The Impact Of Right-To-Work Laws On Interstate Cost Of Living Differentials

by

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Abstract

The impact of right-to-work laws on cost of living differentials is a highly controversial topic due to its possible political implications. This study seeks to investigate the determinants of geographic cost of living in the case of the United States on a state by state basis, focusing on the impact of right-to-work laws. This study hopes to offer some insight into the advantages or disadvantages of a state's adopting a right-to-work law from the point of the state's cost of living. It is intuitive that the passage of right-to-work laws dramatically influences the presence of unionized workers, and it has been suggested that the degree of unionization has a direct relationship with the overall cost of living (Cebula and Toma, 2008). After presenting the history, past literature, and legislation relating to the determinants of cost of living and right-to-work laws, this study employs a reduced form estimation methodology along with a multiplicative heteroscedasticity approach to show that right-to-work laws have an impact on the overall cost of living in a state. After analysis of the empirical results it was concluded that right-to-work laws have a negative effect on a state's cost of living, thus decreasing a state's cost of living.

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Chapter I

Introduction

Should a state adopt a right-to-work law? This question has been and continues to be highly contested. Right-to-work laws prohibit unions from including certain types of union security clauses in their contracts with companies that effectively force the company to make their employees either join the union or at least pay a proportion of their union dues as a condition of employment (Cooper, 2004). In effect, they constitute a ban against the "union shop" (Cebula, 1998). Proponents of right-to-work laws quote Jefferson: "To compel a man to furnish contributions of money for the propagation of opinions which he disbelieves is sinful and tyrannical," whereas opponents quote Martin Luther King: "In our glorious fight for civil rights, we must guard against being fooled by false slogans, as 'right to work.' It provides no 'rights' and no 'works.' Its purpose is to destroy labor unions and the freedom of collective bargaining" (Clay and Larson, 1998). While differences of opinion as to the purpose and effect of such laws exist, there is clearly an agreement that right-to-work laws have an effect on the workings of a state, be it political or personal to the people.

For years, the dominant view in the literature has been that the primary purpose of such legislation is "to make unions more insecure -- to slow down or halt the rate at which unions are organized, and to destroy existing unions" (Ressler and Mixon, 1993). Currently (2010), twenty-two states now have right-to-work laws enacted, meaning that within these states employees are not coerced into financially supporting a union with monopoly

bargaining privileges at their work place in order to keep or get their jobs.[1] In states without right-to-work laws individual employees are required to pay union dues, regardless of whether they desire union representation. While union officials defend this coercion on the grounds that employees are "better off" due to increased wages in the twenty-eight states without right-to-work laws (Cooper, 2004). Incomes may be higher, other factors affecting the state's citizens, on both a personal and political level, must be considered in order to make such a claim valid.

Incomes alone cannot measure the fiscal well-being of a population. Just as personal income varies across regions, so do other factors that influence individual fiscal well-being, such as cost of living (Poulson, 2005). To ascertain whether employees are really better off in states without right-to-work legislation, this study evaluates the impact of right-to-work laws on the state level cost of living. The present study attempts to empirically analyze and identify the determinants of geographic cost of living in the case of the United States on a state by state basis focusing on the impact of right-to-work laws, using the aforementioned studies as a reference point. This study uses the years 1995 and 2006, which gives a decade difference, in order to evaluate whether the model for the determinants of cost of living are stable through time.

The impact of right-to-work laws on cost of living differentials is a highly controversial topic due to its possible political implications. It is intuitive that the passage of right-to-work laws dramatically influences the presence of unionized workers and it has been suggested that lower unionization has an inverse relationship with the overall cost of living (Cebula and Toma, 2008). An econometric approach is used to evaluate the cost of

[1] The states are Alabama, Arizona, Arkansas, Florida, Georgia, Idaho, Iowa, Kansas, Louisiana, Mississippi, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, and Wyoming. Indiana has a very limited right-to-work law, limited to school employees, thus is not considered a right-to-work state in this analysis.

living on a state by state basis. In order to evaluate the cost of living, a reduced form equation is formulated to assess whether or not states have an incentive to adopt right-to-work laws.

This thesis includes five chapters. The first is an introduction. It introduces the topic and states the problem this study is based upon. Chapter two presents the empirical background, reviewing the economic history, legislation, and literature on right-to-work laws and cost of living determinants. A better understanding of the future can be obtained by evaluating past legislation, literature, and economic history. Chapter three explains the theory and methodology behind modeling the cost of living market and presents the empirical framework of the rudimentary model. Chapter four describes the data and data sources and presents the reduced form estimation results. Finally, chapter five offers a brief overview of the thesis and conclusions based on the findings of this study. The evidence as to whether or not right-to-work laws exhibit a positive impact on a state's cost of living is assessed in the final chapter.

Chapter II

Economic History, Legislation, And Literature: Cost Of Living Index And Right-To-Work Laws

Chapter two presents the empirical background, reviewing the economic history, legislation, and literature on right-to-work laws and cost of living determinants. A better understanding of the future can be obtained by evaluating past legislation, literature, and economic history. In order to understand the relationship between the cost of living in a state and the enactment of right-to-work laws one must first understand the definition and evolution of the cost of living and right-to-work legislation. Only then can the relationship between the two be analyzed.

A: Cost of Living in General

The cost of living is defined as the cost of maintaining a certain standard of living, and is used to compare the cost of maintaining a certain standard of living in different geographic areas. Changes in the cost of living over time are compiled into a cost of living index. A cost of living index is a theoretical price index that measures relative cost of living over time (BLS, 2008). It compares two "price situations," which are defined as a list of the prices of all consumer goods and services at a particular time and place. The cost of living index is defined as the ratio of the minimum expenditure required to attain a base level of satisfaction at the initial price situation to the minimum expenditure required to attain the same level of satisfaction at a future price situation. Economic theory implies that when consumers are faced with a price change, consumers do not continue to purchase the same fixed market basket, but shift their purchases toward goods whose relative prices have

fallen, which is referred to as the substitution effect. Thus, given a price increase and just enough additional income to remain on the original level of satisfaction a consumer will reduce consumption of the good whose price has risen and increase consumption of other goods. In order to develop a base level of satisfaction the strength of the substitution effect would need to be known (i.e., the marginal rate of substitution, which quantifies the willingness of the consumer to trade off one good against another would need to be known) (Pollik, 2010). Although this type of behavior is observable the level to which it occurs on an individual basis for consumers is not readily available. Since this type of information is not readily available a "true" cost of living index cannot be constructed, therefore many different methodologies have been developed to approximate the cost of living index.

To construct an (approximate) cost of living index a group of consumers are evaluated through several sample-based sources, most notably the Consumer Expenditure Survey (CEX), the Point of Purchase Survey (POPS), the Commodities and Services Survey, and the CPI Housing Survey.

B. History of the Cost of Living Index

The basis for the theory behind the cost of living index is attributed to utility maximization and assumes that consumers are optimizers which want to gain as much utility as possible from the money they spend. These assumptions lead to a consumer's cost function, the cost of achieving a particular utility level given a set of prices (ILO, 2004). Assuming that the cost function holds across time meaning that consumers get the same amount of utility from a set of purchases in one year, as they would buying the same set in a different year. This leads to a true cost of living index, which compares the consumer's cost function given the prices in one year with the consumer's cost function given the prices in a different year. Since the utility received from a set goods measured as quantities, the utility level can be replaced with a function of quantity, thus creating a version of the true

cost of living index that is based on prices and quantities like most other price indices (ILO, 2004). Since a true cost of living index is impossible to calculate and an estimated cost of living index (COLI) must be used.

Price indexes, particularly the consumer price index (CPI), have often been popularly labeled as cost of living indexes. Although the Congress determined in 1972 that the CPI, which is calculated by the Bureau of Labor Statistics (BLS), would be used to make annual cost of living adjustments (COLA) to social security benefits and many other public transfer payments in order to protect against changes in the cost of living, the CPI is not particularly a good estimate for a COLI. Although both the CPI and a COLI reflect changes in the prices of goods and services, a complete COLI goes beyond this to also take into account changes in other governmental or environmental factors that affect consumers' well-being (BLS, 2007). Therefore, the CPI is ultimately measuring something different from the COLI. The CPI is a fixed-basket, or fixed-weight, price index. This type of index essentially measures changes in the cost of purchasing a fixed basket of goods and services. For the CPI, price quotes are collected monthly, selected to be representative of the various categories of consumer goods and services. The observed price changes are then assigned weights, which represent the importance of each category in aggregate consumer expenditures during some base period. While a COLI is more ambitious and thus more difficult to produce, since its objective is to measure changes over time in the amount that consumers need to spend to reach a certain standard of living (BLS, 2007). A COLI seeks to measure the percentage change in expenditures a household would have to make in order to hold constant at some specified standard of living. The result of this difference between the CPI and the COLI is inadequate adjustments for changes in buying or consumption patterns that consumers make in response to relative price changes. The ability to

substitute means that the increase in the cost to consumers of maintaining their level of well-being tends to be somewhat less than the increase in the cost of the mix of goods and services that was previously purchased (BLS, 2007). This coupled with little to no adjustment for improvements in the quality of consumer goods and services in a technologically dynamic economy leads to an overstatement of the price increases consumers are paying for goods of constant quality. Thus, the growth rate of the CPI, which measures the cost of purchasing a fixed basket of goods and services, tends to outpace COLI, which attempts to calculate the change in expenditure needed to maintain living standards (ILO, 2004).

In the early 1960s the Stigler Committee outlined the conceptual and measurement characteristics of the CPI that distinguished it from a COLI. The principal recommendation of the committee was the establishment of a long-run research program designed to make the CPI a better approximation to a cost of living index. (National Bureau of Economic Research, 1961) In 1995, the Senate Finance Committee appointed an Advisory Committee to Study the Consumer Price Index (widely known as the Boskin Commission after its chair, Michael Boskin) to review and determine whether the CPI overstated the true cost of living. In its final report published in December 1996, the Boskin commission concluded that the CPI was currently, as of 1995-96, overstating the rate of increase in consumers' cost of living by about 1.1 percentage points a year, and recommended a number of steps designed to move the CPI closer to a COLI measure (ILO, 2004). The BLS recently reiterated its acceptance of a COLI as the measurement objective for the CPI, but the BLS added a number of important cautions: "It (the COLI) is a theoretical concept based on the well-being of the individual consumer, so . . . Additional

assumptions about how to apply it as a measurement objective for an aggregated set of consumers . . . Must be made" (BLS, 1997).

C. Literature on Cost of Living Determinants

The determinants of geographic cost of living in the U.S. have been investigated in numerous studies, primarily in the 1980s. Living costs are relevant in a variety of aspects, such as allocating education funds, calculating income transfers, and in relocation decisions (Blanciforti and Kranner, 1993). Living cost differentials have also been found statistically significant in consistently explaining geographic mobility, thus providing insight to policy makers about the role of factors over which they do or do not have power to control (Toma and Cebula, 2008). The bulk of studies have focused on the causes of living-costs on a national level, with the exception of Kurre (2003) and Cebula (1998). These exceptions address living-costs on a county level within individual states, Pennsylvania and Florida, respectively. Studies have also been conducted on a state-wide level, such as in the Cebula and Toma (2008) study. Most studies find that factors such as income per capita, population density, property taxes, geographic area, and unemployment rates influence the geographic cost of living (Cebula, 1997; Cebula and Toma, 2000, 2008; Kurre, 2003).

