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Unemployment and labor force participation across the US States: new evidence from panel data

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Abstract

This study examines the relationship between unemployment and labor force participation to judge the presence of the discouraged worker/added worker/unemployment invariance effect in the US labor market, spanning the period 1976-2014. Panel unit root and cointegration tests explore this relationship. The results indicate the presence of a relationship between unemployment and labor force participation rates, while the impact of unemployment on labor force participation is negative, indicating the prevalence of the discouraged worker effect across the US. These findings receive statistical support through panel causality tests, while they carry significant policy implications in relevance to labor policies across the US states.

JEL Classification: E24, J60
Keywords: Unemployment invariance hypothesis, discouraged worker effect, labor force participation rates, unemployment rates, US states panel data

1. Introduction

Recently, there has been a growing interest in analyzing the labor market indicators and the relation among these indicators (Blanchard and Summers, 1986; Layard et al., 1991; Jaeger and Parkinson, 1994; Murphy and Topel, 1997), but relatively little attention has been put on studies concerning labor force participation and unemployment, despite that the nature of association between unemployment and labor force participation is an important social and economic issue in almost all countries. The empirical relationship between unemployment rates and labor force participation rates is of particular importance for policy makers (Spletzer, 1997; Gustavsson and Österholm, 2006; Veracierto, 2008; Österholm, 2010; Congregado et al., 2011; Lee and Parasnis, 2014) due to the impact of significant macroeconomic effects/shocks on unemployment. It is obvious that changes in the participation rates in response to changing employment opportunities have a direct effect on the magnitude of unemployment and, thus, on the impact of economic policies towards full employment. It seems that labor force participation is responsive to changing conditions in the labor market and this has induced the hypothesis of a causal relation running from unemployment to labor force participation (Blanchard and Diamond, 1990; Burda and Wyploz, 1994; Gomes, 2012; Kakinaka and Miyamoto, 2012).

As stated by Österholm (2010) and Emerson (2011), the presence of a link between unemployment and labor force participation rates has important implications both in the case of theoretical and that of empirical studies. On the theoretical side, there are two possible outcomes regarding the type of the relationship between the unemployment rate and the labor force participation rate. While the presence of any relationship between the two variables is associated with the discouraged worker effect or the added worker effect, the lack of this relationship is an indication of the unemployment invariance hypothesis, which suggests that the long-run unemployment rate is independent of the labor force, the capital stock and productivity levels (Layard et al., 2005; Karanassou and Snower, 2004; Liu, 2014).

The discouraged worker effect refers to the case in which the decision of the labor force to abstain from job search comes as a consequence of low chances in labor markets (Van Ham et al., 2001). A discouraged worker is the one who is not looking for work under the current business conditions, but otherwise would have been searching if the chances or opportunities of obtaining an acceptable job were sufficiently high (Dagsvik et al., 2013). The presence of high unemployment during recessions may lead unemployed workers to be withdrawn from the labor force, i.e. the discouraged workers. By contrast, the added-worker effect states that many secondary workers who are not currently in the labor market may decide to enter when economic conditions start to deteriorate. In other words, worsening economic conditions draw other family members or secondary workers, such as students or females into the labor force, as the main breadwinners become unemployed or under the risk of being unemployed and income starts falling (Congregado et al., 2011).

The discouraged worker effect posits a negative relationship between unemployment and labor force participation. An increase in unemployment discourages people from actively searching for work as the costs of active search increase, while the benefits go down (Cabuc and Zylberberg, 2004). In contrast to the discouraged worker effect, the added worker effect predicts a positive effect of unemployment on labor force participation. Therefore, net changes in the aggregate participation rate come as a response to changes in the unemployment rate, and this depends on the relative strength of the added worker effect vis-à-vis the discouraged worker effect. Overall, the question of which effect dominates depends on the relative magnitudes of these effects and, therefore, turns out to be an empirical question (Lee and Parasnis, 2014:90, Congregado et al., 2011).

The goal of this paper, therefore, is to explore the relationship between unemployment and labor force participation rates as a criterion for assessing the validity of the discouraged worker effect or the added worker effect, as well as the unemployment invariance hypothesis in the U.S. labor market using state-level panel data, spanning the period 1976-2014. This study, however, differs from the earlier studies in general and from those on the U.S. in particular, because the nexus between unemployment and labor force participation rates is examined across all US 48 states, by making use of advanced panel methodologies. In other words, compared with the relevant literature that has examined this relationship for a particular country, this study has some distinguishing novelties. First, the relationship between unemployment and labor force participation rates is examined from the state-level perspective. It should be noted that the nexus between unemployment and labor force participation rates has not been examined previously with panel data across all 48 US states. The study extends the previous results by Emerson (2011) on the nexus between unemployment and labor force participation rates to the case of the US at the state-level in order to address the potential heterogeneity in the behavior of labor force participation and unemployment rates across these states. It is important to take into account this heterogeneity since US states could have a distinct and separate labor market structure due to their peculiar laws, regulations and extends of unionization. The results could contain important policy implications, because state-level information regarding the relationship between unemployment and labor force participation rates offers state-oriented policy prescriptions for policy makers. Second, the study employs advanced panel unit root and cointegration tests with structural breaks so as to take into account the role of regime shifts in the empirical analysis.

To briefly foreshadow the results, they establish the presence of a long-run relationship between the labor force participation rate and the unemployment rate across the US states, implying the rejection of the unemployment invariance hypothesis and the validity of the discouraged worker effect. Moreover, panel causality tests provided robust support to these findings. The rest of the paper is structured as follows. Section 2 presents a brief literature review of papers addressing the link between the labor force participation rate and the unemployment rate, while Section 3 describes the data used, as well as reports the empirical analysis. Finally, Section 4 concludes the paper.

2. Literature review

A number of recent empirical studies have examined the relationship between unemployment rates and labor force participation rates for the case of high income countries (Österholm, 2010; Emerson, 2011; Congregado et al., 2011; Kakinaka and Miyamoto, 2012; Liu, 2014; among others). Their findings document generally that there is a long-run relationship between the two variables, providing supportive evidence for the discouraged worker and the added worker effects in certain cases, rather than the unemployment invariance effect. Kakinaka and Miyamoto (2012) find a negative long-run relationship between the two variables for both total and the male workers, but they do not report evidence of a long-run relationship for the case of female workers.

Congregado et al. (2011) examine the relationship between unemployment rates and labor force participation rates in Spain, spanning the period 1976-2008 using a non-linear threshold cointegration methodology. They find a long-run relationship between the two variables, illustrating that the unemployment invariance hypothesis does not hold, as well as the presence of a dominant added-worker effect below a certain threshold of unemployment. They also document the presence of an insignificant relationship between the two variables above this threshold. Their results support the added-worker effect in the case of Spain.

Lee and Parasnis (2014) investigate the effects of the unemployment rate on the labor force participation rate using country specific institutional data within a panel GMM estimation methodology for 13 developing countries from six different regions for the period 1993-2008 and for 22 OECD countries for the period 1995-2006. Their empirical results confirm that the added worker effect is dominant in the case of developing countries, while the discouraged worker effect seems to be dominant in the case of OECD countries.

In contrast to the above papers, Liu (2014) examines the relationship between unemployment and labor force participation rates from a regional perspective within Westerlund (2006) panel cointegration framework. Using unemployment and labor force participation rates data from nine Japanese regions for the period 1983-2010, the author highlights the presence of a long-run relationship between the two variables across all regions.

3. Data and empirical analysis

3.1 Data

In line with the empirical literature (Emerson, 2011; Liu, 2014; Lee and Parasnis, 2014), the following equation is estimated in the empirical analysis:

$$LFPR_{it} = \beta_0 + \beta_1 U_{it} + \varepsilon_{it} \qquad (1)$$

where $LFPR_{it}$ denotes the labor force participation rate for state i, while U_{it} refers to the unemployment rate for state i; ε_{it} is the error term. A number of potential conclusions may be established after the estimation of Equation (1). In particular, if cointegration is established, then the sign of the slope coefficient on the unemployment rate illustrates which effect is dominant: if there is a positive long-run relationship between the unemployment rate and the labor force participation rate, then the added worker effect prevails in labor markets, while the presence of a negative long-run relationship between the two variables; in other words, the results are consistent with the discouraged worker effect in labor markets.

We utilize monthly data on the U.S. state-level, spanning the period 1976:01-2014:03. Seasonally adjusted data on unemployment (U_{it}) and labor force participation rates ($LFPR_{it}$) for each of the 48 states (excluding Alaska and Hawaii) are obtained from the U.S. Bureau of Labor Statistics. In addition to state-level data, the empirical analysis is also implemented with national unemployment rates and labor force participation rates data to explore the robustness of the state-level empirical findings. Table I summarizes certain descriptive statistics (i.e., mean, maximum, minimum, and standard deviation) of monthly unemployment and labor force participation rates for each of the 48 states. For comparison purposes, we also include both the national labor force participation and unemployment rates. As shown in Table 1, the mean unemployment rate over the sample period is the highest (lowest) in Michigan (Nebraska). Unemployment rates show that the highest (lowest) standard deviation is with West Virginia (South Dakota). The mean labor force participation rate is the largest (smallest) in the case of Minnesota (West Virginia). Moreover, labor force participation rates display that the highest (lowest) standard deviation is with the case of North Dakota (Kentucky). It should be also noted that the mean unemployment rates of many states are higher than the national mean unemployment rate, including Alabama, Arkansas, California, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, and West Virginia.

3.2 Cross-section dependence tests

In the first step of the empirical analysis, we examine the unit root properties in the data through advanced panel unit root tests. Panel unit root tests of the first-generation can lead to spurious results (because of size distortions), if significant degrees of positive residual cross-section dependence exist and are ignored. Consequently, the implementation of second-generation panel unit root tests is desirable only when it has been established that the panel is subject to a significant degree of residual cross-section dependence. In the cases where cross-section dependence is not sufficiently high, a loss of power might result if second-generation panel unit root tests that allow for cross-section dependence are employed. Therefore, before selecting the appropriate panel unit root tests, it is crucial to provide some evidence on the degree of residual cross-section dependence.

Table I.

Descriptive statistics

	Labor Force Participation Rate				Unemployment Rate			
State	**Mean**	**Std Dev**	**Max**	**Min**	**Mean**	**Std Dev**	**Max**	**Min**
Alabama	60.79	2.07	64.40	56.00	6.68	2.40	14.30	3.20
Arizona	63.52	1.91	66.30	58.70	6.39	1.92	11.60	3.50
Arkansas	61.45	1.81	64.70	57.20	6.60	1.46	10.10	4.00
California	65.66	1.27	68.40	62.00	7.50	2.02	12.40	4.70
Colorado	71.24	1.82	74.40	66.60	5.63	1.57	9.10	2.60
Connecticut	67.94	1.67	71.50	63.50	5.48	1.82	9.50	2.10
Delaware	66.55	2.83	71.50	60.40	5.34	1.84	9.30	2.80
Florida	61.01	2.38	64.40	55.20	6.46	1.96	11.40	3.30
Georgia	66.61	2.00	70.60	62.30	6.00	1.73	10.40	3.30
Idaho	67.07	2.07	70.90	62.60	6.02	1.54	9.60	2.70
Illinois	66.76	1.55	69.70	62.60	7.10	1.99	12.90	4.20
Indiana	66.46	2.00	70.50	62.60	6.23	2.35	12.70	2.60
Iowa	69.76	2.67	73.50	63.70	4.80	1.49	8.60	2.50
Kansas	69.23	1.57	71.30	64.70	4.80	0.98	7.50	3.00
Kentucky	62.14	0.76	63.80	59.90	7.00	1.92	12.00	4.10
Louisiana	60.67	1.40	66.70	56.20	7.15	2.26	12.80	3.60
Maine	65.13	2.18	68.30	60.20	5.93	1.56	9.00	3.10
Maryland	69.08	1.67	71.50	64.00	5.36	1.37	8.40	3.30
Massachusetts	67.07	1.21	69.30	64.40	5.75	1.83	11.10	2.60
Michigan	64.61	2.13	68.80	59.90	8.31	2.94	16.80	3.30
Minnesota	72.29	2.27	75.60	65.80	5.03	1.34	9.10	2.50
Mississippi	60.50	1.63	63.00	55.80	7.96	2.02	13.50	4.90
Missouri	66.52	2.77	71.00	59.70	6.01	1.63	10.60	2.80
Montana	66.14	1.62	68.60	61.80	5.78	1.26	8.80	3.10
Nebraska	70.85	2.82	74.40	64.20	3.57	0.93	6.70	2.20
Nevada	69.78	2.32	73.70	62.70	6.88	2.63	13.90	3.80
New Hampshire	70.86	1.86	73.30	65.10	4.50	1.46	7.60	2.10
New Jersey	65.64	1.46	67.70	60.90	6.45	1.92	10.70	3.60
New Mexico	62.21	1.61	64.00	57.80	6.85	1.42	10.00	3.40
New York	61.55	1.45	63.60	58.00	6.73	1.54	10.30	4.00

North Carolina	66.52	1.69	69.30	61.00	5.95	2.04	11.30	3.10
North Dakota	69.55	3.13	74.50	61.50	4.00	0.95	6.80	2.60
Ohio	65.15	1.62	67.70	61.50	6.90	2.13	13.90	3.80
Oklahoma	63.43	1.47	65.40	58.90	5.34	1.45	9.20	2.80
Oregon	66.40	1.85	69.30	61.10	7.33	1.93	12.10	4.70
Pennsylvania	62.57	2.03	65.40	58.20	6.62	1.82	12.90	4.00
Rhode Island	66.46	1.35	68.90	62.80	6.61	2.28	11.90	2.90
South Carolina	64.00	2.08	67.20	57.90	6.57	2.02	11.90	3.20
South Dakota	70.13	2.54	73.50	63.80	3.83	0.78	6.00	2.50
Tennessee	63.41	1.85	66.70	59.10	6.72	2.01	12.80	3.90
Texas	67.44	1.57	69.40	63.30	6.23	1.25	9.30	4.20
Utah	69.47	2.89	73.00	62.50	5.08	1.60	10.00	2.40
Vermont	69.86	2.08	72.30	63.10	4.85	1.41	8.80	2.40
Virginia	67.83	1.22	70.20	65.40	4.76	1.29	7.80	2.20
Washington	66.59	2.10	70.20	60.70	7.12	1.81	12.20	4.40
West Virginia	54.11	1.76	56.90	50.70	8.29	3.11	18.10	3.90
Wisconsin	70.21	2.44	74.30	65.20	5.61	1.84	11.50	3.00
Wyoming	70.26	1.41	72.60	64.20	5.05	1.54	9.10	2.30
The U.S.	65.34	1.47	67.30	61.30	6.49	1.58	10.80	3.80

The cross-section dependence (CD) statistic by Pesaran (2004) is based on a simple average of all pair-wise correlation coefficients of the OLS residuals obtained from standard augmented Dickey-Fuller regressions for each variable in the panel. Under the null hypothesis of cross-sectional independence, the CD test statistic follows asymptotically a two-tailed standard normal distribution. The results reported in Table II uniformly reject the null hypothesis of cross-section independence, providing evidence of cross-sectional dependence in the data, given the statistical significance of the CD statistics regardless of the number of lags (from 1 to 4) included in the ADF regressions.

