568 municipalities across the three different years. After having added the population totals for every district and region, the same calculation process was followed in order to obtain the industrial GDP per capita across every district and region. At this point, initial industrial GDP per capita across municipalities, districts and regions needed for the β-convergence analysis graphs during years 1999, 2004 and 2009 was obtained.

In order to obtain the remaining values required to run a β-convergence analysis, the following steps had to be undertaken. Firstly, I calculated the initial per capita industrial GDP growth rate of each municipality between years 1999 and 2004. Secondly, I also calculated the initial per capita industrial GDP growth rate of each municipality between years 2004 and 2009. Finally, the two values obtained in the previous step were averaged and multiplied by 100 in order to end up with initial per capita industrial GDP average growth rate across years 1999 to 2009 for every single municipality. The same process was followed across each district and region in order to account for their respective per capita industrial GDP average growth rate. Hence, with these additional values, I was finally ready to compute the β-convergence analysis graphs for all municipalities, districts and regions across years 1999, 2004 and 2009.

The next analysis on this research paper is based on σ-convergence. I wanted to use this analysis as a method of checking any data disparities across time. Henceforth, in order to obtain the required values to run this type of analysis, the following steps had to be followed. First, I computed the overall standard deviation across all 568 municipalities. Second, I calculated the overall mean for all the municipalities. With these two values obtained, the next step was just taking the ratio between them. Hence, I divided the standard deviation by the mean in order to account for the coefficient of variation (CV); this was the value used as the σ variable. I followed this process across every single year for every district and region. After obtaining these values, everything was ready to compute the σ-convergence graphs.

IV. Results

In the following section, I present and discuss the results obtained using the β-convergence graphs across years 1999, 2004 and 2009. I divide this analysis into three different sections to better understand what happened to the regions, districts and municipalities of Oaxaca from 1999 to 2009.

Figure 1 below presents the results of the β-convergence computations for the regions of Oaxaca during year 1999. As we can observe, there are only two regions (Costa & Valles Centrales) below the average line. According to the catch-up effect, these two regions should experience a relatively faster initial per capita growth than the other regions when comparing them with Figure 2.