Income can be used to characterize the overall demand for goods and service (Cebula and Toma, 2008). An increase in income will result in a shift in the budget constraint outwards, thus raising the demand for goods and services. This effect implies a positive relationship between income per capita and the cost of living in a state (Blanciforti and Kranner, 1993). Although some economists suggest that with greater demand creating upward pressure on prices the economies of scale effect could also affect cost of living. Higher incomes will increase demand for normal goods, while the demand for inferior goods would ultimately fall, thus the prices would not be affected equally (Kurre, 2003). Greater

effective demand may permit some industries to benefit from economies of scale through agglomeration economies, although there are few industries that are in an economy of scale and most are short lived. As more firms in related industries cluster together, costs of production may decline significantly due to increasing efficiencies of the production of goods, such as lower transportation cost, or due to stiffer competition amongst firms. This clustering of firms may also be advantageous because a cluster of firms attracts more suppliers and customers than a single firm could alone (Suedekum, 2006). This reduction in production cost could potentially offset the raising prices induced by increased demand (Cebula and Toma, 2008).

While income can explain some living-cost differentials other amenity-like factors also play significant roles as well (Cebula and Toma, 2008). According to Riew (1973), quality of life/environmental factors should also be considered, to the extent that these factors are capitalized in housing prices. Given that housing prices are a large component of the cost of living indicators, amenities such as coastal location or dis-amenities such as colder weather may influence migration and housing demand, thus affecting the cost of living (Cebula and Toma, 2008; Riew, 1973). Since housing prices are a large indicator of an area's cost of living the previously mentioned amenities, such as coastal location, or dis-amenities, such as cold weather, may influence migration to the area. This in turn leads to higher or lower demand for housing, thus having an effect on the overall living-costs in the geographic region due to the fact that housing accounts for such a large section of consumer spending (Cebula and Toma, 2000; Riew, 1973). This hypothesis was found to be statistically supported in a study conducted by Toma and Cebula (2008), where an empirical study on the determinants of cost of living were analyzed using a supply and demand framework. Therefore this study also considers these types of factors.

The role of climate has been shown to be a significant factor in migration and may be capitalized into housing prices. In this study climate is proxied by annual heating degree days. This variable is lower in warmer climates, reflecting the desirable feature of warmer temperatures that presumably may be capitalized into housing prices (Cebula and Toma, 2008). Accordingly, as heating degree days increase, reflecting cooler climates, the overall cost of living is expected to decrease. Although, this effect may be negated by heating costs. As the heating degree days increases there is more need for utilities, such as electric and gas, in order to maintain a suitable temperature. Increasing utility cost plays a part in determining a homeowner's budget and therefore may act to increase the cost of living, *ceteris paribus* (Kurre, 2003). Thus, as heating degree days increases it is possible that the net effect is an increase of the overall cost of living. While colder temperatures are considered a dis-amenity, generally coastal locations are deemed desirable. It is hypothesized that for many there is a value in closer proximity to large bodies of water. Many are willing to pay a premium for living in coastal areas and thus act to elevate the overall cost of living (Cebula and Toma, 2008).

Another quality of life variable that may affect interstate cost of living differentials is crime rates. The crime rate of a state proxies undesirable social ills associated with crime that may affect the overall cost of living. As the crime rate increases the level of security and safety in an area decreases creating a disincentive for consumers to live in a particular area. To the extent that these disincentives are capitalized into housing prices the overall cost of living within a state may fall (Cebula and Toma, 2008). This effect is seen because the cost of living index is based on the average price levels in the two selected areas, this study focuses on the ratio of the average price of an item in a state in respect to the average price of the same item nationwide. The average price of a representative

market basket is calculated and assigned weights because it is clearly not true that every product is of equal importance. The share of consumer spending devoted to the category each item represents determines that category's importance, or weight, in the index and housing is the second largest category. Another view on this variable is that as crime rates increase the cost of police and security measures in a region increase, thus increasing the overall cost of living. Thus, the extent to which crime rates affect state cost of living is an empirical question.

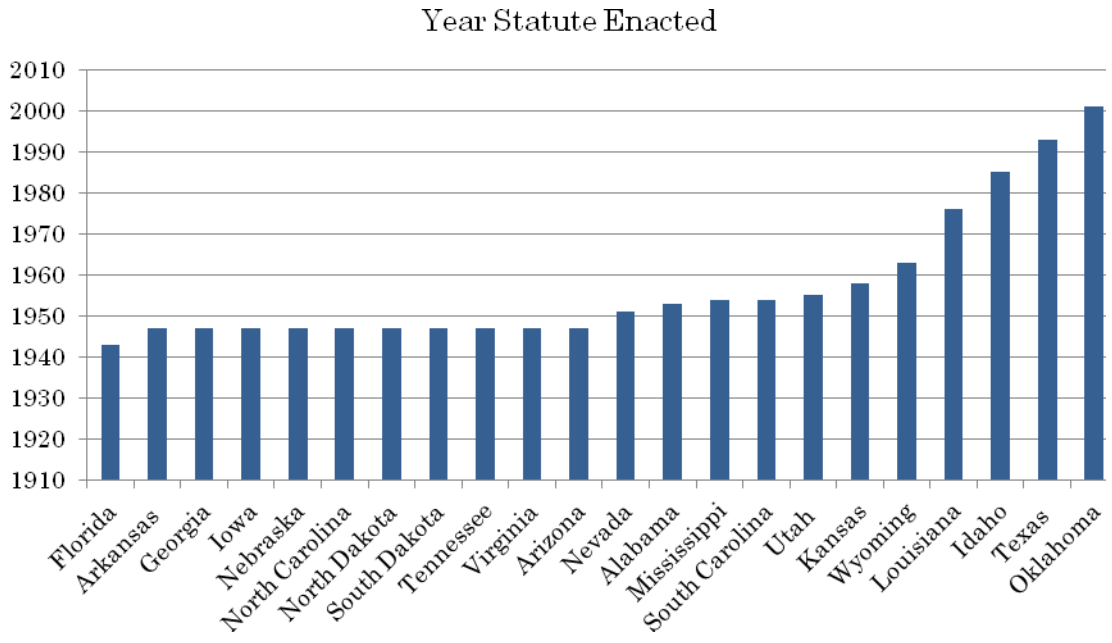
This study focuses primarily on the effects of right-to-work laws on the overall cost of living. Section 14(b) of the Taft-Hartley Act provides that each state shall have the right to enact "right-to-work" laws, which are laws that provide workers/employees the legal right to refuse to join unions in their place of employment (Blanciforti and Kranner, 1993). By nature, states with right-to-work laws tend to have weaker unionization and thus lower union influence. Cebula and Toma (2008) argue that unit labor cost is likely to be lower in states that have enacted such laws. Thus, lower labor unit cost leads to lower overall cost of living in states with right-to-work laws, *ceteris paribus*. Also notice that there is a business side effect on the cost of living caused by the enactment of right-to-work legislation. To the extent that firms are attracted to states with lower labor cost, and thus production cost, the migration of firms to states with right-to-work laws in place may increase income per capita through competition. As more firms move into an area there is increased competition, not only in the sales market, but also in the labor market to recruit workers. This would in turn increase the cost of living through an increase in wages and thus higher demand for goods and services.

D. History of Right-to-Work Legislation

Prior to the 1930s there were various sorts of state laws restricting hours and setting minimum wages, although in 1930 America was still largely governed by an employment-at-will standard. Labor legislation in the early 1930s, such as the Davis-Bacon Act and the Norris-laguardia Act, began to chip away at bargaining freedom, but it was the National Labor Relations Act of 1935 (Wagner Act) that dramatically revolutionized employment contracts (Vedder, 2010). The Wagner Act gave and still gives unions the power of exclusive representation, which allows unions to act as the voice of all of a company's employees. Union representation elections allowed for a small number of workers to force other workers to join a union or lose their job. Under the closed shop arrangement permissible under the Wagner Act, unions controlled who was hired, since union membership was mandatory for employment. The Wagner Act also gave way to union security clauses in the form of agency, in which the union's contract does not mandate that all employees join the union, but it does mandate that the employees pay union dues, and closed shop, in which the union's contract requires that all employees join the union within a specified amount of time of becoming employed (Court and Hunter, 2001).

The majority of states that have enacted right-to-work laws did so in the 1940s and 1950s after the passage of the Taft-Hartley Act of 1947, which was enacted in response to the belief that the pro-union Wagner Act of 1935 gave unions too much power. The Taft-Hartley Act of 1947 outlawed the closed shop arrangement. Moreover, section 14(b) of the Taft-Hartley Act provides that each state shall have the right to enact "right-to-work" laws, which are laws that provide workers/employees the legal right to refuse to join unions in their place of employment (Blanciforti and Kranner, 1993).

Figure 2.1: Right-to-Work Law Adoption Timeline

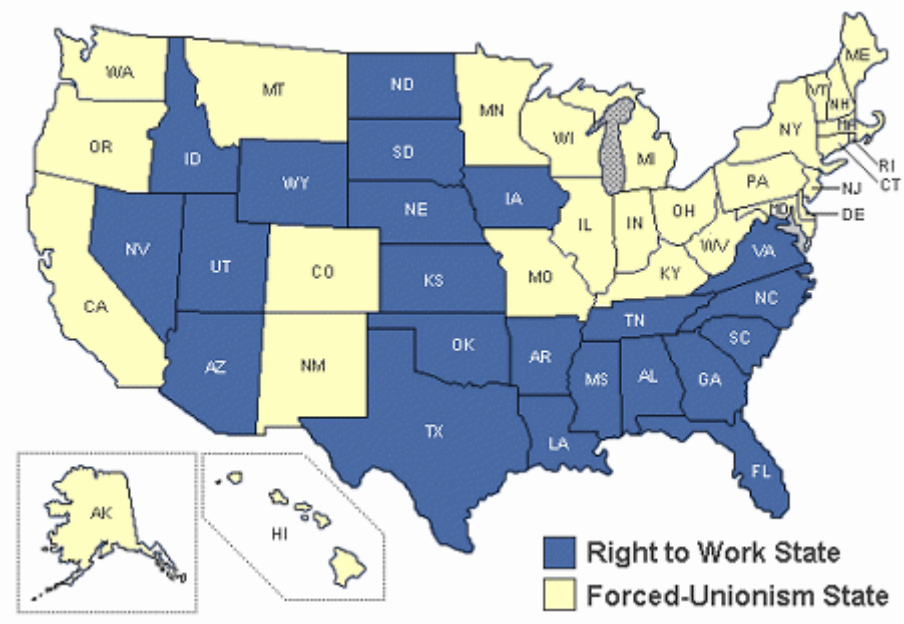


*Note that Delaware (1947), New Hampshire (1949), and Indiana (1965) all enacted right-to-work laws in the years within the parentheses, but are not listed above, because they have since repealed these laws.
**Note that Texas first enacted right-to-work protections in 1947, but the current language of Texas' right-to-work law was enacted in 1993 when the constitution was rewritten.

As can be seen from Figure 2.1, most states adopting right-to-work laws did so during the 1940's or 1950's. The most recent adopters are Idaho, Texas, and Oklahoma. At present twenty-two states have adopted right-to-work laws, none of the fourteen states in the Northeast or East Central parts of the country (industrial Midwest) have these laws[2]. This is likely because unions have been successful in preventing their passage. Outside of that area, however, a solid majority of Americans (65 percent) now live in right-to-work states[3].

[2] The fourteen forced-unionism states include Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, South Dakota, West Virginia, and Wisconsin.
[3] Statistic was calculated by a ratio of the population from right-to-work law states to forced-unionism states, as of 2005 (Census Bureau).