Table II.
Cross-section dependence (CD) tests

	Lags			
Variables	1	2	3	4
LFPR	[0.00]***	[0.00]***	[0.00]***	[0.02]**
U	[0.00]***	[0.00]***	[0.01]***	[0.00]***

Notes: Under the null hypothesis of cross-sectional independence the CD statistic is distributed as a two-tailed standard normal. Results are based on the test of Pesaran (2004). Figures in parentheses denote p-values. ***: p≤0.01; **: p≤0.05.

3.3 Panel unit root tests

Two second-generation panel unit root tests are employed to determine the degree of integration in the respective variables. The Pesaran (2007) panel unit root test does not require the estimation of factor loading to eliminate cross-sectional dependence. Specifically, the usual ADF regression is augmented to include the lagged cross-sectional mean and its first difference to capture the cross-sectional dependence that arises through a single-factor model. The null hypothesis is a unit root for the Pesaran (2007) test. The bootstrap panel unit root tests by Smith et al. (2004) utilize a sieve sampling scheme to account for both the time series and cross-sectional dependence in the data through bootstrap blocks. All four tests by Smith et al. (2004) are constructed with a unit root under the null hypothesis and heterogeneous autoregressive roots under the alternative hypothesis. The results of these panel unit root tests are reported in Table 3 and support of the presence of a unit root in both variables under consideration.

The results in relevance to the non-stationarity of unemployment rates carry certain economic implications. In particular, they are associated with two major economic theories on unemployment behaviour. First, according to the hysteresis in unemployment hypothesis, developed by Blanchard and Summers (1986), any changes in actual unemployment are expected to carry a permanent effect on the equilibrium level of unemployment, i.e. the unemployment rate can be well described by a random walk process (Furuoka, 2014). Second, accrding to Phelps (1967) and Friedman (1968), technological developments, monetary policy changes, human resource developments, and macroeconomic changes in an economy affect unemployment rates, while keeping the actual unemployment rate around the equilibrium level of unemployment, indicating that the unemployment rate is well described as a stationary process (Blanchard and Summers, 1986). The findings in Table III clearly illustrate the validity of the unemployment hysteresis hypothesis, indicating the permanent character of macroeconomic shocks hitting the US states, while they are consistent with those reached by Kula and Aslan (2008) for the case of OECD countries. This could seriously imply permanent changes of the unemployment rate in these states, thus, casting some doubts on the flexibility of US labor wages that is usually believed to accompany the strike of macreocnomic shocks and thus, to nullify movements away from equilibrium unemployment rates. Finally, these findings are expected to impact the association between unemployment and labor force participation rates (Fuchs and Weber, 2015) where the presence of permamnet shocks could add strength to the validity of the discouraged-worker effect, since such shocks tend to discourage especially older workers for both psychological and sociological reasons.

Table III.
Panel unit root tests

Variable	Pesaran CIPS	Pesaran CIPS*	Smith et al. t-test	Smith et al. LM-test	Smith et al. max-test	Smith et al. min-test
LFPR	-1.17	-1.29	-1.30	3.24	-1.25	1.35
ΔLFPR	-5.31***	-5.40***	-5.25***	19.50***	-6.73***	6.43***
U	-1.26	-1.26	-1.39	3.44	-1.43	1.29
ΔU	-5.24***	-5.17***	-6.53***	19.92***	-7.62***	7.26***

Notes: Δ denotes first differences. A constant is included in the Pesaran (2007) tests. Rejection of the null hypothesis indicates stationarity in at least one country. CIPS* = truncated CIPS test. Critical values for the Pesaran (2007) test are -2.40 at 1%, -2.22 at 5%, and -2.14 at 10%, respectively. The null hypothesis is that of a unit root. Both a constant and a time trend are included in the Smith et al. (2004) tests. Rejection of the null hypothesis indicates stationarity in at least one country. For both tests the results are reported at lag = 4. The null hypothesis is that of a unit root. ***: $p \leq 0.01$.

3.4 Panel cointegration tests

Next, the analysis employs panel cointegration methodologies to investigate the long-run equilibrium across the variables under study. Under the presence of cross-sectional dependence, the study makes use of the Durbin-Hausman test, recommended by Westerlund (2008), to explore the presence of cointegration. This test allows for cross-sectional dependence, modelled by a factor model in which the errors in equation (1), ε_{it}, are obtained by idiosyncratic innovations and unobservable factors that are common across units of the panel (Auteri and Constantini, 2005). Thus, the errors in equation (1) are modelled as follows:

$$\varepsilon_{it} = \lambda'_i F_t + e_{it} \tag{2}$$

$$F_{jt} = \rho_j F_{j(t-1)} + u_{jt} \tag{3}$$

$$e_{it} = \varphi_i e_{i(t-1)} + \eta_{it} \tag{4}$$

where F_t is a 1 × K vector of common factors, F_{jt} with j = 1,…, k and λ_i is a conformable vector of factor loadings. It is ensured that F_t is stationary by assuming that $\rho_j < 1$ across all js. In this case, the integration order of the composite regression error ε_{it} depends only on the integrate pattern of the idiosyncratic disturbance e_{it}. Thus, testing the null hypothesis of no-cointegration is equivalent to testing whether $\phi_i = 1$. Two panel cointegration tests can perform the job: the panel and the group mean test. The panel test is constructed under the maintained assumption that $\phi_i = \phi$ for all is, whereas the group mean test assumes that $\phi_i \neq \phi$ for all is. Both tests are based on two estimators of ϕ_i, which have different probability limits under the cointegration alternative hypothesis, while sharing the property of consistency under the no co-integration null hypothesis. Thus, the statistics of DH_g and DH_p tests can be formulated as:

$$DH_g = \sum_{i=1}^{N} \hat{s}_i (\varphi_{1i} - \varphi_{2i})^2 \sum_{t=2}^{T} \hat{e}^2_{i(t-1)} \tag{5}$$

$$DH_p = \hat{s}_n (\varphi_1 - \varphi_2)^2 \sum_{i=1}^{N} \sum_{t=2}^{T} \hat{e}^2_{i(t-1)} \tag{6}$$

where φ_{2i} is the OLS estimator of ϕ_i in equation (4) and φ_2 denotes its pooled counterpart. The corresponding individual and pooled instrumental variable (IV) estimators of ϕ_i, denoted φ_{1i} and φ_1, respectively, are obtained by simply instrumenting $\hat{e}_{i(t-1)}$ with $\hat{e}_{it}$. For the panel test

(DH_p), the null and alternative hypotheses are formulated as H_0: $\phi_i = 1$ for all i = 1, …, N versus H^1_p: $\phi_i = \phi$ and $\phi < 1$ for all i. A common autoregressive parameter is assumed both under the null and alternative hypotheses. In contrast, for the DH_g test, H_0 is tested versus the alternative hypothesis defined as $H^1_g = \phi_i < 1$ for at least some i. In this case, heterogeneous autoregressive parameters are assumed across panel members. Thus, the rejection of null hypothesis indicates that there is a long-run relationship for at least some of the panel units.

Provided that the panel unit root test results confirm that all the variables are integrated in the same order, the presence of cointegration across them is justified. The results of the DH_g and DH_p tests are reported in Table IV. These findings illustrate that the null hypothesis of no-cointegration is rejected at the 1% significance level for both tests, indicating that there exists a significant long-run equilibrium between the labor force participation rate and the unemployment rate.

Table IV.
Westerlund cointegration tests

DH_g	5.979[0.00]***
DH_p	6.816[0.00]***

Notes: p-values are reported in brackets. The criterion used in this paper is $IC_2(K)$ with the Maximum number of factors (K) set equal to 5. For the bandwidth selection, M was chosen to represent the largest integer less than $4(T/100)^{2/9}$, as suggested by Newey and West (1994). ***: $p \leq 0.01$.

3.5 Estimates of the panel cointegrating vector

Next, we apply a panel methodology which takes into account both cross-section and time dimensions of the data to estimate the long run relationship described in Equation (1). However, when the errors of a panel regression are cross-sectionally correlated then standard estimation methods can lead to inconsistent estimates and incorrect inference (Phillips and Sul, 2003). In order to take into account the cross-sectional dependence we implement the econometric methodology of the Common Correlated Effects (CCE) suggested by Pesaran (2006). More specifically, he suggests a new approach to estimation that takes into account cross sectional dependence. The proposed methodology allows individual specific errors to be serially correlated and heteroskedastic. Pesaran's (2006) methodology is fully described in Appendix 2.

Therefore, given that the two variables are cointegrated, we proceed to obtain the long-run estimates of Equation (1). The results are reported in Table V. The findings highlight that the unemployment coefficient is negative and statistically significant. Based on these estimation results, we show that unemployment is not only a major driver for the labor participation rate, but also it exerts a negative impact on the labor participation rate, indicating the validity of the discouraged worker effect in the U.S. labor markets.

3.6 Individual states estimates

Table VI reports the individual CCE-MG estimates across the individual states. In particular, the empirical findings indicate that there is a statistically significant relationship between the labor force participation rate and the unemployment rate in the majority of the states investigated, except in the cases of Alaska, Hawaii, Oklahoma, Oregon, Rhode Island, and Utah. The unemployment rate has a positive effect on the labor force participation rate in the sense that a higher unemployment rate is associated with a higher labor force participation rate in a relatively small number of states, i.e. Connecticut, Iowa, Michigan, Minnesota, Nebraska, Nevada, North Carolina, Tennessee, and Wyoming. In these states, increased unemployment induces greater increases in labor force participation.

Table V.

Common Correlated Effects Mean Group (CCE-MG) long-run estimates

variables	coefficient	t-statistics	p-values
constant	1.3029***	4.3849	0.00
U	-0.1648***	-5.9714	0.00

Note: ***: p≤0.01.

Overall, the workers do not participate into the labor force or they are not involved in the search for jobs, as the unemployment rate goes up across the majority of the states. However, the differentiated results across states could be reflecting either changing demographics, or could be the result of federal and state policies implemented over time. Mofre specifically, the size of aged baby boomers that retires in each state differs, while the percentage of female workers in the labor force could also differ across states, given that the overall female population is no longer the dominant force in the labor market as it once was. Furthermore, younger people are opting to educate themselves rather than work and this tendency could also differ across states. Finally, a less-than-friendly tone towards immigrants is shrinking the supply for some high-skilled jobs, with the figures being different across states. Nevertheless, the quantitative support of the above potential explanations about the differentiated results could be explored given data availability.

Table VI.

Individual state CCE long-run estimates

State	**β_0**	**β_1**	**Result**
	1.129	-0.146	
Alabama	[0.02]	[0.00]	Discouraged-Worker Effect
	[0.26]	[0.30]	
Arizona	1.035 [0.01]	-0.185 [0.00]	Discouraged-Worker Effect
Arkansas	1.016 [0.05]	-0.158 [0.00]	Discouraged-Worker Effect
California	1.236 [0.01]	-0.196 [0.00]	Discouraged-Worker Effect
	0.911	-0.178	Discouraged-Worker Effect
Colorado	[0.03]	[0.00]	
Connecticut	1.236	0.196	Added-Worker Effect

	[0.01]	[0.00]	
Delaware	0.647 [0.05]	-0.108 [0.01]	Discouraged-Worker Effect
Florida	1.226 [0.02]	-0.192 [0.00]	Discouraged-Worker Effect
Georgia	1.164 [0.03]	-0.163 [0.00]	Discouraged-Worker Effect
Idaho	0.669 [0.04]	-0.199 [0.00]	Discouraged-Worker Effect
Illinois	1.241 [0.01]	-0.173 [0.00]	Discouraged-Worker Effect
Indiana	1.385 [0.00]	-0.194 [0.00]	Discouraged-Worker Effect
Iowa	1.073 [0.03]	0.139 [0.00]	Added-Worker Effect
Kansas	0.661 [0.04]	-0.190 [0.00]	Discouraged-Worker Effect
Kentucky	0.626 [0.03]	-0.173 [0.00]	Discouraged-Worker Effect
Louisiana	1.473 [0.00]	-0.192 [0.00]	Discouraged-Worker Effect
Maine	1.138 [0.02]	-0.236 [0.00]	Discouraged-Worker Effect
Maryland	1.253 [0.02]	-0.165 [0.00]	Discouraged-Worker Effect
Massachussetts	1.528 [0.01]	-0.192 [0.00]	Discouraged-Worker Effect
Michigan	1.396 [0.01]	0.148 [0.00]	Added-Worker Effect
Minnesota	1.096 [0.03]	0.182 [0.00]	Added-Worker Effect
Mississippi	0.674 [0.04]	-0.147 [0.00]	Discouraged-Worker Effect
Missouri	1.015 [0.04]	-0.105 [0.03]	Discouraged-Worker Effect
Montana	0.538 [0.05]	-0.128 [0.01]	Discouraged-Worker Effect
Nebraska	1.216 [0.01]	0.109 [0.03]	Added-Worker Effect
Nevada	0.091 [0.05]	0.140 [0.00]	Added-Worker Effect
New Hampshire	1.386 [0.01]	-0.188 [0.00]	Discouraged-Worker Effect
New Jersey	1.273 [0.00]	-0.202 [0.00]	Discouraged-Worker Effect

New Mexico	0.089 [0.05]	-0.158 [0.00]	Discouraged-Worker Effect
New York	1.725 [0.00]	-0.213 [0.00]	Discouraged-Worker Effect
North Carolina	1.395 [0.00]	0.151 [0.00]	Added-Worker Effect
North Dakota	1.064 [0.04]	-0.132 [0.01]	Discouraged-Worker Effect
Ohio	1.357 [0.00]	-0.162 [0.00]	Discouraged-Worker Effect
Oklahoma	0.783 [0.06]	-0.066 [0.18]	—
Oregon	0.468 [0.08]	0.085 [0.15]	—
Pennsylvania	1.439 [0.00]	-0.172 [0.00]	Discouraged-Worker Effect
Rhode Island	1.336 [0.01]	0.047 [0.19]	—
South Carolina	1.163 [0.05]	-0.174 [0.00]	Discouraged-Worker Effect
South Dakota	0.082 [0.05]	-0.159 [0.00]	Discouraged-Worker Effect
Tennessee	0.639 [0.05]	0.108 [0.02]	Added-Worker Effect
Texas	0.085 [0.04]	-0.197 [0.00]	Discouraged-Worker Effect
Utah	0.415 [0.13]	0.057 [0.19]	—
Vermont	1.585 [0.00]	-0.179 [0.00]	Discouraged-Worker Effect
Virginia	1.648 [0.00]	-0.197 [0.00]	Discouraged-Worker Effect
Washinghton	1.679 [0.00]	-0.170 [0.00]	Discouraged-Worker Effect
West Virginia	1.913 [0.00]	-0.175 [0.00]	Discouraged-Worker Effect
Wisconsin	0.658 [0.05]	-0.096 [0.04]	Discouraged-Worker Effect
Wyoming	0.094 [0.03]	0.104 [0.02]	Added-Worker Effect
Panel Result	1.192 [0.01]	-0.168 [0.01]	Discouraged-Worker Effect

Note: Figures in brackets denote p-values.

