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FACTORS INFLUENCING INTER-REGIONAL LIVING-COST DIFFERENTIALS: PANEL DATA ANALYSIS FOR THE CASE OF THE U.S.

ABSTRACT

This empirical study seeks to identify key factors that have influenced geographic (interstate) living-cost differentials in the U.S. in recent years. However, given the evolving literature on the effects of economic freedom in recent years, unlike previous related studies, there is a focus here on the impact of market freedom, in particular, overall labor market freedom. This study effectively differs from previous related studies in a number of ways, including: (a) the adoption of a state-level panel dataset for estimation purposes that represents the period 2000-2012; (b) studying domestic geographic living-cost differentials through Cross Section Random Effects and other estimations; and (c) formally inquiring expressly whether a higher level of labor market freedom (a factor heretofore effectively ignored in the literature on inter-regional living-cost differentials), by increasing the efficiency of labor market transactions so as to reduce the overall cost of production and/or distribution of goods and services within the state, acts to reduce the overall cost of living in the state. Among other things, the estimations all provide compelling evidence that states with higher levels of overall labor market freedom do have a lower overall cost of living.

Keywords: Interstate Living-Cost Differentials, Labor Market Freedom, Income, Population Size, Demographic Traits, Climate
JEL Classifications: R11, R20, R22, R29

RIASSUNTO

I fattori che determinano i differenziali nel costo della vita: un'analisi panel data del caso Stati Uniti

Questo studio empirico cerca di identificare i fattori chiave che hanno influenzato negli ultimi anni i differenziali di vita tra i diversi stati degli USA. Data la recente evoluzione della letteratura sugli effetti della libertà economica questo studio, a differenza dei lavori precedenti, si focalizza

sull'impatto della liberalizzazione dei mercati, in particolare del mercato del lavoro. Sostanzialmente questo articolo differisce dai precedenti sotto diversi aspetti tra i quali: (a) l'adozione di un *panel* di dati a livello di stati per il periodo 2000-2012; (b) lo studio dei differenziali nel costo della vita anche tramite i Cross Section Random Effects; (c) l'analisi della relazione tra livello di libertà nel mercato del lavoro (fattore ignorato in precedenza dalla letteratura sull'argomento), e l'efficienza delle transazioni che riducendo i costi globali di produzione e/o distribuzione delle merci e dei servizi all'interno di uno stato, causa una riduzione del costo globale della vita all'interno di quello stato. Tra l'altro, tutte le stime forniscono evidenze che gli stati con più alti livelli di libertà nel mercato del lavoro hanno un costo di vita globale più basso.

1. INTRODUCTION

Over the past three decades, a number of studies have empirically studied geographic living-cost differentials in the U.S. Efforts to provide useful insights into the calculation of geographic living-cost differences within the U.S. or to generate new estimates thereof have been made by several scholars, including McMahon and Melton (1978), Cobas (1978), McMahon (1991), Raper (1999), Kurre (2003), and Curran *et al.* (2006), among others. Alternatively, several studies have focused either directly or indirectly on identifying determinants of geographic living-cost differentials. These have been conducted at either the metropolitan-area level (Cebula, 1980, 1986, 1989; Ostrosky, 1983, 1986; Hogan, 1984; Curran *et al.*, 2006), the county-level within states (Nord, 2000; Kurre, 2003; Cebula and Todd, 2004; Zimmerman *et al.*, 2008), or at the state level (McMahon and Melton, 1978; McMahon, 1991; Cebula and Toma, 2008; Cebula and Van Rensburg, 2016). Alternatively, Kirk (1982) has investigated whether there has been evidence of a convergence of living-cost levels among metropolitan areas, whereas Kurre (1993) even raises the issue of using living-cost differences as a teaching tool for undergraduates.

Arguably, the study of geographic differentials in the cost of living is motivated by a number of economic and policy considerations. For example, accounting for geographic living-cost differentials influences the identification of/magnitude estimation of the number of persons and families categorized as in poverty in the U.S. (Short, 2014). Alternatively, given the magnitude of these differentials, as argued by Riew (1973), the pattern of internal migration should be expected to be significantly affected by living-cost differentials because, *ceteris paribus*, a higher living-cost reduces real income and as a rule the standard of living. Indeed, several studies over the last quarter of a century have found that net in-migration is a decreasing function of the average overall cost of living (Cebula, 1978; Renas, 1978, 1980, 1983; Cebula and Alexander, 2006; Gunderson and Sorenson, 2010; Foley and Angjellari-Dajci, 2015).

