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The persistence of regional disparities in labor markets: Evidence from Puerto Rico

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Abstract

Puerto Rico, a US territory, has historically shown a high unemployment rate and one of the world's lowest labor participation rates, which suggests the presence of permanent disparities relative to the US. In this study, by accounting for the differences across the regional labor markets in Puerto Rico, we analyze whether the disparities between regional unemployment, employment, and labor force rates with either the US counterpart or the national counterpart are permanent. Using quarterly data from 1990:Q2 to 2019:Q4, univariate and panel unit root tests indicate that permanent disparities are present in the regional labor markets relative to the US and the national counterparts. However, relative to the latter, the processes are break stationary for some regions. Specifically, the evidence suggests that the unemployment disparities of the west area, the employment disparities of the south area, and the labor force disparities of the south and north areas are permanent.

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1. Introduction

A recent post on Liberty Street Economics, the blog of the Federal Reserve Bank of New York,[1] analyzed the post-COVID-19 economic recovery of the economies belonging to the second district of the Federal Reserve and noted that Puerto Rico, a US territory, had achieved a pre-pandemic employment growth rate similar to the recovery trend of the US. According to this post, it is a striking feat because the island has lagged behind the mainland for decades.

In this sense, Puerto Rico has persistently shown one of the lowest labor force participation rates in the world and a high unemployment rate that has always been above the US unemployment rate. From 1976 to 2018, even beyond the current economic depression that started in 2005, the unemployment rate was mostly above ten percent, and the labor force participation rate was around forty-five percent, which was below that of the US (around sixty-five percent).

Although both unemployment rates display short-run co-movements,[2] the data suggests that Puerto Rico has never achieved full employment which, according to Mundell (1961) and McKinnon (1963), is one of the benefits of being a currency area member. The facts mentioned above invite the question of whether permanent disparities are present in the Puerto Rico labor market.

Previous empirical literature about disparities in labor markets is scarce for currency areas. Regarding the eurozone, Estrada et al. (2013) found that the β-convergence for unemployment rates held for the period 1998–2007 but did not hold for the period 2008–2012. For a different period of analysis, Dolls et al. (2018) found that the β-convergence held for unemployment rates between 2000 and 2017 and employment rates between 2000 and 2016. In addition, grouping EU members according to the period of euro adoption and using the time-series β-convergence, σ-convergence, and stochastic convergence approaches, Kónya (2019) found that the convergence of unemployment rates held. Moreover, Krištić et al. (2019) examined the stochastic convergence of unemployment rates, including structural breaks on the unit root tests, and get that stochastic convergence held for some countries.

The goal of this study is to analyze if the stochastic convergence hypothesis (presence of temporary disparities) holds for the regional labor markets of Puerto Rico. We focused on whether regional unemployment, employment, and labor force rates had permanent disparities relative to the US and domestic counterparts. The (no) rejection of the stochastic convergence hypothesis means that the deviations of a regional variable from its counterpart are affected by a (temporary) permanent shock; in other words, the deviations follow a (stationary) non-stationary process.

The persistent patterns in regional labor markets such as the lowest unemployment rate and the highest employment and labor force participation rates in the metro area (San Juan)[3] invited us to address the dynamics of these markets not only with respect to the US but also within Puerto Rico. So, this study brings to the discussion about disparities in currency areas, the dynamics of the regional labor markets with respect to the benchmark economy.

It is known that Puerto Rico almost operates like one of the 50 states from the US. It shares a common currency (the US dollar) with the US; it shares a free-trade zone with the US; and they both share a common customs union. Furthermore, Puerto Ricans are US

[1] "The Region Is Struggling to Recover from the Pandemic Recession", December 21st, 2021 by Jaison R. Abel, Jason Bram, Richard Deitz, and Jonathan Hastings https://tinyurl.com/48fwh8xu

[2] Sobrino and Heath (2013)

[3] In addition, the central region presented the lowest labor force rate, and the southern region had the highest unemployment rate.

citizens. They can get jobs in the US without restrictions and ask the US for federal funds. However, Puerto Ricans do not vote in the US national elections nor pay federal income taxes. So, even though Puerto Rico shows characteristics beyond being a currency area member, the analysis of the persistence of regional labor market disparities in this country will increase the discussion about those disparities in currency areas and help policymakers to assess effective regional policies.

Using six economic areas: central, east, metro, north, south, and west;[4] and quarterly data from 1990:Q2 to 2019:Q4, the univariate and panel unit root tests indicate that the regional processes did not converge for each counterpart, in other words, that permanent disparities are present in the regional labor markets relative to the US and the national counterparts. However, relative to the latter, the processes are break stationary for some regions.

