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An Empirical Analysis of the Impact of the Three Labor Market Freedom Indices and Occupational Licensing on Interstate Living-Cost Differentials

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Abstract
This study provides empirical evidence in the form of 2SLS estimation results suggesting that the overall cost of living index for US states in 2014, *COSTj*, was harmed by the three forms of labor market freedom identified in Stansel, Torra, and McMahon (2015), namely, *UNIONj*, which deals with union density; *MINWAGEj*, which involves the state minimum wage at the subnational level; and *GOVTEMPj*, which involves government employment and the perspective that economic freedom decreases as government employment increases beyond what is necessary to provide governmental productive and protective functions. Furthermore, *COSTj* is found to be helped by the extent of occupational licensing, implying that a greater degree of occupational licensing can serve as a barrier to occupational entry, which in turn can result in reduced employment for some workers and in the receipt of monopoly rents for other workers, a circumstance that, in theory (Friedman 1962), can then yield higher commodity prices for consumers. Together, these results are unique in the geographic living-cost differentials literature.

JEL Codes: P10, R20, R23, R32
Keywords: labor market freedom, geographic living-cost differentials, occupational licensing

I. Introduction

Studying determinants of geographic differentials in the overall cost of living is motivated by both economic and public policy

considerations. For example, given the considerable magnitude of these differentials in the United States, the pattern of internal migration should be expected to be significantly affected by living-cost differentials because, *ceteris paribus*, a higher living-cost level reduces real income and the standard of living. Several empirical studies have found that net in-migration is indeed a decreasing function of the cost of living (Cebula 1978, 1979; Renas and Kumar 1978, 1983; Gunderson and Sorenson 2010; Plantinga et al. 2013; Foley and Angjellari 2015). Thus, the pattern of economic growth and development appears to be affected by the pattern of geographic living-cost differentials in the United States. It would seem reasonable that identifying those factors that influence geographic living-cost differences should be of interest to both researchers and policy makers.[1]

A number of authors have studied geographic living-cost differentials in the United States. Indeed, efforts to provide useful insights into the calculation of geographic living-cost differences 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). In addition, several studies have focused on identifying determinants of geographic living-cost differentials. These investigations have been conducted at the metropolitan-area level (Cebula 1980, 1989; Ostrosky 1983, 1986; Haworth and Rasmussen 1973; Hogan 1984; Curran et al. 2006), at the county level within states (Nord 2000; Kurre 2003), and at the state level (McMahon and Melton 1978; McMahon 1991). Alternatively, Kirk (1982) has looked for evidence of a convergence of living-cost levels among metropolitan areas, whereas Kurre (1993) even addresses the use of geographic living-cost differences as a teaching tool.

This empirical study extends the literature on identifying factors that influence geographic living-cost differences in the United States. It does so in part by formally inquiring whether higher levels of labor market freedom *per se* in a state, a factor heretofore effectively ignored in the living-cost literature, by increasing the efficiency of labor market transactions in the production and/or distribution of goods and services, act to reduce the overall cost of living in the state. This study focuses on the living-cost impacts of the three

[1] It is likely that private sector firms and other stakeholders will have an interest in the factors determining these living-cost differentials.

different forms of labor market freedom indices identified or measured by Stansel, Torra, and McMahon (2015, chap. 3). Section 2 provides the basic model, which includes, describes, and focuses on these three different forms of labor freedom index, while also accounting for a number of literature-established control variables. Section 3 provides empirical findings in the form of two-stage least squares (2SLS) estimates involving all fifty states for the year 2014. Section 4 extends the analysis to include a measure of the extent of occupational licensing in each state, finding that this *de facto* dimension of the notion of labor freedom, since it arguably restricts labor market freedom, also influences (although positively) the overall cost of living (Friedman 1962). Section 5 concludes.

II. Initial Baseline Framework: Labor Market Freedom Indices and Other Factors

The framework for this empirical analysis is one in which the average overall cost of living index for state *j* (*COSTj*), which reflects a vector of prices for the goods and services transacted within state *j*, is treated as a *de facto* overall average measure of prices within the state. It is observed that the Council for Community and Economic Research publishes a regional cost of living index (COLI) on a quarterly basis; it is widely 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 for the year 2014 is the annual average in the year of all four of these quarterly indices.

The general form of the baseline economic model is given by:

$$COSTj = f(LABMKTFREEj, Controlj) \quad (1)$$

where *COSTj* is as described above, *LABMKTFREEj* refers to the degree of labor market freedom (which assumes three different forms, as described below) in state *j*, and *Controlj* refers to certain specific variables for state *j* that have been found in previous studies to influence geographic living-cost differentials in the United States.