Figure 1

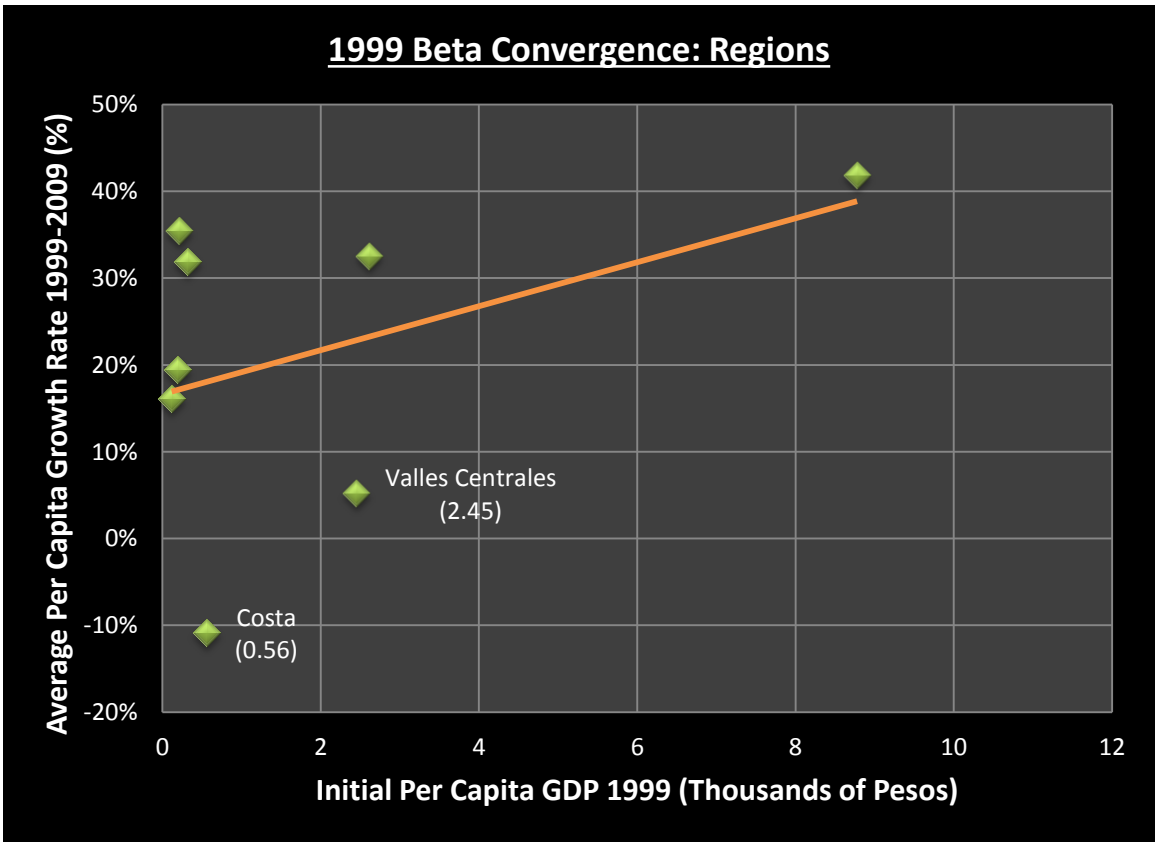
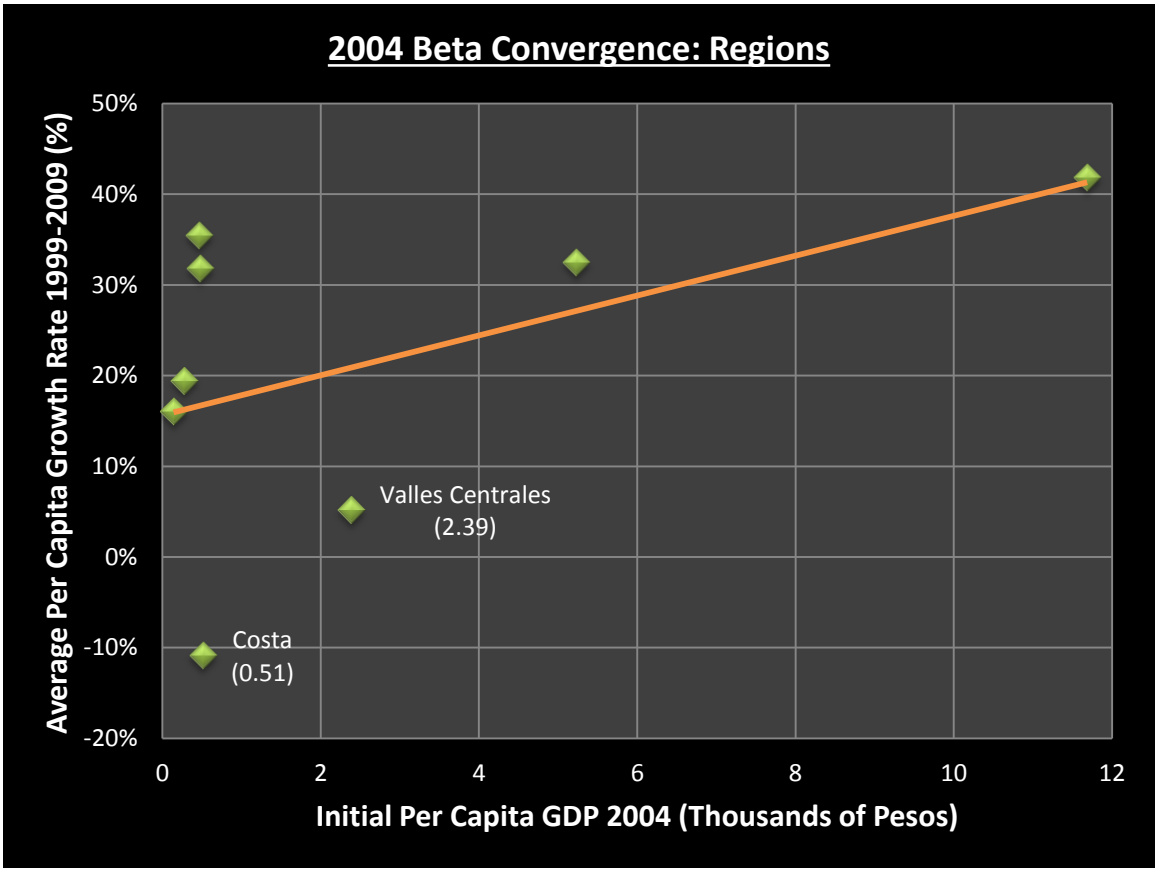