Specifically, the evidence suggests that the unemployment disparities of the west area, the employment disparities of the south area, and the labor force disparities of the south and north areas are permanent. Regarding the US, some of the possible explanations include the Fair Labor Standard Act (FLSA) that regulates the US federal minimum wage, US federal transfers, and the Jones Act (1917)[5] among others. All of them may be interpreted as permanent shocks in this country.

The remainder of the study is organized as follows: the second section discusses relevant literature, the third section discusses the methodology and data, the fourth section presents the results and a discussion, and the final section presents the conclusion.

2. Relevant Literature

The neoclassical economic theory (Solow (1956, 1957); Swan (1956)) predicts that poor economies will grow faster than rich economies. Basically, in a free capital mobility regime, capital flows to the poor countries, where it is more productive toward achieving income convergence. In addition, this theory suggests that regarding the labor market in free capital and labor mobility regimes, the differences in unemployment rates across the countries (regions) of a currency area (country) are temporary.

Specifically, the disparities in regional unemployment rates should be minimized in a frictionless economy. The adjustment process consists of workers in the regions with high unemployment rates moving out to the regions with low unemployment rates, and firms moving from regions with high wage levels due to the low unemployment rate to regions with low wage levels due to the high unemployment rate.[6]

The empirical literature is related to the analysis of the σ-convergence, β-convergence, and stochastic convergence. The first examines whether there is a decrease in the relative dispersion of the unemployment rate. The second studies whether the countries (regions) with high unemployment rates can catch up to the countries(regions) with low unemployment rates; in other words, the high unemployment rates for the former fall faster than the latter. The third focuses on whether the differences in unemployment rates are affected by permanent shocks. Here, the deviations or disparities in the labor markets occur due to economic innovations; therefore, if the economic innovations were temporary (permanent), the

[4]As indicated by Werner (2013), we do not use administrative areas to not neglect the spatial dependencies. These areas are found on the Government of Puerto Rico's web page https://pr.gov.

[5]The shipping services between the US mainland and Alaska, Hawaii, Guam, and Puerto Rico are only performed by vessels that are US-built, US-owned, US-flagged, and US-staffed.

[6]In contrast, the new economic geography model, Krugman (1991, 1992), states that free factor mobility and flexible wages, per se, do not lead to any adjustment in the labor market; instead, the agglomeration economies increase the regional disparities and lead to an unequal spatial distribution of production.

stochastic convergence holds (does not hold). The deviations following a stationary process mean that the regions are in long-term equilibrium. The analysis of the regional disparities in the labor markets started with Blanchard et al. (1992), who did not find stochastic convergence for the employment growth and unemployment rates across US states from 1950 to 1990.

Studies examining β-convergence include Pehkonen and Tervo (1998), who used the unemployment rates of the municipalities of Finland and found that β-convergence held; Gray (2004), who analyzed the unemployment rates of the provinces of Spain and found mixed results for β convergence; and Südekum (2008), who studied 326 municipalities in West Germany and found that conditional β-convergence of the local skill composition held.

Likewise, the empirical literature using the stochastic convergence approach are Rowthorn and Glyn (2006) for the US; Decressin and Fatas (1995) for Europe; Möller (1995), Bayer and Juessen (2007), and Kunz et al. (2012) for West Germany; Jimeno and Bentolila (1998) for Spain; Martin (1997) and Gray (2004) for the UK; Choy et al. (2002) for New Zealand; Debelle and Vickery (1999) for Australia; Presman and Klepfish (2008) for six Israeli districts; and Liontakis et al. (2010) for fifty-one Greek prefectures. Regarding regional employment growth rates, Decressin and Fatas (1995) rejects the hypothesis of stochastic convergence, while Jimeno and Bentolila (1998) and Debelle and Vickery (1999) do not. For the regional unemployment rates, Bayer and Juessen (2007) rejects the hypothesis of stochastic convergence, while Choy et al. (2002) and Presman and Klepfish (2008) do not.

Previous empirical literature about the disparities in labor markets is scarce for currency areas. Regarding the eurozone, Estrada et al. (2013) found that β-convergence for unemployment rates held for the period 1998–2007 but not for the period 2008–2012. For a different period of analysis, Dolls et al. (2018) found that β-convergence held for unemployment rates between 2000 and 2017 and employment rates between 2000 and 2016.

In addition, Kónya (2019) employed the time-series β-convergence, σ-convergence, and stochastic convergence approaches. Using data from 1991 and 2015, four subsets of countries were determined: old EU members, countries that have been part of the eurozone since 2004, countries that joined the eurozone at the end of 2014, and non- EU members. For each group, the benchmark variable was the weighted average unemployment rate.[7] He found that the convergence of unemployment rates held.