The objective of the present study is to extend the literature on identifying key factors that influence inter-state living-cost differences in the U.S. in the following ways: (1) through the adoption of a state-level panel dataset for estimation purposes, one that includes data beginning with the year 2000; (b) by the updating of the analysis of cost-of-living determinants through the year 2012, thereby making the analysis relatively current, using a state-level panel dataset that represents the study period 2000-2012; (c) by undertaking Cross Section Random Effects Model and panel GMM estimations to identify factors influencing interstate living-cost differentials; and (d) by also seeking to extend the literature in question by formally inquiring whether higher overall levels of labor market freedom (a factor heretofore effectively ignored in this literature) *per se* in a state, by increasing the efficiency of labor market transactions in the production and/or distribution of goods and services within that state, act to reduce the overall cost of living in the state.

A basic model/framework is provided in Section 2 of the study. Section 3 of the study provides the empirical model, a description of the data, and initial empirical results, whereas Section 4 provides *de facto* robustness testing. Two different econometric techniques are adopted, namely, in Section 3, the Cross Section Random Effects Model is estimated. In Section 4, in order to better address issues related to potential endogeneity of the explanatory variables in the model, the Panel Generalized Method of Moments (Panel GMM) Cross Section Random Effects Model is estimated. Finally, conclusions and an overview of the results are provided in Section 5. Interestingly, in all of the estimates, the cost of living is found to be negatively and statistically significantly associated with the overall level of labor market freedom, i.e., the average overall cost of living is found to be a decreasing function of the overall level of labor market freedom.

2. THE BASIC FRAMEWORK

The framework of the analysis in this study is one in which the average overall cost of living index in state j (COSTj), which reflects a vector of prices of the goods and services transacted within state j, is treated as a *de facto* overall average measure of prices in state j. Accordingly, there are assumed to be both demand-side and supply-side factors that can influence the equilibrium level of COSTj. Each of these is considered briefly in this section of the study. It is observed that The Council for Community and Economic Research (CCER or C2ER) publishes a regional COLI (cost-of-living index) on a quarterly basis; it is known as the ACCRA COLI because the Council was formerly known as the American Chamber of Commerce Research Association. The value of COSTj adopted in this study in a given year is the annual average in that year of the four quarterly indices.

a. Demand-side Factors

Following earlier studies of geographic living-cost differentials (Cebula, 1980, 1989; Cobas, 1978; Curran *et al.*, 2006; Hogan, 1984; Kurre, 2003; Ostrosky, 1983, 1986), it is hypothesized that the greater the median income level in state j (*MEDINCj*), the greater the demand for goods and services and hence the greater the average aggregate overall price level in the state. Stated somewhat differently, the vector of prices of goods and services is expected to be an increasing function of median income, *ceteris paribus*.

According to the Council of Economic Advisors (2016, Table B-11), the three largest racial/ethnic groups in the U.S. are Whites, Hispanics (Hispanic/Latin), and Blacks (Afro-Americans). The unemployment rate varies significantly according to these demographic categories over time. For example, according to the Council of Economic Advisors (2016, Table B-12), the average annual unemployment rate for Hispanics and Blacks is typically much higher than that for Whites and for the population as a whole. Indeed, over the 2000-2012 study period, the mean unemployment rate for Hispanics was 8.33% and for Blacks was 10.6%, whereas for Whites was 5.77% and for the population as a whole was 6.308%. Typically, persons who are unemployed tend to have a lower overall demand for goods and services. Accordingly, defining the variable minority (*MINORITYj*) as the *sum* of the percentages of the population in state j that are either Black or Hispanic, it follows that the greater the value of *MINORITYj*, the lower the demand for goods in state j and hence the lower the average overall price level of goods and services in the state, *ceteris paribus*. In other words, the higher the value of variable *MINORITYj*, *ceteris paribus*, the lower the overall demand for goods and services in the state due to the higher average unemployment rate for these two demographics *vis-à-vis* the unemployment rate of

Whites or the population as a whole.

It has been suggested that geographic differences in climatic conditions can significantly influence geographic energy cost differences (Ostrosky, 1983; Curran *et al.*, 2006) and hence the overall cost of living. For instance, it can be hypothesized that states with higher average humidity *and* higher average temperatures will be locations where there are higher annual cooling degree days (*CDDj*). In turn, states with more cooling degree days per annum will tend to have higher annual energy costs and, *ceteris paribus*, therefore a higher overall annual cost of living. Arguably, a similar argument can be made in terms of colder climates and annual heating degree days, *HDD*j; however, it was found that whereas inclusion in the model of the variable *CDDj* presented no multi-collinearity problems, inclusion of the *HDDj* variable did result in such problems. Consequently, the study adopts the *CDDj* variable but not the *HDDj* variable. In point of fact, *CDDj* may be considered a *de facto* climate control variable.

Next, consider the size of the total population in state j, *POPj*. Given that the area of each state is in fact fixed, the greater any state's total population, the greater the aggregate demand for goods and services in the state. Accordingly, it is argued that for states, the greater the population, the higher the market prices of goods and services in the state, i.e., *COSTj* is hypothesized to be an increasing function of *POPj*, *ceteris paribus*.