This study emphasizes the impact of the degree of labor market freedom on interstate living-cost differentials. There are several well-known indices of labor market freedom. This study adopts the labor market freedom measures by US state generated by Stansel, Torra, and McMahon (2015). This series is the oldest of the labor market freedom indices. It has three components, each corresponding to a specific form of labor market freedom.

The first form of labor market freedom index, *MINWAGEj*, involves the state minimum wage at the subnational level in state *j*. The fundamental idea in this case is that minimum wage legislation requiring higher wages than market forces would establish limits the ability of less-skilled and new entrants into the workforce to negotiate for employment they might otherwise be willing to accept. Hence, this legislation restricts the economic freedom of these workers as well as that of the employers who might otherwise have hired them. The second form of labor market freedom index for state *j*, *GOVTEMPj*, involves government employment and takes the perspective that economic freedom decreases as government employment increases beyond what is necessary 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, Torra, and McMahon 2014, p. 12). Finally, the third form of labor market freedom index for state *j*, *UNIONj*, deals with union density. This index is predicated on the idea that workers should have the right to choose whether to form and/or join unions. 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 (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 quite difficult even if a majority of workers would prefer it.

As shown in table 1, each of these three labor freedom indices has a computed value that lies between zero and ten (Stansel, Torra, and McMahon 2014, 2015), with a higher index value indicating greater labor market freedom.[2] It is hypothesized here, consistent with Stansel, Torra, and McMahon (2014, chap. 3; 2015, chap. 3), that greater labor market freedom, in each of its three forms, in state *j* theoretically results in a more efficient labor market and thereby results in lower unit labor costs for the production and distribution of goods and services within the state. Accordingly, 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

[2] There is no rounding off.

freedom in state *j* as measured/reflected by *MINWAGEj*, *GOVTEMPj*, and *UNIONj*, *ceteris paribus*.[3]

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Max.	Min.
COSTj	100.4	16.46	163.8	87.6
MINWAGEj	8.066	0.813	9.50	6.40
GOVTEMPj	6.554	1.73	9.70	1.40
UNIONj	7.038	1.484	9.80	3.50
MEDFAMINCj	54,963	9,109	76,165	35,521
POPDENj	194.95	261.05	1,195	1.2
CDDj	1,284	984	4,561	0.0
OCCLICj	92.0	25.78	177.0	41.0

Note: $N = 50$.

Regarding the control variables, following earlier related studies (Cebula 1980, 1989; Cobas 1978; Curran et al. 2006; Hogan 1984; Kurre 1993, 2003; Ostrosky 1983, 1986), it is hypothesized that the greater the median family income level in state *j* (*MEDFAMINCj*), the greater the overall demand for goods and services and hence the higher the overall price level (*COSTj*) in the state, *ceteris paribus*. Furthermore, based on Cebula (1980), Haworth and Rasmussen (1973), Ostrosky (1983), Hogan (1984), and Kurre (2003), it is expected that the dependent variable, *COSTj*, is also an increasing function of the population density in state *j* expressed as the number of persons per square mile, *POPDENj*, *ceteris paribus*, since greater population density implies greater congestion and hence higher costs for the movement of both inputs and commodities. Furthermore, the dependent variable, *COSTj*, is also hypothesized to be an increasing function of the higher energy bills resulting from higher summertime temperatures and humidity levels as reflected in a greater annual number of cooling degree days (*CDDj*), *ceteris paribus* (Haworth and Rasmussen 1973). It is noteworthy that heating degree days (*HDDj*) could also be included in the study to reflect the impact of cold weather on energy bills; however, it was found that, unlike *CDDj*, the introduction of *HDDj* into the analysis yielded significant multicollinearity problems. Hence, while *CDDj* is treated as an explanatory variable in this study, *HDDj* is not.

[3] The ordinary least squares estimates in earlier studies by Cebula (1980), Hogan (1984), and Ostrosky (1983) in effect attempted to allow to a degree for labor freedom through the use of a binary variable for SMSAs whose primary location was a state having a right-to-work law.

Thus, equation (1) becomes the following baseline equation:

$$COSTj = f(MINWAGEj, GOVTEMPj, UNIONj, MEDFAMINCj, POPDENj, CDDj) \quad (2)$$

where (with data sources in parentheses): *COSTj* is an index of the average overall cost of living for a four-person family living in state *j* in 2014 (Council for Community and Economic Research 2016); *MINWAGEj*, *GOVTEMPj*, and *UNIONj* are the labor freedom indices in 2013 (Stansel, Torra, and McMahon 2015, chap. 3); *MEDFAMINCj* is the median family income in state *j* in 2014 (US Census Bureau 2015); *POPDENj* is the population density expressed in terms of residents per square mile in state *j* in 2013 (Council for Community and Economic Research 2016); and *CDDj* is the average annual number of cooling degree days in state *j* (US Census Bureau 2012, table 496). Table 1 provides descriptive statistics for all of these variables.