Likewise, Krištić et al. (2019) examined the stochastic convergence of unemployment rates, including structural breaks on the unit root tests. By using the average unemployment rate of the first eleven eurozone members and the German unemployment rate as counterparts, he discovered that stochastic convergence held for some countries. The conclusion is that belonging to the eurozone is not a sufficient condition for a stochastic convergence in unemployment rates.

3. Methodology

The definition of stochastic convergence can be found in Bernard and Durlauf (1995) and Bernard and Durlauf (1996). At the regional level, the interpretation is region i and its national counterpart converge if the long-run forecast of the log of the processes (regional and national) is equal to fixed time t

$$\lim_{t \Rightarrow \infty} E(x_{it} - x_t | I_t) = u_i$$

[7]He used the labor forces as weights.

Where I_t is the information set at time t, x_{it} is the process of region i, for all i: 1,2,...,N at time t, and x_t is the national process. For our study, x_{it} stands for the regional unemployment rate, employment rate, or the labor force rate, and x_t can be either the US counterpart or the domestic counterpart.

For N regions, the interpretation is as follows: 1) if $u_1 = u_2 = ... = u_N = 0$, absolute convergence is present; and 2) if some of u_s are different from zero, relative convergence is present. Basically, regions converge (diverge) if the deviations are stationary (non-stationary). Since unit roots are considered as the main source of the non-stationarity series, unit root tests are used to examine the stochastic convergence hypothesis.

For our study, we use the augmented Dickey-Fuller (ADF) test, in which the null hypothesis is the presence of unit roots in the time series, and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test, in which the null hypothesis is that the process is stationary. Thus, the stochastic convergence hypothesis will hold if the null hypothesis of the ADF test is rejected and the null hypothesis of KPSS test cannot be rejected. In addition, we employ panel unit roots to gain power in the tests. Finally, unit root tests that include structural breaks are considered because the economy of Puerto Rico might have been subjected to structural breaks as the end of section 936, the beginning of the current economic depression, etc..

3.1. Data

We collect the unemployment rate, employment level, labor force level, and population for the period 1990:04–2019:12 from the Statistical Institute of Puerto Rico[8] for seventy-six municipalities of Puerto Rico.[9] Employment and labor force are divided by the working-age population.[10] The US data was collected from the Bureau of Labor Statistics.[11] Likewise, We group (by averaging) each time series of each municipality by following the economic areas (tourism areas) of the island. We take care not to neglect spatial dependencies because the island shows some patterns: the metro area (San Juan) has the lowest unemployment rate and the highest employment and labor force rates, the central area has the lowest labor force rate, and the southern area has the highest unemployment rate. There are six economic areas: central[12] east,[13] metro,[14] north,[15] south.[16] and west.[17]

The unemployment rate, the employment rate and the labor force rate are converted in logs. The deviations, which are going to be tested, are the regional process minus each counterpart, the US and the domestic ones, respectively. All times series is quarterly, from 1990:Q2 to 2019:Q4, and seasonally adjusted. Figure 1 shows all the calculated series. With respect to the US counterpart, the data does not show any structural break but with respect

[8]The web page estadisticas.pr reports monthly data.

[9]We did not include Culebra or Vieques because they are island-municipalities.

[10]Due to the lack of data about working-age populations, we calculated the working-age population of each municipality by multiplying the proportion of the working age of Puerto Rico by the population of the municipality.

[11]The web page www.bls.gov reports monthly data.

[12]Adjuntas, Aguas Buenas, Aibonito, Barranquitas, Cayey, Ciales, Cidra, Comerío, Corozal, Jayuya, Morovis, Naranjito, Orocovis, Utuado

[13]Caguas, Canóvanas, Ceiba, Fajardo, Gurabo, Humacao, Juncos, Las Piedras, Loíza, Luquillo, Maunabo, Naguabo, Río Grande, San Lorenzo, and Yabucoa

[14]Bayamón, Carolina, Cataño, Guaynabo, San Juan, Toa Baja, Trujillo Alto

[15]Arecibo,Barceloneta, Camuy, Dorado, Florida, Hatillo, Manatí, Toa Alta, Vega Alta, and Vega Baja

[16]Arroyo, Coamo, Guayama, Guayanilla, Juana Díaz, Patillas, Peñuelas, Ponce, Salinas, Santa Isabel, and Villalba

[17]Aguada, Aguadilla, Añasco, Cabo Rojo, Guánica, Hormigueros, Isabela, LaJas, Lares, Las Maras, Maricao, Mayaguez, Moca, Quebradillas, Rincón, Sabana Grande, San Germán, San Sebastián, and Yauco

to the domestic counterpart, a structural break might be present around 2009.