Figure 2.2: Right to Work Laws State Map[4]



E. Literature on Right-to-Work Laws and Cost of Living

The majority of literature on the effects of right-to-work laws on the overall cost of living index builds on the premise that states with right-to-work laws tend to have weaker unionization and thus lower union influence. Some have argued that this is a consequence of such laws (Carroll, 1983), while others differ saying that the laws are able to be enacted because there was already a weakening in unionization (Lumsden and Petersen, 1975; Farber, 1984). Although, neither case disputes that non-right-to-work states are more unionized.

Numerous studies have found evidence to support that states without right-to-work laws have higher levels of unionization. A study by Farber (1984), for instance, looked at the effect of right-to-work laws at the individual level and found that "individuals in right-

[4] Map is located on the National Right to Work Committee and is based on state right-to-work law statutes as of 2001.

to-work states are 8.2 percent less likely to belong to a union than workers in non-right-to-work states." Moore's review of pre-1985 stock model studies also found that right-to-work laws decrease unionization by 3 to 5 percent in aggregate levels (Moore, 1998). Similarly, Glen Fines and David Ellwood (1987) look at union organizing success rates and concluded that right-to-work laws "ultimately diminish (union) membership by five to ten percent" (Ellwood and Fine, 1987).

Alternatively, some studies have found evidence showing that right-to-work laws have no significant effects on unionization rates. Studies such as those conducted by Hunt & White (1983) and Koeller (1985, 1992, 1994), which adjust for taste factors "such as congressional voting [records] or public sector bargaining laws," found that right-to-work laws usually have no effect on the extent of unionization within a state (Moore, 1998). It has been suggested, however, that there is the possibility the right-to-work law variable in these studies mirrors the taste variables mentioned above, which would make their results less informative possibly due to multicollinearity (Moore, 1998).

Although the evidence on right-to-work laws affect on unionization within a state is unclear, there is sufficient evidence to show that right-to-work laws either have no effect on the proportion of union membership within a state or decrease it (i.e. There is no evidence to support that right-to-work laws increase unionization). This affect on the degree of unionization would then in turn cause a change in the overall cost of living within a state. In order to evaluate this effect of right-to-work laws on interstate cost of living differentials economic theory and methodology must be used in order to develop a rudimentary model of the cost of living market. The preceding review of literature chapter outlined five indicators that have been deemed significant cost of living determinants by previous studies. The next chapter will generalize and examine the theoretical lens through which the econometric results should be viewed by presenting the theory and methodology behind

modeling the cost of living market and presents the empirical framework of the rudimentary model.

Chapter III

The Demand And Supply Market Model: Theory And Methodology

The main goal of this study is to analyze the determinants of the state cost of living index in order to gain some insight into the potential impact of right-to-work laws. Since the cost of living in a state is, in principle, the price of a given market basket of goods and amenities purchased in that particular area, a supply and demand model will prove useful in analyzing the determinants of state cost of living differentials. The reduced form price and quantity models will be formulated by solving the demand and supply equations simultaneously and estimated using ordinary least squares (OLS) regression. This chapter will explain the theory and methodology behind formulating the reduced form price and quantity equations for the determinants of state cost of living and present the theory relevant to the determinants of the cost of living. The concept of supply and demand will be reviewed first in order to understand the structure modeling inherent in state cost of living market determinants.

A. Demand and Supply Market Model[5]

The general concepts of demand and supply equations need to be introduced first, in order to understand the cost of living market determinants. The market demand function for good X can be expressed as a function of the price of that good (Px), the price of all other goods associated with that good i.e. Complements (Pc) and substitutes (Ps) for good X, the tastes and preferences of the buyers (TP), the number of buyers (NB), the income of the

[5] Reference Tatum (2007) for information and description layout.

buyers (M), and any other factors (OF) that may affect demand for that particular good. These relationships can be summarized in the demand function:

$$X_D = f\,(Px \mid Ps, Pc, TP, NB, M, OF) \qquad (3.1)$$

These factors do not all affect the demand function in the same manner, therefore, behavioral assumptions regarding these variables are addressed and explained with the use of partial derivatives. Đxd/ðpx is negative implying that the price of good X is inversely related to the quantity demanded of good X. Đxd/ðpc is also negative implying a inverse relationship between the price of a complement and the demand of good X. Đxd/ðps, ðxd/ðtp, ðxd/ðnb, and ðxd/ðm are positive implying a direct relationship between the price of a substitute, taste and preferences, number of consumers, income, and the demand of good X (assuming good X is a normal good)[6]. Table 3.1 below summarizes the demand functions behavioral assumptions.

[6] A normal good is one in which demand increases with an increase in income, *ceteris paribus*.

Table 3.1: Demand Function Behavioral Assumptions

Variable	Mathematical Representation	Relationship	Explanation
Price Good X (Px)	Đxd/ðpx < 0	Negative	If Px increases quantity demanded for X Decreases.
Price Substitute (Ps)	Đxd/ðps > 0	Positive	If Ps increases quantity demanded for X Increases.
Price Complement (Pc)	Đxd/ðpc < 0	Negative	If Pc increases quantity demanded for X Decreases.
Taste And Preferences (TP)	Đxd/ðtp > 0	Positive	If TP increases quantity demanded for X Increases.
Number Of Buyers (NB)	Đxd/ðnb > 0	Positive	If NB increases quantity demanded for X Increases.
Income (M)	Đxd/ðm > 0	Positive	If M increases quantity demanded for X Increases.

The following determinants, with the exception of the price of X cause shifts in the entire supply curve, and therefore the market supply function for good X can be expressed as a function of the price of X (Px), the cost of production including input prices (COP), the price of rival goods (Pr), the price of joint goods (Pj), technology (T), number of producers (NP), and any other factors (OF) that could affect supply for that particular good[7]. Rival goods are goods that can be produced instead of good X, joint goods are goods that can be produced along with good X (by products). These relationships can be summarized in the supply function:

$$X_S = f(Px \mid COP, Pr, Pj, T, NP, OF) \tag{3.2}$$

[7] Note that any factor that increases the cost of production decreases supply, and vice versa.

As is the case with the demand function, not all factors have the same affect on the supply. Đxs/ðpx is positive implying that the price of good X is directly related to the quantity supplied of good X. Đxs/ðcop and ðxs/ðpr are negative implying an inverse relationship between the price of an input or rival good and the quantity supplied of good X. Đxs/ðpj, ðxs/ðt, and ðxs/ðnp are positive implying a direct relationship between the price of a joint good or technology and the quantity supplied of good X. Table 3.2 below summarizes the supply functions behavioral assumptions.

Table 3.2: Supply Function Behavioral Assumptions

Variable	Mathematical Representation	Relationship	Explanation
Price Good X (Px)	Đxs/ðpx > 0	Positive	If Px increases, quantity supplied for X increases.
Cost Of Production (COP)	Đxs/ðcop < 0	Negative	If COP increases, quantity supplied for X decreases.
Price Rival (Pr)	Đxs/ðpr < 0	Negative	If Pr increases, quantity supplied for X decreases.
Price Joint (Pj)	Đxs/ðpj > 0	Positive	If Pj increases, quantity supplied for X increases.
Technology (T)	Đxs/ðt > 0	Positive	If T increases, quantity supplied for X increases.
Number Of Producers (NP)	Đxs/ðnp > 0	Positive	If NP increases, quantity supplied for X increases.

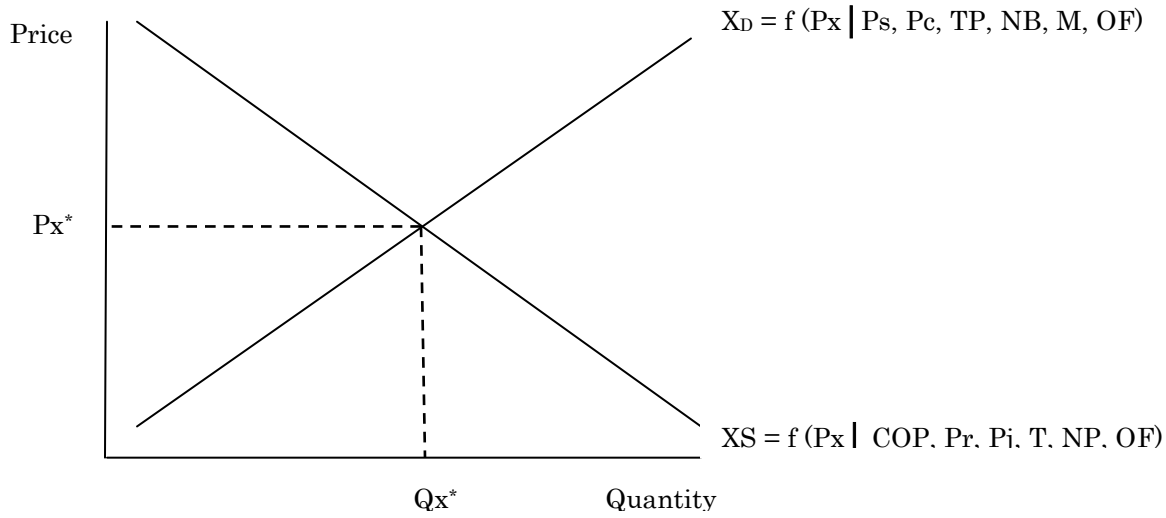
Now that general supply and demand functions and their behavioral assumptions Have been explained, market concepts defined by their interaction can be discussed. The individual demand curve gives the quantity purchased for each price. Analogously, the market demand curve gives the quantity purchased by all the market participants for each price, i.e. The sum of the individual demands. Therefore the market demand curve can be defined as the relationship between the price of a certain commodity and the amount of it that consumers are willing and able to purchase, *ceteris paribus.* By summing the

individual demand curves, the market demand curve represents generic consumer attitudes towards good X. Similar reasoning applies to the individual and market supply curve (mcafee and Johnson, 2006).

On the graph below the X_D equation represents the demand curve and all the factors that could affect it explained previously in the demand function. As summarized in Table 2.1, the law of demand states that when the price of a good rises the quantity demanded falls or when the price falls the quantity demanded rises, *ceteris paribus.* This explains why the slope of the demand curve is downward sloping. The X_S equation represents the supply curve and the all the factors that could affect it as explained in the supply function. The supply curve shows how much of a given commodity producers are willing to produce at a given price in the marketplace holding all other arguments of the supply curve constant. As noted in Table 2.2, the law of supply states that the supply curve is upward sloping implying that as the price of good X increases producers are willing to produce more of good X, *ceteris paribus* (mcafee and Johnson, 2006).

The point at which the supply and demand curves intersect is the equilibrium point**.** The equilibrium represents a steady state in which opposing forces are balanced. Any price below the equilibrium will lead to a shortage, in which quantity demanded will exceed quantity supplied of the good; when the price falls below the equilibrium a surplus, in which quantity supplied will exceed quantity demanded for the good, results. Therefore, the market equilibrium refers to a condition where the pressure for higher prices is exactly balanced by a pressure for lower prices through competition, and thus that the current state of exchange between buyers and sellers can be expected to persist unless there is a change in demand or supply(mcafee and Johnson, 2006). The equilibrium price and quantity are Px* and Qx* respectively and denote the price charged and the quantity exchanged of good X.

Figure 3.1: Market Equilibrium for Good X



Structural equations are simply a form of the supply and demand equations that describe the structure of the market for good X, and can be used to derive reduced form price and quantity equations. An alternative view of the market can be obtained from the implied reduced form equations of the system. Reduced form equations express each endogenous variable (P_X and X, here) in terms of exogenous variables and parameters alone. Since price and quantity are jointly determined a substitution method is one method that can be used to solve for the reduced form equations. To better explain how the reduced form equation is derived a general example is listed below[8]. The general supply and demand structural equations are below in equations (3.3-3.5).