Thus, in this model, the value of cost of living in state j, *COSTj*, as defined, is a function on the demand side of the level of median income in the state, the relative minority presence in the state, annual average cooling degree days in the state, and total state population size, such that:

$$COSTj = f(MEDINCj, MINORITYj, CDDj, POPj), \tag{1}$$

where:

$$f_{MEDICj} > 0,\ f_{MINORITYj} < 0,\ f_{CDDj} > 0,\ f_{POPj} > 0 \tag{2}$$

b. Supply-side Factors

In addition to seeking to provide updated and potentially more dependable insights into factors that may influence overall geographic living-cost differentials, this study seeks to determine, unlike previous related studies, whether geographic differentials in the degree of labor freedom exercise a significant impact on the overall state-level cost of living.

There are several well-known indices of labor market freedom, including those by Stansel *et al.*, (2014; 2015), Gwartney *et al.* (2012), and the Heritage Foundation (2013). This study adopts the labor market freedom index by state for the U.S. generated by Stansel *et al.* (2015, Table 2.1). This index has three components. For simplicity and in the interest of space constraints, only brief descriptions of these components are provided here[1].

The first component involves the state minimum wage at the subnational level. The fundamental idea in this case is that minimum wage legislation requiring higher wages than market forces would impose limits on the ability of low-skilled and new entrants into the workforce to negotiate for employment they might otherwise be willing to accept and hence restricts the economic freedom of these workers as well as the employers who might otherwise have hired them. The second component of the labor market freedom index involves government employment and takes the perspective that economic freedom decreases for several reasons, as government employment increases beyond what is needed for governmental productive and protective functions. Government is regarded as effectively expropriating funds to take an amount of labor out of the labor force, restricting

"...the ability of individuals and organizations to contract freely for labor services since employers looking to hire have to bid against their own tax dollars to obtain labor" (Stansel *et al.*, 2014, p. 12).

Finally, the third labor market freedom component deals with "union density." It is based on the notion that workers should have the right to form and join unions *or* not to do so, as they *choose*. It is observed that certain statutes and regulations governing the labor market (a) often force workers to join a union, even if they prefer not to do so (the "union shop"), (b) permit unionization efforts where coercion can potentially be employed, especially where there exist undemocratic provisions such as union certification *without* a vote by *secret* ballot, and (c) may make decertification of a union difficult even if a majority of workers would prefer decertification. Each of these above indices has a value computed that can be as low as 0.0 and as high as 10.0, with a higher index value implying greater labor market freedom (Stansel *et al.*, 2014, Chapter 3). The present study measures labor market freedom as the equally-weighted

[1] See Stansel *et al.* (2014, pp. 11-14) for a more detailed description and explanation of these components.

average value across these three indices.

Accordingly, the labor market freedom index (*LABMKTFREE*) is a composite index reflecting freedom from government wage restrictions and regulations and the impact of other institutions and measures the ability of both workers and firms to interact freely without restrictions imposed by (a) government legislation such as minimum wage laws, (b) unions (e.g., the union shop), and (c) government employment beyond what is necessary for the government to meet its basic functions. It is hypothesized here that greater labor market freedom (*LABMKTFREE*) in a state results in a more efficiently functioning labor market and thus results in lower labor costs for the production and/or distribution of goods and services in the state. Alternatively stated, the index of the average value of the overall cost of living in state j, *COSTj*, is hypothesized to be a decreasing function of the degree of labor freedom in state j, *LABMKTFREEj, ceteris paribus*[2].

Also on the supply side of the economy in state j, consider the variable *HSPLUSj*, the percentage of the population in state j that is age 25 years and older that holds a high school degree or better. It is hypothesized here that the greater the proportion of the population in a state that in fact holds a high school diploma or has achieved a higher degree of formal education than a high school diploma, the more productive will be the labor force, *ceteris paribus*. Clearly, human capital theory would predict that a more productive labor force produces and/or distributes new goods and services more efficiently and consequently that the unit prices of those goods and services will be lower. Ergo, it is hypothesized that *COSTj* is a decreasing function of *HSPLUSj*, *ceteris paribus*.

Consequently, on the supply side, it is hypothesized in this study that the average overall cost of living in state j, *COSTj*, is hypothesized to be a decreasing function of both the level of labor freedom in the state and the percentage of the population in the state (age 25 and over) with at least a high school diploma:

$$COSTj = g(LABMKTFREEj, HSPLUSj) \tag{3}$$

where:

$$g_{LABMKTFREEj} < 0, g_{HSPLUSj} < 0 \tag{4}$$

[2] Arguably, labor freedom is crudely and partially reflected in the early studies of living-cost differences by Cebula (1980, 1989), Hogan (1984), and Ostrosky (1983, 1986) in the form of a right-to-work dummy.

c. *Synthesis*

Based on the demand-side and supply-side factors elaborated upon above, it follows that:

$$COSTj = h(MEDINCj, MINORITYj, POPj, CDDj, LABMKTFREEj, HSPLUSj) \quad (5)$$

such that:

$$h_{MEDINCj} > 0, h_{MINORITYj} < 0, h_{POPj} > 0, h_{CDDj} > 0, h_{LABMKTFREEj} < 0, h_{HSPLUSj} < 0 \quad (6)$$

In the next section of this study, the general model expressed in (5) and (6) is first estimated empirically using the Cross Section Random Effects Model; in the subsequent section of this study, the model is investigated using dynamic panel data estimation.