3.7 Panel unit root tests with breaks

According to a number of studies in the literature (Congregado et al., 2011; Emerson, 2011), a potential explanation of the documentation of mixed results in relevance to the dominance of the discouraged-worker vs the added-worker effect could be based on the presence of structural changes (structural instability). In other words, the failure to insert the presence of breaks in the testing procedure may generate false results that will invalidate any policy recommendations.

To explore the potential presence of breaks in our research goal, we repeat the empirical analysis so as we can allow for potential breaks. It is well known that the lack of accounting for structural breaks can bias unit root tests, concluding in favor of non-stationarity (Carrion-i-Silvestre et al., 2005) for panel data statistics. The test by Carriorn-i-Silvestre et al. (2005) is employed to check for the presence of potential breaks. This test allows for an unknown number of breaks in the level of each series, while it takes stationarity in its null hypothesis. The statistic is normally distributed under the null hypothesis, while the direction of the divergence under the alternative hypothesis indicates that the test statistic diverges to positive infinity, and is thus compared to the right tail. The maximum number of structural breaks is set equal to five, which is a common choice in the literature. The results, reported in Table VII, point out that the test leads to a clear rejection of stationarity at the levels of our series at the 1% level of significance. Therefore, we interpret these results as evidence in favor of non-stationarity at the levels of our to panel variables, which confirms the previous results of panel unit root testing without breaks.

Table VII.
Panel unit root tests with breaks

LFPR	LM(λ)	43.38***
ΔLFPR	LM(λ)	1.22
U	LM(λ)	39.51***
ΔU	LM(λ)	1.33

Notes: The null hypothesis of the LM(λ) test implies stationarity. A trimming parameter of 0.1T has been used. The test is computed using the Bartlett kernel. All bandwidths and lag lengths are chosen according to $4(T/100)^{2/9}$. The critical value for the LM(λ) test at the 1% significance level is 5.47. ***: $p \leq 0.01$.

3.8 Dedecting the location of breaks

The next stage of the empirical analysis estimates the number of breaks and their location through the Bai and Perron (2003) methodological approach. These findings are reported in Table VIII. From those results we can notice that US states have at some point been subject to breaks, which confirms that accounting for the potential presence of structural changes is the key in testing the association under investigation. The presence of breaks with respect to unemployment rates is consistent with that of non-stationarity evidenced above in relevance to the unit root testing (Papell et al., 2000; Summers, 2003; Lee and Chang, 2008). As can be seen in Table 7, we observe some clustering of the break dates around the 2008 and 2010. More specifically, the findings identify two major break changes associated with the most recent financial crisis of 2008 and the Great Recession following. In addition to the number of breaks, as well as their date identification, the findings also identify that these breaks are synchronized across US states. Such a synchronization may be potentially due to certain idiosyncratic characteristics (i.e., economic, labor structures or institutional) relative to the labor market.

3.9 The role of the 2008 financial crisis

In this part of the empirical analysis we explore the role of the recent financial crisis in relevance to the link between unemployment and labor force participation. There are good reasons for suspecting instability in the cointegrating vector estimated above. One of the striking aspects of the US labor market is rampant increases in the unemployment rate and the continuous decline in the labor force participation across the US as a result of the most recent economic downturn; thus, the nature of the relationship between two variables may change in response to economic conditions and prospects.

Given that the break dates tests identified the year 2008 as a break event, we carry on the analysis by investigating the presence of cointegration across the two regimes (i.e., prior and after the 2008 crisis). Once again, Westerlund (2008) cointegration results, reported in Table IX, display that over both regimes the statistics reject the null of no cointegration at the 1% significance level and confirm the presence of a long-run relationship between the two variables under study.

Table VIII.
Estimated breaks

State	**Break locations**	
	1	**2**
Alabama	2008:10	
Arizona	2008:10	
Arkansas	2009:1	
California	2008:9	2010:6
Colorado	2008:10	2010:6
Connecticut	2009:1	
Delaware	2009:1	
Florida	2008:11	2010:5
Georgia	2008:10	2010:6
Idaho	2008:9	
Illinois	2009:1	
Indiana	2009:1	2010:6
Iowa	2008:10	2010:6
Kansas	2008:11	2010:5
Kentucky	2008:9	
Louisiana	2008:10	2010:6
Maine	2008:9	
Maryland	2009:1	
Massachussetts	2008:10	
Michigan	2009:1	2010:6
Minnesota	2009:1	2010:6
Mississippi	2008:10	
Missouri	2009:1	
Montana	2009:1	2010:5
Nebraska	2009:1	
Nevada	2008:10	
New Hampshire	2008:10	
New Jersey	2009:1	
New Mexico	2009:1	2010:6

New York	2009:1	
North Carolina	2008:11	
North Dakota	2009:1	2010:6
Ohio	2009:1	
Oklahoma	2008:10	
Oregon	________________	
Pennsylvania	2008:10	
Rhose Island	2008:9	
South Carolina	2009:1	
South Dakota	2009:1	
Tennessee	2008:10	2010:6
Texas	2009:1	
Utah	________________	
Vermont	2009:2	
Virginia	2009:1	
Washinghton	2009:1	
West Virginia	2009:1	
Wisconsin	2008:9	2010:6
Wyoming	2009:1	

Notes: The breakpoints were estimated using the Bai and Perron (2003) procedure, while the number of breaks to use for each state was determined using the Schwarz Bayesian information criterion with a maximum of five breaks. The minimum length of each break regime was set to 0.1T, because it allows for some observations within each regime, while simultaneously permitting ample freedom for mmax.

Table IX.
Westerlund cointegration results-prior and after the 2008 crisis

Prior the 2008:4 crisis event	
DH_g	5.847[0.00]***
DH_p	6.506[0.00]***
After the 2008:4 crisis event	
DH_g	6.539[0.00]***
DH_p	6.847[0.00]***

Notes: p-values are reported in brackets. The criterion used in this paper is $IC_2(K)$ with the Maximum number of factors (K) set equal to 5. For the bandwidth selection, M was chosen to represent the largest integer less than $4(T/100)^{2/9}$, as suggested by Newey and West (1994). ***: $p \leq 0.01$.

3.10 Panel long-run estimates across regimes

Finally, given the presence of cointegration across both regimes, we next obtain the long-run estimates using (again the Common Correlated Effects (CCE) methodological approach. The new results are reported in Table X, with the findings providing evidence that the unemployment coefficient is negative and statistically significant over the period pior to the cisis event. Over the period after the crisis, although the negative sign is retained, the unemployment coefficient turns out to be statistically insignificant. In other words, this period is characterized by unstable unemployment and labor force participation rates, which display relatively a long duration of strong upward movements in unemployment and downward movements in labor force participation (Elsby et. al., 2011; Aaronson et al., 2014; Balakrishnan et. al., 2015). These fluctuations make the US a peculiarly appropriate case to examine the nexus between labor force participation and unemployment, because both the added worker and the discouraged effects have presumably been valid during this time period.

These findings are consistent with the presence of both the equally strong added worker effect and the discouraged worker effect (neutralizing each other) as a result of the Great Recession and the recent financial crisis. The weakening of the link between the labor force participation and the unemployment rate suggests that labor force participation has become less sensitive to changes in both unemployment and labor market conditions. Hence, the labor market slump could be a critical factor to understand the continuous fall in labor force participation (Van Zandweghe, 2012).

Table X.

Common Correlated Effects (CCE) long-run estimates (prior and after the 2008 crisis)

Variables	coefficient	t-statistics	p-values
Prior the crisis			
constant	0.7218**	2.5882	0.05
U	-0.2654***	-6.9216	0.00
After the crisis			
constant	1.0483**	2.6195	0.05
U	-0.0349	-1.1548	0.19

Note: ***: p≤0.01; **: p≤0.05.

3.11 Panel causality

Given that association does not imply causality, this section of the empirical analysis makes use of the Pooled Mean Group (PMG) causality methodology recommended by Pesaran et al. (2001). In particular, the Autoregressive Distributed Lag ARDL model proposed by Pesaran et al. (2001) yields the following equation:

$$LFPR_{it} = \sum_{j=1}^{p} \lambda_{ij} LFPR_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} U_{i,t-j} + \mu_i + \varepsilon_{it}$$

where μ_i represents the fixed effect. Given the presence of the established long-run relationship presented above, the ARDL (1,1,1) equation associated with Equation (1) yields:

$$LFRP_{it} = \delta_{0i} + \delta_{1i} U_{it} + \delta_{2i} U_{i,t-1} + \lambda_i LFPR_{i,t-1} + \varepsilon_{it}$$

and

$$U_{it} = \delta'_{0i} + \delta'_{1i} LFPR_{it} + \delta'_{2i} LFPR_{i,t-1} + \lambda'_i U_{i,t-1} + \varepsilon'_{it}$$

The corresponding error correction euations yield:

$\Delta LFPR_{it} = \varphi\ (LFPR_{it} - \theta_0 - \theta_1\ U_{it}) - \delta_{2i}\ \Delta U_{it} + \varepsilon_{it}$

and

$\Delta U_{it} = \varphi'\ (U_{it} - \theta'_0 - \theta'_1\ LFPR_{it}) - \delta'_{2i}\ \Delta LFPR_{it} + \varepsilon'_{it}$

The results of the error-correction equations are reported in Table XI. We notice that the non-causality hypothesis is rejected in all groups of countries. The error-correction coefficients φs are negative and statistically significant implying that financial development does not cause growth in the long run, while the reverse relationship is true. The results illustrate that in the short-run there exists a unidirectional causality running from the unemployment rate to the labor force participation rate, implying the validity of the discouraged worker effect, while in the long run although both error correction coefficients (φs) are negative, only the one that denotes long-run causality running from the unemployment rate to the labor force participation rate turns out to be statistically significant, thus, providing robust support to the above effect. These findings are consistent with those reached in previous studies in the relevant literature ((Blanchard and Diamond, 1990; Burda and Wyploz, 1994; Gomes, 2012; Kakinaka and Miyamoto, 2012).

Table XI.

Panel causality tests

	Short-run causality		Long-run causality
	LFPR	U	φς
U→LFPR	[0.00]	-	-0.128***
LFPR→U	-	[0.24]	-0.019

Note: Figures in brackets denote p-values. ***: p≤0.01.

3.12 Long-run estimates across states: a multivariate (time series) approach

Next, given that labour mobility across US states is substantially high (Molloy and Wozniak, 2011; Herz and Van Rens, 2011), we could explore the presence of linkages between the LFPR in state j and the unemployment rate in state I (this point has been raised by a referee to whom we express our gratitude). For example, a worker in state j might secure employment in state I, while the LFPR in state j might be influenced by the unemployment rate in state i rather than just state j. To this end, we repeat the empirical analysis across states by explicitly incorporating in Equation (1) all unemployment rates coming not only from within the state, but also from the other states. This time however, time series properties are employed.

First, the analysis investigates the presence of stationarity for both the labor force participation rate and the unemployment rate across all 48 US states. Table XII reports the results of the General Least Squared Dickey-Fuller test recommended by Elliott et al (1996). The results illustrate the presence of a unit root in the levels for both variables across all states, while in terms of first differences, the testing procedure indicates the presence of stationarity across all variables. The empirical findings recommend the potential presence of cointegration. Next, the analysis deals with co-integrating labor force participation rates and unemployment rates in a multivariable (time series) framework. To this end, the Johansen (1995) methodology has been used to perform this analysis. After determining the optimal lag length through the Schwarz-Bayesian lag length criterion considering up to 5 lags, the results are reported in Table XIII. They illustrate the presence of co-integration across all 48 states considered. Finally,, the long-run (multivariate) cointegration estimates are obtained. They are reported (for saving space) in Appendix 1 as Table XIV. According to these findings, it is evident that there exist significant spillovers across states in the majority of the cases, where a negative relationship is estiablished between unemployment and labor force participation rates, indicating the vaidity of the discouraged worker effect even in the presence of spillovers across states. The presence of this effect gets stronger for high growth states, i.e. New York, California, Illinois etc, as well as for neighboring states. The positive association between the labor force participation rate in state i and the unemployment rate in state j, i.e. the validity of the added-worker effect, is observed across the states that had been estiblished on a bivariate case.

Table XII.