Demand Equation: $Q_D = a_0 + a_1Px + a_2Ps + a_3tp + a_4Pc + a_5nb + a_6m + a_7of + e_1$ (3.3)

Where: $a_1<0$, $a_2>0$, $a_3>0$, $a_4<0$, $a_5>0$, $a_6>0$ and a_7=unclear; Q_D is quantity demanded

Supply Equation: $Q_S = b_0 + b_1Px + b_2cop + b_3Pj + b_4Pr + b_5t + b_6np + b_7of + e_2$ (3.4)

Where: $b_1>0$, $b_2<0$, $b_3>0$, $b_4<0$, $b_5>0$, $b_6>0$ and b_7=unclear; Q_S is quantity supplied

Quantity Demanded = Quantity Supplied (3.5)

[8] This particular method of derivation is discussed in Damodar N. Gujarati's *Basic Econometrics* fourth edition on p. 737-738 (Gujarati, 2003).

Since quantity and price are endogenous, they are jointly determined (in both the supply and demand equation). The variables price of a substitute (Ps), price of a complement (Pc), income (M), number of producers (NP), consumers taste and preferences (TP), cost of production (COP), price of a joint good (Pj), price of a rival good (Pr), technology (T), number of buyers (NB), and any other factor that affects either demand or supply (OF) are exogenous, meaning they are determined outside the model. To get from the structural equations to the reduced form equations the demand and supply equations must be solved, so that they express the endogenous variables (Px and X) in terms of the exogenous variables and parameters alone. Using equation (3.5), set quantity demanded equal to quantity supplied and solve simultaneously for the price (P_X^E). We find the reduced form equation, listed below in equation[9] (3.6).

Reduced Form Equation: $P_X^E = (b_0-a_0)/(a_1-b_1) + b_2/(a_1-b_1)COP + b_3/(a_1-b_1)Pj + B_4/(a_1-b_1)\ Pr + b_5/(a_1-b_1)T + b_6/(a_1-b_1)NP - a_2/(a_1-b_1)Ps - a_3/(a_1-b_1)M - a_4/(a_1-b_1)Pc - a_5/(a_1-b_1)NB - a_6/(a_1-b_1)TP + (b_7-a_7)/(a_1-b_1)OF + (e_2-e_1)/(a_1-b_1)$ (3.6)

The coefficients derived in the reduced form equation are important to the study because once they are combined with economic theory the expected signs can be hypothesized. By using the signs that were derived from economic theory from the structural equations (3.3) and (3.4) above, the signs of the variables in the reduced form equation coefficients can be hypothesized. Tables 3.3 and 3.4 below show the sign hypothesis of the general reduced form equation.

[9] Note that there is a reduced form equation for equilibrium quantity, but this study focuses only on the equilibrium price equation.

Table 3.3: Sign Hypothesis for the General Reduced Form Equation for Price

Variable	Coefficient	Coefficient/ Sign Hypothesis
Cost Of Production (COP)	(b_2 /a_1-b_1)	(neg/neg)=pos
Price Joint (Pj)	(b_3/a_1-b_1)	(pos/neg)=neg
Price Rival (Pr)	(b_4/a_1-b_1)	(neg/neg)=pos
Technology (T)	(b_5 /a_1-b_1)	(pos/neg)=neg
Number Of Producers (NP)	(b_6/a_1-b_1)	(pos/neg)=neg
Price Substitute (Ps)	$-(a_2 /a_1-b_1)$	Neg(pos/neg)=pos
Taste And Preferences (TP)	$-(a_3/a_1-b_1)$	Neg(pos/neg)=pos
Price Complement (Pc)	$-(a_4/a_1-b_1)$	Neg(neg/neg)=neg
Number Of Buyers (NB)	$-(a_5/a_1-b_1)$	Neg(pos/neg)=pos
Income (M)	$-(a_6/a_1-b_1)$	Neg(pos/neg)= pos
Other Factors (OF)	(b_7-a_7/a_1-b_1)	(?-?/neg)=?

*Note the sign hypothesis for income assumes a normal good and it is assumed that the variable other factors (OF) affects both supply and demand for this general case. Also, "neg" refers to a negative and "pos" refers to a positive sign.
** Note $a_1<0$ and $b_1>0$ because the causes of demand and supply, therefore $a_1-b_1<0$.

The sign hypothesis for the reduced form equation for this general market is derived using the positive or negative relationship assumptions on each explanatory variable obtained from the structural equations (3.3) and (3.4) explained previously in this chapter. Economic theory can be used to confirm that the mathematics explained above is valid, *ceteris paribus*.

While the theory provides a lens through which empirical results should be Interpreted, the data and methodology are the means to which the results are achieved.

The next section will present the data and the econometric methods that are used to estimate the cost of living determinants.

B. Cost of Living Market Model

Based on this previous research the underlying framework in this analysis adopts the premise that factors tending to elevate demand for a representative basket of goods and amenities in a geographic area tend to elevate the overall level of prices in the region, thus acting to increase the overall cost of living in the area. Conversely, factors that increase supply of a representative basket of goods and amenities (perhaps arising from a reduction in production costs) tend to lower prices in a given area, consequently decreasing the overall living-cost for that region (Cebula and Toma, 2000).

Income can be used to characterize the overall demand for goods and services; thus, an increase in income will cause the demand for a market basket of representative goods and services to increase (Cebula and Toma, 2008). While income can explain living-cost differentials, other amenity-like factors are likely to play significant roles as well (Cebula and Toma, 2008). Therefore this study also considers these types of factors, proxied by coastal mileage and heating degree day variables. Both variables act as a representation of consumer taste and preferences in the valuation of attributes offered by a particular state in the demand equation.

This study focuses primarily on the effects of right-to-work laws on the overall cost of living. Section 14(b) of the Taft-Hartley Act provides that each state shall have the right to enact "right-to-work" laws, which are laws that provide workers/employees the legal right to refuse to join unions in their place of employment (Blanciforti and Kranner, 1993). Therefore, right-to-work laws will affect the cost of production to the extent that they lower unionization and possibly lowering labor cost. To the extent that lower labor costs are reflected in the price of final goods and services, the overall cost of living will decrease.

Based on the prior generic discussion, the following structural equations of a basic supply and demand system were developed using the general method discussed above. Equations (3.7) and (3.8) below are the structural equations used to evaluate the cost of living market.

$$\textbf{Demand: } Q_D=\alpha_0+\alpha_1 col_s+\alpha_2 pcinc_s+\alpha_3 hdd_s+\alpha_4 coast_s+\alpha_5 cr_s+\mu_1 \quad (3.7)$$

$$\textbf{Supply: } Q_S=\lambda_0+\lambda_1 col_s+\lambda_2 cr_s+\lambda_3 hdd+\lambda_4 rtw+\mu_2 \quad (3.8)$$

$$\textbf{Equilibrium: } Q_D=Q_S=Q \quad (3.9)$$

Where:

Q_D, is the quantity demand of a representative bundle of goods and amenities within state *s*;

Q_S, is the quantity supplied of a representative bundle of goods and amenities within state *s*.

Col_s, is the cost of living for an average consuming unit in state *s*, 2006;

Cr_s, is the number of violent crimes per 100,000 population in state *s*, 2006;

$Pcinc_s$, is the real per capita income, as deflated by the consumer price index (CPI) in state s, 2005;

Hdd_s, the total annual heating degree days in state s, as defined as the summation of each degree the average temperature for a day moves below 65 degrees Fahrenheit (the average temperature on any given day minus the base temperature of 65 degrees Fahrenheit), 2005;

$Coast_s$, is a measure of the amount of land along coastal areas of states with major bodies of water including the Gulf of Mexico, the Pacific Ocean, the Atlantic Ocean, and the Great Lakes; defined as the number of miles of general coastline;

Rtw_s, a binary dummy variable indicating if a state has right-to-work laws in place, where $rtw_s=1$ for states with right-to-work laws in place and $rtw_s=0$ otherwise, 2006

$\mu_{1,2}$, are stochastic error terms.

A cross sectional framework using state level data for the year 2006 was used. Note that that Alaska and Hawaii are excluded as outliers in this study, therefore making the total observations forty-eight for each year[10]. Table 3.4 below shows the expected signs of the structural equations, followed by the methodology behind the expected coefficient signs.

Table 3.4: Sign Hypothesis for Structural Equations

Variable	Coefficient/ Sign Hypothesis
Cost Of Living (COL_S)	$A_1<0$
Per Capita Income ($PCINC_S$)	$A_2>0$
Heating Degree Days (HDD_S)	$A_3<0$
Coastal Mileage ($coast_s$)	$A_4>0$
Crime Rate (CR_S)	$A_5<0$
Cost Of Living (COL_S)	$\Lambda_1>0$
Crime Rate (CR_S)	$\Lambda_2>0$
Heating Degree Days (HDD_S)	$\Lambda_3>0$
Right-to-Work Laws (RTW_S)	$\Lambda_4>0$

The coefficient on the cost of living (COL_S) variable in the demand equation (α_1) is expected to be negative because consumers will demand less of goods and services as the price of these goods and services increases. The coefficient on the cost of living (COL_S) variable in the supply equation (λ_1) is expected to be positive because producers will increase production to capitalize on rising prices. The income per capita (PCINCS) coefficient (α_2) is expected to be positive since consumer demand will increase with an

[10] Alaska and Hawaii are excluded as outliers because both states have significantly larger cost of living than the other forty-eight states. These two states are also treated as outliers in aspects such as cost of living adjustments (COLA) and other governmental programs.

increase in spending power. The coefficient on the heating degree day (HHD_S) variable (α_3) is expected to be negative, since this variable represents the disincentive of colder climates in a location, thus decreasing demand in that region. The coastal ($COAST_S$) variable (α_4) is expected to be positive since this variable represents desirable amenities in a location, thus increasing demand in that region. The coefficient on the crime rate of a state (CR_S) variable (α_5) is expected to be negative, since this variable represents the disincentive of social ills associated with an increased crime rate, thus decreasing demand in that region. The coefficient on the crime rate of a state (CR_S) variable (λ_2) affects the cost of security forces, such as police officers, to the extent that these increased labor cost are passed onto consumers, it is expected to be positive. The coefficient on the heating degree day (HHD_S) variable (λ_3) is expected to be positive, since as this variable increases, reflecting colder climates, the cost of utilities will also increase in that region. The right-to-work (RTW_S) variable (λ_3) is also expected to be positive; an increase in the right-to-work variable indicates the enactment of right-to-work legislation, this in turn could lower labor cost by weakening unionization. To the extent that the lower labor costs are reflected in increasesd production.

With the variables introduced and economic theory explained, the reduced form equation and sign hypothesis can be discussed. The cost of living affects both the demand and the supply side of the market as shown in the structural equations. Because of this, a substitution method can be used; set the structural equations for quantity demanded and quantity supplied equal to each other and solve to derive a reduced form price equation for the cost of living within a state[11]. This procedure is explained in detail previously in this chapter.

[11] Note that a representative reduced form equation is also available, although not operational empirically.

The equation (3.10) represents the reduced form equation derived from the structural system (3.7-3.9). Appendix B shows a more detailed derivation of the reduced form equation.