3. Cross section random effects estimation results

In this section of the study, empirical estimation results of the model expressed above are provided and discussed. The data sources for each of the variables in the model are provided in Table 1, whereas the descriptive statistics for all of the variables in the model are provided in Table 2. The panel dataset represents the study period 2000, 2004, 2008 and 2012. The model was estimated using the Cross Section (state-level) Random Effects Model. This is because the results of the Hausman specification test (Hausman, 1978) implied that the application of the Fixed Effects Model was not appropriate. Dynamic panel data analysis is provided in Section 4 of this study.

The initial random state-level effects results are provided in Table 3. As shown, the estimated coefficients on all six of the explanatory variables exhibit the hypothesized signs, with all six being statistically significant at the 1% level. The weighted R^2 is 0.61 whereas the weighted adjusted R^2 is 0.60, whereas the unweighted R^2 is 0.61, so that the model explains approximately three-fifths of the variation in the overall interstate living-cost differential. Moreover, the *F*-statistic is statistically significant at the 1% level, attesting to the overall strength of the model.

TABLE 1 - *Data Sources*

Variable	Sources
COSTjt	Council for Community and Economic Research (2014)
LABORFREEjt	Stansel *et al.*, (2015)
HSGRADjt	U.S. Census Bureau, 2010, Table 228; 2006, Table 318; 2010, Table 228), U.S. Census Bureau (2012).
HISPjt	U.S. Census Bureau, 2002, Table 34; 2006, Table 16; 2010, Table 19), U.S. Census Bureau (2012), Pew Research Center (2013).
AFROjt	U.S. Census Bureau, 2002, Table 34; 2006, Table 16; 2010, Table 19), U.S. Census Bureau, U.S. Census Bureau (2012).
MINORITYjt	Equals sum of *AFROjt* and *HISPjt*: U.S. Census Bureau, 2002, Table 34; 2006, Table 16; 2010, Table 19), U.S. Census Bureau, U.S. Census Bureau (2012).
MEDFAMINCjt	U.S. Census Bureau (2002, Table 767; 2006, Table 789; 2009, Table 685; 2010, Table 691), U.S. Census Bureau (2012).
CDDjt	U.S. Census Bureau (2002, Table 369; 2004, Table 381; 2008, Table 393; 2012, Table 396).
POPjt	U.S. Census Bureau (2009, Table 12; 2012, Table 140)

TABLE 2 - *Descriptive Statistics*

Variable	Mean	Standard Deviation	Maximum	Minimum
COSTjt	100.923	14.62	161.70	80.90
LABORFREEjt	6.808	0.590	8.10	5.30
HSGRADjt	84.23	4.593	92.3	72.9
MINORITYjt	18.91	12.41	49.80	1.20
MEDFAMINCjt	45,688	8,475	70,004	29,052
CDDjt	1,269.96	983.548	4,562	1.0
POPjt	5,894,180	6,479,936	37,254,000	494,000

The results in this initial estimation imply that, at the 1% statistical significance level, the overall state-level cost of living (*COSTj*) is a decreasing function of (is negatively associated with) the variable *MINORITYj*. Arguably, this finding reflects the higher unemployment rate and hypothesized lower commodity demand associated with the underlying demographics of this variable (as described above in Section 2) *vis-à-vis* the relatively lower unemployment rate and higher commodity demand of the labor force as a whole. The estimated coefficient on the *HSPLUSj* variable is negative and statistically significant at the 1% level, so that *COSTj* is found here to be a decreasing function of (to be negatively associated with) the variable *HSPLUSj*. This finding is consistent with the hypothesis proffered above in Section 2 of this study that the higher the education level of the population in state j, the more productive/more efficient the labor force in the state is, with the result being, other things held the same, a lower overall living-cost level/index value in state j.