Based on the arguments presented in the preceding section of this study, it follows that

$$f_{MINWAGEj} < 0, f_{GOVTEMPj} < 0, f_{UNIONj} < 0, f_{MEDFAMINCOMEj} > 0, f_{POPDENj} > 0, f_{CDDj} > 0. \quad (3)$$

It is observed that the cost of living variable and the median family income variable are contemporaneous; thus, the possibility of simultaneity bias exists. Accordingly, the model is estimated by 2SLS. The instrument is the 2011 per capita personal income by state, *PCPERINC2011j* (US Department of Commerce, Bureau of Economic Analysis 2014). This variable was chosen as the instrument because it was highly correlated with *MEDFAMINC2014j* while not being correlated with the error term in the system.

III. Initial Findings for the Baseline Model

Results of the 2SLS estimations of equation (2), first in linear form and then in semi-log form, with the White (1980) heteroskedasticity correction adopted, are provided in columns (a) and (b), respectively, of table 2. Terms in parentheses are *t*-values.

In column (a), all six of the estimated coefficients exhibit the expected signs, with four being statistically significant at the 1 percent level, two being statistically significant at the 2.5 percent level, and one being statistically significant at the 5 percent level.[4]

[4] The *F*-statistics are statistically significant at the 1 percent level in both estimates.

Table 2. 2SLS linear and semi-log estimation results

Dependent Variable	(*COSTj*) (a)	log (*COSTj*) (b)
Explanatory Variables		
MINWAGEj	−11.595* (−2.10)	−0.1069* (−2.30)
GOVTEMPj	−5.21*** (−3.11)	−0.0436*** (−2.90)
UNIONj	−6.08*** (−2.67)	−0.05** (−2.34)
MEDFAMINCj	0.0024*** (3.10)	0.00002*** (3.33)
POPDENj	0.019** (2.50)	0.00018*** (2.69)
CDDj	0.0069*** (3.42)	0.00005*** (2.74)
Constant	131.8	4.86
F-statistic	9.40***	8.82***
Instrument rank	7	7
N	50	50

***Statistically significant at the 1 percent level; **statistically significant at the 2.5 percent level; statistically significant at the 5 percent level.

Of greatest relevance, the coefficients on all three labor freedom measures/indices, *MINWAGEj*, *GOVTEMPj*, and *UNIONj*, are negative and statistically significant at well beyond the 5 percent level, so that it appears that the cost of living in state *j* (*COSTj*) is a decreasing function of labor market freedom as reflected in each of these three indices, although the result for variable *MINWAGEj* was found to be statistically insignificant in the more rudimentary model by Cebula et al. (2016). Furthermore, the cost of living in state *j*, *COSTj*, is shown in column (a) to be an increasing function of the annual number of cooling degree days (*CDDj*), median family income (*MEDFAMINCj*), and population density (*POPDENj*). The latter three results are compatible with most previous, related studies (Cebula 1980, 1989; Cobas 1978; Curran et al. 2006; Haworth and Rasmussen 1973; Hogan 1984; Kurre 1993, 2003; Ostrosky 1983, 1986).

Turning to the semi-log estimation results shown in column (b) of table 2, all six of the estimated coefficients exhibit the expected signs, with four being statistically significant at the 1 percent level, one being statistically significant at the 2.5 percent level, and one being statistically significant at the 5 percent level. Thus, as found in the linear estimate provided in column (a) of the table, the cost of living in state *j* is shown to be an increasing function of the annual number of cooling degree days, median family income, and population density (Cebula 1980, 1989; Cobas 1978; Curran et al. 2006; Haworth and Rasmussen 1973; Hogan 1984; Kurre 1993, 2003; Ostrosky 1983, 1986). In addition, the coefficients on all three labor market freedom measures/indices, *MINWAGEj*, *GOVTEMPj*, and *UNIONj*, are again found to be negative and statistically significant at beyond the 5 percent level, so that the cost of living in state *j* is found in this estimate to be a decreasing function of all three labor market freedom measures.

In particular, bearing in mind the magnitudes of the labor market freedom measures (as shown in table 1), a one unit increase in the *MINWAGEj* index is shown to yield (*ceteris paribus*) a 10.69 percent decrease in the cost of living index in state *j*, whereas a one unit increase in the *GOVTEMPj* index is shown to reduce (*ceteris paribus*) the cost of living index by 4.36 percent, and a one unit increase in the *UNIONj* index is shown (*ceteris paribus*) to yield a 5.0 percent decline in the living-cost index.