Cost of Living Reduced Form: $col_s=\beta_1+\beta_2 cr_s+\beta_3 pcinc_s+\beta_5 hdd_s+\beta_6 coast_s+\beta_7 rtw_s+\epsilon$ (3.10)

Where:

ϵ, the reduced form stochastic error term.

With the reduced form equation specified, the next step is to explain the sign Hypothesis. The expected signs of the coefficients are important because that is what the analysis and conclusions are based on. The hypothesized signs of the coefficients are concluded from economic theory explained previously in this chapter and will act as a guide to help interpret the empirical results. Table 3.5 below shows the expected signs of the reduced form equation.

Table 3.5: Sign Hypothesis for the Reduced Form Equation

Variable	Coefficient	Coefficient/ Sign Hypothesis
Crime Rate (CR_S)	$B_2=(\lambda_2-\alpha_5/\alpha_1-\lambda_1)$	$B_2>0$
Per Capita Income ($PCINC_S$)	$B_3=-(\alpha_2/\alpha_1-\lambda_1)$	$B_3>0$
Heating Degree Days (HDD_S)	$B_4=(\lambda_3-\alpha_3/\alpha_1-\lambda_1)$	$B_4<0$
Coastal Mileage ($Coast_s$)	$B_5=-(\alpha_4/\alpha_1-\lambda_1)$	$B_5>0$
Right-to-Work Laws (RTW_S)	$B_6=(\lambda_4/\alpha_1-\lambda_1)$	$B_6<0$

With the definitions of the variables ascertained through the above descriptions, along with the sources and validity of the data discussed. The methodology behind the model can be assessed. Furthermore, methodology will include the descriptive information on the execution of the cost of living model estimation that conveys the context to which the results can be applied.

C. Methodology

Most theoretical studies have tried to ascertain the determinants of cost of living indexes generally based on the agglomeration/congestion hypothesis, rent theory, and other factors, but a review of literature reveals that the regression approach is the most efficient method for estimating geographic cost of living differences (Kurre, 2003). The regression technique is preferred when evaluating the impact of specific geographic cost of living indicators and determining if the determinants are consistent through time. Therefore, ordinary least squares (OLS) regression analysis was the initial method used in estimating the reduced form equation.

OLS is defined as a method for linear regression that determines the values of unknown quantities in a statistical model by minimizing the sum of the residuals (the difference between the predicted and observed values) squared. The OLS approach has been shown to be the optimal estimation because it satisfies the Gauss-Markov theorem, which states that least squares estimators are BLUE (Best Linear Unbiased Estimators) in nature. Each estimator is linear in that it is a linear function of the dependent variable in the regression model. It is unbiased, that is, its average or expected value is equal to the true, but ambiguous parameter value. It has minimum variance in the class of all such linear, unbiased estimators. This is true under the assumptions that the error terms are expected to be zero, have a constant variance, and are uncorrelated with one another (Gujarati, 2003).

The reduced form equation was used in this study instead of the traditional structural equation system because error may occur with the use of structural coefficient estimates alone for deducing quantitative inferences concerning policy. With the use of a market model to analyze the whether a particular law of a particular activity affects

market price and output in a predictable way is common. In this case the structural coefficient of the variable in the various equations provides a direct on the quantity demanded, quantity supplied, or price, but may ignore the indirect effect. Therefore, the magnitude and possible the direction of the effect from the policy or regulatory variable may be misstated. Thus, the reduced form coefficients are used to solve this problem (Ford and Jackson, 1998).

A proper investigation of the cost of living determinants cannot be conducted unless the actual definitions of the variables are known. Furthermore, inferences couldn't be drawn without an understanding of how the model was estimated. Now that data and Methodology behind this analysis has been established, the next chapter will present the empirical results from the estimated model followed by a discussion of the results.

Chapter IV

Empirical Estimates Of The Cost Of Living Market Model

Chapter four details the results of the econometric analysis. The results of the initial OLS estimation of the coefficients for the years 1995 and 2006 are presented. These initial results saw some specification problems and were therefore estimated using a multiplicative heteroscedasticity regression estimation approach. This type of regression approach was used to estimate both years individually as well as a pooled estimation, both with and without a dummy variable and interactions. The following chapter will present and discuss the results of the estimation, which was estimated using the *Limdep* statistical software.

The initial results obtained from standard OLS regression estimation using contemporaneous prices and quantities are summarized in Tables 4.1 and 4.2.

Table 4.1: OLS Estimators for Reduced Form Equation, 1995

Variable	Coefficient	Standard Error	T-Statistic[12]
Constant	58.6182	7.6923	7.6204***
Crime Rate (CR_S)	0.0900	0.0493	1.8267*
Per Capita Income ($PCINC_S$)	0.0011	0.0003	3.6241***
Heating Degree Days (HDD_S)	0.0019	0.0006	3.0732***
Coastal Mileage ($coast_S$)	0.0040	0.0041	0.9921
Right-to-Work Laws (RTW_S)	-1.0893	2.0550	-0.5301

***R2:** 0.557, **Adj. R2:** 0.505, **F-Statistic:** 10.57, **Observations:** 48

Table 4.2: OLS Estimators for Reduced Form Equation, 2006

Variable	Coefficient	Standard Error	T-Statistic
Constant	60.7859	10.9432	5.555***
Crime Rate (CR_S)	0.0018	0.0003	6.209***
Per Capita Income ($PCINC_S$)	-0.0018	0.0009	-1.9660**
Heating Degree Days (HDD_S)	-0.1529	0.0903	-1.6940*
Coastal Mileage ($coast_S$)	0.0088	0.0060	1.4740
Right-to-Work Laws (RTW_S)	-7.3964	2.8938	-2.5560***

***R2:** 0.639, **Adj. R2:** 0.596, **F-Statistic:** 14.84, **Observations:** 48

Heteroskedasticity and autocorrelation sometimes will occur in models which may violate some of the standard linear model assumptions. Since this study is a cross sectional analysis, autocorrelation is unlikely, but to investigate autocorrelation for completeness the

[12] The significance levels of ten, five, and one percent are represented by one, two, and three asterisks, respectively.

Durbin – Watson test is conducted and does not suggest autocorrelation[13]. Therefore, the initial results obtained from standard OLS regression estimation were then examined to test for heteroscedasticity. Depending on the nature of the comparison, heteroscedasticity can result in over or under estimated t-statistics, ultimately causing a variable to appear to be either statistically significant when it may not be or not statistically significant when it actually is significant. Using the Breusch-Pagan test, heteroscedasticity does not appear to be present in the model as seen by a non-rejection of the null hypothesis of homoscedasticity[14].

After establishing that heteroscedasticity was not an issue, a Ramsey RESET test was conducted. This will detect specification error in the model by running a joint hypothesis test between an augmented version of the reduced form equation model and a restricted version of the model. The detection of specification error in the model is seen by rejection of the null hypothesis on the zero restrictions on the fitted terms. The results from the RESET test implied that mis-specification is present within the model, although the test is not informative as to what type of specification error is present. RESET resulted in a rejection of the null hypothesis implying that specification error exists in the model[15]. When a model has specification error the coefficients become biased, inconsistent, and

[13] The Durban-Watson statistic is 2.36 and 2.03, for 1995 and 2006 respectively, suggesting that autocorrelation is not an issue in the model. For more information on the Durban-Watson test for autocorrelation see p.645-646 (Greene, 2003).
[14] The Breusch-Pagan Statistic in the reduced form equation was 5.83 and 10.48, for 1995 and 2006 respectively, indicating heteroscedasticity does not exist in the initial model. For more information on the Breusch-Pagan test for heterscedasticity see p.411-412 (Gujarati, 2003).
[15] The Ramsey RESET F-statistic is 3.11 and 6.80, for 1995 and 2006 respectively, which is greater than the F-critical value at 5%, $F_{0.05;\,3,\,39} = 2.87$ from table on p. 195-195 (Studenmund 2001). Therefore, the null can be rejected indicating that there is mis-specification in the model. For more information on the Ramsey RESET test see p. 521-523 (Gujarati 2003).

inefficient because of the violation of OLS assumptions[16]. These problems will cause unreliable results.

The first possibility is that there are omitted or irrelevant variables in the model. A good possibility of omitted variables is a regional variable, although after including regional dummies into the model they proved to be insignificant and the model still failed the RESET test. A number of other variables were used in order to attempt to correct for the specification error; all were unsuccessfully. They proved to be statistically insignificant in the reduced form model, and none resulted in passing the RESET test[17]. A second possibility is that the model is not in the correct functional form; therefore other functional forms were explored. Other functional forms used include semi-log, log-log, and non-linear model forms[18]. All attempts to correct the specification error via changing the functional form of the model failed to pass RESET. A third possibility is error in measurement. After analyzing the data for possible errors it proved that there were no avoidable errors in measurement. After all these results failed to help the model pass the RESET test, the possibility of a non-constant variance in the model was explored.

To examine this potentiality, a multiplicative heteroscedasticity regression Estimation approach was used to obtain the reduced form equation maximum likelihood estimates[19]. The variance function estimated will include the right-to-work variable. The

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[16] Specification error could mean a few different problems may be wrong with the model, which include omitted or irrelevant variables, incorrect functional form, or errors in measurement.
[17] Some omitted variables that were considered include population, population density, housing (measured by building permits), real estate tax rate, and physicians per capita, as well as regional dummy variables. Some variables excluded as possible irrelevant variables include geographic area, unemployment rate, cooling degree days, and the right-to-work law variable (Reynolds and Edwards, 1986; Cebula and Toma, 2000).
[18] Forms used were non-linear in the variables real income per capita, unemployment rate, cooling degree days, and the coast line miles variable.
[19] The multiplicative heteroscedasticity approach gives parameter estimates that are maximum-likelihood estimates. A regression and variance function is estimated in the model. The logarithm of

right-to-work variable accounts for the differences in the labor market between the states in this study.

A likelihood ratio version of the Ramsey RESET test was conducted on the multiplicative heteroscedasticity regression estimation of the reduced form equation in order to test for specification error. For the initial OLS Ramsey's RESET test procedure was to include in the test regression, or the augmented version of the reduced form equation, the powers of the fitted values from the original regression, starting with the square or second power because the first power is highly collinear. The powers of the fitted values from the original regression goes up to four because if a large number of fitted terms is specified a near singular matrix error may occur since the powers of the fitted values are likely to be highly collinear. The intuition behind the test is that, if non-linear combinations of the explanatory variables have any power in explaining the exogenous variable, then the model is mis-specified. The output from the two regressions, both the augmented version of the reduced form equation model and a restricted version, are subjected to the F-test. For the multiplicative heteroscedasticity regression estimation the process is the same, except instead of conducting an F-test a likelihood ratio test is used. The likelihood ratio test is a joint hypothesis test on the difference, multiplied by two, between the log likelihood function from the augmented version of the reduced form equation model and a restricted version, and subjected to a Chi-squared test. This was

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the variance is assumed to be a function of a different set of explanatory variables which may or may not appear in the regression function. The first step of this method is estimating the regression function by using ordinary least-squares (OLS) and then saving the residuals. These residuals are then squared and logged. These adjusted residuals become the dependent variable for the variance function which is estimated by OLS. The (anti-log of) predicted values from this variance function are then used as weights in a generalized least-squares (GLS) estimation of the regression function. The residuals are once again kept, squared, logged, and act as the dependent variable for a new estimation of the variance function. Iteration between estimates of the regression function and variance function continue until the coefficients of the two models stabilize and converge. When this stabilization and convergence occurs, the parameter estimates are the maximum likelihood estimates presented later in this chapter. This method is mathematically explained in p. 232-235 (Greene 2003).

done and the multiplicative heteroscedasticity regression estimation of the reduced form equation passed the Ramsey RESET test signaling a lack of statistical significance for specification error. Table 4.3 shows the maximum likelihood estimates of the reduced form equation for 1995 and 2006, as well as the variance functions for the reduced form equations. Table 4.3 also includes the maximum likelihood estimates of the reduced form equation for the pooled 1995 and 2006 data, both with and without a year dummy variable and interactions, as well as the variance function estimates for the reduced form equations.