Figure 2



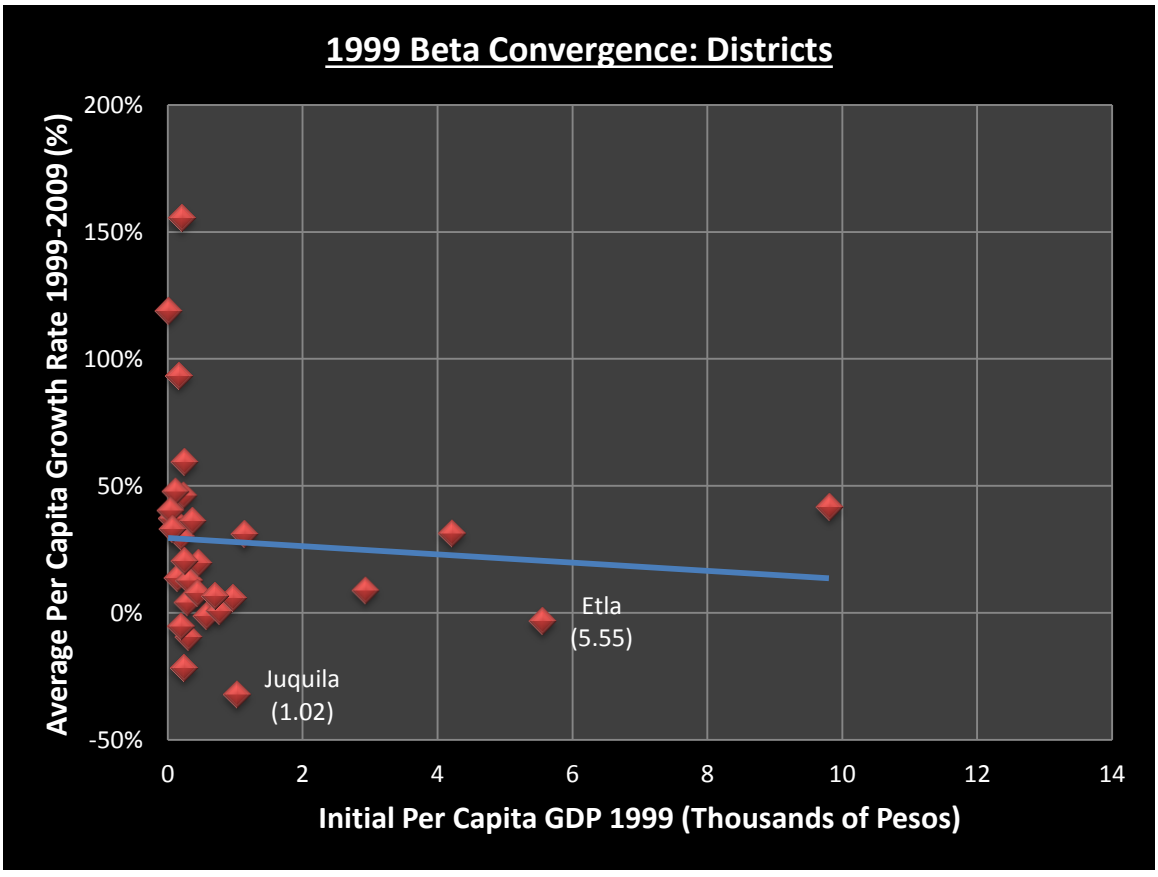
If we take a detailed look at Figure 2 above, we can witness that the two regions that were initially below the average line in Figure 1 (Costa & Valles Centrales) didn't grow at a faster rate than the other regions; in fact, they even suffered a negative growth. These results totally contradict the theory of economic convergence in which the catch-up effect takes place.

While trying to answer the question of why the catch-up effect didn't work for these two regions inside Oaxaca, several reasons are found. The very first one is simply based on the theory that the Mexican Government didn't invest as much money in industrial infrastructure as it should have done across these two regions. It is important to note that these two regions are composed by a higher

than average number of indigenous groups that mostly rely on labor intense economic activities to make a living. For example, in the case of Costa region, it was found that the majority of the population worked in the agriculture and waterfront fisheries sector. On the other side, when looking at Valles Centrales region, I found out that, a part from being one of the regions with the largest number of indigenous groups, its economy heavily relied on tourism interested in the Pre-Hispanic ruins that the region still conserved.