TABLE 3 - *Cross Section Random Effects Estimation Results, Linear Specification*

Explanatory Variables	Coefficient	t-value	p-value
LABORFREEjt	-7.74**	-12.38	0.0000
HSGRADjt	-0.922**	-6.98	0.0000
MINORITYjt	-0.348**	-8.01	0.0000
MEDFAMINCjt	0.0017**	26.35	0.0000
CDDjt	0.0023**	5.57	0.0000
POPjt	0.0000003**	4.36	0.0000
Constant	158.3		
Weighted Statistics:			
R^2	0.61		
adjR^2	0.60		
F-statistic	50.82**		
Unweighted Statistics:			
R^2	0.61		

** Statistically significant at 1% level.

The findings shown in Table 3 also reveal at the 1% statistical significance level that *COSTj* is an increasing function of (is positively associated with) the median income variable, *MEDINCj*. As hypothesized in this study and found in most prior related studies (Cebula, 1980, 1989; Cobas, 1978; Curran *et al.*, 2006; Hogan, 1984; Kurre, 2003; Ostrosky, 1983, 1986), it appears that the higher the median income level in state j, other things held the same, the greater the commodity demand in state j and hence the higher the overall level of commodity prices in that state. The results in Table 3 also indicate that, at the 1% statistical significance level, overall cost of living in state j is an increasing function of (is positively associated with) the annual cooling degree days variable, *CDDj*.

Arguably, climatic/weather conditions involving higher humidity levels and higher temperature levels lead to more cooling degree days and hence to more energy consumption and higher energy bills, so that, other things held the same, the overall cost of living is thereby elevated, as suggested in certain prior studies (Ostrosky, 1983; Curran *et al.*, 2006). The empirical estimation also indicates that, at the 1% statistical significance level, the overall cost of living in state j is an increasing function of (is positively associated with) the total population in state j, *POPj*. Presumably, since the total area of each state is fixed, a higher population in state j implies a higher commodity demand in the state and hence a higher overall level of prices, other things held the same.

Finally, consider the results for the explanatory variable of greatest interest in this study, namely, the heretofore effectively ignored labor market freedom index, *LABMKTFREEj*. The findings in Table 3 indicate that, at the 1% statistical significance level, the overall cost of living index for state j, *COSTj*, is a decreasing function of (is negatively associated with) the labor market freedom index. This outcome is consistent with the hypothesis proffered above, namely, that greater labor market freedom (*LABMKTFREE*) in state j results, other things held the same, in a more efficiently functioning labor market and thus results in lower labor costs for the production and distribution of goods and services within the state, such that the average value of the overall cost of living in state j is a decreasing function of the degree of labor freedom in the state. Interpreting this estimating coefficient is straightforward. Namely, a one unit rise in the labor market freedom index, from say, 6.8 to 7.8, reduces the overall cost-of-living index by approximately 7.74 units, from say, 100.00 to 92.26[3].

Interestingly, as shown in Table 4, where the model is expressed in *semi-log* form rather than in linear form, the same estimation technique yields estimated coefficients that once again all exhibit the hypothesized signs and are found to be statistically significant at the 1% level. Thus, the pattern of signs and statistical significance levels parallels those found in Table 3. The weighted R^2 in this estimated specification is 0.67 whereas the weighted adjusted R^2 is 0.60 with the unweighted R^2 being 0.61, so that the variables in the model in combination explain two-thirds of the variation in the overall cost of living. As for the labor market freedom index, a one unit increase in *LABMKTFREEj* reduces the value of *COSTj* by 6.45%[4]. Finally, before proceeding to the estimates provided in Section 4 of this study, the correlation matrix among the independent variables is presented in Table 5. As shown, there are no significant multi-collinearity issues.

4. Panel GMM results

In this section of the study, we explore the impact of labor market freedom (and the other specified factors) on the overall cost of living in state j, *COSTj*, by estimating the Panel GMM state-level Random Effects Model. This econometric framework is adopted so as to address issues related to potential endogeneity of the explanatory variables in the model (Anderson and Hsiao, 1981; Arellano and Bond, 1991; Blundell and Bond, 1998).

The estimation of the model in linear form is provided in Table 6. The instruments are the two-period lags of the explanatory variables.

As shown, the estimated coefficients on all six of the explanatory variables exhibit the hypothesized signs, with five of the six being statistically significant at the 1% level and the remaining one being statistically significant at beyond the 2% level. Qualitatively, these results effectively parallel those presented in the estimates found in Tables 3 and 4. The results in this estimation imply that, at the 1% statistical significance level, the state-level cost of living index

[3] Interestingly, this finding is *qualitatively* consistent with the finding in the very preliminary, exploratory *OLS* study of *new housing prices* by Cebula and Van Rensburg (2016), where it was found, in a very different specification for the year 2014, that a one unit rise in labor market freedom reduced the price of a *newly constructed single-family home* by 13.1%.

[4] Alternatively stated, a one unit rise in *LABMKTFREEj* is associated with a 6.45% lower value for *COSTj*.