Table 4.3: Maximum Likelihood Estimators for Reduced Form Equation

Equation

Variable	1995 Model	2006 Model	Pooled Model	Fully Interactive Model
Constant	59.8458	65.1750	76.4601	64.7713
	(8.4476)***	(6.8386)***	(12.3645)***	(7.9211)***
Crime Rate	0.0602	-0.0351	0.0824	-0.0444
(CR_S)	(1.3957)	(-0.4598)	(1.9920)**	(-0.6759)
Per Capita	0.0011	0.0014	0.0005	0.0014
Income ($PCINC_S$)	(4.0097)***	(5.2154)***	(4.7187)***	(6.2648)***
Heating Degree	0.0019	-0.0008	0.0015	-0.0009
Days (HDD_S)	(3.8008)***	(-0.9821)	(3.2583)***	(-1.2840)
Coastal Mileage	0.0037	0.0103	0.0068	0.0102
($coast_s$)	(0.8579)	(1.6094)	(1.4669)	(1.8724)*
Right-to-Work	-0.9791	-8.2296	-6.3528	-8.1673
Laws (RTW_S)	(-0.5412)	(-3.1712)***	(-3.4891)***	(-3.7277)***

Interaction

Variable	1995 Model	2006 Model	Pooled Model	Fully Interactive Model
Dummy				-4.7126
	-	-	-	(-0.3877)
D_{CR}				0.1014
	-	-	-	(1.1887)
D_{PCINC}			-	-0.0003
	-	-		(-0.6196)
D_{HDD}			-	0.0027
	-	-		(2.9892)***
D_{coast}				-0.0066
	-	-	-	(-0.8423)
D_{RTW}				7.1789
	-	-	-	(2.2521)**

Variance Function

Variable	1995 Model	2006 Model	Pooled Model	Fully Interactive Model
Sigma	6.3999	10.1199	10.2149	8.3849
	(7.3485)***	(7.2111)***	(10.2956)***	(10.2956)***
Right-to-Work	-1.2149	-1.4651	-1.4971	-1.3471
Laws (RTW_S)	(-2.9525)***	(-3.5763)***	(-5.1579)***	(-4.6413)***

Summary

Variable	1995 Model	2006 Model	Pooled Model	Fully Interactive Model
Observations	48	48	96	96
Chi Squared Statistic	6.9566	7.0872	17.9998	14.3492
Log Likelihood Function	-144.4544	-162.0865	-327.1197	-311.3919

*The t-statistics are listed below the coefficients in parenthesis. The significance levels of ten, five, and one percent are represented by one, two, and three asterisks, respectively.

**Note that the variance function is held constant in all models; therefore a slight variation in the values may occur.

The individual maximum likelihood estimates for the years 1995 and 2006, respectively, will be explained first. Then the two pooled regression estimates will be examined, starting with the simple pooled model.

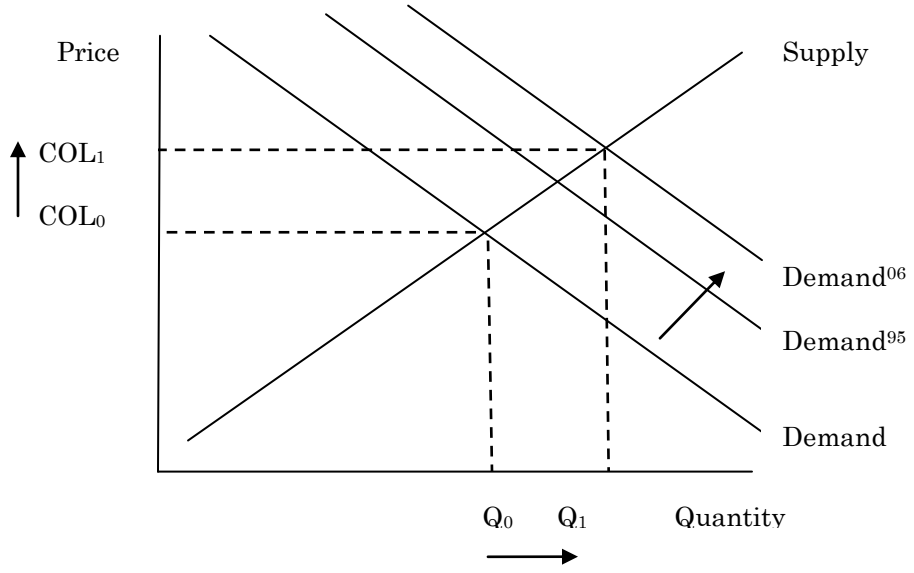
In both the reduced form price equation for 1995 and 2006 found income per capita to be statistically significant, at least at one of the traditional significance levels[20]. In both models income per capita is significant at the one percent level. Heating degree days was found to be positive in the 1995 model and significant at the one percent level, while it is negative and not statistically significant in the 2006 model. This change in significance level and coefficient sign for the heating degree days variable may be attributed to a particularly harsh winter given that the variable is unpredictable and determined by nature (or at random). In addition to the above mentioned variables the 2006 model also found right-to-work laws to be negative and statistically significant at the one percent level, while the 1995 model did not find this variable to be statistically significant. These results suggest that the effect of the factors affecting cost of living may be changing through time; this observation will be explored in later models. Both the 1995 and 2006 models did not find crime rate or coastal mileage to be significant. All variables signs match the sign hypothesis in Table 3.5, with the exception of heating degree days, and are consistent with economic theory. The derivations of the expected signs for all variables are shown mathematically in chapter three. Both models also find the right-to-work variable to be statistically significant at the one percent level in the variance function. This suggest the presence of heteroscedasticity; a systematic difference in cost of living variance between the two years associated with the effect of right-to-work laws.

[20] The traditional significance levels are one, five, and ten percent.

The effect of the crime rate on cost of living is expected to be and is estimated to be positive, for both 1995 and 2006, which is consistent with economic theory. Although, the coefficient has a t-value that is not statistically significant in both 1995 and 2006[21]. The same is true for the coastal mileage variable. Although the variable displays the correct coefficient sign, the variable is not statistically significant in either model.

Per capita income is expected to be positive and the sign on the estimated coefficient is consistent with economic theory, for both 1995 and 2006. The coefficient has a t-value that is statistically significant at the one percent level, for both 1995 and 2006, which implies that the cost of living rises with an increase in per capita income. Since it is assumed that the representative commodity bundle in a specific state is a normal good an increase in per capita income should shift the budget constraint outwards, thus increasing the demand for the bundle. This would thus increase the overall equilibrium cost of living price for that state, *ceteris paribus*. A graphical representation of this is shown below.

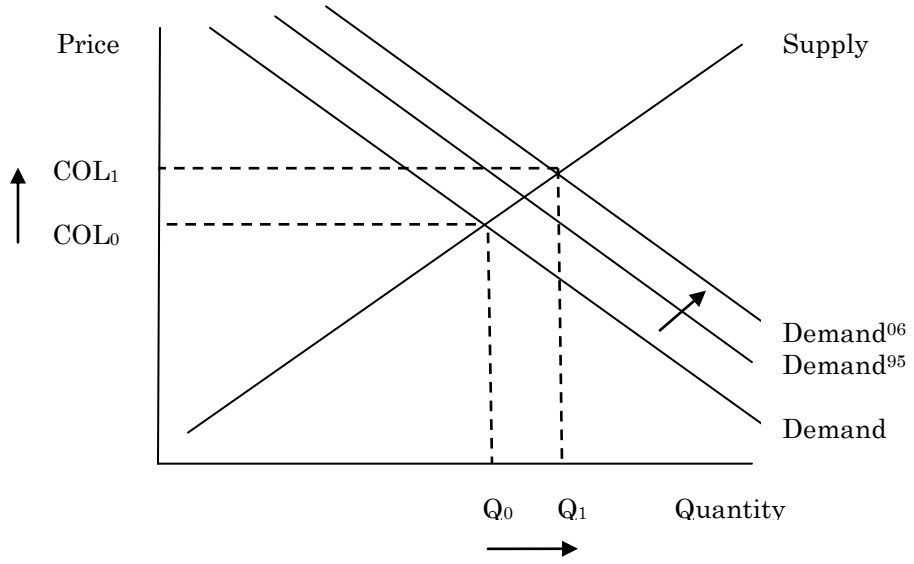
Figure 4.1: The Effects of Per Capita Income on the Cost of Living



[21] A t-statistic was calculated by taking the estimated coefficient and dividing that number by the standard error of the variable.

Now consider the variables in the model that represent amenities or dis-amenities, the coefficient on the heating degree days variable is positive with a statistically significant t-value at the one percent level, for 1995. The variable is negative and statistically insignificant in the 2006 model, therefore the results from the 1995 model will be discussed. Although the economic convention is an inverse relationship, implying that as heating degree days increases, reflecting cooler climates, the overall cost of living is expected to decrease. This relationship represents the dis-incentive of colder climates, impling that consumers are willing to pay a premium for warmer climates. Therefore to the extent that this dis-incentive is capitalized in housing prices the cost of living would decrease as the heating degree days increases, which is the effect observable in the 2006 estimates. Although, this effect may be negated by heating costs, which appears to be what the 1995 estimated model is implying. As the heating degree days increases there is more need for utilities, such as electric and gas, in order to maintain a suitable temperature. Increasing utility cost plays a part in determining a homeowner's budget and therefore may act to increase the cost of living, *ceteris paribus* (Kurre, 2003). Thus, as heating degree days increases it is possible that the net effect is an increase of the overall cost of living. This is the effect that both the 1995 and 2006 models are supporting. A graphical representation of this is shown below.

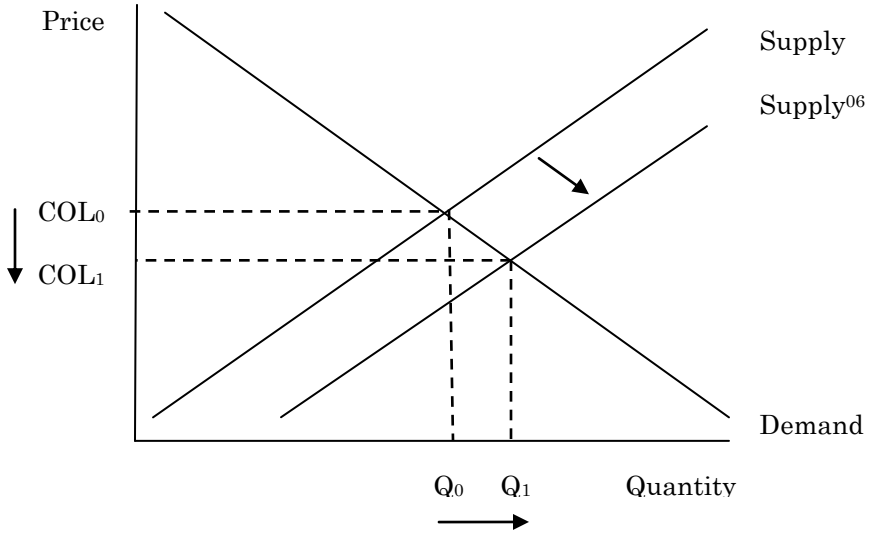
Figure 4.2: The Effects of Heating Degree Days on the Cost of Living



The coefficient on the right-to-work laws variable is expected to be negative. The results are consistent with economic theory and the coefficient has a statistically significant t-value at the one percent level, for 2006 and is insignificant for 1995. This result implies that states enforcing right-to-work laws, which prohibit the "union shops", tend to have weaker unionization. In a labor-market environment with less union power there is less pressure to increase labor cost, hence decreasing unit labor costs in the state. This lower unit labor cost acts to lower the overall cost of living within that state, *ceteris paribus*, due to lower production cost and thus lower final good prices. Also note that the right-to-work law variable is a proxy for a less regulatory environment. Therefore, although there is a inverse relationship with the cost of living the magnitude of the effect caused by right-to-work laws may be smaller that estimated, given that a state that has not enacted right-to-work legislation may also have more regulatory measures in place as well. A graphical representation of this is shown below for 2006, because the effect in 1995 is not clear due to

the insignificance of the variable.