Time series unit root tests

State	Levels	First differences	State	Levels	First differences	State	Levels	First differences
Alabama			Maine			Ohio		
LFPR	-1.17	-4.86***		-1.24	-4.92***		-1.21	-5.03***
U	-1.24	-5.36***		-1.28	-5.37***		-1.27	-5.42***
Arizona			Maryland			Oklahoma		
LFPR	-1.19	-4.91***		-1.25	-5.11***		-1.32	-5.68***
U	-1.24	-5.23***		-1.28	-5.40***		-1.30	-5.41***
Arkansas			Massachusetts			Oregon		
LFPR	-1.26	-5.38***		-1.20	-4.95***		-1.26	-5.48***
U	-1.31	-5.72***		-1.24	-5.39***		-1.24	-5.22***
California			Michigan			Pennsylvania		
LFPR	-1.17	-4.81***		-1.24	-4.98***		-1.29	-5.10***
U	-1.23	-4.97***		-1.29	-5.18***		-1.16	-4.79***
Colorado			Minnesota			Rhode Island		
LFPR	-1.28	-5.36***		-1.21	-4.86***		-1.18	-4.77***
U	-1.25	-5.08***		-1.28	-4.93***		-1.24	-4.90***
Connecticut			Mississippi			South Carolina		

LFPR	-1.19	-4.85***		-1.24	-4.81***		-1.22	-4.85***
U	-1.24	-4.89***		-1.20	-4.76***		-1.29	-5.06***
Delaware			Missouri			South Dakota		
LFPR	-1.08	-3.39**		-1.20	-4.36***		-1.38	-4.52***
U	-1.03	-2.95**		-1.28	-4.74***		-1.26	-4.38***
Florida			Montana			Tennessee		
LFPR	-1.30	-4.81***		-1.27	-4.68***		-1.15	-5.10***
U	-1.22	-4.90***		-1.39	-3.01**		-1.27	-4.83***
Georgia			Nebraska			Texas		
LFPR	-1.28	-4.93***		-1.24	-4.42***		-1.29	-4.61***
U	-1.32	-4.11***		-1.32	-4.30***		-1.34	-4.79***
Idaho			Nevada			Utah		
LFPR	-1.32	-3.29**		-1.22	-4.07***		-1.25	-4.52***
U	-1.07	-2.95**		-0.95	-2.64**		-1.31	-4.05***
Illinois			New Hampshire			Vermont		
LFPR	-1.26	-4.18***		-1.28	-5.26***		-1.21	-4.95***
U	-1.30	-4.59***		-1.27	-5.13***		-1.26	-5.07***
Indiana			New Jersey			Virginia		
LFPR	-1.29	-4.90***		-1.24	-5.36***		-1.27	-4.99***
U	-1.25	-5.29***		-1.26	-5.62***		-1.29	-5.17***
Iowa			New Mexico			Washington		
LFPR	-1.17	-3.42**		-1.18	-5.42***		-1.07	-3.62**

U	-1.19	-3.25**		-1.24	-5.71***		-1.13	-3.40**
Kansas			New York			West Virginia		
LFPR	-1.27	-4.01***		-1.08	-5.83***		-1.14	-5.48***
U	-1.29	-3.48**		-1.13	-6.11***		-1.17	-5.62***
Kentucky			North Carolina			Wisconsin		
LFPR	-1.25	-4.18***		-1.14	-5.26***		-0.86	-2.84**
U	-1.30	-4.53***		-1.21	-5.48***		-0.94	-2.35**
Louisiana			North Dakota			Wyoming		
LFPR	-1.29	-4.26***		-1.28	-4.83***		-1.25	-3.92***
U	-1.22	-4.15***		-1.33	-4.91***		-1.18	-4.16***

Note: ***: $p \leq 0.01$, **: $p \leq 0.05$

Table XIII.

Johansen co-integration results

State		State		State	
Alabama	Yes	Maine	Yes	Ohio	Yes
Arizona	Yes	Maryland	Yes	Oklahoma	Yes
Arkansas	Yes	Massachusetts	Yes	Oregon	Yes
California	Yes	Michigan	Yes	Pennsylvania	Yes
Colorado	Yes	Minnesota	Yes	Rhode Island	Yes
Connecticut	Yes	Mississippi	Yes	South Carolina	Yes
Delaware	Yes	Missouri	Yes	South Dakota	Yes
Florida	Yes	Montana	Yes	Tennessee	Yes
Georgia	Yes	Nebraska	Yes	Texas	Yes
Idaho	Yes	Nevada	Yes	Utah	Yes
Illinois	Yes	New Hampshire	Yes	Vermont	Yes
Indiana	Yes	New Jersey	Yes	Virginia	Yes
Iowa	Yes	New Mexico	Yes	Washington	Yes
Kansas	Yes	New York	Yes	West Virginia	Yes
Kentucky	Yes	North Carolina	Yes	Wisconsin	Yes
Louisiana	Yes	North Dakota	Yes	Wyoming	Yes

4. Conclusion

One of the conspicuous characteristics of the most recent economic downturn in the US is the pervasive increase in the unemployment rate across states. Unlike previous studies, this paper provided some evidence on the relationship between labor force participation and unemployment rates in the U.S., using state-level panel data, spanning the period 1976-2014. We empirically examined the nature of the relationship between labor force participation and unemployment rates by employing panel methodological approaches that allowed for cross-section dependence and the presence of structural breaks across states. The nature of the association between unemployment and labor force participation rates turns out to be substantially important for the designing of an effective economic policy. The empirical results pointed out that, similar to those documented by Emerson (2011), there was a long-run relationship between the labor force participation rate and the unemployment rate for the whole sample of the US states, which leads us to conclude that the unemployment invariance hypothesis, irrespective of the presence of structural breaks, did not receive any statistical support. However, the long-run parameter estimates for the entire panel of states indicated that, contrary to the findings of the added worker effect by Emerson (2011), there was a negative relationship between the labor force participation and the unemployment rate, recommending the prevalence of the discouraged worker effect in the case of the U.S. labor market. The findings indicate the heterogeneity in the response of labor force participation to unemployment across states. Moreover, panel causality tests provided robust support to the cointgration results, and hence, these results are consistent with the discouraged worker effect across US state labor markets.

Hence, the results suggest that policies aimed at reducing unemployment rates and promoting employment opportunities should pay particular attention to the distinct response of state-level labor force participation to such policies. It is important to note that we have underlined two types of states: those for which the added worker effect is dominant and those for which the discouraged worker effect is dominant or alternatively, the case for cancelling the added worker effect out of the discouraged worker effect.

In order to reduce unemployment and promote employment opportunities, which both affect labor force participation, it is crucial to implement both demand and supply-side policies in tandem, because labor force participation dynamics is associated with structural factors (e.g., demographic structures, education opportunities, and retirement conditions) as well as with cyclical factors related to job prospects. Demand-side policies are capable of reducing unemployment caused by recession, while supply-side policies are capable of reducing structural unemployment; in that case they both could used to improve the workings of the labor market in providing job seekers and prospective employers with better information, while matching potential workers to available jobs. These policies need to focus on the underlying causes of unemployment and labor force participation in each and every of the states considered.

This study, however, has certain limitations that must be pointed out when comparing the results with other studies in the relevant literature. The empirical analysis was implemented by using aggregate data. Given data availability, it would be much more interesting to make use of microdata in relevance to gender, age-group and educational characteristics to get some further insights into the dynamics of the US labor market.

Appendix 1

Table XIV.

Spillover effects across states (unemployment in state i to labor force participation in state j)

States: / Unemployment	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Florida
U_{AL}	-0.132[0.00]	-0.096[0.01]	-0.103[0.00]	-0.042[0.15]	-0.095[0.01]	-0.074[0.03]	-0.114[0.01]	-0.086[0.02]
U_{AZ}	-0.146[0.00]	-0.172[0.00]	-0.092[0.01]	-0.045[0.12]	-0.101[0.01]	-0.058[0.05]	-0.083[0.02]	-0.054[0.05]
U_{AR}	-0.127[0.00]	-0.094[0.01]	-0.139[0.00]	-0.063[0.10]	-0.084[0.02]	0.041[0.17]	-0.092[0.01]	-0.049[0.06]
U_{CA}	-0.189[0.00]	-0.135[0.00]	-0.148[0.00]	-0.191[0.00]	-0.157[0.00]	-0.128[0.00]	-0.146[0.00]	-0.114[0.00]
U_{CO}	-0.119[0.00]	-0.109[0.00]	-0.132[0.00]	-0.074[0.02]	-0.161[0.00]	-0.052[0.06]	-0.108[0.00]	-0.062[0.04]
U_{CT}	-0.145[0.00]	-0.129[0.00]	-0.125[0.00]	-0.096[0.01]	-0.118[0.00]	0.174[0.00]	-0.116[0.00]	-0.082[0.02]
U_{DE}	-0.082[0.02]	-0.095[0.01]	-0.084[0.02]	-0.035[0.19]	-0.064[0.05]	0.049[0.14]	-0.094[0.01]	-0.057[0.10]
U_{FL}	-0.118[0.00]	-0.126[0.00]	-0.142[0.00]	-0.071[0.05]	-0.133[0.00]	-0.096[0.01]	-0.125[0.00]	-0.176[0.00]
U_{GA}	-0.124[0.00]	-0.109[0.00]	-0.117[0.00]	-0.084[0.03]	-0.098[0.01]	-0.064[0.05]	-0.131[0.00]	-0.049[0.09]
U_{ID}	-0.058[0.07]	-0.064[0.06]	-0.079[0.02]	-0.038[0.18]	-0.066[0.06]	0.053[0.09]	-0.059[0.04]	-0.036[0.17]
U_{IL}	-0.135[0.00]	-0.109[0.00]	-0.124[0.00]	-0.088[0.02]	-0.113[0.00]	-0.072[0.03]	-0.139[0.00]	-0.063[0.04]
U_{IN}	-0.107[0.00]	-0.082[0.02]	-0.118[0.00]	-0.049[0.10]	-0.115[0.00]	-0.086[0.02]	-0.117[0.00]	-0.074[0.03]
U_{IA}	-0.093[0.01]	-0.077[0.03]	-0.084[0.02]	-0.036[0.16]	-0.068[0.05]	-0.050[0.08]	-0.063[0.05]	-0.038[0.14]
U_{KS}	-0.065[0.09]	-0.079[0.03]	-0.062[0.10]	-0.032[0.19]	-0.057[0.07]	0.046[0.09]	-0.079[0.03]	-0.046[0.10]
U_{KY}	-0.063[0.09]	-0.085[0.03]	-0.068[0.08]	-0.039[0.17]	-0.049[0.09]	-0.053[0.08]	-0.075[0.03]	-0.052[0.08]
U_{LA}	-0.103[0.00]	-0.095[0.01]	-0.112[0.00]	-0.059[0.08]	-0.086[0.02]	-0.071[0.03]	-0.109[0.00]	-0.063[0.08]
U_{ME}	-0.074[0.05]	-0.068[0.06]	-0.090[0.01]	-0.048[0.12]	-0.059[0.08]	-0.075[0.03]	-0.114[0.00]	-0.056[0.09]

U_{MD}	-0.105[0.00]	-0.114[0.00]	-0.098[0.01]	-0.065[0.07]	-0.073[0.03]	-0.068[0.03]	-0.119[0.00]	-0.061[0.04]
U_{MA}	-0.127[0.00]	-0.118[0.00]	-0.137[0.00]	-0.086[0.02]	-0.081[0.03]	-0.146[0.00]	-0.120[0.00]	-0.075[0.03]
U_{MI}	-0.110[0.00]	-0.104[0.00]	-0.116[0.00]	-0.068[0.05]	-0.084[0.02]	-0.095[0.01]	-0.118[0.00]	-0.073[0.03]
U_{MIN}	-0.113[0.00]	-0.126[0.00]	-0.097[0.01]	-0.060[0.06]	-0.092[0.01]	-0.076[0.03]	-0.124[0.00]	-0.069[0.05]
U_{MS}	-0.094[0.01]	-0.082[0.02]	-0.103[0.00]	-0.049[0.15]	-0.071[0.03]	0.058[0.10]	-0.107[0.00]	-0.052[0.13]
U_{MO}	-0.070[0.03]	-0.068[0.03]	-0.093[0.01]	-0.054[0.12]	-0.066[0.07]	-0.051[0.13]	-0.094[0.01]	-0.034[0.20]
U_{MT}	-0.075[0.03]	-0.062[0.07]	-0.095[0.01]	-0.032[0.21]	-0.069[0.06]	0.044[0.16]	-0.082[0.02]	-0.038[0.19]
U_{NE}	-0.071[0.04]	-0.059[0.09]	-0.080[0.02]	-0.031[0.21]	-0.063[0.07]	0.049[0.14]	-0.077[0.03]	-0.042[0.17]
U_{NV}	-0.094[0.01]	-0.098[0.01]	-0.115[0.00]	-0.084[0.02]	-0.103[0.00]	-0.069[0.06]	-0.117[0.00]	-0.073[0.05]
U_{NH}	-0.136[0.00]	-0.112[0.00]	-0.147[0.00]	-0.093[0.01]	-0.118[0.00]	-0.144[0.00]	-0.142[0.00]	-0.087[0.02]
U_{NJ}	-0.116[0.00]	-0.124[0.00]	-0.138[0.00]	-0.101[0.00]	-0.126[0.00]	-0.118[0.00]	-0.149[0.00]	-0.098[0.01]
U_{NM}	-0.085[0.02]	-0.103[0.00]	-0.119[0.00]	-0.065[0.10]	-0.114[0.00]	0.061[0.10]	-0.136[0.00]	-0.073[0.08]
U_{NY}	-0.146[0.00]	-0.139[0.00]	-0.152[0.00]	-0.109[0.00]	-0.136[0.00]	-0.124[0.00]	-0.158[0.00]	-0.116[0.00]
U_{NC}	-0.063[0.07]	-0.085[0.02]	-0.097[0.01]	-0.052[0.10]	-0.068[0.06]	0.042[0.13]	-0.098[0.01]	-0.073[0.06]
U_{ND}	-0.057[0.10]	-0.046[0.12]	-0.052[0.10]	-0.029[0.23]	-0.037[0.21]	0.034[0.24]	-0.050[0.10]	-0.026[0.29]
U_{OH}	-0.081[0.02]	-0.086[0.02]	-0.116[0.00]	-0.068[0.08]	-0.074[0.07]	-0.072[0.07]	-0.108[0.00]	-0.057[0.10]
U_{OK}	-0.089[0.02]	-0.094[0.01]	-0.126[0.00]	-0.061[0.10]	-0.106[0.00]	0.042[0.18]	-0.129[0.00]	-0.038[0.20]
U_{OR}	-0.067[0.09]	-0.083[0.02]	-0.109[0.00]	-0.041[0.15]	-0.063[0.10]	0.036[0.18]	-0.103[0.00]	-0.049[0.13]
U_{PA}	-0.093[0.01]	-0.088[0.02]	-0.125[0.00]	-0.074[0.05]	-0.094[0.01]	0.059[0.10]	-0.137[0.00]	-0.068[0.06]
U_{RI}	-0.104[0.00]	-0.089[0.02]	-0.119[0.00]	-0.070[0.05]	-0.085[0.02]	-0.096[0.01]	-0.128[0.00]	-0.060[0.07]
U_{SC}	-0.071[0.04]	-0.080[0.03]	-0.088[0.02]	-0.048[0.13]	-0.072[0.04]	0.051[0.12]	-0.095[0.01]	-0.031[0.20]
U_{SD}	-0.042[0.18]	-0.038[0.21]	-0.053[0.14]	-0.019[0.35]	-0.030[0.25]	0.039[0.21]	-0.059[0.11]	-0.026[0.31]
U_{TN}	-0.063[0.09]	-0.057[0.12]	-0.072[0.07]	-0.029[0.30]	-0.045[0.13]	0.028[0.37]	-0.058[0.12]	-0.021[0.43]
U_{TX}	-0.086[0.02]	-0.091[0.02]	-0.104[0.00]	-0.063[0.10]	-0.085[0.02]	-0.073[0.07]	-0.118[0.00]	-0.067[0.08]