TABLE 4 - *Cross Section Random Effects Estimation Results, Semi-log Specification*

Dependent Variable Log (*COSTjt*)			
Explanatory Variables	Coefficient	t-value	p-value
LABORFREEjt	-0.0645**	-10.97	0.0000
HSGRADjt	-0.0074**	-5.96	0.0000
MINORITYjt	-0.0029**	-6.99	0.0000
MEDFAMINCjt	0.00005**	15.69	0.0000
CDDjt	0.000015**	24.90	0.0000
POPjt	0.00000003*	4.03	0.0001
Constant	5.02		
Weighted Statistics:			
R^2	0.61		
adjR^2	0.60		
F-statistic	50.74**		
Unweighted Statistics:			
R^2	0.61		

**Statistically significant at 1% level; *statistically significant at 5% level.

TABLE 5 - *Correlation Matrix*

	LABORFREEjt	*HSGRADjt*	*MINORITYjt*	*MEDFAMINCjt*	*CDDjt*	*POPj*
LABORFREEjt	1.000					
HSGRADjt	0.058	1.000				
MINORITYjt	0.161	-0.501	1.000			
MEDFAMINCjt	0.252	0.508	0.054	1.000		
CDDjt	0.149	-0.406	0.443	-0.212	1.000	
POPj	0.117	-0.293	0.452	0.135	0.123	1.000

(*COSTj*) is a decreasing function of the variable *MINORITYj*. Arguably, as observed in Section 3, this finding reflects the higher unemployment rate and a hypothesized resulting lower commodity demand associated with the underlying demographics of this variable (as described in Section 2 of this study) *vis-à-vis* the relatively lower unemployment rate and consequently higher commodity demand of the White labor force. The estimated coefficient on the *HSPLUSj* variable is negative and statistically significant at the 2% level, so that *COSTj* is found here to be a decreasing function of the variable *HSPLUSj*. This finding is consistent with the hypothesis proffered in Section 2 that the higher the education level of the population in state *j*, the more productive and consequently more efficient the labor force in the state is, with the outcome being, other things held the same, a lower overall living-cost level/index value in the state.

The findings shown in Table 3 also reveal, at the 1% statistical significance level, that *COSTj* is an increasing function of median income. As hypothesized in Section 2 of this study and found both in Section 3 of this study and in most prior related studies, it appears that the higher the median income level in state *j*, other things held the same, the greater the commodity demand and hence the higher the overall level of commodity prices in the state. The results in Table 3 also indicate that, at the 1% statistical significance level, the overall cost of living in state *j* is an increasing function of (is positively associated with) the annual cooling degree days variable, *CDDj*, which is consistent with the view that climatic/weather conditions involving higher humidity levels and higher temperature levels lead to more cooling degree days and hence to more energy consumption and higher energy bills, so that, other things held the same, the overall cost of living is thereby elevated by a higher *CDDj*. The empirical estimation also indicates that, at the 1% statistical significance level, the overall cost of living in state j is an increasing function of (is positively associated with) the total population in state j, *POPj*. As argued above, since the total area of each state is fixed, a higher population in state j implies a higher commodity demand in the state and hence a higher overall level of prices, other things held the same.

Finally, consider the results for the explanatory variable of primary interest in this study, i.e., the labor market freedom index, *LABMKTFREEj*. The findings in Table 6 imply that, at the 1% statistical significance level, the overall cost of living index for state j is a decreasing function of (is negatively associated with) the labor market freedom index. This outcome is consistent with the hypothesis proffered above, namely, that greater labor market freedom (*LABMKTFREE*)

TABLE 6 - *Panel GMM Estimation*

Dependent Variable: *COSTjt*

Explanatory Variables	Coefficient	t-value	p-value
LABORFREEjt	-7.85**	-4.23	0.0001
HSGRADjt	-1.15*	-2.49	0.0147
MINORITYjt	-0.44**	-3.70	0.0004
MEDFAMINCjt	0.0016**	10.36	0.0000
CDDjt	0.0025*	2.65	0.0095
POPjt	0.0000004**	2.72	0.0078
Constant	188.8		
Instrument Rank:	7		

**Statistically significant at 1% level; *statistically significant at 5% level.

TABLE 7 - *Alternative Panel GMM Estimation*

Dependent Variable: Log (*COSTjt*)

Explanatory Variables	Coefficient	t-value	p-value
LABORFREEjt	-0.0612**	-3.94	0.0002
HSGRADjt	-1.038*	-2.47	0.0153
MINORITYjt	-0.0037**	-3.73	0.0003
MEDFAMINCjt	0.000014**	10.75	0.0000
CDDjt	0.00002*	2.24	0.0278
POPjt	0.0000003**	2.78	0.0065
Constant	5.29		
Instrument Rank	7		

**Statistically significant at 1% level; *statistically significant at 5% level.

results, other things held the same, in a more efficiently functioning labor market and thus results in lower labor costs for the production and/or distribution of goods and services, such that the average value of the overall cost of living is a decreasing function of the degree of labor freedom in the state. Interpreting this estimating coefficient is straightforward: namely, a one unit rise in the labor market freedom index, from say, 6.8 to 7.8, reduces the overall cost-of-living index by approximately 7.85 units, from say, 100.00 to 92.15. Interestingly, the magnitude of this impact closely resembles that found in the Random Effects estimation summarized in Table 3.