Figure 4.3: The Effects of Right-to-Work Laws on the Cost of Living



Since this study focuses primarily on the effects of right-to-work laws on the overall cost of living further models were examined in order to investigate the insignificance of right-to-work laws in the 1995 model. In order to do this a year dummy variable was created, with a value of one for 1995 and zero for 2006, and the interactions of each variable with the dummy. Then the pooled multiplicative heteroscedasticity regression approach was used to estimate both the pooled model with and without the dummy and interactions.

The results from the pooled model without the dummy and interactions, assumes coefficients on corresponding variables are the same for both years, yielded similar results as the individual models. The pooled model found all variables to be statistically significant, with the exception of the coastal mileage variable, with the correct coefficient signs. Income per capita, heating degree days and right-to-work laws were found to be statistically significant at the one percent level, while the crime rate was significant at the five percent level. The variance function also found the right-to-work variable to be

statistically significant at the one percent level, which supports that there is a systematic difference in variance according to right-to-work laws.

The results from the pooled model with the dummy variable and interactions, or the fully interactive model, provided some insight into the lingering question about right-to-work laws. The results from a Chow test suggest that the coefficients differ between the two years[22]. Furthermore, the results on the variables right-to-work laws and heating degree days, and the corresponding dummy variable interactions for these two variables, indicate that there is a growing effect for these variables over time. The heating degree days variable interaction suggests that this variable has an increasing effect on the cost of living through time, although the relationship is ambiguous. This growing effect may be explained by a particularly mild winter in one of the test years, therefore because this variable lends itself to anomalous results this study focuses on the right-to-work laws interaction results.

The results on the variable for right-to-work laws and the corresponding dummy variable interaction indicate that there is have a negative effect on, or inverse relationship with, the cost of living in a state and that this effect is growing through time. Thus, the variance in cost of living is smaller in right-to-work states, so the model is a better fit for those states that have enacted right-to-work laws versus those that are still forced-unionism states. This explains the insignificance of right-to-work law variable in the 1995 model and the significance of the variable in the 2006 model. Also note that the right-to-work law variable is a proxy for a less regulatory environment. Therefore, although there is a inverse relationship with the cost of living the magnitude of the effect caused by right-

[22] Chow test statistic is 31.46 for the fully interactive model, while the critical value is 22.36, therefore the complete coefficient vector differs over time.

to-work laws may be smaller that estimated, given that a state that has not enacted right-to-work legislation may also have more regulatory measures in place as well.

One explanation of this increasing in the effect of right-to-work laws over time is migration. A fundamental hypothesis in the literature on migration is that differences in the cost of living will motivate people to migrate. As Savageau and D'Agostino (2000) argued, "We… flee living costs that have gotten so high we can't afford them." Sperling and Sanders (2004) reach a similar conclusion in their more recent study. They found evidence that shows while average money incomes are higher in forced-unionism states than in right-to-work states, the cost of living is also higher. Therefore, when this difference in cost of living is taken into account, the adjusted household income is higher in right-to-work states than in forced-unionism states. Thus, it is expected that workers would migrate into right-to-work states. This same evidence was also supported by the research done in a study by Poulson (2005), on the standard of living in right-to-work states. Of course, there is another aspect of why workers are fleeing to right-to-work states.

Another reasoning that workers may flee forced-unionism states, is just that they are 'forced' into unionization. Section 14(b) of the Taft-Hartley Act provides that each state shall have the right to enact "right-to-work" laws, which are laws that provide workers/employees the legal right to refuse to join unions in their place of employment (Blanciforti and Kranner, 1993). Therefore, right-to-work laws give workers the needed protections, while also giving them the freedom they deserve. Right-to-work laws allow workers to make their own decisions on whether to join a union and pay union dues.

Overall, the results were consistent with economic theory. In the next chapter conclusions will be made from interpreting the results focusing on the effects of right-to-work laws on the cost of living.

Chapter V

Summary And Conclusions

The question on whether a state should adopt right-to-work legislation has been a debated topic for several years. While differences of opinion as to the purpose and effect of such laws exists, there is clearly an agreement that right-to-work laws have an effect on the workings of a state. The most common view of right-to-work laws has been that the primary purpose of such legislation is to decrease unionization within a state (Ressler and Mixon, 1993). The debate generally lies in whether a state's population is "better off" in a state that has right-to-work laws. It is argued that forced-unionized states tend to have higher incomes, although other factors play a large role in the well being of a population. Just as personal income varies across regions, so do other factors that influence individual well being, such as cost of living (Poulson, 2005). To ascertain whether employees are really better off in states without right-to-work legislation the main purpose of this study is to evaluate the impact of right-to-work laws on the state level cost of living. This study attempts to empirically analyze and identify the determinants of geographic cost of living in the case of the United States on a state to state basis focusing on the impact of right-to-work laws, for the year 2006.

The determinants of geographic cost of living in the U.S. have been investigated in numerous studies, primarily in the 1980s. Living costs are relevant in a variety of aspects, such as allocating education funds, calculating income transfers, and in relocation decisions (Blanciforti and Kranner, 1993). Living cost differentials have also been found statistically

significant in consistently explaining geographic mobility, thus providing insight to policy makers about the role of factors over which they do or do not have power to control (Toma and Cebula, 2008). The bulk of studies have focused on factors such as income per capita, population density, property taxes, geographic area, and unemployment rates that influence the geographic cost of living (Cebula, 1997; Cebula and Toma, 2000, 2008; Kurre, 2003). This study however also considers amenity, environmental variables, and right-to-work laws into the model.

Below are conclusions drawn from the empirical results of the reduced form equation for the cost of living (Table 4.1). The results of this study suggest evidence that agrees with most experts: under certain conditions, right-to-work laws can play a role in lowering the overall cost of living within a state (Carroll, 1983; Cebula, 1998; Cebula and Toma, 2008). The coefficient on the right-to-work laws variable in the estimated model supports the theory that states enforcing right-to-work laws tend to have weaker unionization, and thus lower overall cost of living. In a labor-market environment with less union power there is less pressure to increase labor cost, hence decreasing unit labor costs in the state. This lower unit labor cost acts to lower the overall cost of living within that state, *ceteris paribus*, due to lower production cost and thus lower final good prices.

This result could potentially be of use to state-level policy makers due to the possible role of right-to-work legislation on the overall cost-of-living. While policy makers have limited to no control over cost-of-living factors, such as climate, land area, and income per capita, there is the possibility that policy makers can increase economic growth and development by enacting simple legislation. To the extent that firms are attracted to states with lower labor cost, and thus production cost, the migration of firms to states with right-to-work laws in place may increase income per capita and lower unemployment rates. Both of which could create an insensitive for population migration into these states.

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Appendix A
Right-To-Work Legislation

Year	Legislation	Brief Summary
1914	The Clayton Act	In response to pressure to clarify labor's position under untitrust laws, Congress, in 1914, enacted the Clayton Act, which included Several major provisions protective of organized labor. The Act stated that "the labor of a human being is not commodity or article of commerce," and provided further that nothing contained in the Federal antitrust laws "shall be construed to forbid the existence and operation of labor...organizations...nor shall Such organizations, or the members thereof, be held or construed to be illegal combinations or conspiracies in restraint of trade under the Anti-trust laws."
1926	Railway Labor Act	In 1926, the Railway Labor Act (RLA) was passed, requiring Employers to bargain collectively and prohibiting discrimination against unions. It applied originally to interstate railroads and Their related undertakings. In 1936, it was amended to include Airlines engaged in interstate commerce.
1931	The Davis-Bacon Act	In 1931, Congress passed the Davis-Bacon Act, requiring that contracts for construction entered into by the Federal Government specify the

		minimum wages to be paid to persons employed under those contracts.
1932	The Norris-laguardia Act	The Norris-laguardia Act, passed in 1932, during the last year of the Hoover Administration, was the first in a series of laws passed by Congress in the 1930s which gave Federal sanction to the right of labor unions to organize and strike, and to use other forms of economic leverage in dealings with management. The law specifically prohibited Federal courts from enforcing So-called "yellow dog" contracts or agreements (under which workers promised not to join a union or promised to discontinue membership in One). In addition, it barred Federal courts from issuing restraining orders or injunctions against activities by labor unions and individuals, including the following: • Joining or organizing a union, or assembling for union purposes, • Striking or refusing to work, or advising others to strike or organize, • Publicizing acts of a labor dispute, • Providing lawful legal aid to persons participating in a labor dispute.

1933	National Industry Recovery Act	In 1933, Congress passed the National Industry Recovery Act (NRA) at the request of newly inaugurated President Franklin Roosevelt. The Act sought to provide codes of "fair competition" and to fix wages and hours in industries subscribing to such codes. Title I of the Act, providing that all codes of fair competition Approved under the Act should guarantee the right of employees to collective bargaining without interference or coercion of employees, was held unconstitutional by the U.S. Supreme Court in 1935.
1935	The Wagner Act	By far the most important labor legislation of the 1930s was the National Labor Relations Act (NLRA) of 1935, more popularly known as The Wagner Act, after its sponsor, Sen. Robert F. Wagner (NY-D). This law included reenactment of the previously invalidated labor sections Of the NRA as well as a number of additions. Among those unfair labor practices forbidden by the Act were: • Dominating or otherwise interfering with formation of a labor union, including the provision of any financial or other support. • Interfering with or restraining employees engaged in the exercise

		of their rights to organize and bargain collectively. • Imposing any special conditions of employment which tended either to encourage or discourage union membership. The law stated, however, that this provision should be construed to prohibit union contracts requiring union membership as a condition of employment in a company -- a provision which, in effect, permitted the closed and union shops. (In the former, only pre-existing members of the union could be hired, in the latter. New employees were required to join the union.) • Discharging or discriminating against an employee because he had given testimony or filed charges under the Act. • Refusing to bargain collectively with unions representing a company's employees.
1936	The Byrnes Act	The Byrnes Act of 1936, named for Sen. James Byrnes (SC-D) and amended in 1938, made it a felony to transport any person in interstate

		commerce who was employed for the purpose of using force of Threats against non-violent picketing in a labor dispute or against organizing or bargaining efforts.
1936	The Walsh-Healy Act	Passed in 1936, the Walsh-Healy Act stated that workers must be paid not less than the "prevailing minimum wage" normally paid in a locality; restricted regular work ing hours to eight hours a day and 40 hours a week, with time-and-a-half pay for additional hours; Prohibited the employment of convicts and children under 18; and established sanitation and safety standards.
1938	Fair Labor Standards	Known as the wage-hour law, this 1938 Act established minimum wages and maximum hours for all workers engaged in covered "interstate Commerce."
1947	The Traft-Hartley Act	In 1947, the Labor-Management Relations Act -- also known as the Taft-Hartley Act was passed by Congress, Vetoed by President Truman (on the basis that it was anti-Labor), and then reapproved over his veto. This comprehensive measure: • Established procedures for delaying or averting so-called "national emergency" strikes, • Excluded supervisory employees from coverage of the Wagner Act,

		• Prohibited the "closed shop" altogether, • Banned closed-shop union hiring halls that discriminated against non-union members. Taft-Hartley retained the Wagner Act's basic guarantees of workers' rights to join unions, bargain collectively, and strike And retained the same list of unfair labor practices forbidden To employers. The Act also added a list of unfair labor practices forbidden to unions.
1959	The Landrum-Grifln Act	The Labor-Management Reporting and Disclosure Act of 1959, also known as the Landrum-Griffin Act, made major additions to the Taft-Hartley Act, including: • Definition of additional unfair labor practices, • A ban on organizational or recognition picketing, • Provisions allowing State labor relations agencies and courts to assume jurisdiction over labor disputes the NLRB declined to consider at the same time prohibiting the NLRB from broadening the categories of cases it would not handle.