U_{UT}	-0.053[0.12]	-0.080[0.02]	-0.076[0.04]	-0.040[0.19]	-0.073[0.05]	0.045[0.18]	-0.095[0.01]	-0.038[0.22]
U_{VT}	-0.105[0.00]	-0.114[0.00]	-0.128[0.00]	-0.071[0.07]	-0.098[0.01]	-0.084[0.02]	-0.126[0.00]	-0.064[0.07]
U_{VA}	-0.083[0.02]	-0.076[0.03]	-0.102[0.00]	-0.059[0.08]	-0.095[0.01]	-0.062[0.07]	-0.110[0.00]	-0.058[0.08]
U_{WA}	-0.065[0.08]	-0.073[0.06]	-0.090[0.01]	-0.061[0.08]	-0.083[0.02]	0.055[0.10]	-0.099[0.01]	-0.053[0.10]
U_{WV}	-0.071[0.07]	-0.076[0.06]	-0.087[0.02]	-0.049[0.14]	-0.068[0.07]	-0.075[0.06]	-0.092[0.01]	-0.066[0.07]
U_{WI}	-0.062[0.08]	-0.060[0.08]	-0.076[0.05]	-0.048[0.13]	-0.072[0.05]	0.045[0.15]	-0.068[0.06]	-0.044[0.15]
U_{WY}	-0.049[0.14]	-0.058[0.09]	-0.063[0.08]	-0.030[0.29]	-0.053[0.10]	0.024[0.36]	-0.073[0.06]	-0.036[0.26]

States: Unemployment	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana
U_{AL}	-0.114[0.00]	-0.087[0.02]	-0.063[0.10]	-0.060[0.10]	0.056[0.11]	-0.044[0.19]	-0.073[0.07]	-0.089[0.02]
U_{AZ}	-0.062[0.10]	-0.052[0.14]	-0.059[0.11]	-0.068[0.09]	-0.073[0.07]	-0.051[0.15]	-0.069[0.09]	-0.041[0.21]
U_{AR}	-0.066[0.09]	-0.044[0.19]	-0.038[0.24]	-0.052[0.15]	-0.079[0.06]	0.058[0.10]	-0.052[0.14]	-0.046[0.18]
U_{CA}	-0.134[0.00]	-0.159[0.00]	-0.092[0.01]	-0.161[0.00]	-0.153[0.00]	-0.137[0.00]	-0.166[0.00]	-0.125[0.00]
U_{CO}	-0.083[0.02]	-0.058[0.10]	-0.061[0.10]	-0.071[0.05]	0.069[0.08]	-0.048[0.14]	-0.059[0.10]	-0.066[0.05]
U_{CT}	-0.101[0.00]	-0.127[0.00]	-0.109[0.00]	-0.106[0.00]	-0.125[0.00]	0.155[0.00]	-0.164[0.00]	-0.127[0.02]
U_{DE}	-0.055[0.10]	-0.053[0.10]	-0.042[0.14]	-0.047[0.13]	0.040[0.14]	0.035[0.19]	-0.052[0.10]	-0.051[0.10]
U_{FL}	-0.120[0.00]	-0.157[0.00]	-0.136[0.00]	-0.098[0.01]	-0.139[0.00]	-0.162[0.00]	-0.158[0.00]	-0.135[0.00]
U_{GA}	-0.152[0.00]	-0.133[0.00]	-0.097[0.01]	-0.086[0.03]	-0.119[0.00]	-0.145[0.00]	-0.124[0.00]	-0.129[0.00]
U_{ID}	-0.035[0.20]	-0.174[0.00]	-0.065[0.10]	-0.059[0.10]	0.037[0.19]	0.057[0.08]	-0.046[0.15]	-0.038[0.19]
U_{IL}	-0.108[0.00]	-0.147[0.00]	-0.161[0.00]	-0.176[0.02]	-0.127[0.00]	-0.096[0.01]	-0.145[0.00]	-0.089[0.02]
U_{IN}	-0.112[0.00]	-0.095[0.01]	-0.124[0.00]	-0.175[0.00]	-0.126[0.00]	-0.097[0.01]	-0.135[0.00]	-0.092[0.01]
U_{IA}	-0.063[0.10]	-0.079[0.05]	-0.048[0.14]	-0.039[0.15]	0.120[0.00]	-0.059[0.08]	-0.066[0.05]	-0.072[0.04]

U_{KS}	-0.054[0.12]	-0.083[0.02]	-0.026[0.28]	-0.077[0.03]	-0.071[0.05]	-0.169[0.00]	-0.081[0.02]	-0.066[0.09]
U_{KY}	-0.069[0.08]	-0.088[0.02]	-0.036[0.27]	-0.072[0.04]	0.058[0.10]	-0.072[0.04]	-0.158[0.00]	-0.061[0.09]
U_{LA}	-0.109[0.00]	-0.124[0.00]	-0.075[0.04]	-0.091[0.01]	-0.089[0.01]	-0.079[0.03]	-0.112[0.00]	-0.177[0.00]
U_{ME}	-0.091[0.01]	-0.128[0.00]	-0.095[0.01]	-0.085[0.02]	-0.126[0.00]	-0.079[0.03]	-0.126[0.00]	-0.148[0.00]
U_{MD}	-0.119[0.00]	-0.137[0.00]	-0.094[0.01]	-0.075[0.03]	-0.138[0.00]	-0.161[0.00]	-0.173[0.00]	-0.095[0.01]
U_{MA}	-0.138[0.00]	-0.149[0.00]	-0.116[0.00]	-0.119[0.00]	-0.152[0.00]	-0.163[0.00]	-0.144[0.00]	-0.098[0.01]
U_{MI}	-0.104[0.00]	-0.125[0.00]	-0.103[0.00]	-0.141[0.00]	-0.158[0.00]	-0.154[0.00]	-0.103[0.00]	-0.096[0.01]
U_{MIN}	-0.093[0.01]	-0.122[0.00]	-0.176[0.00]	-0.163[0.00]	-0.177[0.00]	-0.142[0.00]	-0.149[0.00]	-0.099[0.01]
U_{MS}	-0.071[0.08]	-0.106[0.00]	-0.054[0.10]	-0.062[0.09]	0.053[0.10]	0.029[0.28]	-0.077[0.04]	-0.071[0.05]
U_{MO}	-0.070[0.03]	-0.068[0.03]	-0.093[0.01]	-0.054[0.12]	-0.066[0.07]	-0.051[0.13]	-0.094[0.01]	-0.034[0.20]
U_{MT}	-0.046[0.15]	-0.050[0.13]	-0.024[0.37]	-0.051[0.13]	-0.066[0.07]	0.049[0.13]	-0.068[0.07]	-0.042[0.18]
U_{NE}	-0.049[0.14]	-0.028[0.35]	-0.016[0.47]	-0.035[0.19]	-0.060[0.07]	0.053[0.13]	-0.038[0.31]	-0.025[0.38]
U_{NV}	-0.091[0.01]	-0.119[0.00]	-0.103[0.00]	-0.144[0.00]	-0.136[0.00]	-0.093[0.01]	-0.140[0.00]	-0.086[0.02]
U_{NH}	-0.155[0.00]	-0.163[0.00]	-0.133[0.00]	-0.103[0.00]	-0.125[0.00]	-0.142[0.00]	-0.159[0.00]	-0.099[0.01]
U_{NJ}	-0.119[0.00]	-0.122[0.00]	-0.131[0.00]	-0.112[0.00]	-0.129[0.00]	-0.125[0.00]	-0.142[0.00]	-0.105[0.00]
U_{NM}	-0.088[0.02]	-0.114[0.00]	-0.095[0.01]	-0.074[0.05]	-0.105[0.00]	0.076[0.04]	-0.131[0.00]	-0.084[0.02]
U_{NY}	-0.143[0.00]	-0.152[0.00]	-0.129[0.00]	-0.116[0.00]	-0.167[0.00]	-0.149[0.00]	-0.154[0.00]	-0.124[0.00]
U_{NC}	-0.069[0.06]	-0.088[0.02]	-0.058[0.08]	-0.074[0.03]	-0.082[0.03]	0.060[0.08]	-0.093[0.01]	-0.075[0.05]
U_{ND}	-0.039[0.28]	-0.042[0.14]	-0.024[0.41]	-0.025[0.40]	-0.062[0.07]	0.047[0.13]	-0.059[0.07]	-0.035[0.24]
U_{OH}	-0.072[0.03]	-0.097[0.01]	-0.103[0.00]	-0.089[0.02]	-0.116[0.00]	-0.081[0.02]	-0.124[0.00]	-0.079[0.03]
U_{OK}	-0.085[0.02]	-0.099[0.01]	-0.066[0.05]	-0.064[0.05]	-0.117[0.00]	0.090[0.01]	-0.123[0.00]	-0.071[0.03]
U_{OR}	-0.029[0.52]	-0.034[0.48]	-0.018[0.59]	-0.045[0.14]	-0.069[0.08]	0.062[0.10]	-0.037[0.51]	-0.033[0.56]
U_{PA}	-0.098[0.01]	-0.124[0.00]	-0.129[0.00]	-0.093[0.01]	-0.115[0.00]	0.126[0.00]	-0.145[0.00]	-0.086[0.02]
U_{RI}	-0.116[0.00]	-0.095[0.01]	-0.124[0.00]	-0.107[0.00]	-0.139[0.00]	-0.127[0.00]	-0.140[0.00]	-0.081[0.02]

U_{SC}	-0.065[0.06]	-0.057[0.08]	-0.036[0.19]	-0.041[0.13]	0.048[0.11]	0.057[0.10]	-0.051[0.11]	-0.039[0.18]
U_{SD}	-0.041[0.18]	-0.040[0.19]	-0.034[0.26]	-0.026[0.37]	-0.057[0.06]	0.037[0.22]	-0.028[0.35]	-0.065[0.04]
U_{TN}	-0.039[0.27]	-0.059[0.11]	-0.022[0.52]	-0.024[0.50]	0.041[0.15]	0.032[0.24]	-0.081[0.02]	-0.055[0.13]
U_{TX}	-0.082[0.02]	-0.114[0.00]	-0.106[0.00]	-0.075[0.03]	-0.089[0.02]	-0.080[0.02]	-0.124[0.00]	-0.147[0.00]
U_{UT}	-0.035[0.31]	-0.042[0.27]	-0.025[0.50]	-0.045[0.17]	-0.084[0.02]	0.051[0.14]	-0.049[0.15]	-0.039[0.21]
U_{VT}	-0.113[0.00]	-0.139[0.00]	-0.103[0.00]	-0.095[0.01]	-0.124[0.00]	-0.086[0.02]	-0.137[0.00]	-0.089[0.01]
U_{VA}	-0.124[0.00]	-0.095[0.01]	-0.072[0.05]	-0.070[0.05]	-0.098[0.01]	-0.126[0.00]	-0.139[0.00]	-0.086[0.02]
U_{WA}	-0.063[0.09]	-0.041[0.18]	-0.028[0.39]	-0.035[0.22]	-0.063[0.04]	0.051[0.10]	-0.084[0.02]	-0.036[0.22]
U_{WV}	-0.077[0.05]	-0.102[0.00]	-0.038[0.29]	-0.055[0.10]	0.061[0.09]	-0.037[0.29]	-0.091[0.01]	-0.085[0.02]
U_{WI}	-0.035[0.33]	-0.042[0.28]	-0.026[0.51]	-0.030[0.36]	-0.071[0.05]	0.049[0.13]	-0.035[0.33]	-0.024[0.54]
U_{WY}	-0.038[0.30]	-0.059[0.08]	-0.031[0.35]	-0.035[0.32]	-0.073[0.03]	0.049[0.12]	-0.028[0.39]	-0.036[0.31]
States:	Maine	Maryland	Masschussetts	Michigan	Minnesota	Mississippi	Missouri	Montana
Unemployment								
U_{AL}	-0.035[0.31]	-0.041[0.27]	-0.028[0.43]	-0.053[0.10]	0.027[0.43]	-0.068[0.06]	-0.040[0.27]	-0.085[0.02]
U_{AZ}	-0.032[0.34]	-0.036[0.31]	-0.024[0.53]	0.038[0.30]	0.033[0.32]	-0.075[0.03]	-0.063[0.08]	-0.048[0.25]
U_{AR}	-0.041[0.29]	-0.062[0.08]	-0.031[0.35]	0.046[0.24]	0.029[0.43]	0.081[0.02]	-0.058[0.10]	-0.042[0.21]
U_{CA}	-0.116[0.00]	-0.128[0.00]	-0.090[0.01]	-0.147[0.00]	-0.159[0.00]	-0.173[0.00]	-0.152[0.00]	-0.168[0.00]
U_{CO}	-0.073[0.03]	-0.054[0.12]	-0.048[0.18]	0.055[0.12]	0.065[0.09]	-0.081[0.02]	-0.063[0.08]	-0.089[0.02]
U_{CT}	-0.112[0.00]	-0.109[0.00]	-0.104[0.00]	-0.124[0.00]	-0.121[0.00]	0.152[0.00]	-0.179[0.00]	-0.175[0.00]
U_{DE}	-0.046[0.32]	-0.034[0.42]	-0.029[0.46]	0.037[0.40]	0.034[0.42]	0.051[0.14]	-0.055[0.09]	-0.062[0.07]
U_{FL}	-0.103[0.00]	-0.124[0.00]	-0.119[0.00]	-0.147[0.01]	-0.155[0.00]	-0.118[0.00]	-0.129[0.00]	-0.138[0.00]
U_{GA}	-0.152[0.00]	-0.133[0.00]	-0.097[0.01]	-0.086[0.03]	-0.119[0.00]	-0.145[0.00]	-0.124[0.00]	-0.129[0.00]
U_{ID}	-0.032[0.26]	-0.039[0.24]	-0.025[0.39]	0.042[0.15]	0.036[0.38]	0.037[0.38]	-0.044[0.14]	-0.039[0.24]

