CHAPTER 3

COVID-19 PANDEMIC AND REGIONAL INEQUALITIES IN THE U.S.

Hasan Engin DURAN[1]

INTRODUCTION

Covid-19 Pandemic has started in 2019 and has been influencing more than 600 Million of individuals as a cumulative number of cases and led to about 6.5 Million people to die by 28th October, 2022 (WHO, 2022). It has been still ongoing in the world and showing quite diverse and deep impact on the health of individuals, social and economic life. Particularly, during the initial stage of the pandemic, many countries had to go to a "lock down" period during which social life has come to a halt, local services sector, tourism, industry and many other economic activities have declined dramatically. Consequently, the world real GDP has tightened 3.27 % in 2020 whereas it experienced a rebound (5.58 % positive growth) in 2021 as a result of decreasing mortality rates and revival of business and social life.2

US economy has also been affected by the pandemic. While GDP growth was moderate (2.3 %) in 2019, it experienced a remarkable recession in 2020 with a negative growth rate -3.4 %. In 2021, it is observed a jump in GDP to 5.7 % annual growth rate. 3

From another perspective, not all regional economies may be equally affected by the pandemic. Therefore, income distribution across regions may be influenced by such a world-wide externality. It may be discussed several opposing theoretical views on the impact of negative shocks on regional income distributions. An optimistic one is put forward by the Neoclassical framework: It follows that under specific conditions and the law of diminishing marginal returns, all economies (regions) will get to a unique steady state and there will be no incomes difference between economies (Solow, 1956; Barro & Sala-i Martin, 1991; Duran and Erdem,

[1] Assist. Prof. Dr. Economics, Izmir Institute of Technology, Faculty of Architecture, City and Regional Planning Department, Email: enginduran@iyte.edu.tr

[2] Source: https://www.macrotrends.net/countries/WLD/world/gdp-growth-rate.

[3] Source: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=US

2017; Barro & Sala-i Martin, 1992; Duran, 2014; Duran, 2015). This argument excludes economic shocks and fluctuations (Duran, 2014; Magrini , Gerolimetto & Duran, 2015; Petrakos, Rodriquez-Pose & Rovolis, 2005). So, income inequalities are expected to decrease regardless of the shocks. Another optimistic view states that during recessions and slumps, developed (industrialized) regions are more affected since their economic structure are more sensitive to economic circumstances (Rodriquez-Pose & Fratesi, 2007; Petrakos & Saratsis, 2000; Duran, 2014, Azzoni, 2001; Petrakos, Rodriquez-Pose & Rovolis, 2005; Berry, 1988) They include sectors more exposed to economic circumstances, to policies (i.e. monetary policy) and to economic shocks (such as manufacturing, tourism, construction) (Rodriquez-Pose & Fratesi, 2007; Duran, 2014, Petrakos & Saratsis, 2000 ; Azzoni, 2001; Petrakos, Rodriquez-Pose & Rovolis, 2005; Berry, 1988; Carlino, DeFina & Sill, 2003; 2013; Carlino & Defina; 1998;1999; Park & Hewings, 2003; Owyang & Wall, 2009). Backward regions, on the other hand, are more sheltered as they are possibly more assisted by intensive public spendings and employment (Rodriquez-Pose & Fratesi, 2007; Petrakos & Saratsis, 2000; Duran, 2014, Azzoni, 2001; Petrakos, Rodriquez-Pose & Rovolis, 2005; Berry, 1988 Carlino, DeFina & Sill, 2003; 2013; Carlino & Defina; 1998; 1999; Park & Hewings, 2003; Owyang & Wall, 2009). Consequently, income inequality may decrease in crisis times.

However, a pessimistic view on the impact of such externality is provided by Pekkala (2000). According to her, in general, labor mobility plays an equilibrating role between regional per capita incomes. Such that labor moves from underdeveloped places to developed areas in which job incentives and wages are higher (Pekkala, 2000; Duran, 2014). Mobility is known to be higher during expansions. In these times, less developed regions increase their per capita income as they lose their labor (Pekkala, 2000; Duran, 2014). In crisis times, however, labor mobility slows down that expands the gap between developed and poorer regions (Pekkala, 2000; Duran, 2014).

Hence, the literature is far from a clear cut with respect to the impact of negative externalities and crisis on the regional inequalities.