*All information from the Congressional Digest, June-July 1993.

Appendix B
Derivation Of Reduced Form Equation

$Q_D=Q_S$

Where:

Q_D, is the quantity demand of a representative bundle of goods and services within state *s*;

Q_S, is the quantity supplied of a representative bundle of goods and services within state *s*.

To find the reduced-form equation note:

$$A_0+\alpha_1 col_s+\alpha_2 pcinc_s+\alpha_3 hdd_s+\alpha_4 coast_s+\alpha_5 cr_s+\mu_1=\lambda_0+\lambda_1 col_s+\lambda_2 cr_s+\lambda_3 hdd+\lambda_4 rtw+\mu_2$$

So that:

$$Col_s=(\lambda_0-\alpha_0/\alpha_1-\lambda_1)+(\lambda_2-\alpha_5/\alpha_1-\lambda_1)\ CR_S+(-\alpha_2/\alpha_1-\lambda_1)PCINC_S+(\lambda_3-\alpha_3/\alpha_1-\lambda_1)HDD_S+(\alpha_4/\alpha_1-\lambda_1)COAST_S+$$

$$(\lambda_4/\alpha_1-\lambda_1)RTW_S+(\mu_2-\mu_1/\alpha_1-\lambda_1)$$

$$=\beta_1+\beta_2 cr_s+\beta_3 pcinc_s+\beta_4 hdd_s+\beta_5 coast_s+\beta_6 rtw_s+\epsilon$$

Where:

ϵ, a stochastic error term.

Appendix C
Descriptive Statistics Of Variables: 1995
(Not Logarithmic Form)

Variable	Mean	Std Dev.	Minimum	Maximum
COL_S	98.428	8.011	88.381	120.030
CR_S	53.969	27.050	8.670	107.100
$PCINC_S$	22067.300	3305.310	16690.000	31814.000
$COAST_S$	94.544	219.272	0.000	1192.330
HDD_S	5557.400	2205.850	853.000	10345.000
RTW_S	0.438	0.501	0.000	1.000
$POPD_S$	148.638	189.371	4.907	910.988

*N=48 for all variables.

Appendix D
Descriptive Statistics Of Variables: 2006
(Not Logarithmic Form)

Variable	Mean	Std Dev.	Minimum	Maximum
COL_S	102.150	13.180	88.500	134.700
CR_S	96.868	139.317	0.459	574.964
$PCINC_S$	33215.800	4933.130	24664.000	47388.000
$COAST_S$	94.544	219.272	0.000	1192.330
HDD_S	5010.540	1938.480	625.000	8782.000
RTW_S	0.458	0.504	0.000	1.000
$POPD_S$	248.184	497.967	5.202	2716.290

*N=48 for all variables.

Appendix E
1995 Data Set

State	COL	PCINC	HDD	CR	Coast	RTW	Dummy
Alabama	90.59	19212.00	3239.00	63.24	53.00	1	1
Arizona	92.56	20074.00	1613.00	71.35	0.00	1	1
Arkansas	89.33	18093.00	3642.00	55.32	0.00	1	1
California	106.90	24091.00	2029.00	96.60	840.00	0	1
Colorado	95.41	23954.00	7053.00	44.02	0.00	0	1
Connecticut	120.03	31814.00	6425.00	40.59	0.00	0	1
Delaware	101.86	26279.00	5051.00	72.50	28.00	0	1
Florida	94.26	23030.00	853.00	107.10	110.65	1	1
Georgia	94.13	21718.00	3218.00	65.71	0.00	1	1
Idaho	89.60	18860.00	6608.00	32.20	0.00	1	1
Illinois	105.79	25310.00	6928.00	99.61	0.00	0	1
Indiana	100.47	21457.00	6453.00	52.47	0.00	0	1
Iowa	99.36	20911.00	7531.00	35.44	0.00	1	1
Kansas	100.97	21855.00	5217.00	42.07	0.00	1	1
Kentucky	90.05	18866.00	5001.00	36.47	309.46	0	1
Louisiana	88.98	19000.00	1939.00	100.74	334.03	1	1
Maine	102.69	20150.00	8338.00	13.14	88.41	0	1
Maryland	103.54	26352.00	5139.00	98.69	225.69	0	1
Massachusetts	115.34	28032.00	6573.00	68.72	0.00	0	1
Michigan	102.09	23943.00	7442.00	68.78	0.00	0	1
Minnesota	105.30	23944.00	9502.00	35.61	78.99	0	1
Mississippi	88.38	16690.00	2826.00	50.28	0.00	1	1
Missouri	101.68	21836.00	5557.00	66.38	0.00	0	1
Montana	89.07	18443.00	8462.00	17.14	0.00	0	1
Nebraska	100.63	21450.00	6809.00	38.20	0.00	1	1
Nevada	97.86	24336.00	3433.00	94.52	153.72	1	1
New Hampshire	92.91	25587.00	7740.00	11.45	139.37	0	1
New Jersey	99.18	29833.00	5707.00	59.98	0.00	0	1
New Mexico	110.83	18158.00	4114.00	81.92	283.05	0	1
New York	115.84	27595.00	6254.00	84.19	305.12	0	1
North Carolina	90.58	21082.00	3894.00	64.64	0.00	1	1
North Dakota	109.12	18621.00	10345.00	8.67	0.00	1	1
Ohio	101.50	22547.00	6532.00	48.25	0.00	0	1

Oklahoma	89.78	18596.00	3667.00	66.41	210.30	0	1
Oregon	91.98	21554.00	4839.00	52.24	0.00	0	1
Pennsylvania	100.64	23580.00	6283.00	42.73	1192.33	0	1
Rhode Island	110.22	23798.00	6097.00	36.80	9.02	0	1
South Carolina	91.71	19031.00	3099.00	98.19	0.00	1	1
South Dakota	98.61	19564.00	8293.00	20.75	0.00	1	1
Tennessee	92.30	21076.00	4449.00	77.15	57.59	1	1
Texas	90.00	21119.00	2000.00	66.39	0.00	1	1
Utah	90.41	18167.00	5613.00	32.88	0.00	1	1
Vermont	104.61	21231.00	8354.00	11.83	25.17	0	1
Virginia	98.16	23985.00	4881.00	36.15	94.19	1	1
Washington	96.28	23701.00	5393.00	48.43	0.00	0	1
West Virginia	89.35	17714.00	5767.00	21.02	0.00	0	1
Wisconsin	102.41	22265.00	8516.00	28.11	0.00	0	1
Wyoming	91.24	20727.00	8037.00	25.42	0.00	1	1

Appendix F
2006 Data Set

State	COL	PCINC	HDD	CR	Coast	RTW	Dummy
Alabama	91.60	29623.00	2651.00	42.52	53.00	1	0
Arizona	104.40	30019.00	3548.00	50.14	0.00	1	0
Arkansas	88.60	26681.00	2066.00	55.16	0.00	1	0
California	134.70	36936.00	2559.00	53.25	840.00	0	0
Colorado	101.50	37510.00	6780.00	39.16	0.00	0	0
Connecticut	127.30	47388.00	5568.00	28.08	0.00	0	0
Delaware	100.30	37088.00	4348.00	68.16	28.00	0	0
Florida	103.60	34001.00	625.00	71.20	110.65	1	0
Georgia	92.10	30914.00	2664.00	47.10	0.00	1	0
Idaho	94.50	28478.00	6556.00	24.72	0.00	1	0
Illinois	95.60	36264.00	6653.00	54.16	0.00	0	0
Indiana	92.90	31173.00	5727.00	31.48	0.00	0	0
Iowa	93.10	31670.00	5281.00	28.35	0.00	1	0
Kansas	90.60	32866.00	4662.00	42.50	0.00	1	0
Kentucky	94.20	28272.00	4133.00	26.30	309.46	0	0
Louisiana	94.60	24664.00	1647.00	69.77	334.03	1	0
Maine	108.60	30808.00	6196.00	11.55	88.41	0	0
Maryland	126.50	41972.00	4251.00	67.86	225.69	0	0
Massachusetts	122.70	43501.00	7625.00	44.70	0.00	0	0
Michigan	101.30	32804.00	6202.00	56.24	0.00	0	0
Minnesota	97.10	37290.00	7923.00	31.20	78.99	0	0
Mississippi	89.40	25051.00	4801.00	29.86	0.00	1	0
Missouri	90.00	31231.00	2432.00	54.56	0.00	0	0
Montana	99.30	29015.00	7635.00	25.37	0.00	0	0
Nebraska	90.20	32923.00	6040.00	28.18	0.00	1	0
Nevada	107.40	35744.00	3078.00	74.16	153.72	1	0
New Hampshire	121.40	37768.00	8782.00	13.87	139.37	0	0
New Jersey	131.70	43831.00	7085.00	35.16	0.00	0	0
New Mexico	103.10	27889.00	4944.00	64.32	283.05	0	0
New York	130.40	39967.00	4460.00	43.49	305.12	0	0
North Carolina	94.00	31041.00	3534.00	47.56	0.00	1	0
North Dakota	93.80	31357.00	5417.00	12.79	0.00	1	0
Ohio	95.40	31860.00	6883.00	35.03	0.00	0	0
Oklahoma	88.50	29948.00	3475.00	49.74	210.30	1	0

Oregon	105.80	32289.00	5038.00	28.03	0.00	0	0
Pennsylvania	100.90	34937.00	5451.00	43.49	1192.33	0	0
Rhode Island	124.40	35324.00	5257.00	22.75	9.02	0	0
South Carolina	94.20	28285.00	2510.00	76.55	0.00	1	0
South Dakota	91.10	32523.00	7350.00	17.14	0.00	1	0
Tennessee	90.80	30969.00	3709.00	76.02	57.59	1	0
Texas	88.90	32460.00	1942.00	51.63	0.00	1	0
Utah	96.10	27321.00	5922.00	22.44	0.00	1	0
Vermont	122.30	32717.00	4126.00	13.66	25.17	0	0
Virginia	103.50	37503.00	7610.00	28.22	94.19	1	0
Washington	104.40	35479.00	5565.00	34.59	0.00	0	0
West Virginia	95.30	26419.00	6995.00	27.97	0.00	0	0
Wisconsin	94.20	33278.00	4982.00	28.40	0.00	0	0
Wyoming	100.90	37305.00	7818.00	23.96	0.00	1	0