U_{IL}	-0.116[0.00]	-0.108[0.00]	-0.101[0.00]	-0.128[0.00]	-0.135[0.00]	-0.139[0.00]	-0.156[0.00]	-0.192[0.00]
U_{IN}	-0.104[0.00]	-0.091[0.01]	-0.094[0.00]	-0.117[0.00]	-0.128[0.00]	-0.135[0.00]	-0.158[0.00]	-0.174[0.00]
U_{IA}	-0.037[0.23]	-0.029[0.35]	-0.028[0.36]	0.057[0.10]	0.064[0.06]	-0.069[0.05]	-0.073[0.03]	-0.084[0.01]
U_{KS}	-0.059[0.10]	-0.054[0.12]	-0.046[0.18]	-0.071[0.03]	0.041[0.15]	-0.102[0.00]	-0.089[0.02]	-0.095[0.01]
U_{KY}	-0.035[0.24]	-0.038[0.24]	-0.035[0.24]	-0.066[0.04]	0.038[0.24]	-0.078[0.03]	-0.105[0.00]	-0.084[0.02]
U_{LA}	-0.114[0.00]	-0.085[0.02]	-0.074[0.04]	-0.096[0.01]	-0.076[0.04]	-0.084[0.02]	-0.126[0.00]	-0.131[0.00]
U_{ME}	-0.198[0.00]	-0.083[0.02]	-0.054[0.12]	-0.089[0.02]	-0.105[0.00]	-0.118[0.00]	-0.129[0.00]	-0.157[0.00]
U_{MD}	-0.124[0.00]	-0.148[0.00]	-0.110[0.00]	-0.128[0.00]	-0.119[0.00]	-0.153[0.00]	-0.164[0.00]	-0.182[0.00]
U_{MA}	-0.142[0.00]	-0.156[0.00]	-0.173[0.00]	-0.128[0.00]	-0.113[0.00]	-0.159[0.00]	-0.179[0.00]	-0.183[0.00]
U_{MI}	-0.071[0.03]	-0.075[0.03]	-0.082[0.02]	0.126[0.00]	-0.114[0.00]	-0.126[0.00]	-0.101[0.00]	-0.119[0.00]
U_{MIN}	-0.096[0.01]	-0.109[0.00]	-0.114[0.00]	-0.137[0.00]	0.160[0.00]	-0.128[0.00]	-0.136[0.00]	-0.135[0.00]
U_{MS}	-0.054[0.12]	-0.076[0.03]	-0.051[0.13]	0.047[0.15]	0.038[0.25]	-0.128[0.00]	-0.093[0.01]	-0.079[0.03]
U_{MO}	-0.050[0.13]	-0.061[0.05]	-0.032[0.27]	0.056[0.13]	0.060[0.08]	-0.074[0.03]	-0.091[0.01]	-0.083[0.02]
U_{MT}	-0.042[0.18]	-0.045[0.16]	-0.029[0.34]	-0.058[0.10]	0.061[0.08]	0.069[0.06]	-0.082[0.02]	-0.111[0.00]
U_{NE}	-0.038[0.22]	-0.031[0.26]	-0.025[0.33]	0.049[0.14]	0.035[0.23]	0.050[0.11]	-0.079[0.03]	-0.064[0.07]
U_{NV}	-0.095[0.01]	-0.124[0.00]	-0.090[0.01]	-0.136[0.00]	-0.148[0.00]	-0.134[0.00]	-0.146[0.00]	-0.152[0.00]
U_{NH}	-0.134[0.00]	-0.131[0.00]	-0.139[0.00]	-0.114[0.00]	-0.128[0.00]	-0.147[0.00]	-0.150[0.00]	-0.147[0.00]
U_{NJ}	-0.114[0.00]	-0.128[0.00]	-0.135[0.00]	-0.126[0.00]	-0.125[0.00]	-0.137[0.00]	-0.148[0.00]	-0.156[0.00]
U_{NM}	-0.081[0.02]	-0.075[0.03]	-0.058[0.09]	-0.071[0.05]	-0.088[0.02]	0.096[0.01]	-0.116[0.00]	-0.147[0.00]
U_{NY}	-0.135[0.00]	-0.128[0.00]	-0.134[0.00]	-0.148[0.00]	-0.152[0.00]	-0.178[0.00]	-0.163[0.00]	-0.173[0.00]
U_{NC}	-0.076[0.03]	-0.081[0.02]	-0.065[0.07]	-0.078[0.03]	-0.089[0.02]	0.094[0.01]	-0.099[0.01]	-0.116[0.00]
U_{ND}	-0.035[0.33]	-0.036[0.33]	-0.022[0.45]	0.051[0.14]	0.036[0.33]	0.041[0.18]	-0.052[0.13]	-0.057[0.11]
U_{OH}	-0.076[0.03]	-0.091[0.01]	-0.093[0.01]	-0.107[0.00]	-0.124[0.00]	-0.136[0.00]	-0.109[0.00]	-0.138[0.00]
U_{OK}	-0.081[0.02]	-0.073[0.03]	-0.063[0.05]	-0.072[0.03]	-0.095[0.01]	0.098[0.01]	-0.135[0.00]	-0.128[0.00]

U_{OR}	-0.035[0.39]	-0.039[0.36]	-0.027[0.49]	-0.051[0.10]	0.062[0.08]	0.084[0.01]	-0.079[0.03]	-0.093[0.01]
U_{PA}	-0.095[0.01]	-0.108[0.00]	-0.114[0.00]	-0.103[0.00]	-0.119[0.00]	0.130[0.00]	-0.142[0.00]	-0.147[0.00]
U_{RI}	-0.109[0.00]	-0.099[0.01]	-0.116[0.00]	-0.125[0.00]	-0.138[0.00]	-0.146[0.00]	-0.149[0.00]	-0.138[0.00]
U_{SC}	-0.052[0.11]	-0.050[0.11]	-0.039[0.23]	0.045[0.13]	0.048[0.11]	0.064[0.09]	-0.075[0.04]	-0.091[0.01]
U_{SD}	-0.022[0.47]	-0.031[0.38]	-0.035[0.32]	0.021[0.48]	0.027[0.43]	0.062[0.09]	-0.073[0.03]	-0.069[0.04]
U_{TN}	-0.068[0.04]	-0.059[0.09]	-0.054[0.10]	-0.063[0.05]	0.068[0.04]	0.077[0.03]	-0.085[0.02]	-0.071[0.04]
U_{TX}	-0.085[0.02]	-0.108[0.00]	-0.102[0.00]	-0.128[0.00]	-0.094[0.01]	-0.137[0.00]	-0.129[0.00]	-0.145[0.00]
U_{UT}	-0.039[0.29]	-0.041[0.27]	-0.030[0.37]	0.041[0.19]	-0.073[0.03]	0.075[0.03]	-0.042[0.19]	-0.044[0.18]
U_{VT}	-0.124[0.00]	-0.145[0.00]	-0.132[0.00]	-0.140[0.00]	-0.138[0.00]	-0.097[0.01]	-0.134[0.00]	-0.149[0.00]
U_{VA}	-0.118[0.00]	-0.138[0.00]	-0.094[0.01]	-0.117[0.00]	-0.094[0.01]	-0.138[0.00]	-0.144[0.00]	-0.163[0.00]
U_{WA}	-0.055[0.10]	-0.040[0.19]	-0.030[0.37]	-0.052[0.10]	-0.059[0.09]	0.074[0.03]	-0.088[0.02]	-0.071[0.03]
U_{WV}	-0.052[0.10]	-0.042[0.10]	-0.033[0.36]	-0.057[0.09]	0.065[0.08]	-0.072[0.03]	-0.095[0.01]	-0.081[0.02]
U_{WI}	-0.031[0.38]	-0.039[0.33]	-0.029[0.56]	0.038[0.33]	0.042[0.29]	0.053[0.10]	-0.058[0.09]	-0.049[0.20]
U_{WY}	-0.039[0.29]	-0.045[0.19]	-0.041[0.23]	0.046[0.19]	0.049[0.17]	0.062[0.10]	-0.049[0.17]	-0.038[0.28]

States:	Nebraska	N. Hampshire	New Jersey	New Mexico	New York	N. Carolina	N. Dakota	Ohio
Unemployment								
U_{AL}	0.052[0.11]	-0.043[0.19]	-0.035[0.28]	-0.064[0.07]	0.029[0.40]	-0.061[0.07]	-0.082[0.02]	-0.039[0.26]
U_{AZ}	-0.088[0.02]	-0.039[0.28]	-0.028[0.48]	-0.076[0.03]	-0.035[0.31]	0.019[0.64]	-0.069[0.07]	-0.042[0.27]
U_{AR}	-0.079[0.03]	-0.061[0.08]	-0.034[0.33]	-0.075[0.03]	-0.024[0.58]	0.085[0.02]	-0.071[0.03]	-0.041[0.39]
U_{CA}	-0.128[0.00]	-0.133[0.00]	-0.095[0.01]	-0.152[0.00]	-0.128[0.00]	-0.149[0.00]	-0.159[0.00]	-0.124[0.00]
U_{CO}	-0.071[0.03]	-0.045[0.18]	-0.042[0.21]	-0.059[0.11]	0.052[0.15]	-0.070[0.03]	-0.069[0.07]	-0.056[0.13]
U_{CT}	0.035[0.36]	-0.039[0.33]	-0.041[0.30]	-0.048[0.25]	-0.024[0.48]	0.064[0.07]	-0.075[0.03]	-0.052[0.10]
U_{DE}	-0.068[0.07]	-0.032[0.45]	-0.024[0.55]	-0.062[0.09]	0.031[0.48]	0.059[0.10]	-0.073[0.03]	-0.038[0.40]

U_{FL}	-0.148[0.00]	-0.085[0.02]	-0.094[0.00]	-0.079[0.03]	-0.075[0.03]	-0.089[0.02]	-0.156[0.00]	-0.075[0.03]
U_{GA}	-0.137[0.00]	-0.121[0.00]	-0.137[0.01]	-0.089[0.03]	-0.115[0.00]	-0.156[0.00]	-0.174[0.00]	-0.128[0.00]
U_{ID}	0.035[0.36]	-0.041[0.32]	-0.029[0.42]	-0.049[0.27]	0.031[0.39]	0.066[0.08]	-0.040[0.32]	-0.032[0.39]
U_{IL}	-0.164[0.00]	-0.117[0.00]	-0.124[0.00]	-0.127[0.00]	-0.132[0.00]	-0.148[0.00]	-0.175[0.00]	-0.190[0.00]
U_{IN}	-0.144[0.00]	-0.095[0.01]	-0.106[0.00]	-0.126[0.00]	-0.121[0.00]	-0.158[0.00]	-0.181[0.00]	-0.163[0.00]
U_{IA}	-0.072[0.03]	-0.058[0.09]	-0.044[0.25]	-0.059[0.10]	0.041[0.27]	-0.065[0.06]	-0.079[0.03]	-0.040[0.28]
U_{KS}	-0.108[0.00]	-0.066[0.07]	-0.042[0.27]	-0.070[0.03]	-0.036[0.38]	-0.115[0.00]	-0.148[0.00]	-0.059[0.10]
U_{KY}	-0.072[0.03]	-0.045[0.25]	-0.039[0.34]	-0.061[0.07]	0.034[0.38]	-0.071[0.03]	-0.133[0.00]	-0.061[0.09]
U_{LA}	-0.129[0.00]	-0.089[0.02]	-0.081[0.02]	-0.107[0.00]	-0.079[0.03]	-0.096[0.01]	-0.144[0.00]	-0.116[0.00]
U_{ME}	0.062[0.08]	-0.088[0.02]	-0.079[0.03]	-0.096[0.01]	-0.116[0.00]	-0.129[0.00]	-0.154[0.00]	-0.132[0.00]
U_{MD}	-0.148[0.00]	-0.125[0.00]	-0.119[0.00]	-0.147[0.00]	-0.124[0.00]	-0.159[0.00]	-0.177[0.00]	-0.152[0.00]
U_{MA}	-0.145[0.00]	-0.162[0.00]	-0.178[0.00]	-0.134[0.00]	-0.126[0.00]	-0.174[0.00]	-0.192[0.00]	-0.159[0.00]
U_{MI}	-0.148[0.00]	-0.088[0.02]	-0.095[0.01]	0.114[0.00]	-0.128[0.00]	-0.145[0.00]	-0.173[0.00]	-0.120[0.00]
U_{MIN}	-0.109[0.00]	-0.116[0.00]	-0.119[0.00]	-0.152[0.00]	0.137[0.00]	-0.149[0.00]	-0.168[0.00]	-0.131[0.00]
U_{MS}	0.059[0.11]	-0.036[0.48]	-0.032[0.52]	-0.049[0.13]	0.030[0.53]	-0.106[0.00]	-0.082[0.02]	-0.054[0.13]
U_{MO}	-0.071[0.03]	-0.060[0.06]	-0.031[0.27]	-0.063[0.09]	-0.042[0.20]	-0.079[0.03]	-0.095[0.01]	-0.037[0.22]
U_{MT}	0.040[0.19]	-0.036[0.49]	-0.030[0.56]	-0.051[0.11]	-0.066[0.08]	0.048[0.12]	-0.042[0.18]	-0.028[0.58]
U_{NE}	0.085[0.02]	-0.030[0.26]	-0.022[0.35]	-0.054[0.11]	-0.032[0.28]	0.051[0.13]	-0.071[0.03]	-0.036[0.25]
U_{NV}	-0.131[0.00]	-0.122[0.00]	-0.098[0.01]	-0.165[0.00]	-0.130[0.00]	-0.145[0.00]	-0.174[0.00]	-0.141[0.00]
U_{NH}	-0.168[0.00]	-0.163[0.00]	-0.144[0.00]	-0.159[0.00]	-0.129[0.00]	-0.172[0.00]	-0.183[0.00]	-0.141[0.00]
U_{NJ}	-0.149[0.00]	-0.132[0.00]	-0.181[0.00]	-0.165[0.00]	-0.148[0.00]	-0.161[0.00]	-0.186[0.00]	-0.159[0.00]
U_{NM}	-0.092[0.01]	-0.078[0.03]	-0.065[0.07]	-0.086[0.02]	-0.071[0.03]	0.099[0.01]	-0.138[0.00]	-0.114[0.00]
U_{NY}	-0.173[0.00]	-0.133[0.00]	-0.142[0.00]	-0.157[0.00]	-0.184[0.00]	-0.175[0.00]	-0.192[0.00]	-0.136[0.00]
U_{NC}	-0.085[0.02]	-0.080[0.02]	-0.067[0.07]	-0.089[0.02]	-0.059[0.10]	0.136[0.00]	-0.124[0.00]	-0.086[0.02]