4. Outcomes

Table I shows the outcomes of the tests for the regional deviations of the US counterpart. For the relative unemployment rate, when the ADF test is used, the null hypothesis cannot be rejected for all regions, whereas for the KPSS test, the null hypothesis can be rejected at five percent of significance for all areas except the metro area. Regarding the relative employment rate, the null hypothesis of the ADF test cannot be rejected for all regions, but using KPSS test, the null hypothesis can be rejected at five percent of significance for all regions as well. For the deviations of the labor force rate using the ADF test, the null hypothesis cannot be rejected for all regions, but the null hypothesis of the KPSS test can be rejected at five percent of significance for all areas.

Table II shows the outcomes of the tests for regional deviations concerning the domestic counterpart. Regarding the relative unemployment rate, the null hypothesis cannot be rejected for all regions in the ADF test, while for the KPSS test, the null hypothesis can be rejected at five percent of significance for all regions but the west area. For the relative employment rate, the null hypothesis cannot be rejected for all regions using the ADF test, but it can be rejected at five percent of significance for all areas except the north and metro areas using the KPSS test. Regarding the relative labor force rate, the null hypothesis cannot be rejected for all regions using the ADF test, whereas using the KPSS test, the null hypothesis can be rejected at five percent of significance for all areas.

In addition, Table III shows the outcomes of three different panel unit root tests: Levin-Lin, Im-Pesaran-Shin, and Hadri LM. For the first and second, the null hypothesis is unit root presence, and for the third, the null hypothesis is the stationary series. Regarding the deviations with respect to the US counterpart, we cannot reject the null hypothesis for Levin-Lin but we can reject the null hypothesis for Hadri LM at one percent of level of significance. Using the Im-Pesaran-Shin test, we can just reject the null hypothesis for the relative unemployment rate at five percent of level of significance. For the deviations concerning the domestic counterpart, we cannot reject the null hypothesis for Levin-Lin and Im-Pesaran-Shin, but we can reject the null hypothesis for Hadri LM at one percent of level of significance.

Furthermore, we run a Zivot-Andrews test, where the hypothesis null is the process has a unit root with structural breaks and the alternative hypothesis is the process is stationary with structural breaks. For deviations relative to the US counterpart (Table IV), all deviations except the relative employment rate of west area are not break stationary. For regional deviations from the national counterpart (Table V), the outcomes indicate that, for the north and metro areas, the relative unemployment rate is break stationary. The structural breaks are 2011:Q3 and 1999:Q4, respectively. For the east, central, and west areas, the relative employment and labor force rates are break stationary, with the structural break at 2009:Q4. The structural break in 2009 might be related to the issuance of the 7 Act which resulted in 30,000 public servants being laid off.

To check up the results of the Table V, we run the Zivot-Andrews test using the metro area processes as counterparts. We use that area because it has persistently shown the lowest unemployment rate and the highest employment and labor force rates.[18] Table VI displays the outcomes and indicates that, for the relative unemployment rates, we reject the null hypothesis at one percent of significance level for the north and east areas and at

[18]We run the ADF and KPSS tests as well and the outcomes indicate the rejection of stochastic convergence hypothesis for all cases. Those results are upon request.

five percent of significance level for central and south areas. For the relative employment rates, we reject the null hypothesis at one percent of significance level for the east and west areas, and at five percent of significance level for north and central areas. Likewise, for relative labor force rate, for all areas, the null hypothesis cannot be rejected which means that all areas present permanent disparities in labor force rate with respect to the metro area. The outcomes of the tables V and VI suggest that the unemployment disparities of the west area, the employment disparities of the south area, and the labor force disparities of the south and north areas are permanent.

In summary, using ADF and KPSS, we cannot conclude that stochastic convergence is present, because it is necessary not only to reject the null hypothesis of the ADF test but also not to reject the null hypothesis of the KPSS test. Besides panel unit root tests show similar results, regions of Puerto Rico show permanent disparities. In addition, the unit root tests including structural breaks indicates that the deviations are mostly non-stationary for the deviations relative to the US. However, for the deviations relative to the national counterpart, there are different levels of persistence. Specifically, the evidence suggests that the unemployment disparities of the west area, the employment disparities of the south area, and the labor force disparities of the south and north areas are permanent.

4.1. Discussion

Some possible explanations for our outcomes are the impact of the FLSA that regulates the US federal minimum wage, US federal transfers, and the Jones Act (1917), among others. All of them may be interpreted as permanent shocks in this country. For Puerto Rico, Castillo-Freeman and Freeman (2007) find that the federal minimum wage, regulated by the FLSA since 1938, reduces the employment level by eight to ten percent.