IV. The Broader Specification: Occupational Licensing Formally Considered

The results summarized in table 2, insofar as they include the three labor market freedom measures (*MINWAGEj*, *GOVTEMPj*, and *UNIONj*), all of which are found to be statistically significant, are effectively unique to the geographic living-cost literature. However, these labor market freedom measures do not expressly take into account the impact of differences in the degree of occupational licensing across the states.[5] Carpenter et. al. (2012) and Summers (2007) provide data on the number of occupations in each state subject to occupational licensing, based on which Hershbeln, Boddy, and Kearney (2015, p. 2) have observed that "nearly 30 percent of

[5] Occupational licensing requirements at the sub-state level are not considered in this study.

workers in the US need a license to perform their jobs [and] it is time to examine licensing practices."

In principle, occupational licensing can potentially act as a barrier to occupational entry, which in turn can result in reduced employment for some workers in an occupation and the receipt of monopoly rents for other workers who get employment in that same occupation. Moreover, this scenario of economic events can, in theory (Friedman 1962), yield higher commodity prices for consumers. Indeed, Kleiner and Krueger (2013) find that for the United States, after controlling for education, labor market experience, occupation, and other variables, licensing is associated with a 15–18 percent wage premium in the labor market. Arguably, this estimate may partially reflect a premium for higher unmeasured human capital, but it is also consistent and likely in large part due to rents (Kleiner and Krueger 2013, p. 199). It logically follows that, *ceteris paribus*, the greater the extent of occupational licensing in a state, the higher the overall cost of living in that state.

Accordingly, this section of the study seeks to extend this inquiry into the factors influencing the overall cost of living in the states by including as a new explanatory variable *OCCLICj*, the estimated number of occupations in each state in 2012 that were subject to a state-imposed occupational license requirement (Carpenter et. al. 2012; Summers 2007). Arguably, this variable constitutes yet another dimension of labor market freedom, albeit one not emphasized in Stansel, Torra, and McMahon (2014, 2015). Based on the observations provided previously, higher values for this variable in state *j* are hypothesized in this study to reduce labor market freedom and therefore, *ceteris paribus*, to elevate the cost of living, *COSTj* (Friedman 1962).

Accordingly, equations (2) and (3) are now replaced by equations (4) and (5):

$$COSTj = f(MINWAGEj, GOVTEMPj, UNIONj, MEDFAMINCj, POPDENj, CDDj, OCCLICj) \quad (4)$$

$$f_{MINWAGEj} < 0,\ f_{GOVTEMPj} < 0,\ f_{UNIONj} < 0,\ f_{MEDFAMINCOMEj} > 0,\ f_{POPDENj} > 0, f_{CDDj} > 0, f_{OCCLICj} > 0 \quad (5)$$

Respectively, columns (a) and (b) in table 3 provide the linear and semi-log estimates of equation (4) after adopting the White (1980) heteroskedasticity correction. In column (a), all seven of the estimated coefficients exhibit the hypothesized signs, with four being statistically significant at the 1 percent level and three being statistically significant at the 5 percent level.

Table 3. 2SLS linear and semi-log estimation results for the full model including occupational licensing

Dependent Variable	(*COSTj*) (a)	log (*COSTj*) (b)
Explanatory Variables		
MINWAGEj	−10.49* (−2.14)	−0.0975** (−2.32)
GOVTEMPj	−5.386*** (−3.45)	−0.0451*** (−3.18)
UNIONj	−6.212*** (−2.77)	−0.0512** (−2.44)
MEDFAMINCj	0.0022*** (3.36)	0.00002*** (3.51)
POPDENj	0.0154* (2.00)	0.00015*** (2.15)
CDDj	0.0077*** (4.47)	0.00006* (3.66)
OCCLICj	0.1384* (2.09)	0.0012* (2.08)
Constant	119.5	4.76
F-statistic	10.07***	9.33***
Instrument rank	8	8
N	50	50

***Statistically significant at the 1 percent level; **statistically significant at the 2.5 percent level; statistically significant at the 5 percent level.

Thus, as in columns (a) and (b) of table 2, the cost of living in a state, *COSTj*, is found to be an increasing function of median family income, cooling degree days per year, and population density, while being a decreasing function of each of the three forms of labor market freedom investigated in this study: *MINWAGEj*, *GOVTEMPj*, and *UNIONj*, as found in Stansel, Torra, and McMahon (2015). In addition, with respect to the additional explanatory variable considered in this section of the study (*OCCLICj*), the cost of living is also found to be an increasing function of the estimated number of occupations in each state subject to a state-imposed occupational license requirement. Arguably, this variable represents yet another dimension of labor

market freedom, with a higher value for *OCCLICj* implying a *lesser* degree of labor freedom.