U_{ND}	0.066[0.08]	-0.035[0.46]	-0.032[0.49]	-0.058[0.10]	-0.031[0.50]	0.073[0.03]	-0.118[0.00]	-0.041[0.40]
U_{OH}	-0.148[0.00]	-0.095[0.01]	-0.102[0.00]	-0.136[0.00]	-0.121[0.00]	-0.162[0.00]	-0.174[0.00]	-0.140[0.00]
U_{OK}	-0.085[0.02]	-0.071[0.03]	-0.069[0.06]	-0.075[0.03]	-0.061[0.08]	0.091[0.01]	-0.156[0.00]	-0.103[0.00]
U_{OR}	-0.072[0.03]	-0.044[0.12]	-0.039[0.18]	-0.073[0.03]	-0.041[0.14]	0.081[0.02]	-0.088[0.02]	-0.072[0.03]
U_{PA}	-0.151[0.01]	-0.125[0.00]	-0.130[0.00]	-0.151[0.00]	-0.124[0.00]	0.138[0.00]	-0.157[0.00]	-0.129[0.00]
U_{RI}	-0.162[0.00]	-0.105[0.00]	-0.119[0.00]	-0.142[0.00]	-0.134[0.00]	-0.165[0.00]	-0.173[0.00]	-0.133[0.00]
U_{SC}	0.067[0.09]	-0.054[0.10]	-0.042[0.12]	-0.072[0.03]	0.041[0.013]	0.069[0.08]	-0.085[0.02]	-0.038[0.15]
U_{SD}	0.040[0.13]	-0.033[0.29]	-0.031[0.32]	-0.025[0.43]	-0.028[0.41]	0.060[0.09]	-0.094[0.01]	-0.038[0.14]
U_{TN}	-0.069[0.05]	-0.054[0.10]	-0.051[0.11]	-0.065[0.06]	0.052[0.11]	0.079[0.03]	-0.094[0.01]	-0.046[0.15]
U_{TX}	-0.106[0.00]	-0.111[0.00]	-0.092[0.01]	-0.125[0.00]	-0.086[0.02]	-0.142[0.00]	-0.159[0.00]	-0.121[0.00]
U_{UT}	-0.081[0.02]	-0.049[0.12]	-0.038[0.20]	-0.074[0.03]	-0.039[0.20]	0.071[0.03]	-0.089[0.02]	-0.041[0.20]
U_{VT}	-0.146[0.00]	-0.141[0.00]	-0.138[0.00]	-0.159[0.00]	-0.139[0.00]	-0.136[0.00]	-0.168[0.00]	-0.145[0.00]
U_{VA}	-0.137[0.00]	-0.126[0.00]	-0.119[0.00]	-0.146[0.00]	-0.099[0.01]	-0.150[0.00]	-0.173[0.00]	-0.144[0.00]
U_{WA}	-0.071[0.03]	-0.053[0.10]	-0.039[0.20]	-0.074[0.03]	-0.059[0.08]	0.078[0.03]	-0.114[0.00]	-0.070[0.03]
U_{WV}	-0.077[0.03]	-0.050[0.10]	-0.035[0.23]	-0.069[0.05]	0.061[0.09]	-0.078[0.03]	-0.119[0.00]	-0.085[0.02]
U_{WI}	-0.063[0.07]	-0.036[0.36]	-0.025[0.57]	-0.038[0.34]	-0.045[0.26]	0.070[0.03]	-0.059[0.09]	-0.041[0.25]
U_{WY}	-0.069[0.05]	-0.041[0.24]	-0.038[0.26]	-0.045[0.21]	-0.041[0.24]	0.068[0.05]	-0.052[0.10]	-0.036[0.30]

States:	Oklahoma	Oregon	Pennsylvania	Rhode Island	S. Carolina	S. Dakota	Tennessee	Texas
Unemployment								
U_{AL}	-0.055[0.10]	0.040[0.19]	-0.033[0.30]	0.029[0.34]	0.084[0.03]	-0.065[0.06]	-0.052[0.02]	-0.081[0.03]
U_{AZ}	-0.084[0.02]	-0.061[0.07]	-0.055[0.10]	0.048[0.13]	-0.051[0.12]	-0.072[0.03]	-0.069[0.04]	-0.068[0.05]
U_{AR}	-0.050[0.12]	-0.062[0.07]	-0.031[0.36]	-0.072[0.03]	-0.083[0.03]	0.088[0.02]	-0.074[0.03]	-0.062[0.07]
U_{CA}	-0.132[0.00]	-0.158[0.00]	-0.092[0.01]	-0.104[0.00]	-0.164[0.00]	-0.183[0.00]	-0.151[0.00]	-0.136[0.00]

U_{CO}	-0.075[0.03]	0.059[0.11]	-0.045[0.17]	0.042[0.18]	0.076[0.03]	-0.077[0.03]	-0.079[0.03]	-0.058[0.10]
U_{CT}	-0.031[0.38]	0.036[0.36]	-0.037[0.36]	0.041[0.33]	-0.028[0.45]	0.069[0.05]	-0.079[0.03]	-0.041[0.33]
U_{DE}	-0.066[0.07]	0.035[0.43]	-0.021[0.58]	0.055[0.11]	0.074[0.03]	0.063[0.08]	-0.071[0.03]	-0.034[0.45]
U_{FL}	-0.141[0.00]	-0.154[0.00]	-0.096[0.01]	-0.076[0.03]	-0.158[0.00]	-0.173[0.00]	-0.159[0.00]	-0.096[0.01]
U_{GA}	-0.119[0.00]	-0.136[0.00]	-0.119[0.00]	-0.093[0.01]	-0.158[0.00]	-0.159[0.00]	-0.178[0.00]	-0.133[0.00]
U_{ID}	-0.059[0.10]	0.038[0.36]	-0.025[0.45]	0.043[0.32]	0.028[0.42]	0.037[0.36]	0.038[0.36]	-0.028[0.42]
U_{IL}	-0.149[0.00]	-0.127[0.00]	-0.121[0.00]	-0.118[0.00]	-0.159[0.00]	-0.161[0.00]	-0.178[0.00]	-0.174[0.00]
U_{IN}	-0.126[0.00]	-0.099[0.01]	-0.115[0.00]	-0.120[0.00]	-0.139[0.00]	-0.154[0.00]	-0.172[0.00]	-0.155[0.00]
U_{IA}	-0.075[0.03]	0.059[0.10]	-0.041[0.26]	0.052[0.12]	0.045[0.23]	-0.061[0.09]	-0.075[0.03]	-0.043[0.24]
U_{KS}	-0.112[0.00]	-0.073[0.03]	-0.048[0.17]	0.063[0.08]	-0.061[0.08]	-0.119[0.00]	-0.135[0.00]	-0.066[0.05]
U_{KY}	-0.071[0.03]	0.042[0.27]	-0.036[0.33]	0.039[0.30]	0.069[0.03]	-0.076[0.03]	-0.128[0.00]	-0.084[0.02]
U_{LA}	-0.122[0.00]	-0.094[0.01]	-0.085[0.02]	-0.116[0.00]	-0.085[0.02]	-0.099[0.01]	-0.138[0.00]	-0.109[0.00]
U_{ME}	-0.081[0.02]	-0.089[0.02]	-0.095[0.01]	-0.092[0.01]	-0.128[0.00]	-0.144[0.00]	-0.158[0.00]	-0.136[0.00]
U_{MD}	-0.141[0.00]	-0.130[0.00]	-0.125[0.00]	-0.169[0.00]	-0.148[0.00]	-0.164[0.00]	-0.172[0.00]	-0.160[0.00]
U_{MA}	-0.153[0.00]	-0.169[0.00]	-0.175[0.00]	-0.139[0.00]	-0.142[0.00]	-0.179[0.00]	-0.185[0.00]	-0.166[0.00]
U_{MI}	-0.122[0.00]	-0.092[0.01]	-0.098[0.01]	0.125[0.00]	-0.139[0.00]	-0.142[0.00]	-0.158[0.00]	-0.128[0.00]
U_{MIN}	-0.114[0.00]	-0.129[0.00]	-0.115[0.00]	-0.126[0.00]	0.139[0.00]	-0.156[0.00]	-0.161[0.00]	-0.135[0.00]
U_{MS}	-0.068[0.04]	0.039[0.29]	-0.031[0.40]	0.035[0.33]	0.074[0.03]	-0.115[0.00]	-0.089[0.02]	-0.070[0.03]
U_{MO}	-0.053[0.10]	0.035[0.33]	-0.028[0.37]	0.031[0.36]	-0.066[0.04]	-0.075[0.03]	-0.091[0.01]	-0.072[0.03]
U_{MT}	-0.034[0.32]	0.031[0.40]	-0.027[0.30]	0.030[0.40]	-0.069[0.04]	0.058[0.08]	0.049[0.12]	-0.052[0.10]
U_{NE}	0.074[0.03]	0.038[0.29]	-0.020[0.52]	0.024[0.44]	-0.058[0.08]	0.055[0.10]	-0.075[0.03]	-0.046[0.14]
U_{NV}	-0.125[0.00]	-0.149[0.00]	-0.101[0.01]	-0.138[0.00]	-0.144[0.00]	-0.157[0.00]	-0.163[0.00]	-0.146[0.00]
U_{NH}	-0.131[0.00]	-0.126[0.00]	-0.158[0.00]	-0.164[0.00]	-0.141[0.00]	-0.159[0.00]	-0.160[0.00]	-0.149[0.00]
U_{NJ}	-0.128[0.00]	-0.117[0.00]	-0.163[0.00]	-0.160[0.00]	-0.149[0.00]	-0.157[0.00]	-0.173[0.00]	-0.152[0.00]

U_{NM}	-0.084[0.02]	-0.074[0.03]	-0.062[0.08]	-0.074[0.03]	-0.078[0.03]	0.105[0.01]	-0.125[0.00]	-0.119[0.00]
U_{NY}	-0.166[0.00]	-0.142[0.00]	-0.158[0.00]	-0.161[0.00]	-0.178[0.00]	-0.179[0.00]	-0.183[0.00]	-0.142[0.00]
U_{NC}	-0.081[0.02]	-0.073[0.03]	-0.065[0.05]	-0.082[0.03]	-0.069[0.04]	0.109[0.00]	-0.128[0.00]	-0.089[0.02]
U_{ND}	-0.048[0.12]	0.031[0.40]	-0.027[0.48]	0.029[0.46]	-0.035[0.32]	0.079[0.03]	-0.124[0.00]	-0.040[0.28]
U_{OH}	-0.125[0.00]	-0.098[0.01]	-0.113[0.00]	-0.128[0.00]	-0.139[0.00]	-0.153[0.00]	-0.159[0.00]	-0.146[0.00]
U_{OK}	-0.058[0.08]	-0.075[0.03]	-0.062[0.06]	-0.071[0.03]	-0.065[0.04]	0.096[0.01]	-0.130[0.00]	-0.109[0.00]
U_{OR}	-0.052[0.10]	0.064[0.15]	-0.035[0.32]	0.031[0.36]	-0.062[0.17]	0.085[0.02]	-0.095[0.01]	-0.068[0.12]
U_{PA}	-0.133[0.00]	-0.129[0.00]	-0.158[0.00]	-0.169[0.00]	-0.163[0.00]	0.182[0.00]	-0.174[0.00]	-0.132[0.00]
U_{RI}	-0.128[0.00]	-0.114[0.00]	-0.126[0.00]	0.039[0.30]	-0.136[0.00]	-0.152[0.00]	-0.135[0.00]	-0.109[0.00]
U_{SC}	-0.048[0.12]	0.057[0.10]	-0.041[0.31]	0.038[0.20]	-0.156[0.00]	0.074[0.03]	-0.081[0.02]	-0.061[0.09]
U_{SD}	-0.038[0.20]	0.033[0.38]	-0.026[0.49]	0.023[0.54]	-0.048[0.13]	-0.142[0.00]	-0.073[0.03]	-0.070[0.05]
U_{TN}	-0.069[0.05]	-0.066[0.06]	-0.063[0.07]	-0.068[0.05]	0.084[0.02]	-0.137[0.00]	-0.091[0.01]	-0.074[0.03]
U_{TX}	-0.119[0.00]	-0.124[0.00]	-0.085[0.02]	-0.114[0.00]	-0.128[0.00]	-0.135[0.00]	-0.148[0.00]	-0.169[0.00]
U_{UT}	-0.080[0.02]	0.055[0.09]	-0.036[0.32]	0.034[0.34]	-0.048[0.12]	0.042[0.15]	0.049[0.12]	-0.052[0.10]
U_{VT}	-0.124[0.00]	-0.118[0.00]	-0.132[0.00]	-0.147[0.00]	-0.130[0.00]	-0.149[0.00]	-0.163[0.00]	-0.140[0.00]
U_{VA}	-0.116[0.00]	-0.139[0.00]	-0.104[0.00]	-0.113[0.00]	-0.110[0.01]	-0.147[0.00]	-0.162[0.00]	-0.141[0.00]
U_{WA}	-0.075[0.03]	0.054[0.10]	-0.042[0.15]	0.046[0.13]	-0.068[0.04]	0.075[0.03]	-0.119[0.00]	-0.075[0.03]
U_{WV}	-0.071[0.03]	0.055[0.10]	-0.040[0.16]	0.042[0.15]	0.065[0.05]	-0.074[0.03]	-0.126[0.00]	-0.089[0.02]
U_{WI}	-0.062[0.07]	0.039[0.28]	-0.022[0.51]	0.038[0.30]	-0.049[0.12]	0.072[0.03]	0.061[0.08]	-0.058[0.10]
U_{WY}	-0.058[0.10]	0.040[0.25]	-0.031[0.37]	0.035[0.32]	-0.066[0.05]	0.069[0.04]	0.057[0.10]	-0.042[0.24]