Other estimations of the model yield qualitatively comparable results to those shown in Table 6. For example, as shown in Table 7, where the model is expressed in *semi-log* form rather than linear form, the estimated coefficients once again all exhibit the hypothesized signs, with four found to be statistically significant at the 1% level and two found to be statistically significant at the 5% level. Thus, the pattern of signs and statistical significance levels parallels those found in Table 6 (as well as those in Tables 3 and 4). As for the labor market freedom index, as shown in Table 7, a one unit increase in *LABMKTFREEj* reduces the value of the overall cost-of living index by 6.12%; this impact is quite nearly the same as that obtained for the counterpart finding shown in Table 5.

5. Conclusion

This study has revisited the issue of identifying factors that influence geographic living-cost differentials in the U.S. This empirical study endeavors to identify factors that influence state-level living-cost differentials in the U.S. It differs from previous studies in a number of ways, including: the adoption of a state-level panel dataset for estimation purposes; the updating of the analysis of cost-of-living determinants using a panel dataset that represents the study period 2000-2012, thereby making the analysis relatively current; using both Cross Section Random Effects estimations to identify factors that influence domestic geographic living-cost differentials than heretofore has been the case; and formally inquiring expressly whether higher levels of labor market freedom, a factor heretofore effectively ignored in this literature, act, by increasing the efficiency of labor market transactions so as to reduce the overall cost of production and/or distribution of goods and services, to reduce the overall cost of living within states.

Among other things, the estimations all strongly imply that the average overall cost of living in state j is an increasing function of the state's median income, its average annual cooling degree days, and its total population size and a decreasing function of the state's percentage of the population that is Hispanic or Black and the percentage of the state's population age 25 and older that has a high diploma or higher educational attainment level. In addition, the study focuses on the potential impact of labor market freedom on the cost of living, finding that the greater the degree of labor market freedom, the lower the overall cost of living in a state, other things held the same. More specifically, it is found that that a one unit increase in the labor market freedom index (obtained from Stansel *et al.*, 2015) reduces the overall cost of living by approximately 6.12%-6.45%. Clearly, given the significance of living-cost differentials to a host of regionally-related issues, such as migration patterns, the potential impact of labor market freedom warrants further investigation.

REFERENCES

Anderson, T.W. and C. Hsiao (1981), "Estimation of Dynamic Models with Error Components", *Journal of the American Statistical Association* 76 (375), 598-606.

Arellano, M. and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, 58(2), 277-297.

Blundell, R. and S. Bond (1998), "Initial Conditions and Moment Conditions in Dynamic Panel-Data Models", *Journal of Econometrics*, 87(1), 115-143.

Cebula, R.J. (1978), "An Empirical Note on the Tiebout-Tullock Hypothesis", *Quarterly Journal of Economics*, 92(4), 705-711.

Cebula, R.J. (1980), "Determinants of Geographic Living-Cost Differentials in the United States: An Empirical Note", *Land Economics*, 56(4), 477-481.

Cebula, R.J. (1986), "A Living-cost Index for SMSAs", *Social Science Quarterly*, 67(4), 887-891.

Cebula, R.J. (1989), "The Analysis of Geographic Living-Cost Differentials: A Brief Empirical Note", *Land Economics*, 65(1), 64-67.

Cebula, R.J. and G.M. Alexander (2006), "Determinants of Net Interstate Migration, 2000-2004", *Journal of Regional Analysis and Policy*, 36(2), 116-123.

Cebula, R.J. and S. Todd (2004), "An Empirical Note on Determinants of Geographic Living-Cost Differentials for Counties in the State of Florida, 2003", *Review of Regional Studies* 34(1), 112-119.

Cebula, R.J. and M. Toma (2008), "An Empirical Analysis of Determinants of Interstate Living-Cost Differentials, 2005", *Journal of Regional Analysis and Policy*, 38(3), 222-228.

Cebula, R.J., and A.J. Van Rensburg (2016), "Does Greater Labor Market Freedom Lead to Lower New Home Prices in the U.S.? An Exploratory Inquiry", *Applied Economics Letters*, 23(6), 415-419.

Cobas, J.A. (1978), "A Method to Estimate the Bureau of Labor Statistics Family Budgets for All Standard Metropolitan Statistical Areas", *Social Science Quarterly*, 59(3), 546-552.

C2ER (2014), "Cost of Living by State", Council for Community and Economic Research, at: <www.c2er.org> or <www.missourieconomy.org/indicators/cost_of_living/index.stm> or <http://www.top50states.com/>.