The increases in the minimum wage seek to improve the purchasing power of the low-income workers, however, those ones mainly affect the youth and low-skilled workers. The minimum wages of the Puerto Rico and the US have always been pretty similar, however, for our period of analysis, the youth unemployment rate of the former has been on average around 26 percent while that of the latter, on average around 12 percent.[19] This fact might be one of the reasons, that determined in 2016, the modification of Section 6(g) of FLSA[20] to allow employers to pay employees in Puerto Rico who are under the age of 25 years a sub-minimum wage of not less than $4.25 per hour for the first 90 consecutive calendar days after initial employment by their employer.

In addition, the high freight costs due to the Jones Act make exports less competitive, which negatively affects the creation of jobs.[21] Likewise, according to Dietz (2001), Section 936 (1976–1996), which aimed to invite large US firms through tax exemptions and transform Puerto Rico into an export-platform economy, was unable to have a large impact on employment because those firms were capital intensive and hired high-skilled workers but were unable to create strong links with other economic sectors.

In this scenario, according to Dietz (2001), two "safety valves" prevented a social distress: the US federal transfers and the fact that Puerto Ricans are American citizens.[22] The federal payments may have affected the labor market in two ways: a) they increased the

[19] Source: Federal Reserve of St. Louis https://fred.stlouisfed.org/

[20] The Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA)

[21] Dunham and Associates (2019).

[22] Moreover, Dietz suggested that federal payments are more successful in decreasing poverty and income inequalities than Section 936. In addition, Ruiz (1994) found that every US$1 million in transfer payments created twenty-six jobs through the demand for goods and services.

opportunity cost of finding a job and did not increase (increased) the labor force rate in the formal (underground) economy,[23] and b) they impeded a massive labor reallocation to the US. In spite of that, the federal payments must have generated sluggish labor adjustments, as the insularity and the Spanish-based language of the Puerto Ricans have historically led to the net immigration rate being persistently negative. The current out-migration[24] and low birth rate have caused Puerto Rico to be one of the countries with the highest population decline.

Likewise, the spatial distribution of the economic activities in Puerto Rico may explain the dynamics of the regional labor markets. According to Marein (2021), the spatial concentration of the population was related to the booms in coffee, tobacco, and sugarcane as well as the urbanization and industrialization processes.[25] These processes led to the population clustering in San Juan and its adjacent municipalities (metro area). This clustering process might have been supported by the Jones Act which implicitly determine the almost-exclusive use of the Port of San Juan.[26]

Finally, with respect to the US, the outcomes suggest that the regional labor markets of Puerto Rico are in a long-term disequilibrium, nevertheless, in the short-run, Sobrino and Heath (2013) find that the unemployment rates of the US and Puerto Rico share a non-synchronized business cycle specifically they find that the unemployment rate of the Island positively (negatively) responds by 0.81% to a one percent increase (decrease) in the US unemployment rate after one quarter. There are permanent disparities that avoid to achieved full employment, one the benefits of belonging to a currency area. Belonging to a currency area is not a sufficient condition for temporary disparities in regional labor markets.

5. Conclusions

The goal of this study is to test the regional stochastic convergence in the labor markets of Puerto Rico. Specifically, we seek to examine the persistence of regional disparities with respect to the US and domestic counterparts. Through the use of univariate and panel unit root tests, the outcomes show the rejection of the stochastic convergence hypothesis. In addition, unit root tests including structural breaks also indicates that processes have a unit root with a structural break relative to the US counterparts, however, with respect to the domestic counterparts, there are different levels of persistence of regional disparities.

With respect to the US, we cannot conclude that stochastic convergence is present, in other words, the regional disparities in labor markets are permanent. The outcomes are consistent with the reception of the US federal transfers. The US federal transfers are a valve that has prevented a massive migration from Puerto Rico to the US, although it is important to mention that Puerto Rico's population has been decreasing for the past ten years. The outcomes indicate that there are rigidities for the reallocation of workers to the US. Another reason is the presence of the federal minimum wage, which has been regulated by the FLSA since 1938. The federal minimum wage mainly impacts the less-educated youth. As for the domestic counterpart, the processes are break stationary for some regions. Specifically, the evidence suggests that the unemployment disparities of the

[23] The size of the underground economy of Puerto Rico is unknown.

[24] According to Abel and Deitz (2014), the less-educated youth are the main segment of the emigrating population.

[25] The industrialization process started with the applications of Sections 932 and 936, which encouraged foreign direct investment and invited large US firms via tax exemptions.

[26] The other important port of Puerto Rico is Ponce but is farther the US mainland than San Juan is.

west area, the employment disparities of the south area, and the labor force disparities of the south and north areas are permanent.