There is a rich set of evidence in the literature on the regional inequalities in US. Most of the papers find a tendency of state level economies to convergence to each other (Rey & Montouri, 1999; Barro & Sala-i Martin, 1991). Duran (2014) and Magrini, Gerolimetto & Duran, (2015) have found that recently regional inequalities rise during expansions and decrease during recessions.

However, Covid-19 is a quite new and special disturbance that increase the curiosity of researchers. Covid-19 is one of the very sudden negative shocks that may have quite diverse and deep impact on state level economies.

Hence, the purpose of this paper is to search the effect of Covid-19 pandemic on the income inequalities across US states. In section 2, data and methods are explained, in section 3, empirical results are presented and, in section 4, the study is concluded.

DATA AND METHODS

Our dataset covers 51 US states over the period 1997-2021. The variable analyzed is the per capita real GDP (y). The real GDP data was obtained from BEA (U.S. Department of Commerce, Bureau of Economic Analysis (https://www.bea.gov/)) and population data was obtained from OECD's database at stat.oecd.org (BEA, 2022; OECD, 2022)

4 types of methods were used. First, Coefficient of Variation (Standard Deviation/Mean) of state level per capita real GDP was charted for each year (Figure 1). Second, per capita real GDP in relative terms (state income /mean income) were plotted on maps in Figure 2 for particular years such as the initial year (1997), the year that GFC was observed (Global Financial Crisis) (2009), the year that first Covid case was detected in the world (2019) and the remaining two years after the onset of pandemic (2020-2021). Also growth rate of states between 2021-2019 were plotted (Figure 3). The maps were created by using online tool at www.datawrapper.de. Third, Kernel Density graphs of relative incomes were illustrated for the selected years (Figure 4) (Simonoff, 1996; Marron & Nolan 1989; Härdle 1991)). Normal distribution was assumed, Silverman (1986) bandwidths are used with 100 points. Fourth, Kolmogorov-Smirnov Tests were applied in order to test the following hypotheses (Kolmogorov, 1933; Smirnov, 1939):

Ho: distribution of y at two different times$(t, t+k)$are statistically identical

Ha: distribution of y at two different times$(t, t+k)$are statistically different

The test is applied to the pairs of years. 1997, 2009, 2019, 2020 and 2021 years are considered. The results are presented in the Table1.

In this paper, Eviews 4, Eviews 10, Stata 13 and online tool at www.datawrapper.de was used in the implementation of statistical analysis.

EMPIRICAL RESULTS

As an outcome, it is found a set of results. First, coefficient of variation exhibits a persistent and stationary evolution from 1997 to 2021 (Figure 1). From 2000 to 2009 income inequalities tend to expand mildly (from 0.35 to 0.41), hit a peak level in 2009 a year which Great Financial Crisis was observed. After 2009, the inequalities tend to decrease until 2019 which is the start year of Covid-19. The evolution of disparities is in anti-cyclical fashion (consistent with Dimelis & Livada (1999) and Mendershausen (1946)). After 2019, it increases again. However, the movements are not large and observed in the form of small increase or decreases.

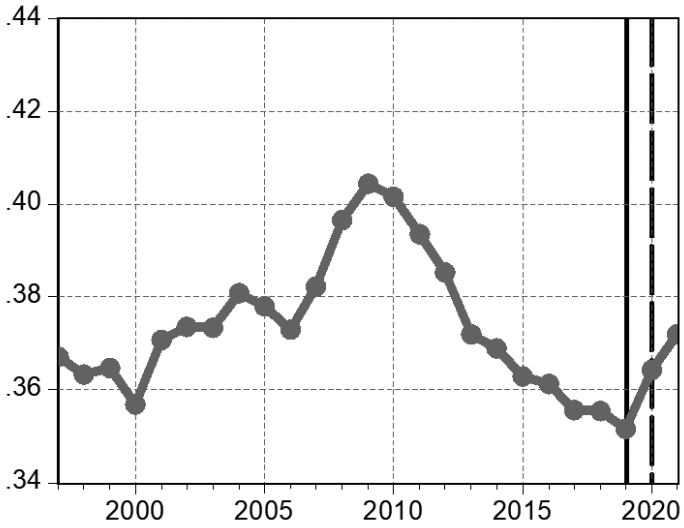

Figure 1. Coefficient of Variation (SD/Mean), per capita Real GDP
Sources: BEA (2022), OECD (2022)

Second, in the maps below (Figure 2), it is plotted the relative income distribution. The geographical patterns seem almost always same over time. Hence, it gives a visual inspection that the income distribution across states is structural and does not change much over time. The relatively richer places are scattered as well as relatively poorer areas. However, over the 15 years, richer provinces' geographical position and also poorer provinces do not change significantly.