In column (b) of table 3, all seven estimated coefficients once again exhibit the hypothesized signs, with three being statistically significant at the 1 percent level, two being statistically significant at the 2.5 percent level, and two being statistically significant at the 5 percent level. These results imply, as in column (a), that *COSTj* is an increasing function of the median family income level, cooling degree days per annum, and population density, as well as the number of occupations subject to a state-imposed occupational license requirement, while being a decreasing function of the three labor market freedom indices derived by Stansel, Torra, and McMahon (2015, chap. 3): *MINWAGEj*, *GOVTEMPj*, and *UNIONj*.

Thus, bearing in mind the magnitudes of the labor market freedom measures (table 1), a one unit increase in the *MINWAGEj* index is shown to yield a 9.75 percent decrease in the cost of living index in state *j*, whereas a one unit increase in the *GOVTEMPj* index is shown to reduce the cost of living index by 4.51 percent and a one unit increase in the *UNIONj* index is shown to yield a 5.12 percent decline in the living-cost index. Furthermore, keeping in mind the magnitudes of the data reflecting the *OCCLICj* variable, a one unit increase in this variable is found (*ceteris paribus*) to increase the cost of living index by 0.12 percent. Thus, for example, increasing the number of occupations subject to a state-required occupational license by ten would, on average, increase the cost of living in a state by 1.2 percent.

Before closing the empirical portions of this study, the issue of multicollinearity is worthy of attention. Table 4 provides the correlation matrix among all seven of the explanatory variables in the present analysis. As this table shows, multicollinearity is not a problem in any of the estimations.

Table 4. Correlation matrix

	MEDFAMINCj	*MINWAGEj*	*GOVTEMPj*	*UNIONj*	*CDDj*	*POPDENj*	*OCCLICj*
MEDFAMINCj	1.000						
MINWAGEj	0.468	1.000					
GOVTEMPj	0.341	0.167	1.000				
UNIONj	−0.427	−0.268	−0.500	1.000			
CDDj	−0.322	−0.242	0.020	0.299	1.000		
POPDENj	0.345	0.466	0.417	−0.430	−0.049	1.000	
OCCLICj	0.231	0.166	0.247	0.266	0.255	0.319	1.000

V. Conclusion

This study finds empirical evidence in the form of 2SLS estimations suggesting that the average overall cost of living index for US states (*COSTj*) is harmed by all three forms of labor market freedom identified by Stansel, Torra, and McMahon (2014, 2015): (1) *MINWAGEj*, which involves the state minimum wage at the subnational level in state *j*; (2) *GOVTEMPj*, which involves government employment and the perspective that economic freedom decreases as government employment increases beyond what is needed for the provision of governmental productive and protective functions; and (3) *UNIONj*, which deals with the degree of union density. In addition, *COSTj* is found to be helped by *OCCLICj*, the estimated number of occupations in each state subject to a state-imposed occupational license requirement, a variable that is hypothesized in this study to reflect labor market freedom considerations not stressed by Stansel, Torra, and McMahon (2014, 2015).[6]

Although, as observed by Hall et al. (2013), the economic effects of economic freedom in its various forms have been studied extensively, the results provided in the present study appear to be unique to the literature on geographic living-cost differentials for the United States. These findings are only preliminary/exploratory. For example, at a minimum, more elaborate modeling in terms of the explanatory variables is certainly needed. Moreover, the present study, although considering variables (i.e., *MINWAGEj*, *GOVTEMPj*, *UNIONj*, and *OCCLICj*) not effectively investigated in the existing related literature, could be advanced by future research efforts consisting of panel data-set estimations spanning several years so as to provide potentially more definitive insights into the impact of labor freedoms and occupational licensing on geographic living-cost differentials. Finally, alternative economic and labor freedom measures, such as those found in Gwartney, Lawson, and Hall (2013), could be considered in future related research.

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[6] It also is noteworthy that the estimations in the present study all find the cost of living index, *COSTj*, to be an increasing function of median family income, annual cooling degree days, and population density, as found in several previous related studies of earlier years (Cebula 1980, 1989; Cebula and Van Rensberg 2016; Cobas 1978; Curran et al. 2006; Haworth and Rasmussen 1973; Hogan 1984; Kurre 1993, 2003; Ostrosky 1983, 1986).

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