Finally, with respect to the US, the outcomes suggest that the regional labor markets of Puerto Rico are in a long-term disequilibrium, nevertheless, in the short-run, the unemployment rates of the US and Puerto Rico share a non-synchronized business cycle. There are permanent disparities that avoid to achieved full employment, one the benefits of belonging to a currency area. Belonging to a currency area is not a sufficient condition for temporary disparities in regional labor markets. Further research may address the role of the shocks mentioned above on the relative unemployment rate, relative employment rate, and relative labor force rate. Determining the role of these shocks may provide valuable information for policymakers—not only for those in Puerto Rico but also for those in the US mainland.

References

Abel, J. R. and Deitz, R. (2014). The causes and consequences of puerto rico's declining population. *Current Issues in Economics and Finance*, 20(4).

Bayer, C. and Juessen, F. (2007). Convergence in west german regional unemployment rates. *German Economic Review*, 8(4):510–535.

Bernard, A. B. and Durlauf, S. N. (1995). Convergence in international output. *Journal of Applied Econometrics*, 10(2):97–108.

Bernard, A. B. and Durlauf, S. N. (1996). Interpreting tests of the convergence hypothesis. *Journal of Econometrics*, 71(1-2):161–173.

Blanchard, O. J., Katz, L. F., Hall, R. E., and Eichengreen, B. (1992). Regional evolutions. *Brookings Papers on Economic Activity*, 1992(1):1–75.

Castillo-Freeman, A. J. and Freeman, R. B. (2007). 6. when the minimum wage really bites: The effect of the us-level minimum on puerto rico. In *Immigration and the work force*, pages 177–212.

Choy, W. K., Maré, D. C., and Mawson, P. (2002). Modelling regional labour market adjustment in new zealand. Technical report, New Zealand Treasury Working Paper.

Debelle, G. and Vickery, J. (1999). Labour market adjustment: Evidence on interstate labour mobility. *Australian Economic Review*, 32(3):249–263.

Decressin, J. and Fatas, A. (1995). Regional labor market dynamics in europe. *European Economic Review*, 39(9):1627–1655.

Dietz, J. L. (2001). Puerto rico: The 'three-legged 'economy. *Integration and Trade Journal*, 5(15):247–273.

Dolls, M., Fuest, C., Krolage, C., Neumeier, F., and Stöhlker, D. (2018). Convergence in the emu: What and how?

Dunham, J. and Associates (2019). The jones act, a legacy of economic ruin.

Estrada, Á., Galí, J., and López-Salido, D. (2013). Patterns of convergence and divergence in the euro area. *IMF Economic Review*, 61(4):601–630.

Gray, D. (2004). Persistent regional unemployment differentials revisited. *Regional Studies*, 38(2):167–176.

Jimeno, J. F. and Bentolila, S. (1998). Regional unemployment persistence (spain, 1976–1994). *Labour Economics*, 5(1):25–51.

Kónya, L. (2019). Did the unemployment rates converge in the eu? *Empirical Economics*, pages 1–31.

Krištić, I. R., Dumančić, L. R., and Arčabić, V. (2019). Persistence and stochastic convergence of euro area unemployment rates. *Economic Modelling*, 76:192–198.

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy*, 99(3):483–499.

Krugman, P. R. (1992). A dynamic spatial model. *National Bureau of Economic Research*.

Kunz, M. et al. (2012). *Regional Unemployment Disparities in Germany: An Empirical Analysis of the Determinants and Adjustment Paths on a Small Regional Level*, volume 331. wbv.

Liontakis, A., Papadas, C. T., and Tzouramani, I. (2010). Regional economic convergence in greece: A stochastic dominance approach.

Marein, B. (2021). Spatial population trends and economic development in puerto rico, 1765–2010. *European Review of Economic History*.

Martin, R. (1997). Regional unemployment disparities and their dynamics. *Regional Studies*, 31(3):237–252.

McKinnon, R. I. (1963). Optimum currency areas. *The American Economic Review*, 53(4):717–725.

Möller, J. (1995). Empirische analyse der regionalentwicklung. *Regensburger Diskussionsbeiträge zur Wirtschaftswissenschaft*, 271.

Mundell, R. A. (1961). A theory of optimum currency areas. *The American Economic Review*, 51(4):657–665.

Pehkonen, J. and Tervo, H. (1998). Persistence and turnover in regional unemployment disparities. *Regional Studies*, 32(5):445–458.

Presman, N. and Klepfish, V. (2008). Regional unemployment rate convergence in israel. In *ECOMOD conference, Berlin*.

Rowthorn, R. and Glyn, A. J. (2006). Convergence and stability in us employment rates. *Contributions in Macroeconomics*, 6(1):1–43.

Ruiz, A. (1994). The impact of transfer payments(federal and others) to individual and to government on the puerto rican economy. *Ceteris Paribus*, 4:55–72.