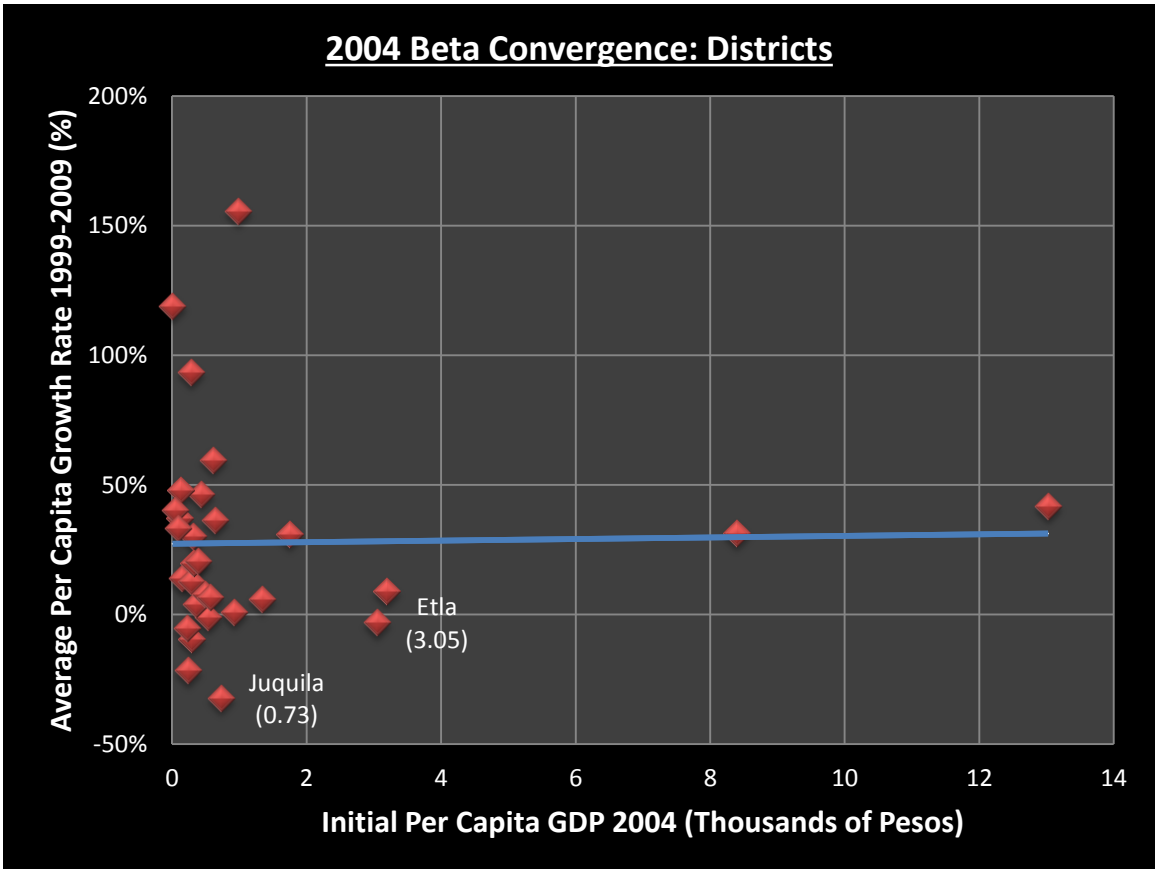
To move into the second section of the β-convergence computations, we need to change our sample to districts. Figure 3 below shows the β-convergence results obtained across the 30 districts inside Oaxaca in 1999.

Figure 3



In order for the catch-up effect to work across the 30 districts of Oaxaca, the ones that were below the average line should have increase at a faster rate than the ones that were above it. However, if we compare Figure 3 above with Figure 4 below, paying extra attention to Juquila and Etla districts, we will realize, once again, that the catch-up effect doesn't hold across districts.