Unemployment / States:	Utah	Vermont	Virginia	Washinghton	W. Virginia	Wisconsin	Wyoming
U_{AL}	0.054[0.10]	-0.038[0.29]	-0.035[0.32]	-0.052[0.11]	0.050[0.12]	-0.061[0.05]	0.056[0.09]
U_{AZ}	-0.082[0.02]	-0.065[0.04]	-0.059[0.07]	-0.081[0.02]	-0.074[0.03]	-0.063[0.04]	-0.068[0.04]
U_{AR}	0.052[0.10]	-0.065[0.04]	-0.084[0.02]	-0.071[0.03]	-0.087[0.03]	0.038[0.29]	0.042[0.25]
U_{CA}	-0.124[0.00]	-0.140[0.00]	-0.109[0.00]	-0.135[0.00]	-0.161[0.00]	-0.152[0.00]	-0.164[0.00]
U_{CO}	-0.079[0.03]	-0.065[0.04]	-0.058[0.07]	-0.053[0.10]	0.056[0.09]	-0.071[0.03]	-0.067[0.04]
U_{CT}	-0.080[0.02]	-0.110[0.36]	-0.071[0.03]	-0.084[0.02]	-0.081[0.02]	0.107[0.00]	-0.095[0.01]
U_{DE}	-0.062[0.05]	-0.039[0.29]	-0.028[0.42]	-0.051[0.12]	0.072[0.03]	0.068[0.04]	-0.074[0.03]
U_{FL}	-0.136[0.00]	-0.148[0.00]	-0.113[0.00]	-0.094[0.01]	-0.126[0.00]	-0.158[0.00]	-0.167[0.00]
U_{GA}	-0.124[0.00]	-0.132[0.00]	-0.138[0.00]	-0.091[0.01]	-0.147[0.00]	-0.137[0.00]	-0.165[0.00]
U_{ID}	0.056[0.10]	-0.033[0.34]	-0.029[0.37]	-0.045[0.15]	0.042[0.14]	0.039[0.30]	0.037[0.32]
U_{IL}	-0.142[0.00]	-0.136[0.00]	-0.130[0.00]	-0.124[0.00]	-0.152[0.00]	-0.153[0.00]	-0.171[0.00]
U_{IN}	-0.122[0.00]	-0.095[0.01]	-0.126[0.00]	-0.129[0.00]	-0.144[0.00]	-0.151[0.00]	-0.158[0.00]
U_{IA}	-0.078[0.03]	-0.064[0.08]	-0.062[0.09]	-0.058[0.10]	0.054[0.10]	-0.067[0.08]	-0.073[0.03]
U_{KS}	-0.128[0.00]	-0.084[0.02]	-0.065[0.08]	-0.061[0.09]	-0.066[0.08]	-0.126[0.00]	-0.138[0.00]
U_{KY}	-0.075[0.03]	-0.056[0.10]	-0.068[0.08]	-0.055[0.10]	0.069[0.07]	-0.078[0.03]	-0.135[0.00]
U_{LA}	-0.126[0.00]	-0.099[0.01]	-0.092[0.01]	-0.124[0.00]	-0.089[0.02]	-0.113[0.00]	-0.144[0.00]
U_{ME}	-0.085[0.02]	-0.094[0.02]	-0.091[0.01]	-0.088[0.02]	-0.135[0.00]	-0.148[0.00]	-0.152[0.00]
U_{MD}	-0.145[0.00]	-0.133[0.00]	-0.129[0.00]	-0.177[0.00]	-0.136[0.00]	-0.161[0.00]	-0.179[0.00]
U_{MA}	-0.157[0.00]	-0.176[0.00]	-0.172[0.00]	-0.143[0.00]	-0.148[0.00]	-0.162[0.00]	-0.181[0.00]
U_{MI}	-0.121[0.00]	-0.095[0.01]	-0.093[0.01]	0.128[0.00]	-0.144[0.00]	-0.148[0.00]	-0.152[0.00]
U_{MIN}	-0.126[0.00]	-0.133[0.00]	-0.118[0.00]	-0.129[0.00]	0.125[0.00]	-0.151[0.00]	-0.167[0.00]

U_{MS}	0.065[0.08]	-0.059[0.09]	-0.042[0.18]	-0.049[0.13]	0.077[0.03]	-0.124[0.00]	-0.084[0.02]
U_{MO}	0.056[0.10]	-0.053[0.10]	-0.042[0.17]	-0.037[0.25]	-0.069[0.07]	-0.078[0.03]	-0.095[0.01]
U_{MT}	0.064[0.08]	-0.030[0.37]	-0.025[0.44]	-0.061[0.09]	-0.029[0.40]	0.060[0.09]	0.048[0.12]
U_{NE}	0.079[0.03]	-0.031[0.36]	-0.023[0.47]	-0.050[0.12]	-0.028[0.42]	0.051[0.11]	-0.072[0.03]
U_{NV}	-0.123[0.00]	-0.131[0.00]	-0.115[0.00]	-0.134[0.00]	-0.140[0.00]	-0.152[0.00]	-0.155[0.00]
U_{NH}	-0.142[0.00]	-0.129[0.00]	-0.154[0.00]	-0.168[0.00]	-0.147[0.00]	-0.166[0.00]	-0.163[0.00]
U_{NJ}	-0.126[0.00]	-0.120[0.00]	-0.148[0.00]	-0.153[0.00]	-0.142[0.00]	-0.151[0.00]	-0.153[0.00]
U_{NM}	-0.082[0.02]	-0.076[0.03]	-0.065[0.07]	-0.078[0.03]	-0.074[0.03]	0.116[0.00]	-0.129[0.00]
U_{NY}	-0.162[0.00]	-0.147[0.00]	-0.155[0.00]	-0.167[0.00]	-0.174[0.00]	-0.176[0.00]	-0.180[0.00]
U_{NC}	-0.080[0.02]	-0.076[0.03]	-0.068[0.06]	-0.085[0.02]	-0.068[0.06]	0.117[0.00]	-0.124[0.00]
U_{ND}	0.050[0.11]	-0.035[0.34]	-0.029[0.43]	-0.031[0.40]	-0.025[0.48]	0.071[0.03]	-0.113[0.00]
U_{OH}	-0.127[0.00]	-0.092[0.01]	-0.125[0.00]	-0.121[0.00]	-0.144[0.00]	-0.157[0.00]	-0.154[0.00]
U_{OK}	-0.079[0.03]	-0.071[0.03]	-0.060[0.09]	-0.078[0.03]	-0.064[0.07]	0.093[0.01]	-0.116[0.00]
U_{OR}	0.057[0.10]	0.068[0.05]	-0.031[0.39]	-0.034[0.36]	-0.032[0.39]	0.081[0.02]	-0.085[0.02]
U_{PA}	-0.130[0.00]	-0.124[0.00]	-0.152[0.00]	-0.160[0.00]	-0.168[0.00]	0.169[0.00]	-0.171[0.00]
U_{RI}	-0.125[0.00]	-0.110[0.00]	-0.123[0.00]	0.062[0.08]	-0.139[0.00]	-0.146[0.00]	-0.138[0.00]
U_{SC}	0.041[0.27]	-0.051[0.10]	-0.044[0.15]	-0.039[0.20]	-0.118[0.00]	0.077[0.03]	-0.085[0.02]
U_{SD}	0.039[0.30]	-0.036[0.23]	-0.025[0.47]	-0.028[0.45]	-0.042[0.21]	-0.123[0.00]	-0.078[0.03]
U_{TN}	-0.074[0.03]	-0.068[0.05]	-0.064[0.07]	-0.070[0.04]	0.086[0.02]	-0.118[0.00]	-0.095[0.01]
U_{TX}	-0.124[0.00]	-0.129[0.00]	-0.088[0.02]	-0.128[0.00]	-0.123[0.00]	-0.131[0.00]	-0.142[0.00]
U_{UT}	0.035[0.23]	-0.028[0.45]	-0.031[0.26]	-0.034[0.24]	-0.044[0.28]	0.046[0.25]	0.053[0.13]
U_{VT}	-0.122[0.00]	-0.153[0.00]	-0.138[0.00]	-0.149[0.00]	-0.136[0.00]	-0.128[0.00]	-0.151[0.00]
U_{VA}	-0.120[0.00]	-0.132[0.00]	-0.168[0.00]	-0.134[0.00]	-0.119[0.00]	-0.145[0.00]	-0.157[0.00]
U_{WA}	-0.078[0.03]	-0.051[0.10]	-0.044[0.13]	-0.156[0.00]	-0.040[0.17]	0.071[0.03]	-0.105[0.00]

U_{WV}	-0.070[0.03]	-0.063[0.07]	-0.073[0.03]	-0.041[0.30]	-0.158[0.00]	-0.075[0.03]	-0.108[0.00]
U_{WI}	-0.065[0.07]	-0.033[0.35]	-0.030[0.37]	-0.055[0.10]	-0.028[0.39]	-0.070[0.03]	0.065[0.07]
U_{WY}	-0.068[0.05]	-0.035[0.34]	-0.033[0.36]	-0.050[0.12]	-0.030[0.37]	0.066[0.05]	0.089[0.02]

Notes: Figures in brackets denote p-values. Alabama AL; Arizona AZ; Arkansas AR; California CA; Colorado CO; Connecticut CT; Delaware DE; Florida FL; Georgia GA; Idaho ID; Illinois IL; Indiana IN; Iowa IA; Kansas KS; Kentucky KY; Louisiana LA; Maine ME; Maryland MD; Massachusetts MA; Michigan MI; Minnesota MN; Mississippi MS; Missouri MO; Montana MT; Nebraska NE; Nevada NV; New Hampshire NH; New Jersey NJ; New Mexico NM; New York NY; North Carolina NC; North Dakota ND; Ohio OH; Oklahoma OK; Oregon OR; Pennsylvania PA; Rhode Island RI; South Carolina SC; South Dakota SD; Tennessee TN; Texas TX; Utah UT; Vermont VT; Virginia VA; Washington WA; West Virginia WV; Wisconsin WI; Wyoming WY.

Appendix 2

Pesaran (2006) adopts a multifactor residual model, such as:

$$LFPR_{it} = \beta_i + \beta_i U_{it} + \varepsilon_{it} \tag{2}$$

$$\varepsilon_{it} = \lambda'_i F_t + u_{it} \tag{3}$$

where subscript it is the ith cross section observation at time t, for $t = 1,2,\ldots,T$ and i $= 1,2,\ldots,N$. F_t is the mx1 vector of unobserved common factors. Pesaran (2006) considers the case of weakly stationary factors. However, Kapetanios et al. (2011) show that Pesaran's CCE approach continues to yield consistent estimation and valid inference even when common factors are unit root processes (I(1)). To deal with the residual cross section dependence Pesaran (2006) uses cross sectional averages, $LFPR_t = \frac{1}{N}\sum_{i=1}^{N} LFPR_{it}$, U_t= $\frac{1}{N}\sum_{i=1}^{N} Uit$ as observable proxies for common factors F_t. Slope coefficients as well as their means, can be consistently estimated within the following auxiliary regression:

$$LFPR_{it} = \alpha_j + \beta_j\, U_{it} + a\, \overline{LFPR}_t + c\, \overline{U}_t + e_{it} \tag{4}$$

Pesaran (2006) refers to the resulting OLS estimators $\hat{B}_{j,CCE}$ of the individual specific slope coefficients $B_j = (\beta)'$, as the 'Common Correlated Effect' (CCE) estimators:

$$\hat{B}_{j,CCE} = \left(X_j'\overline{D}X_j\right)X_j'\overline{D}E_j,$$

where: $X_j = \left(x_{j1}, x_{j2}, \ldots, x_{jT}\right)'$, $x_{jt} = \left(Y_{jt}, Y_{jT}^2\right)'$, $E_j = \left(E_{j1}, E_{j2}, \ldots, E_{jT}\right)'$, $\overline{D} = I_T - \overline{H}(\overline{H}'\overline{H})^{-1}\overline{H}$, $\overline{H} = (h_1, h_2, \ldots, h_T)'$, and

$h_t = (1, \overline{LFRP}_t, \overline{U}_t)$ as the 'Common Correlated Effect' (CCE) estimators. The 'Common Correlated Effects Mean Group' (CCEMG) estimator is the average of the individual CCE estimators $\hat{B}_{j,CCE}$:

$$\hat{B}_{CCEMG} = \sum_{j=1}^{N} \hat{B}_{j,CCE} .$$

The new CCEMG estimator follows asymptotically the standard normal distribution. Specifically:

$$\sqrt{N}(\hat{B}_{CCEMG} - B) \xrightarrow{d} N(0, \Sigma_{MG}) . \tag{5}$$

In a series of Monte Carlo experiments, Pesaran (2006) and Kapetanios et al. (2011) show that the CCE estimators have the correct size, and in general have better small-sample properties than alternatives that are available in the literature. Furthermore, they have shown that small-sample properties of the CCE estimators do not seem to be much affected by the residual serial correlation of the errors.

References

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