Sobrino, C. R. and Heath, E. (2013). Currency area and non-synchronized business cycles between the us and puerto rico. *Economics Bulletin*, 33(3).

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1):65–94.

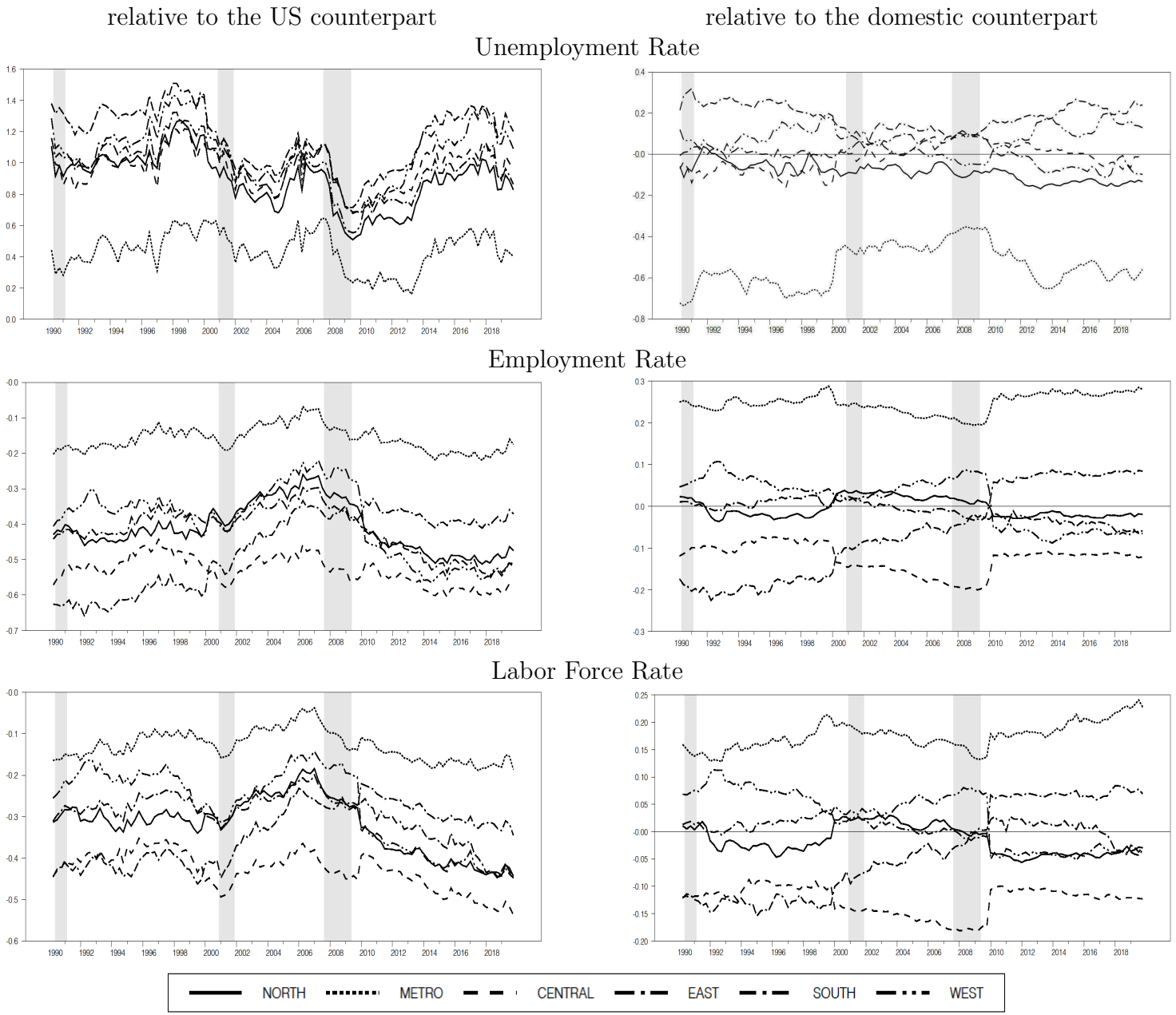
Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, pages 312–320.

Südekum, J. (2008). Convergence of the skill composition across german regions. *Regional Science and Urban Economics*, 38(2):148–159.

Swan, T. W. (1956). Economic growth and capital accumulation. *Economic record*, 32(2):334–361.

Werner, D. (2013). *The Evolution of Regional Labor Market Disparities*. wbv Publikation.