Figure 4

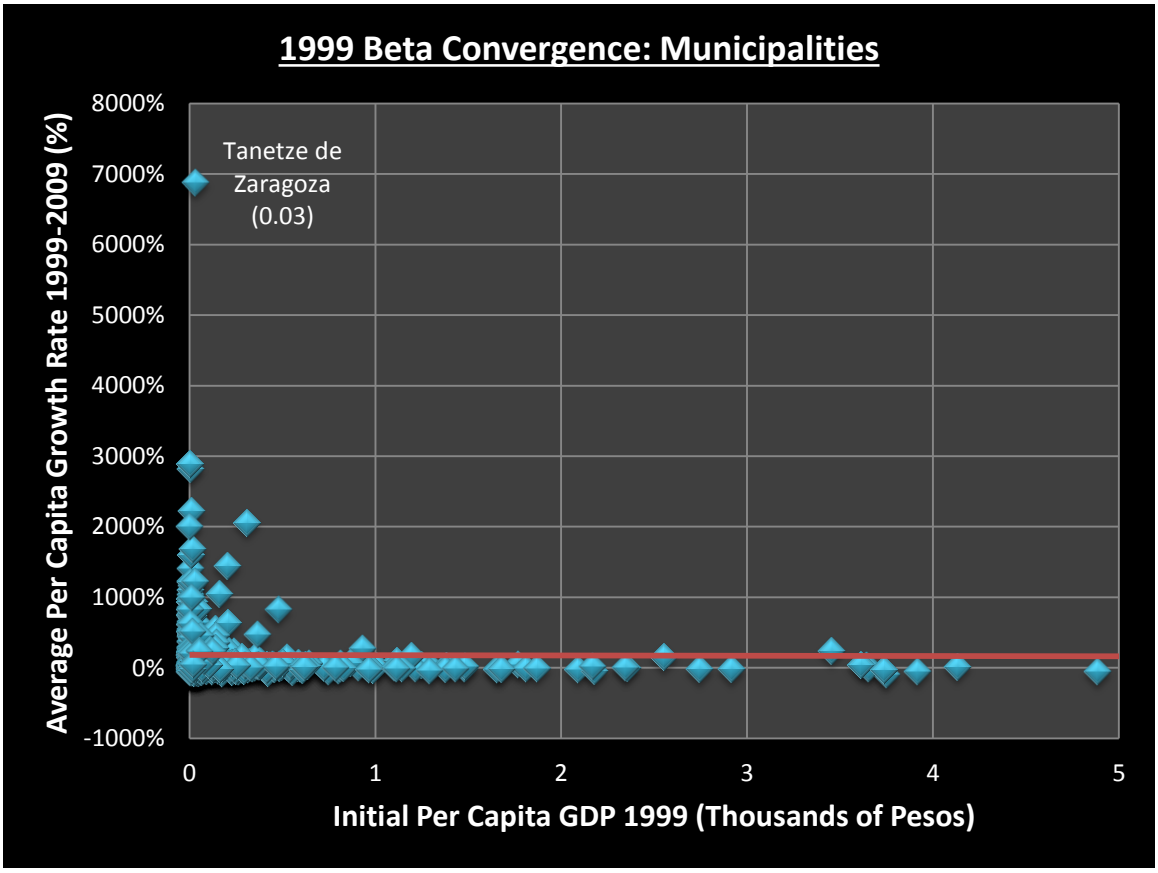


By comparing Figure 4 to Figure 3, we can observe the following changes. First, just as it happened with the regions graphs, the average line expands, nevertheless, the districts that are below it don't increase at a faster rate at the beginning of 2004. Moreover, Juquila and Etla districts end up posting considerable negative growths from 1999 to 2004.

While trying to answer the question of why districts in Oaxaca didn't follow up with the catch-up effect, the following reasons have been found. On the one hand, Juquila district is located inside Costa region; the same one that we analyzed in the previous scenario. Furthermore, this district has a large amount of indigenous people that practice animal husbandry and agriculture for their own consumption, factors that don't really stimulate the district's economy. On the other hand, Etla district is located inside Valles Centrales region; the second region that we analyzed during the first section of this analysis. Etla district suffers a strong discrimination in industry development investment from the Mexican Government at the same time that its economy is heavily dependent on tourism from Pre-Hispanic ruins; a source of income with very low potential.