Council of Economic Advisers (2016), Economic Report of the President, 2016, U.S. Government Printing Office: Washington, DC.

Curran, L.B., H. Wolman, , E.W. Hill and K. Furdell (2006), "Economic Well-being and Where We Live: Accounting for Geographical Cost-of-living Differences in the U.S.", *Urban Studies*, 43(13), 2443-2466.

Foley, M. and F. Angjellari-Dajci (2015), "Net Migration Determinants", *Journal of Regional Analysis and Policy*, 45(1), 30-35.

Gunderson, R.J. and D.J. Sorenson (2010), "An Examination of Domestic Migration from California Counties", *Journal of Regional Analysis and Policy*, 40(1), 34-52.

Gwartney, J., R.A. Lawson and J. Hall (2012), Economic Freedom of the World: 2012 Annual Report, Fraser Institute, at: <http://www.freetheworld.com/datasets_efw.html>

Hausman, J.A. (1978), "Specification Tests in Econometrics", *Econometrica*, 46(6), 1251-1271.

Heritage Foundation (2013), "Index of Economic Freedom: Explore the Data", At: <http://www.heritage.org/Index/Explore.aspx>.

Hogan, T.D. (1984), "Determinants of Geographic Living-Cost Differentials in the United States: Comment", *Land Economics*, 60(1), 115-119.

Kirk, R.J. (1982), "Differentials in the Cost of Living", *Growth and Change*, 13(2), 24-30.

Kurre, J.A. (1993), "Using Spatial Cost of Living Differences as a Teaching Tool", *Journal of Regional Analysis and Policy*, 23(1), 101-120.

Kurre, J.A. (2003), "Is the Cost of Living Less in Rural Areas"? *International Regional Science Review*, 26(1), 86-116.

McMahon, W.W. (1991), "Geographic Cost of Living Differences: An Update", *Real Estate Economics*, 19(3), 426-450.

McMahon, W.W., and C. Melton (1978), "Measuring Cost of Living Variation", *Industrial Relations*, 17(3), 324-332.

Nord, M. (2000), "Does It Cost Less to Live in Rural Areas? Evidence from New Data on Food Security and Hunger", *Rural Sociology*, 65(1), 104-125.

Ostrosky, A.L. (1983), "Determinants of Geographic Living-Cost Differentials in the United States: Comment", *Land Economics*, 59(3), 350-352.

Ostrosky, A.L. (1986), "A Further Note on the Urban Family Budget", *Social Science Quarterly*, 67(1), 212-213.

Raper, M. (1999), "Self-Selection Bias and Cost-of-Living Estimates, *Journal of Economics and Finance*, 23(1), 64-77.

Renas, S.M. and R. Kumar (1978), "The Cost of Living, Labor Market Opportunities, and the Migration Decision: A Case of Misspecification?", *The Annals of Regional Science*, 12(2), 95-104.

Renas, S.M. (1980), "An Empirical Note on the Tiebout-Tullock Hypothesis: Comment", *Quarterly Journal of Economics*, 94(3), 619-623.

Renas, S.M. and R. Kumar (1983), "The Cost of Living, Labor Market Opportunities, and the Migration Decision: More on the Problems of Misspecification and Aggregation Bias", *The Annals of Regional Science*, 17(1), 98-110.

Riew, J. (1973), "Migration and Public Policy", *Journal of Regional Science*, 13(1), 65-76.

Short, K. (2014), "The Supplemental Poverty Measure: 2013", U.S. Department of Commerce, U.S. Government Printing Office: Washington, DC.

Stansel, D., J. Torra and F. McMahon (2014), Economic Freedom of North America, 2014 Annual Report, Fraser Institute, at: <www.freetheworld.com/2014/efna/economic-freedom-of-north-america-2014.pdf>.

Stansel, D., J. Torra and F. McMahon (2015), Economic Freedom of North America, 2015 Annual Report, Fraser Institute, at: <www.freetheworld.com/2015/efna/economic-freedom-of-north-america-2015.pdf>.

U.S. Census Bureau (2002), American Community Survey Briefs, Household Income: 2002, U.S. Government Printing Office: Washington, DC.

U.S. Census Bureau (2006), Statistical Abstract of the United States, 2006, U.S. Government Printing Office: Washington, DC.

U.S. Census Bureau (2009), Statistical Abstract of the United States, 2009, U.S. Government Printing Office: Washington, DC.

U.S. Census Bureau (2010), Statistical Abstract of the United States, 2010, U.S. Government Printing Office: Washington, DC.

U.S. Census Bureau (2012), Statistical Abstract of the United States, 2012, U.S. Government Printing Office: Washington, DC.

Zimmerman, J.N., S. Ham and S.M. Frank (2008), "Does It or Doesn't It? Geographic Differences and the Cost of Living", *Rural Sociology*, 73(3), 463-486.