Figure 1: Regional Disparities relative to the US and the National Counterparts



Note: Shadow bars are US recessions for the periods: 1990:Q3-1991:Q1, 2001:Q1- 2001:Q4 and 2007:Q3 2009:Q2

Table I: Tests for Regional Deviations from the US Counterpart						
	Unemployment Rate		Employment Rate		Labor Force Rate	
	ADF	KPSS	ADF	KPSS	ADF	KPSS
North	-2.20	4.08**	-1.00	1.53**	-0.35	2.66**
Metro	-2.39	0.40	-1.70	0.53*	-1.37	0.69*
East	-1.73	1.41**	-2.00	0.67*	-1.59	0.96**
Central	-2.35	0.31	-1.61	2.73**	-0.53	3.15**
South	-1.66	1.51**	-1.47	5.56**	-1.28	3.93**
West	-1.69	0.98**	-0.75	5.16**	0.27	7.33**
			1% (**)		5%(*)	
ADF Critical Values			-3.45		2.87	
KPSS Critical Values			0.74		0.46	

Table II:Tests for Regional Deviations from the National Counterpart						
	Unemployment Rate		Employment Rate		Labor Force Rate	
	ADF	KPSS	ADF	KPSS	ADF	KPSS
North	-1.66	1.13**	-1.61	0.44	-1.52	0.69*
Metro	-2.49	1.45**	-1.07	0.30	1.10	4.76**
East	-1.11	1.91**	-1.01	3.04**	-1.20	0.93**
Central	-1.58	2.76**	-1.67	1.56**	-1.62	0.96**
South	-2.11	1.48**	-1.04	10.37**	-1.12	10.52**
West	-1.64	0.35	-1.32	3.83**	-1.01	4.50**
			1% (**)		5%(*)	
ADF Critical Values			-3.45		2.87	
KPSS Critical Values			0.74		0.46	

Table III: Panel Tests (p-values)			
	Unemployment Rate	Employment Rate	Labor Force Rate
	Regional Deviations from the US Counterpart		
Levin Lin	0.52956	0.67111	0.97288
Im-Pesaran-Shin	0.01852	0.20574	0.92269
Hadri LM	0.00000	0.00000	0.00000
	Regional Deviations from the National Counterpart		
Levin Lin	0.46727	0.53403	0.61380
Im-Pesaran-Shin	0.558552	0.56737	0.57837
Hadri LM	0.00000	0.00000	0.00000

Table IV: Zivot-Andrews Test for Regional Deviations from the US Counterpart						
	Unemployment Rate		Employment Rate		Labor Force Rate	
	statistic	date	statistic	date	statistic	date
North	3.59	2000:Q1	-3.94	2009:Q4	-3.44	2009:Q4
Metro	-4.24	2008:Q1	-3.68	2010:Q4	-3.44	2010:Q3
East	-3.32	2013:Q2	-3.56	2010:Q4	-3.56	2002:Q4
Central	-3.71	2013:Q2	-3.36	2010:Q4	-3.31	2002:Q4
South	-3.77	2000:Q1	-3.15	1999:Q4	-3.27	2001:Q1
West	-3.74	2000:Q1	-5.30*	2009:Q4	-4.66	2009:Q4
			1% (**)		5%(*)	
Critical Values			-5.34		-4.80	

Table V: Zivot-Andrews Test for Regional Deviations from the National Counterpart						
	Unemployment Rate		Employment Rate		Labor Force Rate	
	statistic	date	statistic	date	statistic	date
North	-4.95*	2011:Q3	-4.62	1998:Q4	-3.64	2009:Q4
Metro	-4.99*	1999:Q4	-4.64	2009:Q4	-3.81	2003:Q3
East	-3.96	2009:Q4	-6.47**	2009:Q4	-7.70**	2009:Q4
Central	-4.71	2000:Q1	-5.19*	2009:Q4	-6.48**	2009:Q4
South	-3.63	1997:Q1	-4.19	1999:Q4	-2.94	2014:Q4
West	-3.86	2002:Q1	5.79**	2009:Q4	-6.54**	2009:Q4
			1% (**)		5%(*)	
Critical Values			-5.34		-4.80	

Table VI: Zivot-Andrews Test for Regional Deviations from the Metro Counterpart						
	Unemployment Rate		Employment Rate		Labor Force Rate	
	statistic	date	statistic	date	statistic	date
North	-5.35**	1999:Q4	-5.22*	2009:Q4	-4.68	1999:Q4
East	-5.54**	1999:Q4	-5.83**	2009:Q4	-4.35	2008:Q2
Central	-4.88*	2009:Q4	-4.86*	1999:Q1	-4.41	2008:Q2
South	-4.92*	1999:Q4	-4.53	1999:Q4	-2.53	2001:Q1
West	-4.34	1999:Q4	-5.64**	2009:Q4	-4.76	2009:Q4
			1% (**)		5%(*)	
Critical Values			-5.34		-4.80	