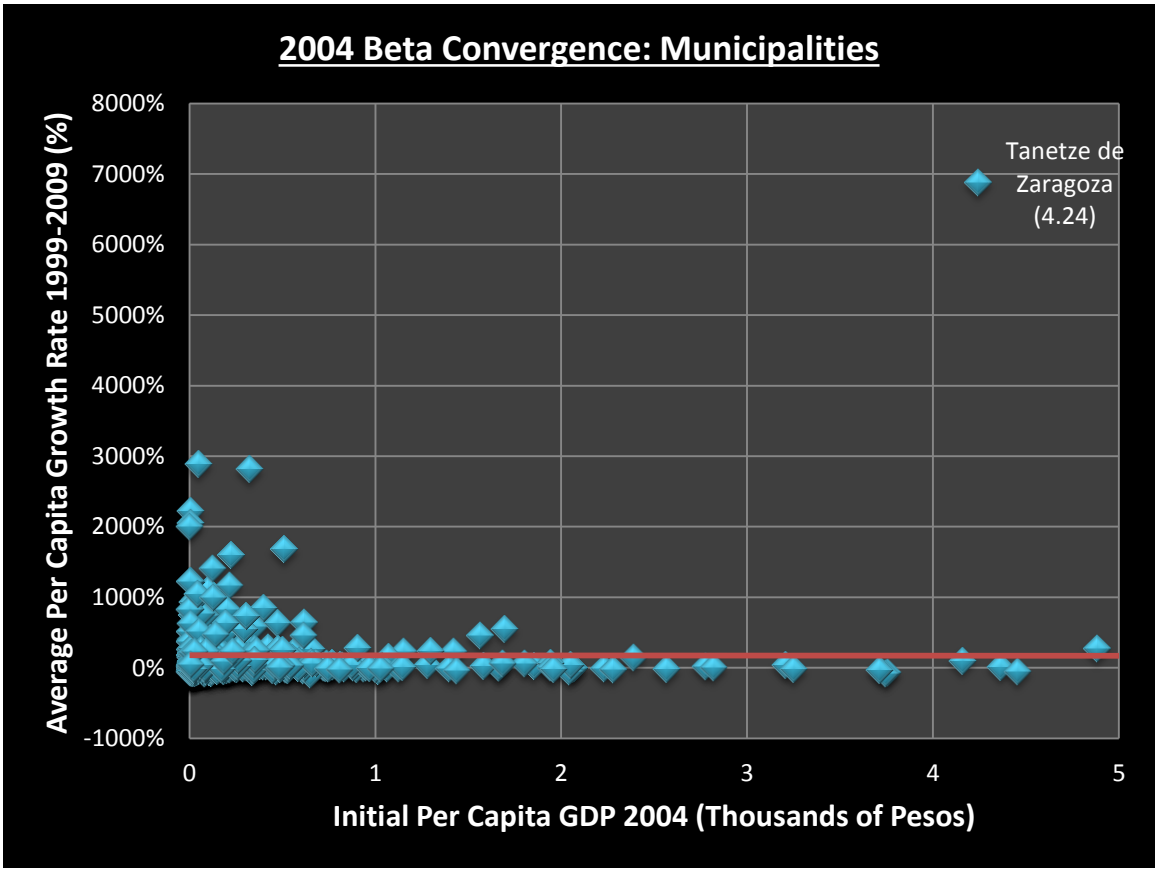
Moving into the third and final section of this research study, the 568 municipalities have been analyzed using the same method of β-convergence in order to understand what happened in Oaxaca at the municipality level. According to the catch-up effect, while looking at Figure 5 below, we should be able to observe municipalities below the red average line expanding from year 1999 to 2004 at a faster rate than municipalities above the average line. While looking at this specific scenario, it is important to note that the graph has been zoomed into the 7,000% on the y-axis and the 5 thousands of Pesos on the x-axis. The zooming has been done in order to better appreciate the change of the municipalities below the average line. However, when looking at Figure 5 below and understanding the results obtained, it's imperative to pay attention to the change that Tanetze de Zaragoza municipality experiences from 1999 to 2004.

Figure 5



In 1999, Tanetze de Zaragoza was a municipality well above the average line, hence, according to the catch-up effect; this municipality should have experienced a slower growth than municipalities below the average till the beginning of 2004. Nevertheless, if we compare the graph from 1999 on Figure 5 above to the graph from 2004 on Figure 6 below, we can clearly appreciate that the average line didn't expand due to a slower growth from the municipalities below it. Moreover, Tanetze de Zaragoza municipality had a change from 0.03 thousands of Pesos in 1999 to 4.24 thousands of Pesos in 2004. This factor proofs, once again, how the catch-up effect didn't even hold at the municipality level inside the Mexican State of Oaxaca.