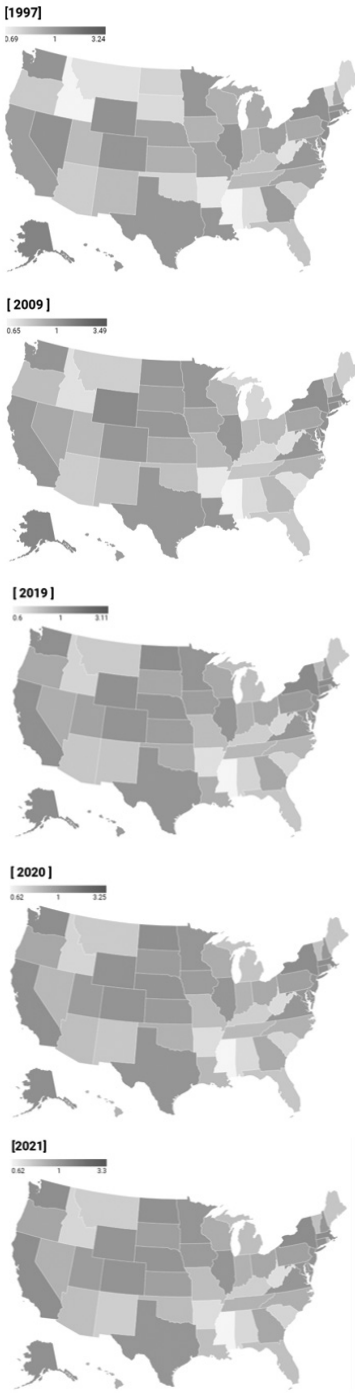

Figure 2. Maps of per capita relative real GDP (mean=1),
Sources: BEA (2022), OECD (2022)

Third, the pandemic had quite different growth impacts on states. Almost half of the states had contracted their GDP per capita (such as Louisiana, North Dakota, Hawaii, Alaska, Oklahoma, New Mexico, Connecticut, New Jersey, Pennsylvania) whereas others experienced a positive growth (such as California, Washington, Arizona, Florida, New Hampshire, Maine, North Carolina, Arkansas, Tennessee) between 2019 and 2021. However, it is not observed distinct spatial patterns. All these patterns, might have emerged due to the socio-economic structure, industrial and sectoral composition of these states.

Fourth, Kernel Density estimations provide information about the evolution of relative income distribution across states (Simonoff, 1996; Marron & Nolan 1989; Härdle 1991; Silverman, 1986). It is presented for 1997, 2009, 2019, 2020 and 2021. All distributions have two modes which probability density has a peak level. The first and biggest mode is concentrated around the average relative income (1) and the second one is on the relatively high income (about at 3-3.5). The distributions seem all identical across the years. There are quite small changes from 1997 to 2021. More importantly, from 2019 to 2021, almost no change in the shape of the distribution is observed. Hence, one may argue that although covid-19 pandemic had a dramatic effect on many health, social and economic issues, we do not observe a real impact on the income distribution across regions.

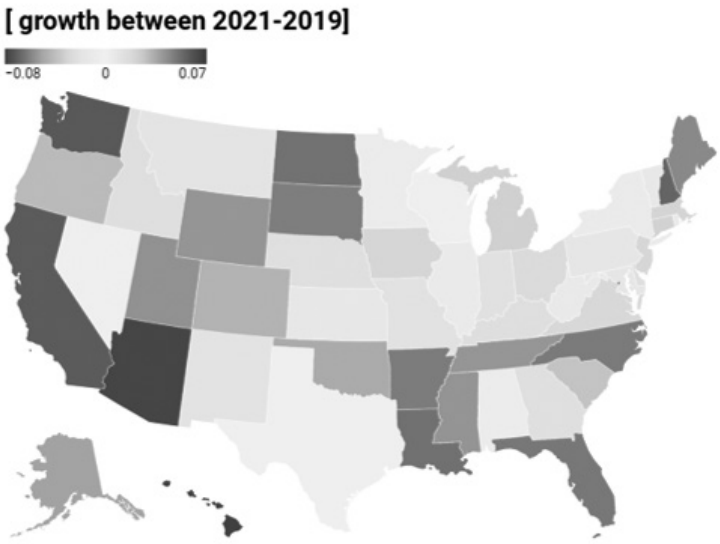

Figure 3. Economic Growth of Per Capita real GDP
Sources: BEA (2022), OECD (2022)