Figure 6



After doing some research to find reasons of why Tanetze de Zaragoza had such a big growth from 1999 to 2004, it was found that this specific municipality had a large number of indigenous groups, just as the ones that had been below the average line since 1999. At this point I wondered; what is it that this specific municipality has over the rest? Tanetze de Zaragoza has a privileged location among all other municipalities inside Oaxaca as it is very close to Oaxaca City; the largest city in the state. It is relevant to note that the municipality in which Oaxaca City is located didn't appear in the β-convergence municipalities graph as it was out of the zoomed area. However, Oaxaca City had a tremendous economic growth, just like it happened to Tanetze de

Zaragoza. This specific municipality served as a supplier of organic coffee to Oaxaca City and many other locations. Furthermore, it used the economies of scale implemented around Oaxaca City to distribute the goods that it produced. Moreover, just by the simple fact of being closer to a big city, Tanetze de Zaragoza experienced a higher than average investment in real state.

As we have seen across the three different scenarios used in this research study, the catch up effect didn't hold true across any of them. Because of this reason, several conclusions are formulated in order to explain the reason why the theory of economic convergence has not worked in one of the poorest states of Mexico from 1999 to 2009.

V. Conclusions

Regions, districts and municipalities of Oaxaca have not economically converged from 1999 to 2009. Hence, we can also say for certain that the theory of the catch-up effect in which poorer economies' per capita incomes are supposed to grow at a faster rate than richer ones didn't hold true across the three different types of scenarios analyzed in this research study.

As we saw along the results section of this research study, regions below the average line didn't grow at a faster rate than regions above the average line. Some of the reasons that explain this situation are as follows. First, Costa and Valles Centrales regions are engaged in industries that contribute very little to the region's overall GDP. Because of this reason, we can state that Costa and Valles

Centrales regions have been engaged for too long in economic activities that yield a very low potential to develop their economy. Moreover, these two regions are composed by large amounts of indigenous groups, which mean that the Mexican Government should have invested more money into these two regions to stimulate their economy and give indigenous groups opportunities to contribute into the region's overall GDP.

Similar results were obtained across the districts inside Oaxaca. In fact, the two districts in which the analysis focused the most (Etla and Juquila) were located inside the same two regions that we have discussed above. Hence, very similar reasons explain why these two districts fell apart economically and posted negative growth from 1999 to 2004.

When looking at the municipalities results, what stood out the most was how some municipalities above the average line grew exponentially while the ones that were below the average line didn't almost grow. According to what we saw in the specific case of Tanetze de Zaragoza, some municipalities that posted such a large growth was simply because they were able to benefit from being closer to a big city and use the big city's economies of scale to expand.

Overall, the Mexican Government has not succeeded in developing all regions, districts and municipalities of Oaxaca uniformly. The strategy developed between 1999 and 2009 drives Mexico into big economic differences. This research study aims to create a better scope in identifying the considerable economic disparities that Oaxaca has suffered from 1999 to 2009.

Works Cited

Abdulai, A. and Becerril, J. “The impact of Improvized Maize Varieties on Poverty in Mexico: A propensity Score-Matching Approach.” *World Development* Vol. 38, No. 7, pp. 1024-1035, 2010.

Cruz-Vasquez, M. and Salas-Alfaro, R. “La Recaudacion Por Derechos de Agua en los Municipios de Usos y Costumbres y en Aquellos de Organizacion Legal, en el Estado de Oaxaca, Mexico.” *Revista de Derecho y Economia* No. 38, pp. 87-102, 2012.

Galan-Lopez, A., Solana-Vazquez, O. and Velazquez-Sanchez R. “Las Instituciones Microfinancieras en la Inclusion de las Regiones de Oaxaca.” *Revista Internacional Administracion & Finanzas* Volume 6, No. 7, pp. 131-139, 2013.

Gonzalez-Rivas, M. “Trade Openness, Infrastructure, and the Wellbeing of Mexico’s South.” *Mexican Studies/Estudios Mexicanos* Vol. 27, No. 2 (Summer 2011), pp. 491-494

Monfort, P. “Convergence of EU regions Measures and Evolution.” *European Union Regional Policy,* n° 01/2008.

National Commission for the Development of the Indigenous Peoples (2010). *"Condiciones Socioeconómicas y Demográficas de la Población Indígena."* Región Sur, Tomo 1, 2010.

Pfitzner, C. Barry and Steven D. Lang. “Economic convergence: evidence from counties in Virginia.” *Virginia Social Sciences Journal,* Volume 41, 2006, pp. 44-56.

Sala-i-Martin, X. “The Classical Approach to Convergence.” *The Economic Journal*, 1996, 106(July), 1019-1036.