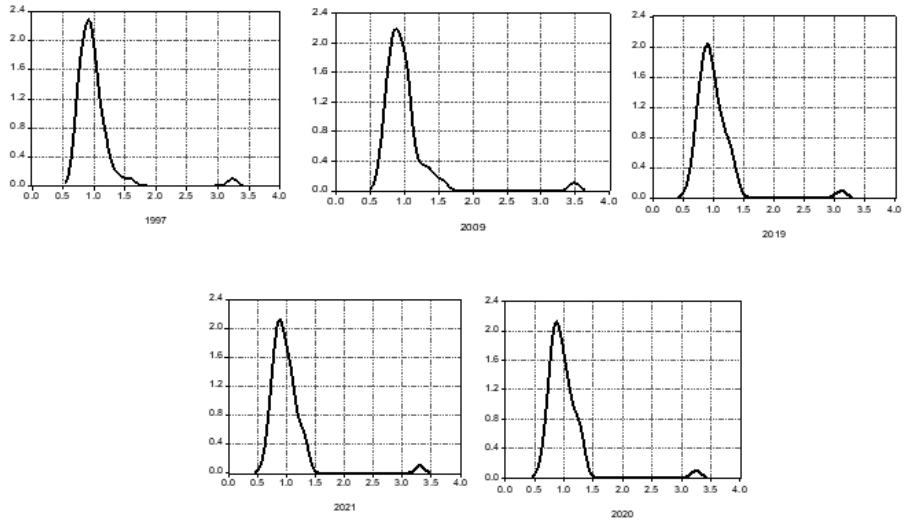

Figure 4. Kernel Density of Relative Real GDP per capita
Sources: BEA (2022), OECD (2022)

To complement formally the results obtained from Kernel Densities, we apply and summarize the results from Kolmogorov-Smirnov test in the Table 1. It tests bilaterally the statistical difference between the state level income distribution across 5 different years (Kolmogorov, 1933; Smirnov, 1939). As a result, in none of them, there is a statistical significance between the years. All K-S test statistics as well as corresponding p-values indicate insignificance.

Thus, it is confirmed with Kernel Density Estimates and KS tests that the covid-19 did not have a remarkable influence on the income distribution across states and disparities.

Table 1. Kolmogorov-Smirnov Test Results

1st year	2nd Year	Combined KS Test Statistics	Exact P-Value
1997	2009	0.12	0.85
1997	2019	0.12	0.85
1997	2020	0,08	0,99
1997	2021	0,08	0,97
2009	2019	0,16	0,55
2009	2020	0,1	0,97
2009	2021	0.12	0.85
2019	2020	0,08	0,97
2019	2021	0,06	1,00
2020	2021	0,06	1,00

Sources: BEA (2022), OECD (2022)

CONCLUSION

This paper has investigated the impact of Covid-19 Pandemic on regional income inequalities in the US. As a result of descriptive, illustrative and inferential analysis, several conclusions are reached.

First, from 1997 to 2021, income inequalities across states, measured by the coefficient of variation (CoV), had only mild changes and no real tendency of homogenization or worsening of the income distribution was observed. Second, visually, it is observed that regional disparities are slightly higher during the crisis times, such 2019 and 2020, than economic expansion years. Third, relative income distribution and its geographical pattern is almost constant over time. Fourth, Covid-19 had a diverse impact on the economic growth of the states, while in almost half of the states, there is tightening of the economy, in the others, it is observed positive economic growth between 2019 and 2021. Fifth, we found that the covid-19 pandemic did not influence significantly the state level income distribution and inequalities.

Consequently, having in mind these results, an important policy suggestion may be that during the negative shock times, all regions should be assisted but the backward regions should be assisted more by providing subsidies, tax exemptions, improvement of social and physical infrastructure in order to maintain economic and social cohesion.

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